CITY OF WOODBURY

LOCAL GOVERNMENT ENERGY AUDIT

FOR
NEW JERSEY
BOARD OF PUBLIC UTILITIES

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TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY 1
2.0 BUILDING INFORMATION AND EXISTING CONDITIONS 3
2.1 City Hall 3
2.2 Public Library 5
2.3 Fire Station 7
3.0 UTILITIES 9
4.0 EPA PORTFOLIO MANAGER 10
5.0 ENERGY CONSERVATION MEASURES 11
5.1 Building Envelope 11
5.1.1 ECM-1 Install Insulation above Ceiling 11
5.1.2 ECM-2 Install Storm Windows 12
5.1.3 ECM-3 Cover Window A/C Units in Winter 12
5.2 HVAC Systems 13
5.2.1 ECM-4 Replace Existing Condensing Units for AHUs 13
5.2.2 ECM-5 HVAC Replacement of Rooftop Units 13
5.2.3 ECM-6 Replace HW Motors w/ Premium Efficiency Motors 14
5.2.4 ECM-7 Replace Window A/C units w/Energy Star Units 14
5.3 Control Systems 15
5.3.1 ECM-8 Night-Set Back 15
5.4 Domestic Hot Water System 15
5.4.1 ECM-9 Replace Electric DHW Heaters with a Condensing Natural Gas DHW Heater 15
5.5 Kitchen Equipment 16
5.5.1 ECM-10 Replace Appliances with Energy Star Alternatives 16
5.6 Plumbing Systems 16
5.6.1 ECM-11 Install Low Flow Plumbing Fixtures 16
5.7 Lighting/Electrical Systems 17
5.7.1 ECM-L1 Lighting Replacement / Upgrades 17
5.7.2 ECM-L2 Install Lighting Controls (Occupancy Sensors) 18
5.7.3 ECM-L3 Lighting Replacements with Controls (Occupancy Sensors) 18

6.0 PROJECT INCENTIVES 20
6.1 Incentives Overview 20
6.1.1 New Jersey Smart Start Program 20
6.1.2 Direct Install Program 20
6.1.3 New Jersey Pay For Performance Program (P4P) 21
6.1.4 Energy Savings Improvement Plan (ESIP) 23
7.0 ALTERNATIVE ENERGY SCREENING EVALUATION 24
7.1 Solar 24
7.1.1 Photovoltaic Rooftop Solar Power Generation 24
7.1.2 Solar Thermal Hot Water Generation 25
7.2 Demand Response Curtailment 25
8.0 CONCLUSIONS & RECOMMENDATIONS 27

APPENDICES

A Utility Usage Analysis and List of Third Party Energy Suppliers
B Equipment Inventory
C ECM Calculations and Cost Estimates
D New Jersey BPU Incentive Programs
i. Smart Start
ii. Direct Install
iii. Pay For Performance Incentive Program (P4P)
iv. Energy Savings Improvement Plan (ESIP)
E Photovoltaic (PV) Solar Power Generation Analysis
F EPA Portfolio Manager

REPORT DISCLAIMER

This audit was conducted in accordance with the standards developed by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) for a Level II audit. Cost and savings calculations for a given measure were estimated to within ±20%, and are based on data obtained from the owner, data obtained during site observations, professional experience, historical data, and standard engineering practice. Cost data does not include soft costs such as engineering fees, legal fees, project management fees, financing, etc.

A thorough walkthrough of the building was performed, which included gathering nameplate information and operating parameters for all accessible equipment and lighting systems. Unless otherwise stated, model, efficiency, and capacity information included in this report were collected directly from equipment nameplates and /or from documentation provided by the owner during the site visit. Typical operation and scheduling information was obtained from interviewing staff and spot measurements taken in the field.

1.0 EXECUTIVE SUMMARY

This energy audit was performed by CHA in connection with the New Jersey Board of Public Utilities' Local Government Energy Audit (LGEA) Program for the City of Woodbury. The purpose of this report is to identify energy savings opportunities associated with major energy consumers and inefficient practices. This report details the results of the energy audit conducted for the buildings listed below:

Building Name	Address	Square Feet	Construction Date
Municipal Complex	33 Delaware Street Woodbury, NJ 08096	29,300	1774, 1997

The potential annual energy and cost savings for each energy conservation measure (ECM) are shown in the following table.

Building Name	Electric Savings (kWh)	NG Savings (therms)	Total Savings ($)	Payback (years)
Municipal Complex	45,229	1,154	7,832	10.6

Each individual measure's annual savings are dependent on that measure alone, there are no interactive effects calculated. There are three options shown for Lighting ECM savings; only one option can be chosen. Incentives shown (if any) are based only on the SmartStart Incentive Program. Other NJBPU or local utility incentives may also be available/ applicable and are discussed in Section 5.0.

Each measure recommended by CHA typically has a simple payback period of 15 years or less to be consistent with the requirements of the Energy Savings Improvement Plan (ESIP) which has a maximum payback period of 15 years. Occasionally, we will recommend an ECM that has a longer payback period, based on the need to replace that piece(s) of equipment, such as a boiler for example.

The following table provides a detailed summary of each ECM by building, including costs, savings, SmartStart incentives and payback.

Summary of Energy Conservation Measures

Municipal Complex	ECM #	Energy Conservation Measure	Est. Costs ($)	Est. Savings ($/year)	Payback w/o Incentive	Potential Incentive ($)*	Payback w/ Incentive	Recommended
X	1	Install Insulation above Ceiling	10,012	762	13.1	0	13.1	X
X	2	Install Storm Windows	7,626	221	34.5	0	34.5	
X	3	Cover Window A/C Units in Winter	650	91	7.1	0	7.1	X
X	4	Replace Existing Condensing Units for AHUs	43,500	381	114.2	2760	106.9	
X	5	HVAC Replacement of Rooftop Units	197,800	720	274.7	4937	267.9	
X	6	Replace HW Motors with Premium Efficiency Motors	1,886	130	14.5	0	14.5	X
X	7	Replace Window A/C units w/Energy Star Units	3,400	105	32.4	0	32.4	
X	8	Night Set-Back	3,000	549	5.5	0	5.5	X
X	9	Replace Electric DHW Heaters w/ a Condensing Natural Gas DHW Heater	58,864	3,427	17.2	1800	16.7	
X	10	Replace Appliances with Energy Star Alternatives	3,000	42	71.4	0	71.4	
X	11	Install Low Flow Plumbing Fixtures	23,800	889	26.8	0	26.8	
X	L1	Lighting Replacement / Upgrades	52,594	4,472	11.8	4760	10.7	
X	L2	Install Lighting Controls (Occupancy Sensors)	22,680	2,257	10.0	2940	8.7	
X	L3	Lighting Replacements with Controls (Occupancy Sensors)	75,274	6,300	11.9	7700	10.7	X
			504,086	**20,346**	**24.8**	**24,897**	**23.6**	
			90,822	**7,832**	**11.6**	**7700**	**10.6**	

2.0 BUILDING INFORMATION AND EXISTING CONDITIONS

2.1 City Hall

Address: 33 Delaware Street, Woodbury, NJ 08096
Gross Floor Area: 5,400
Number of Floors: 2
Year Built: 1774
Additions: 1997
Description of Spaces: Council Chambers, offices, restrooms, storage rooms and boiler room.
Description of Occupancy: The building offers many services to the residents of Woodbury. There are approximately 22 employees in this building.
Number of Computers: The building has approximately 22 desktop and laptop computers.
Building Usage: Hours of operation are 8:30 AM – 4:30 PM Monday through Friday.

Building Envelope

Construction Materials: Framing and plaster with no insulation
Façade: Brick Veneer
Roof: Majority of roof is pitched. The roof composition is acoustical ceiling tile, air gap, wood, and imitation slate shingles. There is a flat adhered rubber membrane section with white reflective surface..
Windows: Building is an historic building and windows cannot be updated without board consent. Windows currently are wood-framed and single pane.
Exterior Doors: Wood framed doors with single pane windows.

Heating Ventilation & Air Conditioning (HVAC) Systems

Heating Systems: The building utilizes (3) Weil Mcclain gas-fired condensing hot water boilers to produce heat. The boilers were installed 4 years ago; have heating input capacities of 310,000 BTU and thermal efficiencies of 93%. These boilers serve heating coils in (3) York air handling units located in attics that provide heating to all the interior spaces. There are also fin tube radiators that provide supplemental heat. There are also (2) 3 HP B&G pumps that pump hot water to the Fire Station's unit heaters hanging on the first and second floor.

Cooling Systems: 100% of the area is cooled by (3) York air handling units each having remote condensing units, located on the roof. Each unit has 10-tons (120,000 BTU/Hr) of cooling capacity which is supplied to the interior spaces through ductwork and diffusers in the ceilings. These units are constant volume units and are 16 years old. Refer to equipment schedule in Appendix B for more information.

Ventilation Systems: The air handling units bring fresh air into the building through outdoor air ducts and distribute to spaces. Facility has operable windows.

Exhaust Systems: The building utilizes exhaust fans of various sizes located on the roof to exhaust air from restrooms and storage areas.

Controls Systems

The building is controlled by a hybrid of an electronic Johnson Control Metasys digital control system (DDC) and pneumatically actuated dampers and valves. The system utilizes an air compressor to produce compressed air needed to actuate valves and dampers. The Metasys system can monitor the pneumatic controls operation.

The boiler plants are provided with their own stand-alone controls systems that control boiler/pump start/stop (based on outdoor air temperatures) and hot water reset, also based on outdoor air temperatures.

Typical setpoints in the facility are 68°F heating and 70°F cooling during occupied times, and 80°F cooling during unoccupied times. The system is capable of doing a temperature setback for heating but the building can't recover due to the poor building envelope so it isn't utilized. Each space has a sensor that is tied into the BAS.

Domestic Hot Water Systems

The building is served by two (2) electric water heaters. The first heater is a 10 gallon 1.5 kW and the second one is a 30 gallon with (2) 4.5 kW elements. These units provide hot water to sinks in restrooms.

Kitchen Equipment

The building does not have a kitchen. Staff members have a designated area with a refrigerator and microwave for breaks and lunch.

Plumbing Systems

The fixtures observed in restrooms were documented as having high flow valves and faucets. The urinals are 2.5 gpf, the toilets are 3.5 gpf and the sinks are 2.5gpm. There are 4 toilets, 1 urinal, and 5 sinks. There aren't any showers in this building.

Lighting / Electrical Systems

The majority of the facility has 32 watt florescent lighting with electronic ballasts. Typically these lamps are present in offices and meeting rooms. In corridors and some other spaces compact fluorescent bulbs of various wattages are used. The basement area has 40W T-12 bulbs with magnetic ballast. All indoor lights are switched manually. Exterior lights are 150MH wall packs controlled by a photocell sensor.

2.2 Public Library

Address: 33 Delaware Street, Woodbury, NJ 08096
Gross Floor Area: 5,756
Number of Floors: 2
Year Built: 1997
Additions: N/A
Description of Spaces: Conference rooms, offices, restrooms, storage rooms and janitor closets.
Description of Occupancy: The building serves as a public library where residents can rent books, use computers, etc. There are approximately 10 employees in this building.
Number of Computers: The building has approximately 30 desktop and laptop computers.
Building Usage: Hours of operation are 10:30 AM – 9:00 PM Monday through Thursday, 10:30 AM – 5:00 PM Friday and 10:30 AM – 1:00 PM Saturday.

Building Envelope

Construction Materials: Framing and plaster with insulation
Facade: Brick Veneer
Roof: Flat roof comprised of structural steel, an insulation layer, and a waterproof membrane.
Windows: Double pane windows with wooden frames.
Exterior Doors: Aluminum framed doors with double pane windows.

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Heating Ventilation & Air Conditioning (HVAC) Systems

Heating Systems: The building utilizes (4) gas fired packaged roof top units to heat the building. Each Rooftop serves a portion of the floor. The HVAC system distributes air through the low pressure ductwork and ceiling diffusers. These units are 2,500 CFM each and are constant volume units.

Cooling Systems: The same (4) gas fired packaged roof top units have cooling that covers 100% of the building. These units are 2,500 CFM each and are constant volume units.

Ventilation Systems: The packaged roof top units bring fresh air into the building through outdoor air dampers and distribute the air to spaces. On average these units bring in 20% OA (outside air). Facility has operable windows.

Exhaust Systems: The building utilizes exhaust fans of various sizes located on the roof to exhaust air from restrooms and storage areas.

Controls Systems

The rooftop units are controlled by programmable thermostats. The control scheme was simplified for the librarians. They can override the set points to adjust the temperature as they see fit.

Typical set points in the facility are 72°F heating and 74°F cooling during occupied times, and 90°F cooling and either 55 or 65°F (depending on the unit) during unoccupied times.

Domestic Hot Water Systems

The building is served by one (1) electric water heater with (2) 4.5 kW heating elements and a capacity of 30 gallons. The thermal efficiency is 80%. The unit supplies hot water to sinks in restrooms.

Kitchen Equipment

The building does not have a kitchen. Staff members have a designated area with a refrigerator and microwave for breaks and lunch. There is also a coffee maker.

Plumbing Systems

The building was built in 1997 and the plumbing fixtures are low flow and existing to the building. There are not any showers in either building.

Lighting / Electrical Systems

The majority of the facility has 32 Watt T-8 florescent lighting with electronic ballast. There is compact fluorescent spot lighting around the perimeter of different wattages. In restrooms and some other spaces compact fluorescent bulbs are also used. All indoor lights are switched manually. Exterior lights are 150MH wall packs controlled by a photocell sensor.

2.3 Fire Station

Address: 29 Delaware Street, Woodbury, NJ 08096
Gross Floor Area: 3,375
Number of Floors: 2
Year Built: 1774
Additions: 1997
Description of Spaces: game rooms, meeting room, offices, restrooms, storage rooms and museum.
Description of Occupancy: The building serves as a museum and a fire station. There are approximately 4 full-time employees in this building plus volunteers.
Number of Computers: The building has approximately 7 desktop and laptop computers.
Building Usage: Hours of operation are 7:00 AM – 4:00 PM Monday through Sunday. Volunteers man the station after the full-time employees leave.

Building Envelope

Construction Materials: Framing and plaster with no insulation
Facade: Brick Veneer
Roof: Majority of roof is pitched. The roof composition is wood, tar paper and imitation slate shingles. There is a flat adhered rubber membrane section over the fireman museum.
Windows: Double pane windows.
Exterior Doors: Aluminum framed doors with single pane windows.

Heating Ventilation & Air Conditioning (HVAC) Systems

Heating Systems: The first floor of fire station is heated by (4) hot water unit heaters that are fed from the boilers installed in the basement of the city call building. There is also some fin tube radiators on the second floor and a unit heater that are fed from the same source. The fireman museum is heated by a gas fired furnace located in an adjacent closet.

Cooling Systems: Cooling is provided to only office spaces by eight window air conditioning units. These units are 1-ton (12,000 BTU/HR) in size. The fireman museum has a separate remote electric DX condensing unit, located on the roof of the library, which serves a coiling coil in the ductwork of the furnace system to provide cooling for that space.

Ventilation Systems: Facility has operable windows, no mechanical ventilation.

Exhaust Systems: The restrooms do not have dedicated exhaust fans. However, each restroom has an operable window.

Controls Systems

The unit heaters are controlled by thermostats. The occupants have control over the desired temperature. The employees control the window air-conditioning units for cooling.

Domestic Hot Water Systems

In the storage closet on the first floor there is an electric water heater that serves the restrooms in this building. The heater capacity is 40 gallons with a 4.5 kW heating element. This unit supplies hot water to sinks and a shower in the building.

Kitchen Equipment

The building does not have commercial kitchen nor dedicated kitchen hood. It has a residential stove with a (2) refrigerator and microwave. The staff uses this area as a break room and a place to eat meals.

Plumbing Systems

The fixtures are older vintage. It is estimated that these fixtures were not updated in 1997 with the renovation. The urinals are 2.5 gpf, the toilets are 3.5 gpf and the sinks are 2.5gpm. There are 2 toilets, 1 urinal, and 1 sinks. There is one shower also.

Lighting / Electrical Systems

The facility has 32 watt T-8 florescent lighting with electronic ballast. There are some areas where incandescent bulbs have been replaced with compact fluorescent equivalents. However, some fixtures still need to be replaced. Several 165W were found in the Museum and 60W incandescent bulbs were found in the pool room and the kitchen / dining area. The lights are switched manually. Exterior lights are 150MH wall packs controlled by a photocell sensor.

3.0 UTILITIES

Utilities include electricity and natural gas. Electricity is delivered and supplied by Public Service Electric & Gas (PSE&G). Natural gas is delivered and supplied by Public Service Electric & Gas (PSE&G). Water bills were not provided by the City of Woodbury. However, the unit cost information for the water was provided.

For the 12-month period ending in December 2013, the utilities usages for the buildings were as follows:

Electric							
Building Name	**Acct No.**	**Annual Usage** kWh	**Annual Cost** $	**Blended Rate** $/kWh	**Supply Rate** $/kWh	**Peak Demand** kW	**Demand Rate** $/kW
Municipal Complex	67 114 395 03 / 67 114 404 04	331,950	48,716	0.147	.114	102.3	11.79

Blended Rate: Average rate charged determined by the annual cost / annual usage
Supply Rate: Actual rate charged for electricity usage in kWh
Demand Rate: Rate charged for actual electrical demand in kW

Natural Gas			
Building Name	**Annual Usage** Therms	**Annual Cost** $	**Rate** $/Therm
Municipal Complex	23,888	27,497	1.15

Electrical usage was generally higher in the summer months when cooling equipment was operational. Natural gas consumption was highest in winter months for heating. See Appendix A for a detailed utility analysis. See Appendix A for a detailed utility analysis.

Under New Jersey's energy deregulation law, the supply portion of the electric (or natural gas) bill is separated from the delivery portion. The supply portion is open to competition, and customers can shop around for the best price for their energy suppliers. The electric and natural gas distribution utilities will still deliver the gas/ electric supplies through their wires and pipes – and respond to emergencies, should they arise – regardless of where those supplies are purchased. Purchasing the energy supplies from a company other than your electric or gas utility is purely an economic decision; it has no impact on the reliability or safety of the service. Additional information on selecting a third party energy supplier is available here:

http://www.state.nj.us/bpu/commercial/shopping.html.

See Appendix A for a list of third-party energy suppliers licensed by the Board of Public Utilities to sell within the building's service area.

4.0 EPA PORTFOLIO MANAGER

The EPA Portfolio Manager benchmarking tool was used to assess the building's energy performance. Portfolio Manager provides a site and source Energy Use Intensity (EUI), as well as an Energy Star performance rating for qualifying building types. The EUIs are provided in kBtu/ft^2/year, and the performance rating represents how energy efficient a building is on a scale of 1 to 100, with 100 being the most efficient. In order for a building to receive and Energy Star label, the energy benchmark rating must be at least 75. As energy use decreases from implementation of the proposed measures, the Energy Star rating will increase.

The site EUI is the amount of heat and electricity consumed by a building as reflected in utility bills. Site energy may be delivered to a facility in the form of primary energy, which is raw fuel burned to create heat or electricity, such as natural gas or oil; or as secondary energy, which is the product created from a raw fuel such as electricity or district steam. To provide an equitable comparison for different buildings with varying proportions of primary and secondary energy consumption, Portfolio Manager uses the convention of source EUIs. The source energy also accounts for losses incurred in production, storage, transmission, and delivery of energy to the site, which provide an equivalent measure for various types of buildings with differing energy sources. The results of the Portfolio Manager benchmarking tool are contained in the table below.

Building	Site EUI kBtu/ft^2/yr	Source EUI Btu/ft^2/yr	Energy Star Rating (1-100)
Municipal Complex	352.7	705	N/A

The municipal Complex was not eligible for an Energy Start Rating due to the buildings not meeting the property type, property use, and/or energy data requirements of the EPA. The municipal Complex is a poor performer based on site/source EUI. This is most likely attributed to poor building envelop. By implementing the measures discussed in this report, it is expected that the EUI can be further reduced and the Energy Star Rating further increased.

The Portfolio Manager account can be accessed by entering the username and password shown below at the login screen of the Portfolio Manager website (https://www.energystar.gov/istar/pmpam/).

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

The user name and password for the building's EPA Portfolio Manager Account has been provided to Randi Woerner, Economic Development Director of the City of Woodbury.

[redacted] [redacted]

5.0 ENERGY CONSERVATION MEASURES

Energy conservation measures (ECM's) are energy savings recommendations that typically require a financial investment. Energy savings can be in the form of:

- electrical demand (KW=kilowatts),
- electrical usage (Kwh=Kilowatt-hour),
- natural gas (Therms=100,000 BTU),
- propane gas (Gallons=91,650 BTU),
- Fuel Oil (Gallons =138,700 Btu), and
- water (KGAL=1,000 gallons).

These recommendations are influenced by the time period that it takes to "break even" referred to as "Simple Payback". Simple payback is calculated by dividing the cost of implementing the ECM by the energy cost savings (in dollars) of that ECM.

Another financial indicator of the performance of a particular ECM is the Return on Investment or ROI.

Two other financial analyses included in this report are Internal Rate of Return (IRR) and Net Present Value (NPV). Internal Rate of Return is the discount rate at which the present value of a project costs equals the present value of the project savings. Net Present Value is the difference between present value of an investment's future net cash flows and the initial investment. If the NPV equals "0", the project would equate to investing the same amount of dollars at the desired rate. NPV is sometimes referred to as Net Present Worth. These values are provided in the Summary Tab in Appendix C.

5.1 Building Envelope

5.1.1 ECM-1 Install Insulation above Ceiling

Majority of the roof of the city hall portion of the building is pitched. The roof composition is acoustical ceiling tile, air gap, wood, and imitation slate shingles. There is a flat adhered rubber membrane section with white reflective surface. Due to the vintage of the construction of the building insulation is not present. During the renovation of 1997 insulation was not added. This ECM addressed blowing in 6" of loose-fill cellulose insulation (R-2.7/inch) between the ceiling joists of the attic to minimize heating and cooling energy losses.

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

ECM-1 Install Insulation above Ceiling

Building Name	Budget Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	10,012	110	0	597	762	0.9	0	13.1	13.1

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.1.2 ECM-2 Install Storm Windows

The City Hall Building is an historic building and windows cannot be updated without board consent. Windows currently are wood-framed and single pane. There are infiltration issues in areas. All windows are constructed with wood frames and single pane glazing. Since this building is an historic building the windows cannot be updated like the firehouse and library. To help solve the infiltration issues it was deemed adding storm windows was the most cost effective solution. This ECM will decrease heating and cooling energy losses as well as increasing occupant comfort.

The calculation uses bin weather data estimate the occupied and unoccupied bin hours. This is converted to existing energy for the occupied and unoccupied cases using the existing window U-factor and the heating and cooling temperature. The two are summed together to create the annual utility usage for the baseline. The same steps are done to calculate the proposed utility usage. The difference in heating losses through the windows results in annual heating natural gas and cooling electricity savings.

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

ECM-2 Install Storm Windows

Building Name	Budget Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	7,626	147	0	174	221	(0.6)	0	>15	>15

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.1.3 ECM-3 Cover Window A/C Units in Winter

The firehouse has a total of 8 window air conditioners. Seals between these units and the window openings fail over time leading to infiltration of unconditioned outside air and exfiltration of conditioned air which results in increased heating energy usage. Installing interior shell covers onto all of the A/C units will reduce infiltration, and will result in a reduction of the buildings heating loads, therefore, providing natural gas savings.

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

ECM-3 Cover Window A/C Units in Winter

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	650	0	0	79	91	1.1	0	7.2	7.2

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.2 HVAC Systems

The following are ECMs associated with the HVAC Systems.

5.2.1 ECM-4 Replace Existing Condensing Units for AHUs

The City Hall Building has (3) air handling units in the attic space that serves different areas of the building. These air handling units each have remote condensing units for cooling. These condensing units were installed in 1997. Although these units are still in good working condition they are nearing the end of their useful life according to ASHRAE.

It is recommended that these units be replaced with new models that will operate at a higher energy efficiency ratio (EER). This ECM assesses the replacement of each of the condensing units and associated energy savings.

The assumption of this calculation is that the operating hours and capacity remain the same. The energy savings is the result of operating a higher efficiency unit.

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

ECM-4 Replace Existing Condensing Units for AHUs

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	43,500	2,593	0	0	381	(0.9)	2,760	>15	>15

* Incentive shown is per the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.2.2 ECM-5 HVAC Replacement of Rooftop Units

The Library has (4) gas-fired heating / DX cooling packaged rooftop units that were installed in 1997. Although these units are still in good working condition they are nearing the end of their useful life according to ASHRAE.

It is recommended that these units be replaced with new models that will operate at a higher energy efficiency ratio (EER). This ECM assesses the replacement of each of the RTUs in question and gives the resulting energy savings.

It is assumed in the performance of this calculation that the operating hours, number of units, and capacity stays the same. The energy savings result from properly operating units and higher efficiency units over existing units.

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

ECM-5 HVAC Replacement of Rooftop Units

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	197,800	4,900	0	0	720	(0.9)	4,937	>15	>15

* Incentive shown is per the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.2.3 ECM-6 Replace HW Motors w/ Premium Efficiency Motors

The hot water plant of the municipal building located in the basement of City Hall uses two (2) 3 HP pumps. The pumps are constant flow with 84% efficiency motors. By adding inverter duty premium efficiency motors with an estimated efficiency of 90% significant electrical energy can be saved.

The calculation uses electrical nameplate data (HP) from the motor, efficiency and the runtime hours to estimate the annual electrical usage in kWh. The proposed annual electrical usage in kWh is calculated from converting the electrical nameplate data (HP) from the motor to kW using the efficiency multiplied by the runtime hours. The difference between the two values is the energy savings.

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

ECM-6 Replace HW Motors with Premium Efficiency Motors

Building Name	Budget Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	1,886	888	0	0	130	0.3	0	14.5	14.5

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.2.4 ECM-7 Replace Window A/C units w/Energy Star Units

The Fire House has eight (8) 1.5 ton (18,000 BTU/Hr) window mounted A/C units. These units were older units and use more energy than newer ENERGY STAR models. This ECM assesses replacing the window units with newer Energy Star appliances to be installed by the maintenance staff.

The assumption of this calculation is that the operating hours and capacity stay the same. The energy saving results from operating a higher efficiency unit.

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

ECM-7 Replace Window A/C units w/Energy Star Units

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	3,400	645	0	0	95	(0.3)	0	>15	>15

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.3 Control Systems

The following are ECMs associated with the Controls Systems:

5.3.1 ECM-8 Night-Set Back

The City Hall building has the ability to use night time set-back but because of the poor envelope conditions, which equate to the building not being able to recover in the winter, it is not utilized. To implement this ECM the building envelope will have to be upgraded. Several recommendations have been mentioned in the building envelope section. This ECM accesses being able to lower the unoccupied temperature at night which will result in an energy savings.

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

ECM-8 Night Set-Back

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	3,000	0	0	478	549	1.7	0	5.5	5.5

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.4 Domestic Hot Water System

5.4.1 ECM-9 Replace Electric DHW Heaters with a Condensing Natural Gas DHW Heater

The Library, Fire House, and City Hall Buildings have electric heaters that can be converted to natural gas tankless heaters with a higher efficiency. The natural gas for this area has booster pumps on it and is not consistent. However, if the utility company can supply enough gas to these buildings; this could be a significant energy saver.
According to the U.S. Department of Energy, 2.5% of stored capacity is lost every hour during DHW heater standby. This value was applied to the total volume to determine annual standby losses. Proposed efficiency was based on a typical high efficiency natural gas condensing type hot water heater. In some instances, a tankless condensing

unit was proposed. The new water heater will require water and gas piping modifications, venting, and electrical connections.

ECM-9 Replace Electric DHW Heaters w/ a Condensing Natural Gas DHW Heater

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	58,864	7,331	20	(146)	3,427	(0.1)	1,800	>15	>15

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.5 Kitchen Equipment

The following are ECMs associated with the Kitchen Equipment.

5.5.1 ECM-10 Replace Appliances with Energy Star Alternatives

The buildings have appliances are older style microwaves, and refrigerators. Switching to newer style energy star models can save up to 10% off the electric bills. This ECM assesses changing these appliances to ENERGY STAR models.

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

ECM-10 Replace Appliances with Energy Star Alternatives

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	3,000	291	0	0	42	(0.8)	0	>15	>15

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.6 Plumbing Systems

The following are ECMs associated with the Plumbing Systems.

5.6.1 ECM-11 Install Low Flow Plumbing Fixtures

During the audit some buildings were found to have high flow plumbing fixtures. Sinks are 2.5 gpm, urinals are 2.5 gal / flush and toilets were 3.5 gal / flush. The numbers used in this analysis are the fixtures of each type that were found to be high flow. These numbers do not represent all the fixtures in the building.

Building	Toilets	Urinals	Sinks
City Hall	4	1	5
Fire House	2	1	1

The water savings associated from replacing these fixtures with low-flow fixtures was calculated by taking the difference of the annual water usage for the proposed and base case. The basis of this calculation is the number of times each fixture is used, gallons per use, and number of fixtures. Replacing the existing fixtures in the restrooms with 1.28 gals/flush toilets, 1.0 gal/flush urinals, and 0.5 gpm faucets will conserve water which will result in lower annual water and sewer charges.

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

ECM-11 Install Low Flow Plumbing Fixtures

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Water					
	$	kWh	kW	Kgal/yr.	$		$	Years	Years
Municipal Complex	23,800	0	0	53	889	(0.4)	0	>15	>15

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.7 Lighting/Electrical Systems

The following are ECMs associated with the Lighting/Electrical Systems.

5.7.1 ECM-L1 Lighting Replacement / Upgrades

Typically the buildings have 32 Watt T-8 florescent lighting with electronic ballast. There were some spaces found with T-12 bulbs with magnetic ballast and/or incandescent bulbs. This ECM addresses updating all the fixtures with more efficient bulbs. T-8 and T-12 bulbs can be relamped and reballasted to super T-8s and incandescent will be changed to compact fluorescent bulbs. Metal Halides on the exterior of buildings have LED options also. We investigated the LED retrofit and determined that the payback was poor vs retrofitting with Super T-8.

Energy savings for this measure were calculated by comparing the existing and proposed fixture wattages and using estimated times of operation. These calculations are based upon 1 to 1 replacements with the fixtures. They do not take into account lumen output and square footage. A more comprehensive study may be performed to determine correct lighting levels.

Supporting calculations, including assumptions for lighting hours and annual energy usage for each fixture, are provided in Appendix C and summarized below:

ECM-L1 Lighting Replacement / Upgrades

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	52,594	28,189	9	0	4,472	0.5	4,760	11.8	10.7

* Incentive shown is per the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.7.2 ECM-L2 Install Lighting Controls (Occupancy Sensors)

The buildings currently do not have occupancy sensors.

Review of the comprehensive lighting survey determined that lighting in these areas could benefit from installation of occupancy sensors to turn off lights when the areas are unoccupied.

This measure recommends installing occupancy sensors for the current lighting system. Using a process similar to that utilized in Section 5.7.1, the energy savings for this measure was calculated by applying the known fixture wattages in the space to the estimated existing and proposed times of operation for each fixture.

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

ECM-L2 Install Lighting Controls (Occupancy Sensors)

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	22,680	19,801	0	0	2,257	0.9	2,940	10.0	8.7

* Incentive shown is per the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

5.7.3 ECM-L3 Lighting Replacements with Controls (Occupancy Sensors)

This measure is a combination of ECM-L1 and ECM-L2; recommending replace/upgrade the current lighting fixtures to more efficient ones and installing occupancy sensors on the new lights. Interactive effects of the higher efficiency lights and occupancy sensors lead the energy and cost savings for this measure to not be cumulative or equivalent to the sum of replacing the lighting fixtures alone and installing occupancy sensors without the lighting upgrade. We investigated the LED retrofit and determined that the payback was poor vs retrofitting with Super T-8 w/ controls

.

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

ECM-L3 Lighting Replacements with Controls (Occupancy Sensors)

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
		Electricity		Natural Gas					
	$	kWh	kW	Therms	$		$	Years	Years
Municipal Complex	75,274	44,231	9	0	6,300	0.4	7,700	11.9	10.7

* Incentive shown is per the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

6.0 PROJECT INCENTIVES

6.1 Incentives Overview

The following sections give detailed information on available incentive programs including New Jersey Smart Start, Direct Install, New Jersey Pay for Performance (P4P) and Energy Savings Improvement Plan (ESIP). If the Building District wishes to and is eligible to participate in the Energy Savings Improvement Plan (ESIP) program and/or the Pay for Performance Incentive Program (P4P), it cannot participate in either the Smart Start or Direct Install Programs. Refer to Appendix D for more information on the Smart Start program.

6.1.1 New Jersey Smart Start Program

For this energy audit, The New Jersey Smart Start Incentives are used in the energy savings calculations, where applicable. This program is intended for medium and large energy users and provides incentives for:

- Electric Chillers
- Gas Chillers
- Gas Heating
- Unitary HVAC
- Ground Source Heat Pumps
- Variable frequency Drives/ motors
- Refrigeration
- Prescriptive and performance lighting and lighting controls

The equipment is procured using a typical bid- build method, installed and paid for and then the incentives are reimbursed to the building.

Refer to appendix D for more information on the Smart Start program.

6.1.2 Direct Install Program

The Direct Install Program applies to smaller facilities that have a peak electrical demand of 200 kW or less 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 utility companies.

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 70% of the costs for lighting, HVAC, motors, refrigeration, and other equipment upgrades with higher efficiency alternatives. If a building is eligible for this funding, the Direct Install Program can reduce the implementation cost of energy conservation projects.

The Direct Install program has specific HVAC equipment and lighting requirements and is generally applicable only to smaller package HVAC units, small boilers and lighting retrofits.

The program pays a maximum amount of $75,000 per building, and up to $250,000 per customer per year. Installations must be completed by an approved Direct Install participating contractor, a list of which can be found on the New Jersey Clean Energy Website. Contractors will coordinate with the applicant to arrange installation of recommended measures identified in a previous energy assessment, such as this energy audit. The incentive is reimbursed to City of Woodbury upon successful replacement and payment of the equipment.

The following table summarizes the eligibility of each building for Direct Install. If a building does not qualify, it is because the electrical demand is greater than the maximum peak electrical demand of 200 kW for the last 12 month period.

Building Name	Eligible for Direct Install (Y/N)
City Hall	Y
The Public Library	Y
Fire Station	Y

Refer to Appendix D for more information on this program.

6.1.3 New Jersey Pay For Performance Program (P4P)

The buildings may be eligible for incentives from the New Jersey Office of Clean Energy. The most significant incentives are available from the New Jersey Pay for Performance (P4P) Program. The P4P program is designed to offset the cost of energy conservation projects for facilities that pay the Societal Benefits Charge (SBC) and whose demand (kW) in any of the preceding 12 months exceeds 100 kW. This demand minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations and *is not applicable to public buildings*. 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). Additionally, the overall return on investment (ROI) must exceed 10%. 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. 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 ERP must include a detailed energy audit of the desired ECMs, energy savings calculations (using building modeling software) and inputting of all utility bills into the EPA Portfolio Manager website.

- Incentive Amount: $0.10/SF
- Minimum incentive: $5,000
- Maximum Incentive: $50,000 or 50% of Facility annual energy cost

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. The ERP must be completed by a Certified Energy Manager (CEM) and submitted along with the project application.

Incentive #2: Installation of Recommended Measures – This incentive is based on projected energy savings as determined in Incentive #1 (Minimum 15% savings must be achieved), and is paid upon successful installation of recommended measures.

Electric

- Base incentive based on 15% savings: $0.09/ per projected kWh saved.
- For each % over 15% add: $0.005 per projected kWh saved.
- Maximum incentive: $0.11/ kWh per projected kWh saved.

Gas

- Base incentive based on 15% savings: $0.90/ per projected Therm saved.
- For each % over 15% add: $0.05 per projected Therm saved.
- Maximum incentive: $1.25 per projected Therm saved.

Incentive cap: 25% 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.

Electric

- Base incentive based on 15% savings: $0.09/ per projected kWh saved.
- For each % over 15% add: $0.005 per projected kWh saved.
- Maximum incentive: $0.11/ kWh per projected kWh saved.

Gas

- Base incentive based on 15% savings: $0.90/ per projected Therm saved.
- For each % over 15% add: $0.05 per projected Therm saved.
- Maximum incentive: $1.25 per projected Therm saved.

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.

For the purpose of demonstrating the eligibility of the ECM's to meet the minimum savings requirement of 15% annual savings and 10% ROI for the Pay for Performance Program, all ECM's identified in this report have been included in the incentive calculations. The results for each building are shown in Appendix D, along with more detailed program information.

6.1.4 Energy Savings Improvement Plan (ESIP)

The Energy Savings Improvement Program (ESIP) allows government agencies to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. Under the recently enacted Chapter 4 of the Laws of 2009 (the law), the ESIP provides all government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources.

ESIP allows local units to use “energy savings obligations” (ESO) to pay for the capital costs of energy improvements to their facilities. This can be done over a maximum term of 15 years. ESOs are not considered “new general obligation debt” of a local unit and do not count against debt limits or require voter approval. They may be issued as refunding bonds or leases. Savings generated from the installation of energy conservation measures pay the principal of and interest on the bonds; for that reason, the debt service created by the ESOs is not paid from the debt service fund, but is paid from the general fund.

For local governments interested in pursuing an ESIP, the first step is to perform an energy audit. Pursuing a Local Government Energy Audit through New Jersey's Clean Energy Program is a valuable first step to the ESIP approach. The “Local Finance Notice” outlines how local governments can develop and implement an ESIP for their facilities. The ESIP can be prepared internally if the entity has qualified staff. If not, the ESIP must be implemented by an independent contractor and not by the energy savings company producing the Energy Reduction Plan.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Local units should carefully consider all alternatives to develop an approach that best meets their needs. Refer to Appendix D for more information on this program.

7.0 ALTERNATIVE ENERGY SCREENING EVALUATION

7.1 Solar

7.1.1 Photovoltaic Rooftop Solar Power Generation

The 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. The amount of available roof area determines how large of a solar array can be installed on any given roof. The table below summarizes the approximate roof area available on each building and the associated solar array size that can be installed.

Building Name	Available Roof Area	System Size
	Ft^2	kW
Municipal Complex	3,461	20.0

The PVWATTS solar power generation model was utilized to calculate PV power generation; this model is provided in Appendix E.

Installation of (PV) arrays in the state New Jersey will allow the owner to participate in the New Jersey Solar Renewable Energy Certificates Program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1000 kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. Payments that will be received by the PV producer (building) will change from year to year dependent upon supply and demand. There is no definitive way to calculate an exact price that will be received by the PV producer for SREC credits over the next 15 years. Renewable Energy Consultants estimates an average of $170/SREC for 2013 and this number was utilized in the cash flow for this report.

The system costs for PV installations were derived from recent solar contractor budgetary pricing in the state of New Jersey and include the total cost of the system installation (PV panels, inverters, wiring, ballast, controls). The cost of installation is currently about $4.00 per watt or $4,000 per kW of installed system, for a typical 100 kW system. There are other considerations that have not been included in this pricing, such as the condition of the roof and need for structural reinforcement. Photovoltaic systems can be ground mounted if the roof is not suitable, however, this installation requires a substantial amount of open property (not wooded) and underground wiring, which adds more cost. 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 most likely need to be replaced during the useful life of the PV system.

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

Building Name	Budgetary Cost	Annual Utility Savings			Total Savings	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)	Recommended
		Electricity		Natural Gas					
	$	kW	kWh*	Therms	$	$	Years	Years	Y/N
Municipal Complex	80,000	20.0	26,275	0	3,941	3,941	20.3	9.5	Y

* Calculated based on historical data for 08096 zip code; annual kWh savings will change based on actual location
** Estimated Solar Renewable Energy Certificate Program (SREC) at $170/1000 kWh

Note: The installation of PV Solar arrays are only recommended for buildings whose individual paybacks are less than 15 years. Before implementation is pursued, the building should hire a certified solar PV contractor.

7.1.2 Solar Thermal Hot Water Generation

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

A standard solar hot water system is typically composed of solar collectors, heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually placed on the roof of the building, oriented south, and tilted around the site's latitude, to maximize the amount of radiation collected on a yearly basis.

Several options exist for using active solar thermal systems for space heating. The most common method involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system). The most practical system would transfer the heat from the panels to thermal storage tanks and transfer solar produced thermal energy to use for domestic hot water production. DHW is presently produced by gas-fired water heaters and, therefore, this measure would offer natural gas utility savings.

Factoring in free area and efficiency of the passive solar heating systems, the effectiveness of the solar thermal hot water would not maximize and therefore this measure is not recommended.

7.2 Demand Response Curtailment

Presently, electricity is delivered by Jersey Central Power & Lights (JCP&L), which receives the electricity from regional power grid RFC East. PJM Interconnection is the

regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia including the State of New Jersey.

Utility Curtailment is an agreement with the utility provider's 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 utility provider offers incentives to the CSP to participate in this program. Enrolling in the program will require program participants to drop electrical load or turn on emergency generators during high electrical demand conditions or during emergencies. Part of the program also will require that program participants reduce their required load or run emergency generators with notice to test the system.

A pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. From January 2012 through December 2013 the following table describes the electricity load profile for each building.

Building Name	Peak Demand kW	Min Demand kW	Avg Demand kW	Onsite Generation Y/N	Eligible? Y/N
Municipal Complex	102.3	48.3	78.8	N	N

Implementation for this measure will require a load shedding sequence to be established by using a demand control system. If the building has onsite electricity generation available, some load can be supplemented by running that device.

8.0 CONCLUSIONS & RECOMMENDATIONS

The LGEA energy audit conducted by CHA for the City of Woodbury identified potential annual savings of $7,832/yr with an overall payback of 10.6 years, if the recommended ECMs are implemented.

Municipal Complex	ECM #	Energy Conservation Measure	Est. Costs ($)	Est. Savings ($/year)	Payback w/o Incentive	Potential Incentive ($)*	Payback w/ Incentive	Recommended
X	1	Install Insulation above Ceiling	10,012	762	13.1	0	13.1	X
X	3	Cover Window A/C Units in Winter	650	91	7.1	0	7.1	X
X	6	Replace HW Motors with Premium Efficiency Motors	1,886	130	14.5	0	14.5	X
X	8	Night Set-Back	3,000	549	5.5	0	5.5	X
X	L3	Lighting Replacements with Controls (Occupancy Sensors)	75,274	6,300	11.9	7700	10.7	X
			90,822	**7,832**	**11.6**	**7,700**	**10.6**	
			90,822	**7,832**	**11.6**	**7700**	**10.6**	

APPENDIX A

Utility Usage Analysis and Alternate Utility Suppliers

City of Woodbury
33 Delaware St, Woodbury, NJ 08096

Utility Bills: Account Numbers

Account Number	Building	Location	Type	Notes
67 114 395 03 / 67 114 404 04	Municipal Complex - Combined	33 Delaware St, Woodbury, NJ 08096	Electricity	
67 114 404 04	Municipal Complex / Library	33 Delaware St, Woodbury, NJ 08096	Natural Gas	

City of Woodbury
33 Delaware St, Woodbury, NJ 08096

For Service at: **Municipal Complex - Combined**
Account No.: **67 114 395 03 / 67 114 404 04** **Delivery -** PSE&G
Meter No.: **678000885, 9199409** **Supplier -** South Jersey Energy
Electric Service

			Provider Charges			Usage (kWh) vs. Demand (kW) Charges		Unit Costs		
Month	**Consumption (kWh)**	**Demand (kW)**	**Delivery ($)**	**Supplier ($)**	**Total ($)**	**Consumption ($)**	**Demand ($)**	**Blended Rate ($/kWh)**	**Consumption ($/kWh)**	**Demand ($/kW)**
January-12	27,060	73.40	1,187.00	3,012.97	4,199.97	3,880.24	319.73	0.16	0.14	4.36
February-12	26,205	77.70	1,178.13	3,055.43	4,233.56	3,895.62	337.94	0.16	0.15	4.35
March-12	20,625	78.00	958.13	2,400.61	3,358.74	3,061.90	296.84	0.16	0.15	3.81
April-12	21,173	71.60	943.27	2,450.45	3,393.72	3,129.28	264.44	0.16	0.15	3.69
May-12	22,373	77.60	1,007.16	2,542.92	3,550.08	3,260.22	289.86	0.16	0.15	3.74
June-12	28,110	57.80	1,825.11	2,781.99	4,607.10	3,899.01	708.09	0.16	0.14	12.25
July-12	36,465	103.70	2,723.98	3,504.48	6,228.46	4,965.01	1,263.45	0.17	0.14	12.18
August-12	30,300	93.20	2,310.75	2,949.21	5,259.96	4,164.69	1,095.27	0.17	0.14	11.75
September-12	27,690	87.20	2,133.46	2,752.46	4,885.92	3,863.25	1,022.67	0.18	0.14	11.73
October-12	23,745	74.90	1,120.59	2,466.95	3,587.54	3,261.46	326.08	0.15	0.14	4.35
November-12	18,833	49.10	843.37	1,816.94	2,660.31	2,443.53	216.78	0.14	0.13	4.42
December-12	22,673	45.50	955.88	2,114.54	3,070.42	2,868.89	201.53	0.14	0.13	4.43
January-13	24,390	77.60	1,169.81	1,890.23	3,060.04	2,719.33	340.71	0.13	0.11	4.39
February-13	19,110	76.70	950.57	1,556.45	2,507.02	2,170.17	336.85	0.13	0.11	4.39
March-13	33,300	68.10	1,366.33	2,946.76	4,313.09	4,013.05	300.04	0.13	0.12	4.41
April-13	23,280	78.90	1,091.72	1,894.53	2,986.25	2,639.98	346.27	0.13	0.11	4.39
May-13	26,220	53.70	1,077.99	2,133.78	3,211.77	2,973.37	238.40	0.12	0.11	4.44
June-13	35,100	100.50	2,660.50	2,856.44	5,516.94	4,279.85	1,237.09	0.16	0.12	12.31
July-13	37,530	102.30	2,781.05	3,479.01	6,260.06	4,217.56	2,042.50	0.17	0.11	19.97
August-13	30,510	90.90	2,357.02	2,866.17	5,223.19	3,320.04	1,903.15	0.17	0.11	20.94
September-13	28,650	84.00	2,197.22	2,768.68	4,965.90	3,147.00	1,818.90	0.17	0.11	21.65
October-13	23,280	89.10	1,184.61	2,313.42	3,498.03	2,676.08	821.95	0.15	0.11	9.23
November-13	24,510	48.30	1,051.97	2,396.38	3,448.35	2,801.15	647.20	0.14	0.11	13.40
December-13	26,070	75.90	1,223.36	2,502.28	3,725.64	2,960.30	765.34	0.14	0.11	10.08
Total (All)	**637,200**	**103.70**	**$36,298.96**	**$61,453.06**	**$97,752.02**	**$80,610.94**	**$17,141.08**	**$0.15**	**$0.13**	**$9.74**
Total (last 12-months)	**331,950**	**102.30**	**$19,112.15**	**$29,604.12**	**$48,716.27**	**$37,917.87**	**$10,798.40**	**$0.15**	**$0.11**	**$11.79**
Notes	1	2	3	4	5	6	7	8	9	10

1.) Number of kWh of electric energy used per month
2.) Number of kW of power measured
3.) Electric charges from Delivery provider
4.) Electric charges from Supply provider
5.) Total charges (Delivery + Supplier)
6.) Charges based on the number of kWh of electric energy used
7.) Charges based on the number of kW of power measured
8.) Total Charges ($) / Consumption (kWh)
9.) Consumption Charges ($) / Consumption (kWh)
10.) Demand Charges ($) / Demand (kW)

City of Woodbury
33 Delaware St, Woodbury, NJ 08096

For Service at: **Fire House**
Account No.: **67 114 404 04** **Delivery -** PSE&G
Meter No.: **9199409** **Supplier -** South Jersey Energy
Electric Service

			Provider Charges			Usage (kWh) vs. Demand (kW) Charges		Unit Costs		
Month	**Consumption (kWh)**	**Demand (kW)**	**Delivery ($)**	**Supplier ($)**	**Total ($)**	**Consumption ($)**	**Demand ($)**	**Blended Rate ($/kWh)**	**Consumption ($/kWh)**	**Demand ($/kW)**
January-12	16,740	43.70	726.04	1,879.03	2,605.07	2,415.55	189.52	0.16	0.14	4.34
February-12	16,785	48.60	748.44	1,954.66	2,703.10	2,492.82	210.28	0.16	0.15	4.33
March-12	12,915	38.30	580.73	1,511.83	2,092.56	1,925.92	166.64	0.04	0.15	4.35
April-12	15,323	41.00	621.69	1,705.59	2,327.28	2,196.86	130.42	0.15	0.14	3.18
May-12	15,323	41.00	621.69	1,705.59	2,327.28	2,196.86	130.42	0.15	0.14	3.18
June-12	19,350	18.50	997.15	1,851.58	2,848.73	2,620.51	228.22	0.15	0.14	12.34
July-12	24,435	62.60	1,740.48	2,298.52	4,039.00	3,277.21	761.79	0.17	0.13	12.17
August-12	19,440	54.50	1,402.49	1,861.12	3,263.61	2,640.96	622.65	0.17	0.14	11.42
September-12	19,440	54.50	1,402.49	1,861.12	3,263.61	2,640.96	622.65	0.17	0.14	11.42
October-12	15,165	45.50	704.56	1,549.03	2,253.59	2,056.45	197.14	0.15	0.14	4.33
November-12	13,973	18.50	547.65	1,440.29	1,987.94	1,905.18	82.76	0.14	0.14	4.47
December-12	13,973	18.50	547.65	1,440.29	1,987.94	1,905.18	82.76	0.14	0.14	4.47
January-13	14,940	43.70	699.19	1,157.85	1,857.04	1,665.71	191.33	0.12	0.11	4.38
February-13	8,910	44.60	481.64	726.37	1,208.01	1,012.83	195.18	0.14	0.11	4.38
March-13	23,400	40.80	928.19	2,070.68	2,998.87	2,819.96	178.91	0.13	0.12	4.39
April-13	15,000	48.00	690.05	1,220.70	1,910.75	1,701.02	209.73	0.13	0.11	4.37
May-13	16,560	18.00	611.59	1,347.65	1,959.24	1,877.92	81.32	0.12	0.11	4.52
June-13	22,440	62.40	1,677.08	1,826.17	3,503.25	2,736.18	767.07	0.16	0.12	12.29
July-13	24,360	62.40	1,754.95	2,180.51	3,935.46	2,737.54	1,197.92	0.16	0.11	19.20
August-13	20,160	56.40	1,511.28	1,807.07	3,318.35	2,193.77	1,124.58	0.16	0.11	19.94
September-13	18,960	48.00	1,359.92	1,744.69	3,104.61	2,082.66	1,021.95	0.16	0.11	21.29
October-13	16,080	56.40	794.59	1,487.39	2,281.98	1,604.38	677.60	0.14	0.10	12.01
November-13	15,840	18.00	622.04	1,472.51	2,094.55	1,581.32	513.23	0.13	0.10	28.51
December-13	17,400	45.60	793.43	1,578.41	2,371.84	1,740.47	631.37	0.14	0.10	13.85
Total (All)	**416,910**	**62.60**	**$22,564.99**	**$39,678.64**	**$62,243.63**	**$52,028.19**	**$10,215.44**	**$0.15**	**$0.12**	**$10.38**
Total (last 12-months)	**214,050**	**62.40**	**$11,923.95**	**$18,620.00**	**$30,543.95**	**$23,753.76**	**$6,790.19**	**$0.14**	**$0.11**	**$13.13**
Notes	1	2	3	4	5	6	7	8	9	10

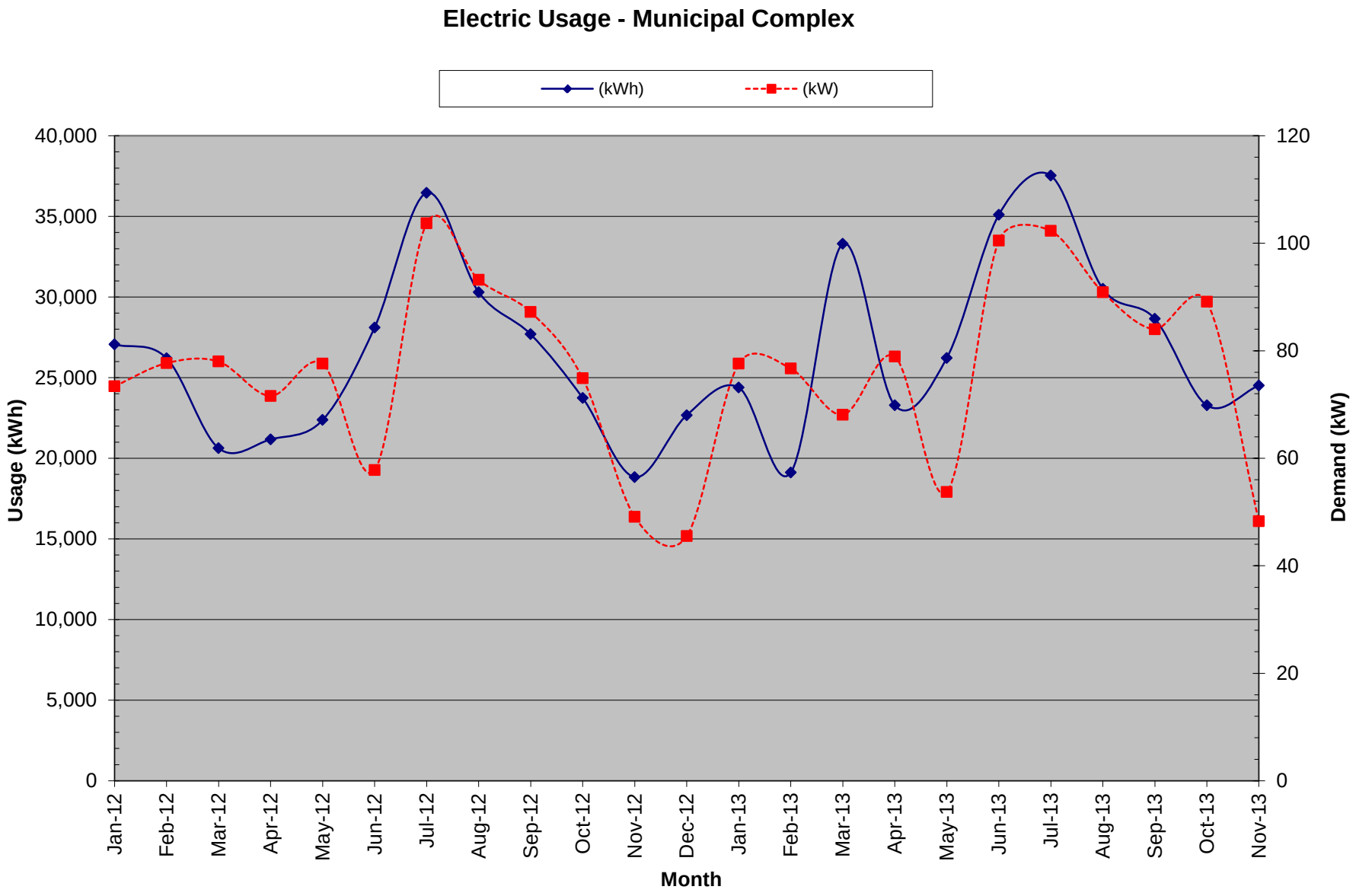
1.) Number of kWh of electric energy used per month
2.) Number of kW of power measured
3.) Electric charges from Delivery provider
4.) Electric charges from Supply provider
5.) Total charges (Delivery + Supplier)
6.) Charges based on the number of kWh of electric energy used
7.) Charges based on the number of kW of power measured
8.) Total Charges ($) / Consumption (kWh)
9.) Consumption Charges ($) / Consumption (kWh)
10.) Demand Charges ($) / Demand (kW)

City of Woodbury
33 Delaware St, Woodbury, NJ 08096

For Service at: **Municipal Complex**
Account No.: **67 114 395 03** **Delivery -** PSE&G
Meter No.: **678000885** **Supplier -** South Jersey Energy
Electric Service

			Provider Charges			Usage (kWh) vs. Demand (kW) Charges		Unit Costs		
Month	**Consumption (kWh)**	**Demand (kW)**	**Delivery ($)**	**Supplier ($)**	**Total ($)**	**Consumption ($)**	**Demand ($)**	**Blended Rate ($/kWh)**	**Consumption ($/kWh)**	**Demand ($/kW)**
January-12	10,320	29.70	460.96	1,133.94	1,594.90	1,464.69	130.21	0.15	0.14	4.38
February-12	9,420	29.10	429.69	1,100.77	1,530.46	1,402.80	127.66	0.16	0.15	4.39
March-12	7,710	39.70	377.40	888.78	1,266.18	1,135.98	130.20	0.05	0.15	3.28
April-12	5,850	30.60	321.58	744.86	1,066.44	932.42	134.02	0.18	0.16	4.38
May-12	7,050	36.60	385.47	837.33	1,222.80	1,063.36	159.44	0.17	0.15	4.36
June-12	8,760	39.30	827.96	930.41	1,758.37	1,278.50	479.87	0.20	0.15	12.21
July-12	12,030	41.10	983.50	1,205.96	2,189.46	1,687.80	501.66	0.18	0.14	12.21
August-12	10,860	38.70	908.26	1,088.09	1,996.35	1,523.73	472.62	0.18	0.14	12.21
September-12	8,250	32.70	730.97	891.34	1,622.31	1,222.29	400.02	0.20	0.15	12.23
October-12	8,580	29.40	416.03	917.92	1,333.95	1,205.01	128.94	0.16	0.14	4.39
November-12	4,860	30.60	295.72	376.65	672.37	538.35	134.02	0.14	0.11	4.38
December-12	8,700	27.00	408.23	674.25	1,082.48	963.71	118.77	0.12	0.11	4.40
January-13	9,450	33.90	470.62	732.38	1,203.00	1,053.62	149.38	0.13	0.11	4.41
February-13	10,200	32.10	468.93	830.08	1,299.01	1,157.34	141.67	0.13	0.11	4.41
March-13	9,900	27.30	438.14	876.08	1,314.22	1,193.09	121.13	0.13	0.12	4.44
April-13	8,280	30.90	401.67	673.83	1,075.50	938.96	136.54	0.13	0.11	4.42
May-13	9,660	35.70	466.40	786.13	1,252.53	1,095.45	157.08	0.13	0.11	4.40
June-13	12,660	38.10	983.42	1,030.27	2,013.69	1,543.67	470.02	0.16	0.12	12.34
July-13	13,170	39.90	1,026.10	1,298.50	2,324.60	1,480.02	844.58	0.18	0.11	21.17
August-13	10,350	34.50	845.74	1,059.10	1,904.84	1,126.27	778.57	0.18	0.11	22.57
September-13	9,690	36.00	837.30	1,023.99	1,861.29	1,064.34	796.95	0.19	0.11	22.14
October-13	7,200	32.70	390.02	826.03	1,216.05	1,071.70	144.35	0.17	0.15	4.41
November-13	8,670	30.30	429.93	923.87	1,353.80	1,219.83	133.97	0.16	0.14	4.42
December-13	8,670	30.30	429.93	923.87	1,353.80	1,219.83	133.97	0.16	0.14	4.42
Total (All)	**220,290**	**41.10**	**$13,733.97**	**$21,774.42**	**$35,508.39**	**$28,582.75**	**$6,925.64**	**$0.16**	**$0.13**	**$8.93**
Total (last 12-months)	**117,900**	**39.90**	**$7,188.20**	**$10,984.12**	**$18,172.32**	**$14,164.11**	**$4,008.21**	**$0.15**	**$0.12**	**$10.06**
Notes	1	2	3	4	5	6	7	8	9	10

1.) Number of kWh of electric energy used per month
2.) Number of kW of power measured
3.) Electric charges from Delivery provider
4.) Electric charges from Supply provider
5.) Total charges (Delivery + Supplier)
6.) Charges based on the number of kWh of electric energy used
7.) Charges based on the number of kW of power measured
8.) Total Charges ($) / Consumption (kWh)
9.) Consumption Charges ($) / Consumption (kWh)
10.) Demand Charges ($) / Demand (kW)

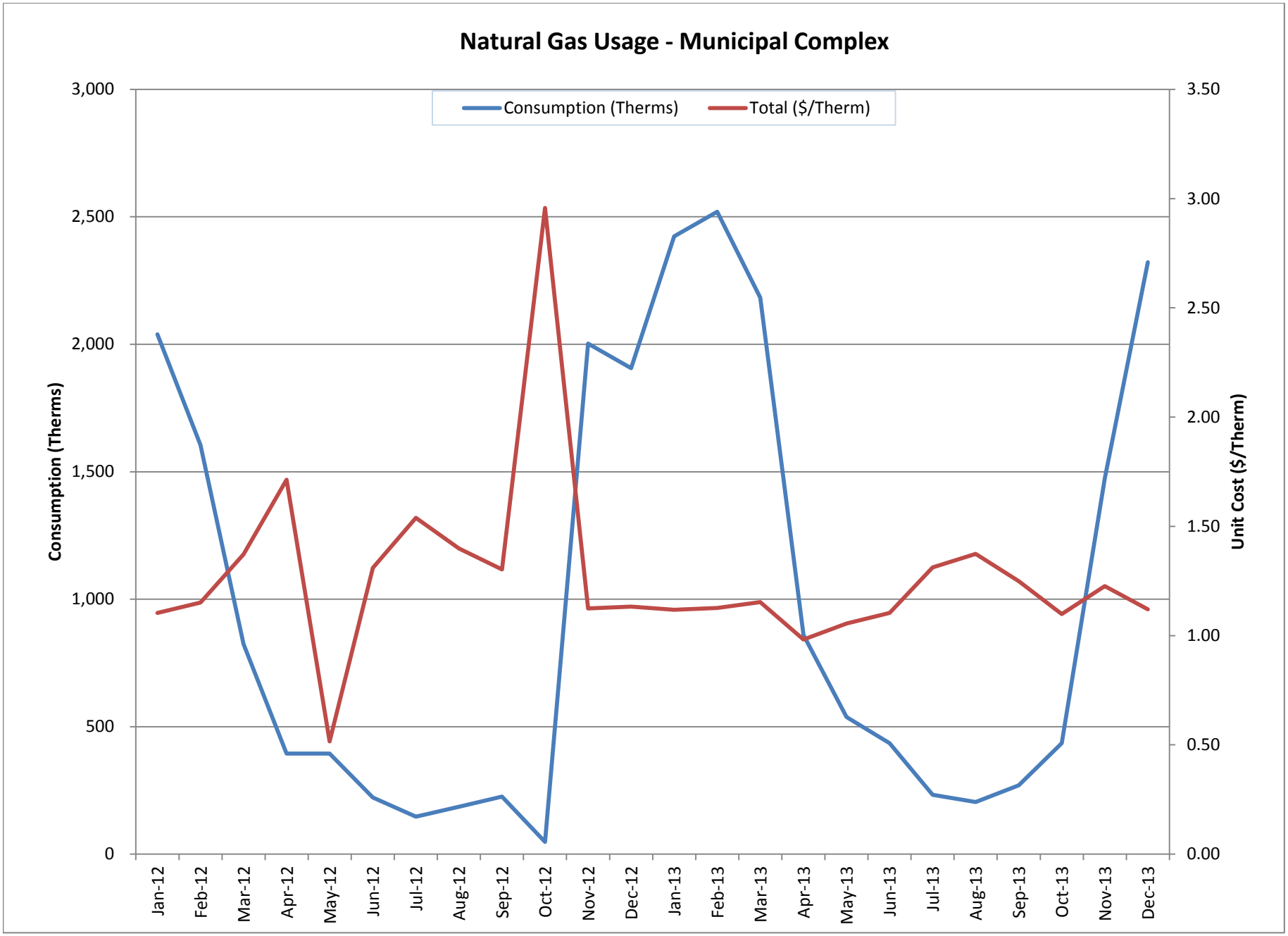


Utility Data -City Hall
Electric Graph

City of Woodbury
33 Delaware St, Woodbury, NJ 08096

For Service at: **Municipal Complex**
Account No.: **67 114 404 04**
Natural Gas Service
Delivery - **PSE&G**
Supplier - **Hess**

		Charges			Unit Costs		
Month	**Consumption (Therms)**	**Delivery ($)**	**Supply ($)**	**Total ($)**	**Delivery ($/Therm)**	**Supply ($/Therm)**	**Total ($/Therm)**
January-12	2,039	$ 781.91	$ 1,469.87	$ 2,251.78	$ 0.383	$ 0.721	$ 1.104
February-12	1,605	$ 690.89	$ 1,156.73	$ 1,847.62	$ 0.431	$ 0.721	$ 1.151
March-12	824	$ 536.45	$ 594.15	$ 1,130.60	$ 0.651	$ 0.721	$ 1.372
April-12	394	$ 155.39	$ 520.20	$ 675.59	$ 0.394	$ 1.319	$ 1.713
May-12	394	$ 155.39	$ 48.20	$ 203.59	$ 0.394	$ 0.122	$ 0.516
June-12	222	$ 131.00	$ 160.23	$ 291.23	$ 0.589	$ 0.721	$ 1.310
July-12	147	$ 120.34	$ 106.01	$ 226.35	$ 0.818	$ 0.721	$ 1.539
August-12	186	$ 125.83	$ 133.91	$ 259.74	$ 0.677	$ 0.721	$ 1.398
September-12	226	$ 131.48	$ 162.59	$ 294.07	$ 0.583	$ 0.721	$ 1.303
October-12	47	$ 106.21	$ 34.28	$ 140.49	$ 2.236	$ 0.722	$ 2.958
November-12	2,003	$ 807.63	$ 1,443.84	$ 2,251.47	$ 0.403	$ 0.721	$ 1.124
December-12	1,906	$ 785.36	$ 1,373.91	$ 2,159.27	$ 0.412	$ 0.721	$ 1.133
January-13	2,423	$ 962.12	$ 1,746.72	$ 2,708.84	$ 0.397	$ 0.721	$ 1.118
February-13	2,520	$ 1,023.07	$ 1,816.15	$ 2,839.22	$ 0.406	$ 0.721	$ 1.127
March-13	2,183	$ 943.81	$ 1,573.44	$ 2,517.25	$ 0.432	$ 0.721	$ 1.153
April-13	859	$ 224.78	$ 619.39	$ 844.17	$ 0.262	$ 0.721	$ 0.982
May-13	537	$ 179.61	$ 387.30	$ 566.91	$ 0.334	$ 0.721	$ 1.055
June-13	435	$ 166.68	$ 313.50	$ 480.18	$ 0.383	$ 0.721	$ 1.104
July-13	233	$ 137.65	$ 167.76	$ 305.41	$ 0.592	$ 0.721	$ 1.312
August-13	204	$ 133.59	$ 147.32	$ 280.91	$ 0.654	$ 0.721	$ 1.374
September-13	270	$ 142.95	$ 194.30	$ 337.25	$ 0.530	$ 0.720	$ 1.249
October-13	435	$ 164.19	$ 313.64	$ 477.83	$ 0.377	$ 0.721	$ 1.098
November-13	1,474	$ 745.13	$ 1,062.13	$ 1,807.26	$ 0.506	$ 0.721	$ 1.227
December-13	2,321	$ 926.22	$ 1,673.35	$ 2,599.57	$ 0.399	$ 0.721	$ 1.120
Total	**23,888**			**$ 27,496.60**			**$ 1.151**


Natural Gas Usage - Municipal Complex
Consumption (Therms)
Total ($/Therm)
Consumption (Therms)
Unit Cost ($/Therm)
3,000
2,500
2,000
1,500
1,000
500
0
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12
Jul-12
Aug-12
Sep-12
Oct-12
Nov-12
Dec-12
Jan-13
Feb-13
Mar-13
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Dec-13

APPENDIX B

Equipment Inventory

City of Woodbury
CHA Project #27551
Fire House

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size /Efficiency	Location	Areas/Equipment Served	Date Installed	Remaining Useful Life (years)
AHU-1	1	Armstrong	BCZ36D12N00E-1	6004K00936	Natural Gas / DX Cooling	3-ton	Closet	Museum		
DWH-1	1	Bradford White	M240S6DS-1NCWW	ED10505521	Hot Water Heating / Electric	40 gallons, 4.5 kW	Closet	Garage		

City Of Woodbury
CHA Project #27551
Municipal Complex / Library

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size /Efficiency	Location	Areas/Equipment Served	Date Installed	Remaining Useful Life (years)	Other Info.	Current year	Years Old	ASHRAE life expectancy
B-1	1	Weil McClain	Ultra 310	CP5590501	Heating / Natural Gas	310,000 BTU input, 289,000 output, 93%	MER	Municipal Complex / Fire House	2008	19		2014	6	25
B-2	1	Weil McClain	Ultra 310	CP5590087	Heating / Natural Gas	310,000 BTU input, 289,000 output, 93%	MER	Municipal Complex / Fire House	2008	19		2014	6	25
B-3	1	Weil McClain	Ultra 310	CP5655016	Heating / Natural Gas	310,000 BTU input, 289,000 output, 93%	MER	Municipal Complex / Fire House	2008	19		2014	6	25
P1-A	1	B&G	-	-	Heating / Electricity	3 HP, 84.0%	MER	Fire House	1998	0		2014	16	12
P1-B	1	B&G	-	-	Heating / Electricity	3 HP, 84.0%	MER	Fire House	1998	0		2014	16	12
DHW-1	1	MOR FLO	ER10STR	9138200945	Hot Water / Electricity	10 Gallons, 1500 W	MER	Basement Sink, Restroom	1998	0		2014	16	12
DWH-2	1	Bradford White	M230L6D5-1NCWW	HM15960208	Hot Water / Electricity	30 Gallons, 4.5 kW Upper, 4.5 kW Lower	MER	Restroom	2001	0		2014	13	12
AHU-1	1	York	AP60FSFC10X10	CAFM-017215			Attic	Construction Office	1997	8		2014	17	25
AHU-2	1	York	AP60FSFC10X10	CAFM-017216			Attic	City Hall	1997	8		2014	17	25
AHU-3	1	York	AP60FSFC10X10	CAFM-017217			Attic Above Council Chambers	Council Chambers	1997	8		2014	17	25
CU-1	1	York	HC4E090A25B	NCFM029934	Cooling / Electric DX	10-ton	Ground	AHU-1	1997	0		2014	17	15
CU-2	1	York	HC4E090A25B	NCFM024945	Cooling / Electric DX	10-ton	Ground	AHU-2	1997	0		2014	17	15
CU-3	1	York	HC4E090A25B	NCFM024952	Cooling / Electric DX	10-ton	Roof	AHU-3	1997	0		2014	17	15
RTU-1	1	York	D3CG090N16525ECF	NLEM133142	Cooling / Electric DX	204,000 BTU input, 161,500 output	Roof	Library	1997	8		2014	17	25
RTU-2	1	York	D3CG090N16525ECF	NLEM133139	Cooling / Electric DX	204,000 BTU input, 161,500 output	Roof	Library	1997	8		2014	17	25
RTU-4	1	York	D3CG090N16525ECF	NLEM133140	Cooling / Electric DX	204,000 BTU input, 161,500 output	Roof	Library	1997	8		2014	17	25
RTU-3	1	York	D3CG090N16525ECF	NLEM136024	Cooling / Electric DX	204,000 BTU input, 161,500 output	Roof	Library	1997	8		2014	17	25
DWH-1	1	Bradford White	M240S6DS-1NCWW	GE13451313	Hot Water / Electricity	4.5 kW Upper, 4.5 kW Lower	Above Ceiling	6 Sinks, Janitor Sink	2006	4		2014	8	12

APPENDIX C

ECM Calculations

City of Woodbury - NJBPU
CHA Project #27751

Rate of Discount (used for NPV) 3.0%

Utility Costs		Yearly Usage	Metric Ton Carbon Dioxide Equivalent	Building Area	Annual Utility Cost	
$ 0.147	$/kWh blended		0.000420205	29,300	Electric	Natural Gas
$ 0.114	$/kWh supply	331,950	0.000420205		48,716	27,497
$ 11.79	$/kW	102.3	0			
$ 1.15	$/Therm	23,888	0.00533471			
$ 11.74	$/kgals	316	0			

City Hall

	Item	Savings					Cost	Simple Payback	Life Expectancy	Equivalent CO_2 (Metric tons)	NJ Smart Start Incentives	Direct Install Eligible (Y/N)	Direct Install Incentives	Max Incentives	Payback w/ Incentives	Simple Projected Lifetime Savings					ROI	NPV	IRR
		kW	kWh	therms	Water kgal	$										kW	kWh	therms	kgal/yr	$			
ECM-1	Install Insulation above Ceiling	0.0	110	597	0	702	$ 10,012	14.3	25	3.2	$ -	N	$ -	$ -	14.3	0.0	2,742	14,918	0	$ 17,559	0.8	$2,218	4.9%
ECM-2	Install Storm Windows	0.0	147	174	0	221	$ 7,626	34.4	15	1.0	$ -	N	$ -	$ -	34.4	0.0	2,202	2,607	0	$ 3,322	(0.6)	($4,983)	-9.0%
ECM-4	Replace Existing Condensing Units for AHUs	0.0	2,593	0	0	381	$ 43,500	114.1	15	1.1	$ 2,760	Y	$ 30,500	$ 2,760	106.9	0.0	38,899	0	0	$ 5,718	(0.9)	($36,189)	-18.2%
ECM-6	Replace Motors with Premium Efficency Motors on HW Pumps	0.2	888	0	0	130	$ 1,886	14.5	15.0	0.4	$ -	Y	$ 1,300	$ -	14.5	3.1	13,320	0	0	$ 2,393	0.3	($332)	0.4%
ECM-8	Night-Time Set-Back	0.0	0	478	0	549	$ 3,000	5.5	15.0	2.5	$ -	N	$ -	$ -	5.5	0.0	0	7,166	0	$ 8,241	1.7	$3,559	16.4%
ECM-9	Replace Electric DHW Heaters w/ Tankless Water Heaters	6.0	1,740	(24)	0	1,019	$ 19,654	19.3	15.0	0.6	$ 600	Y	$ 13,800	$ 600	18.7	90.0	26,095	(362)	0	$ 16,153	(0.2)	($6,884)	-2.6%
ECM-10	Replace Appliances w/ Energy Star Alternatives	0.0	97	0	0	14	$ 1,000	70.0	15.0	0.0		N	$ -	$ -	70.0	0.0	1,458	0	0	$ 214	(0.8)	($829)	-15.0%
ECM-11	Replace Plumbing Fixtures with Low Flow Options	0.0	0	0	50	588	$ 15,800	26.9	15.0	0.0	$ -	N	$ -	$ -	26.9	0.0	0	0	752	$ 8,823	(0.4)	($8,778)	-6.5%
ECM-L1	Lighting Replacements / Upgrades	2.5	3,904	0	0	804	$ 15,572	19.4	15.0	1.6	$ 930	Y	$ 10,900	$ 930	18.2	38.0	58,565	0	0	$ 13,989	(0.1)	($5,047)	-2.3%
ECM-L2	Install Lighting Controls (Add Occupancy Sensors)	0.0	11,618	0	0	1,324	$ 11,340	8.6	15.0	4.9	$ 1,470	Y	$ 7,900	$ 1,470	7.5	0.0	174,265	0	0	$ 25,617	1.3	$5,941	10.4%
ECM-L3	Lighting Replacements with Controls (Occupany Sensors)	2.5	13,514	0	0	1,899	$ 26,912	14.2	15.0	5.7	$ 2,400	Y	$ 18,800	$ 2,400	12.9	38.0	202,714	0	0	$ 35,179	0.3	($1,839)	1.9%
	Total (Does Not Include ECM-L1 & ECM-L2)	**8.7**	**19,089**	**1,224**	**50**	**$ 5,506**	**$ 129,391**	23.5	16.1	21.1	$ 5,760		$ 64,400	$ 5,760	22.5	131.1	287,430	24,330	752	$ 97,602	(0.2)	($54,471)	-3.7%
	Total Measures with Payback <15	**2.7**	**14,512**	**1,074**	**0**	**$ 3,281**	**$ 41,811**	12.7	15.0	**11.8**	$ -		$ -	$ -	12.7	0.0	0	7,166	0	$ 8,241	(0.8)	($2,639)	2.1%
	% of Existing	**9%**	**6%**	**5%**	**16%**																		

City:		**Philadelphia, PA**	**108**	Occupied Hours/Week			
	Enthalpy		Occupied	Occupied	Occupied	Occupied	Occupied
Temp	h (Btu/lb)	Bin Hours	Hours	Hours	Hours	Hours	Hours
102.5		0	0	0	0	0	0
97.5	33.1	3	2	1	0	0	0
92.5	38.0	33	21	12	4	2	1
87.5	36.2	123	79	44	16	6	2
82.5	33.8	477	307	170	61	22	8
77.5	32.7	656	422	234	84	30	11
72.5	31.0	742	477	265	95	34	12
67.5	28.1	784	504	280	100	36	13
62.5	24.6	983	632	351	125	45	16
57.5	21.2	625	402	223	80	28	10
52.5	18.3	540	347	193	69	25	9
47.5	16.0	457	294	163	58	21	7
42.5	14.4	671	431	240	86	31	11
37.5	12.5	1,067	686	381	136	49	17
32.5	10.5	685	440	245	87	31	11
27.5	8.5	369	237	132	47	17	6
22.5	7.0	321	206	115	41	15	5
17.5	5.3	184	118	66	23	8	3
12.5	3.8	40	26	14	5	2	1
7.5		0	0	0	0	0	0
2.5		0	0	0	0	0	0
-2.5		0	0	0	0	0	0
-7.5		0	0	0	0	0	0
		8,760					

Multipliers	
Material:	1.1
Labor:	1.35
Equipment:	1.1

Exist Heating Efficiency	80%
Cooling Eff (kW/ton)	1.2

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CHA Project #27751
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Note: pricing is for energy calculations only -do not use for procurement

ECM-1: Install Insulation above Ceiling

Existing: Ceiling can lead to increased energy consumption due to infiltration/exfiltration and heat gain/loss.
Proposed: Install 6" fiberglass blown-in loose-fill insulation in attic cavity to reduce heat transfer.

			Cooling System Efficiency	1.2	kW/ton	Heating System Efficiency		80%	
Area of ceiling	4,000	SF	Ex Occupied Clng Temp.	74	*F	Heating On Temp.		60	*F
Existing Infiltration Factor	**0.20**	**cfm/SF**	Ex Unoccupied Clng Temp.	80	*F	Ex Occupied Htg Temp.		71	*F
Proposed Infiltration Factor	**0.20**	**cfm/SF**	Cooling Occ Enthalpy Setpoint	27.5	Btu/lb	Ex Unoccupied Htg Temp.		71	*F
Existing U Value	**0.10**	**Btuh/SF/°F**	Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb	Electricity	$	0.147	$/kWh
Proposed U Value	**0.04**	**Btuh/SF/°F**				Natural Gas	$	1.15	$/therm

					EXISTING LOADS		PROPOSED LOADS		COOLING ENERGY		HEATING ENERGY	
					Occupied	**Unoccupied**	**Occupied**	**Unoccupied**				
Avg Outdoor Air Temp. Bins °F	**Avg Outdoor Air Enthalpy**	**Existing Equipment Bin Hours**	**Occupied Equipment Bin Hours**	**Unoccupied Equipment Bin Hours**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat 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	50.1	0	0	0	-93,310	-90,794	-85,806	-84,870	0	0	0	0
97.5	42.5	6	2	4	-63,853	-61,338	-57,666	-56,730	37	34	0	0
92.5	39.5	45	16	29	-50,957	-48,441	-46,086	-45,150	222	205	0	0
87.5	36.6	146	52	94	-38,420	-35,905	-34,866	-33,930	538	500	0	0
82.5	34.0	298	106	192	-26,964	-24,448	-24,726	-23,790	756	719	0	0
77.5	31.6	476	170	306	-16,228	0	-15,306	0	276	260	0	0
72.5	29.2	662	237	426	0	0	0	0	0	0	0	0
67.5	27.0	740	264	476	0	0	0	0	0	0	0	0
62.5	24.5	765	273	492	0	0	0	0	0	0	0	0
57.5	21.4	733	262	471	17,324	17,324	13,770	13,770	0	0	159	126
52.5	18.7	668	239	430	23,741	23,741	18,870	18,870	0	0	198	158
47.5	16.2	659	235	424	30,157	30,157	23,970	23,970	0	0	249	198
42.5	14.4	685	245	441	36,574	36,574	29,070	29,070	0	0	313	249
37.5	12.6	739	264	475	42,990	42,990	34,170	34,170	0	0	397	316
32.5	10.7	717	256	461	49,407	49,407	39,270	39,270	0	0	443	352
27.5	8.6	543	194	349	55,823	55,823	44,370	44,370	0	0	379	301
22.5	6.8	318	114	205	62,239	62,239	49,470	49,470	0	0	248	197
17.5	5.5	245	88	158	68,656	68,656	54,570	54,570	0	0	210	167
12.5	4.1	156	56	100	75,072	75,072	59,670	59,670	0	0	146	116
7.5	2.6	92	33	59	81,489	81,489	64,770	64,770	0	0	94	75
2.5	1.0	36	13	23	87,905	87,905	69,870	69,870	0	0	40	31
-2.5	0.0	19	7	12	94,322	94,322	74,970	74,970	0	0	22	18
-7.5	-1.5	8	3	5	100,738	100,738	80,070	80,070	0	0	10	8
TOTALS		**8,760**	**3,129**	**5,631**					1829	1719	**2,908**	**2,312**

Existing Window Infiltration	**800**	**cfm**
Existing Window Heat Transfer	**419**	**Btuh/°F**
Proposed Window Infiltration	**800**	**cfm**
Proposed Window Heat Transfer	**156**	**Btuh/°F**

Savings	**597**	**Therms**	**$**	**686**
	110	**kWh**	**$**	**16**
			$	**702**

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CHA Project #27751
City Hall

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-1: Install Insulation above Ceiling - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
6 " thick Fiberglass blown-in loose-fill insulation	4000	SF	0.50	0.25	$ 0.15	$ 2,200	$ 1,350	$ 660	$ 4,210	RS Means 2012
Extended Effort	1	LS		2,500.00		$ -	$ 3,375	$ -	$ 3,375	Engineering Estimate
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 7,585	Subtotal
$ 758.50	10% Contingency
$ 1,668.70	20% Contractor O&P
$ -	0% Engineering Fees
$ 10,012	**Total**

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Note: pricing is for energy calculations only -do not use for procurement

ECM-2: Install Storm Windows

Existing: Windows are not properly sealed. This can lead to increased energy consumption due to infiltration/exfiltration and heat gain/loss.
Proposed: Install new storm windows and weather sealing to properly seal windows

Linear Feet of window Edge	710.0	LF	Cooling System Efficiency	1.2	kW/ton	Heating System Efficiency	80%	
Area of window glass	759.0	SF	Ex Occupied Clng Temp.	74	*F	Heating On Temp.	60	*F
Existing Infiltration Factor	**0.20**	**cfm/LF**	Ex Unoccupied Clng Temp.	80	*F	Ex Occupied Htg Temp.	71	*F
Proposed Infiltration Factor	**0.10**	**cfm/LF**	Cooling Occ Enthalpy Setpoint	27.5	Btu/lb	Ex Unoccupied Htg Temp.	71	*F
Existing U Value	**0.60**	**Btuh/SF/°F**	Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb	Electricity	$ 0.147	$/kWh
Proposed U Value	**0.60**	**Btuh/SF/°F**				Natural Gas	$ 1.15	$/therm

					EXISTING LOADS		PROPOSED LOADS		COOLING ENERGY		HEATING ENERGY	
					Occupied	**Unoccupied**	**Occupied**	**Unoccupied**				
Avg Outdoor Air Temp. Bins °F	**Avg Outdoor Air Enthalpy**	**Existing Equipment Bin Hours**	**Occupied Equipment Bin Hours**	**Unoccupied Equipment Bin Hours**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat 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	50.1	0	0	0	-27,420	-24,688	-20,200	-17,467	0	0	0	0
97.5	42.5	6	2	4	-20,287	-17,555	-15,494	-12,762	11	8	0	0
92.5	39.5	45	16	29	-16,093	-13,361	-12,259	-9,527	65	47	0	0
87.5	36.6	146	52	94	-11,963	-9,230	-9,055	-6,323	149	107	0	0
82.5	34.0	298	106	192	-8,024	-5,292	-5,948	-3,215	187	125	0	0
77.5	31.6	476	170	306	-4,214	0	-2,904	0	72	49	0	0
72.5	29.2	662	237	426	0	0	0	0	0	0	0	0
67.5	27.0	740	264	476	0	0	0	0	0	0	0	0
62.5	24.5	765	273	492	0	0	0	0	0	0	0	0
57.5	21.4	733	262	471	8,218	8,218	7,183	7,183	0	0	75	66
52.5	18.7	668	239	430	11,262	11,262	9,843	9,843	0	0	94	82
47.5	16.2	659	235	424	14,306	14,306	12,504	12,504	0	0	118	103
42.5	14.4	685	245	441	17,350	17,350	15,164	15,164	0	0	149	130
37.5	12.6	739	264	475	20,393	20,393	17,825	17,825	0	0	188	165
32.5	10.7	717	256	461	23,437	23,437	20,485	20,485	0	0	210	184
27.5	8.6	543	194	349	26,481	26,481	23,145	23,145	0	0	180	157
22.5	6.8	318	114	205	29,525	29,525	25,806	25,806	0	0	117	103
17.5	5.5	245	88	158	32,569	32,569	28,466	28,466	0	0	100	87
12.5	4.1	156	56	100	35,612	35,612	31,127	31,127	0	0	69	61
7.5	2.6	92	33	59	38,656	38,656	33,787	33,787	0	0	44	39
2.5	1.0	36	13	23	41,700	41,700	36,447	36,447	0	0	19	16
-2.5	0.0	19	7	12	44,744	44,744	39,108	39,108	0	0	11	9
-7.5	-1.5	8	3	5	47,788	47,788	41,768	41,768	0	0	5	4
TOTALS		**8,760**	**3,129**	**5,631**					483	336	**1,380**	**1,206**

Existing Window Infiltration	**142**	**cfm**
Existing Window Heat Transfer	**455**	**Btuh/°F**
Proposed Window Infiltration	**71**	**cfm**
Proposed Window Heat Transfer	**455**	**Btuh/°F**

Savings	**174**	**Therms**	**$**	**200**
	147	**kWh**	**$**	**22**
			$	**221**

Window ID	Location	Quantity	Width (ft)	Height (ft)	Linear Feet (LF)	Area (SF)	Infiltration Rate (CFM/LF)	U Value (Btuh/SF/°F)	Infiltration (CFM)	Heat Transfer (Btuh/°F)
1	Exterior Wall	3	3	3	36.0	27.0	0.2	0.6	7.2	16.2
2	Exterior Wall	1	4	3	14.0	12.0	0.2	0.6	2.8	7.2
3	Exterior Wall	30	3	8	660.0	720.0	0.2	0.6	132.0	432.0
Total		**34**	**10**	**14**	**710.0**	**759.0**	**0.20**	**0.60**	**142.0**	**455.4**

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CHA Project #27751
City Hall

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-2: Install Storm Windows - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
3'x3' Storm Window	3	EA	85.00	23.00		$ 281	$ 93	$ -	$ 374	RS Means 2011
4'x3' Storm Window	1	EA	90.00	24.50		$ 99	$ 33	$ -	$ 132	RS Means 2011
3'x8' Storm Window	30	EA	126.00	27.50		$ 4,158	$ 1,114	$ -	$ 5,272	RS Means 2011
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 5,777	Subtotal
$ 577.75	10% Contingency
$ 1,271.04	20% Contractor O&P
$ -	0% Engineering Fees
$ 7,626	**Total**

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EQUIPMENT	AREA/EQUIPMENT SERVED	COOLING CAPACITY (MBH)
CU-1	AHU-1	120
CU-2	AHU-2	120
CU-3	AHU-3	120
	Total Electric DX Cooling:	*360* *MBH*

ECM-4: Replace Existing Condensing Units for AHUs

ECM Description Summary

By replacing older split system DX equipment with higher SEER/EER DX condensing units, significant electrical energy can be saved. Control schemes can be incorporated that were not possible with the older equiopment as well, but the equipment can also operate in same manner as existing (i.e., stand alone, or monitored/sequenced by a BAS). It is recommended these units be replaced by more modern DX split system equipment with high efficiecny fans and compressors.

ASSUMPTIONS			Comments
Electric Cost	$0.147	/ kWh	
Average run hours per Week	50	Hours	
Space Balance Point	55	F	
Space Temperature Setpoint	74	deg F	Setpoint.
BTU/Hr Rating of existing DX equipment	360,000	Btu / Hr	Total BTU/hr of DX cooling equipment to be replaced.
Average EER	10.3		Units average more than 11 years old, EERs were 8 when new
Existing Annual Electric Usage	7,279	kWh	

Item	Value	Units	Comments
Proposed EER	16.0		New condensing unit (per manufacturer)
Proposed Annual Electric Usage	4,686	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Electrical Usage Savings	2,593	kWh
Annual Cost Savings	$381	

OAT - DB Bin Temp F	Annual Hours	Cooling Hrs at Temp Above balance point	Assumed % of time of operation	Assumed hrs of Operation
102.5	0	0	100%	0
97.5	3	1	89%	1
92.5	33	10	79%	8
87.5	123	37	68%	25
82.5	477	142	58%	82
77.5	656	195	47%	92
72.5	742	0	0%	0
67.5	784	0	0%	0
62.5	983	0	0%	0
57.5	625	0	0%	0
52.5	540	0	0%	0
47.5	457	0	0%	0
42.5	671	0	0%	0
37.5	1,067	0	0%	0
32.5	685	0	0%	0
27.5	369	0	0%	0
22.5	321	0	0%	0
17.5	184	0	0%	0
12.5	40	0	0%	0
7.5	0	0	0%	0
2.5	0	0	0%	0
-2.5	0	0	0%	0
-7.5	0	0	0%	0
Total	8,760	385	54%	208

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CHA Project #27751
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ECM-4: Replace Existing Condensing Units for AHUs - Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Existing (3) Acs & CUs demolition	3	EA	$ 100	$ 250		$ 330	$ 1,013	$ -	$ 1,343	RS Means 2012
(3) ACs, 10.0 ton air conditioner condensing units	3	EA	$ 4,950	$ 1,600		$ 16,335	$ 6,480	$ -	$ 22,815	RS Means 2012
- Reprogram DDC system for (3) CUs	3	EA	$ 75	$ 300		$ 248	$ 1,215	$ -	$ 1,463	Engineering Estimate
Electrical - misc.	1	LS	$ 1,000	$ 5,000		$ 1,100	$ 6,750	$ -	$ 7,850	Engineering Estimate
						$ -	$ -	$ -	$ -	

$ 33,470	Subtotal
$ 3,347	10% Contingency
$ 6,694	20% Contractor O&P
$ -	10% Engineering
$ 43,500	**Total**

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ECM-6: Replace Motors with Premium Efficency Motors on HW Pumps

Demand Cost
$/kW-month
$ 11.79

Energy Cost
$/kWh
$ 0.11

Multipliers		
Material	Labor	Equipment
1.10	1.35	1.10

Savings Analysis

#	Description	Location	Existing HP	Load Factor	Existing Efficiency$_a$	Existing kW	New HP$_b$	New Load Factor	New Efficiency$_a$	New kW	Demand Savings	Demand Savings $	Annual Hours	kWh Savings	$ kWh Savings	Total $ Savings	Estimated Cost	Payback Years
1	P1-A	Basement	3	0.8	0.840	2.1	3	0.8	0.882	2.0	0.102	$ 14	4,334	444	$ 51	$ 65	$ 943	14.5
2	P1-B	Basement	3	0.8	0.840	2.1	3	0.8	0.882	2.0	0.102	$ 14	4,334	444	$ 51	$ 65	$ 944	14.5
12																		
		Total	**6**			**4.3**	**6**			**4.1**	**0.20**	**$ 29**		**888**	**$ 101**	**$ 130**	**$ 1,886**	

Cost Estimates

#	Unit Costs Materials	Unit Costs Labor	Unit Costs Equipment	Subtotal Costs Materials	Subtotal Costs Labor	Subtotal Costs Equipment	Total Cost	Remarks
1	$ 550	$ 250	$ -	$ 605	$ 338	$ -	$ 943	RS Means 2011
2	$ 550	$ 250	$ 1	$ 605	$ 338	$ 1	$ 944	RS Means 2011
12								

Notes
a Existing and new efficiencies should be entered if known. If not known, use provided curve fit based on "DOE Survey Installed Average" and NEMA Premium values, respectively.

b Same as existing HP unless resized to better match load

Costs from RSM Electrical Costs 2006, p202
Motors - Totally enclosed, premium efficiency
Table used for cost estimates

HP	Mat'l	Labor	Total
0	0	0	$ -
1	$ 284	$ 150	$ 434
2	$ 342	$ 200	$ 542
3	$ 550	$ 250	$ 800
5	$ 550	$ 250	$ 800
7.5	$ 621	$ 270	$ 891
10	$ 749	$ 270	$ 1,019
15	$ 999	$ 400	$ 1,399
20	$ 1,218	$ 400	$ 1,618
25	$ 1,492	$ 500	$ 1,992
30	$ 1,736	$ 500	$ 2,236
40	$ 2,253	$ 600	$ 2,853
50	$ 2,771	$ 600	$ 3,371
60	$ 4,141	$ 900	$ 5,041
75	$ 5,298	$ 1,000	$ 6,298
100	$ 6,303	$ 1,200	$ 7,503
125	$ 9,135	$ 1,500	$ 10,635
150	$ 10,353	$ 1,600	$ 11,953
200	$ 12,424	$ 2,000	$ 14,424

costs updated 12/09

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CHA Project #27751
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ECM-8: Night-Time Set-Back

EXISTING CONDITIONS		
Existing Facility Total Electric usage	331,950	kWh
Existing Facility Natural Gas Usage	23,888	Therms
Cost of Electricty	$ 0.15	$/kWh
Cost of Natural Gas	$ 1.15	$/Therm
SAVINGS		
TOD Electric savings	0	kWh[1]
TOD Natural Gas savings	478	Therms[2]
Total Cost Savings	$ 549	
Estimated Total Project Cost	$ 3,000	[3]
Simple Payback	5.5	**years**

Assumptions

1	0%	Approximate percent of total electric savings due to night setback
2	2%	Approximate percent of total natural gas savings due to night setback
3	$ 3,000	Project cost is an estimate for Tekmar 265 Controller

Question:

Is there a typical rule-of-thumb for how much energy can be saved in a commercial building by raising the cooling setpoint in the summer and lowering the h

Answer:

As a rule of thumb, energy savings are 2% to 4% for every 1 degree difference in thermostat setting—either raising the cooling setpoint or lowering the heat

2% to 4% per degree * 10 degrees * (12 hours/24 hours) = 10% to 20% savings

Note these estimates are percentages of your electrical use for heating and cooling—not a percentage of your total electric bill.

Keep in mind that actual savings depend on your climate zone. Savings as a percentage of your heating and cooling bill will be greater in mild climates than

More information on the energy savings due to adjusting thermostat setpoints is available at "Thermostats and Control Systems," U.S. Department of Energ

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ECM-9: Replace Electric DHW Heater w/ Tankless Condensing Gas-Fired DHW Heater

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

Item	Value	Units	Formula/Comments
Occupied days per week	5	days/wk	
Occupied weeks per year	52	week/yr	
Water supply Temperature	60	˚F	Termperature of water coming into building
Hot Water Temperature	120	˚F	
Hot Water Usage per day	18	gal/day	Calculated from usage below
Annual Hot Water Energy Demand	2,315	MBTU/yr	Energy required to heat annual quantity of hot water to setpoint
Existing Tank Size	40	Gallons	Per manufacturer nameplate
Hot Water Temperature	120	˚F	Per building personnel
Average Room Temperature	72	˚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	3,504	MBTU/yr	
Total Annual Hot Water Demand (w/ standby losses)	5,819	Mbtu/yr	Building demand plus standby losses
Existing Water Heater Efficiency	98%		Per Manufacturer
Total Annual Energy Required	5,937	Mbtu/yr	
Total Annual Electric Required	**1,740**	**kWh/yr**	**Electrical Savings**
Average Annual Electric Demand	0.20	kW	
Peak Electric Demand	**6.00**	**kW**	**Per Manufacturer's Nameplate (Demand Savings)**
New Tank Size	0	Gallons	tankless
Hot Water Temperature	120	˚F	
Average Room Temperature	72	˚F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.0	MBH	
Annual Standby Hot Water Load	0	MBTU/yr	
Prop Annual Hot Water Demand (w/ standby losses)	2,315	MBTU/yr	
Proposed Avg. Hot water heater efficiency	96%		Based on Navien CR180 instantaneous, condensing DHW Heater
Proposed Total Annual Energy Required	2,411	MBTU/yr	
Proposed Fuel Use	24	Therms/yr	Standby Losses and inefficient DHW heater eliminated
Elec Utility Demand Unit Cost	$11.79	$/kW	
Elec Utility Supply Unit Cost	$0.11	$/kWh	
NG Utility Unit Cost	$1.15	$/Therm	
Existing Operating Cost of DHW	$1,047	$/yr	
Proposed Operating Cost of DHW	$28	$/yr	
Annual Utility Cost Savings	**$1,019**	**$/yr**	

Daily Hot Water Demand

			#USES PER DAY		FULL TIME OCCUPANTS**				
FIXTURE	*BASE WATER USE GPM	DURATION OF USE (MIN)	MALE	FEMALE	MALE	FEMALE	TOTAL GAL/DAY	% HOT WATER	TOTAL HW GAL/DAY
LAVATORY (Low-Flow Lavs use 0.5 GPM)	2.5	0.25	15	15	1	1	19	50%	9
SHOWER	2.5	5	0	0	1	1	0	75%	0
KITCHEN SINK	2.5	0.5	0	1	1	1	1	75%	1
MOP SINK	2.5	2	1	1	1	1	10	75%	8
Dishwasher (gal per use)	10	1	0	0	1	1	0	100%	0
						TOTAL	30		**18**

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

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CHA Project #27751
City Hall

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-9: Replace Electric DHW Heater w/ Tankless Condensing Gas-Fired DHW Heater - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Gas-Fired DHW Heater Removal	2	EA		$ 50		$ -	$ 135	$ -	$ 135	RS Means 2012
High Efficiency Gas-Fired DHW Heater	2	LS	$ 4,000	$ 280		$ 8,800	$ 756	$ -	$ 9,556	Vendor Quote
Miscellaneous Electrical	2	LS	$ 300			$ 660	$ -	$ -	$ 660	RS Means 2012
Venting Kit	2	EA	$ 450	$ 650		$ 990	$ 1,755	$ -	$ 2,745	RS Means 2012
Miscellaneous Piping and Valves	2	EA	$ 200			$ 440	$ -	$ -	$ 440	RS Means 2012
						$ -	$ -	$ -	$ -	

$ 13,536	Subtotal
$ 1,354	10% Contingency
$ 2,978	20% Contractor O&P
$ 1,787	10% Engineering Fees
$ 19,654	**Total**

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ECM-10: Replace Appliances w/ Energy Star Alternatives

Refrigerator Calculations for the ENERGY STAR Appliance Calculator

Inputs - *to edit these values go to the INPUTS tab*

			DEFAULT	USER ENTRY	
ENERGY STAR model total volume	*2*	selected model: Top-mounted freezer or refrigerator only (automatic defrost)	17.9	17.9	cubic feet
	1	Refrigerator-freezer or refrigerator only (manual or partial-auto defrost)	12.2	-	
	2	Top-mounted freezer or refrigerator only (automatic defrost)	17.9		
	3	Side-by-side (automatic defrost)	22.7		
	4	Side-by-side with through-the-door ice (automatic defrost)	24.6		
	5	Bottom-mounted freezer (automatic defrost)	20.0		
	6	Bottom-mounted freezer with through-the-door ice (automatic defrost)	25.4		
ENERGY STAR type & unit energy consumption		selected model: Top-mounted freezer or refrigerator only (automatic defrost)	389	389	kWh/year
	1	Refrigerator-freezer or refrigerator only (manual or partial-auto defrost)	350	-	
	2	Top-mounted freezer or refrigerator only (automatic defrost)	389		
	3	Side-by-side (automatic defrost)	490		
	4	Side-by-side with through-the-door ice (automatic defrost)	498		
	5	Bottom-mounted freezer (automatic defrost)	446		
	6	Bottom-mounted freezer with through-the-door ice (automatic defrost)	517		
Incremental cost			$40	$40	

Assumptions - *users can edit the highlighted values to modify the assumptions*

ENERGY STAR model volume		refrigerator	12.27	cubic feet
		freezer	5.63	
		adjusted	21.44	
Conventional model volume		total	17.90	
		refrigerator	12.27	
		freezer	5.63	
		adjusted	21.44	
Conventional type & unit energy consumption		Top-mounted freezer or refrigerator only (automatic defrost)	486	kWh/year
	1	Refrigerator-freezer or refrigerator only (manual or partial-auto defrost)	438	
	2	Top-mounted freezer or refrigerator only (automatic defrost)	486	
	3	Side-by-side (automatic defrost)	613	
	4	Side-by-side with through-the-door ice (automatic defrost)	623	
	5	Bottom-mounted freezer (automatic defrost)	558	
	6	Bottom-mounted freezer with through-the-door ice (automatic defrost)	646	
Annual days of operation			365	days
Equipment lifetime			12	years

Annual energy consumption per refrigerator

Conventional	ENERGY STAR	Savings	
486	389	97	kWh

References

Volume: - EPA research on available models, 2012

Energy consumption: - ENERGY STAR - ENERGY STAR specification
- Conventional - Federal standard, Technical Support Document, Table 3.2.9

Incremental cost: - EPA research on available models, 2010

Equipment lifetime: - Appliance Magazine, Market Research Report, January 2011

Refrigerator Calculations for the ENERGY STAR Appliance Calculator

Inputs - *to edit these values go to the INPUTS tab*

			DEFAULT	USER ENTRY	
ENERGY STAR model total volume	*2*	selected model: Top-mounted freezer or refrigerator o	17.9	0.0	cubic feet
	1	Refrigerator-freezer or refrigerator only (m	12.2	-	
	2	Top-mounted freezer or refrigerator only (a	17.9		
	3	Side-by-side (automatic defrost)	22.7		
	4	Side-by-side with through-the-door ice (au	24.6		
	5	Bottom-mounted freezer (automatic defros	20.0		
	6	Bottom-mounted freezer with through-the-	25.4		
ENERGY STAR type & unit energy consumption		selected model: Top-mounted freezer or refrigerator o	221	389	kWh/year
	1	Refrigerator-freezer or refrigerator only (m	199	-	
	2	Top-mounted freezer or refrigerator only (a	221		
	3	Side-by-side (automatic defrost)	406		
	4	Side-by-side with through-the-door ice (au	325		
	5	Bottom-mounted freezer (automatic defros	367		
	6	Bottom-mounted freezer with through-the-	431		
Incremental cost			$40	$40	

Assumptions - *users can edit the highlighted values to modify the assumptions*

ENERGY STAR model volume	refrigerator		0.00	cubic feet
	freezer		0.00	
	adjusted		0.00	
Conventional model volume	total		0.00	
	refrigerator		0.00	
	freezer		0.00	
	adjusted		0.00	
Conventional type & unit energy consumption		Top-mounted freezer or refrigerator o	276	kWh/year
	1	Refrigerator-freezer or refrigerator only (m	248	
	2	Top-mounted freezer or refrigerator only (a	276	
	3	Side-by-side (automatic defrost)	508	
	4	Side-by-side with through-the-door ice (au	406	
	5	Bottom-mounted freezer (automatic defros	459	
	6	Bottom-mounted freezer with through-the-	539	
Annual days of operation			365	days
Equipment lifetime			12	years

Annual energy consumption per refrigerator

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CHA Project #27751
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ECM-9: Replace Appliances w/ Energy Star Alternatives - Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
20.6 Cu FT Energy Star Refrigerator	1	EA	$ 800			$ 880	$ -	$ -	$ 880	Frigidaire Price on Bestbuy
						$ -	$ -	$ -	$ -	

$ 880	Subtotal
$ 88.00	10% Contingency
$ -	0% Contractor O&P
$ -	0% Engineering
$ 1,000	**Total**

Note: pricing is for energy calculations only -do not use for procurement

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CHA Project #27751
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ECM-11: Replace urinals and flush valves with low flow

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$11.74	$ / kGal
Urinals in Building to be replaced	1	
Average Flushes / Urinal (per Day)	9	
Average Gallons / Flush	2.5	Gal

PROPOSED CONDITIONS		
Proposed Urinals to be Replaced	1	
Proposed Gallons / Flush	0.125	Gal
Proposed Material Cost of new urinal & valve	$1,200	RS Means 2012
Proposed Installation Cost of new urinal & valve	$1,000	RS Means 2012
Total cost of new urinals & valves	$2,200	

SAVINGS		
Current Urinal Water Use	8	kGal / year
Proposed Urinal Water Use	0	kGal / year
Water Savings	8	kGal / year
Cost Savings	$92	/ year
Simple Payback	24.0	years

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ECM-11: Replace toilets and flush valves with low flow

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$11.74	$ / kGal
Toilets in Building	4	
Average Flushes / Toilet (per Day)	9	
Average Gallons / Flush	3.5	Gal

PROPOSED CONDITIONS		
Proposed Toilets to be Replaced	4	
Proposed Gallons / Flush	1.28	Gal
Proposed Material Cost of new toilet & valve	$1,400	RS Means 2012
Proposed Installation cost of new toilet & valve	$1,000	RS Means 2012
Total cost of new toilets & valves	$9,600	

SAVINGS		
Current Toilet Water Use	46	kGal / year
Proposed Toilet Water Use	17	kGal / year
Water Savings	29	kGal / year
Cost Savings	$342	/ year
Simple Payback	28.0	years

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ECM-11: Replace faucets with low flow

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$11.74	$ / kGal
Faucets in Building	4	
Average Uses / Faucet (per day)	9	# Uses
Average Time of Use	0.5	min
Average Flowrate	2.5	gpm

PROPOSED CONDITIONS		
Proposed Faucets to be Replaced	4	
Proposed Flowrate	0.5	gpm
Proposed Material Cost of new Faucets	$700	RS Means 2012
Proposed Installation cost of new Faucets	$300	RS Means 2012
Total cost of new faucets	$4,000	

SAVINGS		
Current Faucet Water Use	16	kGal / year
Proposed Faucet Water Use	3	kGal / year
Water Savings	13	kGal / year
Cost Savings	$154	/ year
Simple Payback	25.9	years

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New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 2012. Building must have a minimum average electric demand of 100 kW. This minimum is waived for buildings owned by local governements or non-profit organizations.
Values used in this calculation are for measures with a ROI greater than 10%

Total Building Area (Square Feet)	29,300
Is this audit funded by NJ BPU (Y/N)	Yes

Board of Public Utilites (BPU)

Incentive #1		
Audit is funded by NJ BPU	$0.10	$/sqft

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$48,716	$27,497
Existing Usage (from utility)	331,950	23,888
Proposed Savings	0	478
Existing Total MMBtus	3,522	
Proposed Savings MMBtus	48	
% Energy Reduction	**1.4%**	
Proposed Annual Savings	$3,281	

	Min (Savings = 15%)		Increase (Savings > 15%)		Max Incentive		Achieved Incentive	
	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm
Incentive #2	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.00	$0.00
Incentive #3	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.00	$0.00

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$0
Incentive #2	$0	$0	$0
Incentive #3	$0	$0	$0
Total All Incentives	**$0**	**$0**	**$0**

Total Project Cost	$0

		Allowable Incentive
% Incentives #1 of Utility Cost*	0.0%	$0
% Incentives #2 of Project Cost**	#DIV/0!	#DIV/0!
% Incentives #3 of Project Cost**	#DIV/0!	#DIV/0!
Total Eligible Incentives***	**#DIV/0!**	
Project Cost w/ Incentives	#DIV/0!	

Project Payback (years)	
w/o Incentives	w/ Incentives
0.0	#DIV/0!

* 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 25% of total project cost.
Maximum allowable amount of Incentive #3 is 25% 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; maximum 2 million per project

City of Woodbury - NJBPU
CHA Project #27751

Rate of Discount (used for NPV) 3.0%

Utility Costs		Yearly Usage	Metric Ton Carbon Dioxide Equivalent	Building Area	Annual Utility Cost	
$ 0.147	$/kWh blended		0.000420205	29,300	Electric	Natural Gas
$ 0.114	$/kWh supply	331,950	0.000420205		48,716	27,497
$ 11.79	$/kW	102.3	0			
$ 1.15	$/Therm	23,888	0.00533471			
$ 11.74	$/kgals	316	0			

Fire House

	Item	Savings					Cost	Simple Payback	Life Expectancy	Equivalent CO_2 (Metric tons)	NJ Smart Start Incentives	Direct Install Eligible (Y/N)	Direct Install Incentives	Max Incentives	Payback w/ Incentives	Simple Projected Lifetime Savings					ROI	NPV	IRR
		kW	kWh	therms	Water kgal	$										kW	kWh	therms	kgal/yr	$			
ECM-3	Cover Window A/C Units in Winter	0.0	0	79	0	91	$ 650	7.2	15	0.4	$ -	N	$ -	$ -	7.2	0.0	0	1,181	0	$ 1,358	1.1	$430	11.0%
ECM-7	Replace Window A/C Units with ENERGY Star models	0.0	713	0	0	105	$ 3,400	32.4	25.0	0.3	$ -	N	$ -	$ -	32.4	0.0	17,827	0	0	$ 2,621	(0.2)	($1,575)	-1.9%
ECM-9	Replace Electric DHW Heaters w/ Tankless Water Heaters	4.5	3,961	(102)	0	972	$ 19,654	20.2	15.0	1.1	$ 600	Y	$ 13,800	$ 600	19.6	67.5	59,422	(1,523)	0	$ 16,534	(0.2)	($7,456)	-3.2%
ECM-10	Replace Appliances w/ Energy Star Alternatives	0.0	97	0	0	14	$ 1,000	70.0	12.0	0.0	$ -	N	$ -	$ -	70.0	0.0	1,167	0	0	$ 172	(0.8)	($858)	-20.3%
ECM-11	Replace Plumbing Fixtures with Low Flow Options	0.0	0	0	26	301	$ 8,000	26.5	15.0	0.0		N	$ -	$ -	26.5	0.0	0	0	385	$ 4,520	(0.4)	($4,403)	-6.4%
ECM-L1	Lighting Replacements / Upgrades	1.5	2,956	0	0	548	$ 5,825	10.6	15.0	1.2	$ 460	Y	$ 4,100	$ 460	9.8	22.4	44,342	0	0	$ 9,687	0.7	$1,180	5.9%
ECM-L2	Install Lighting Controls (Add Occupancy Sensors)	0.0	2,645	0	0	302	$ 5,940	19.7	15.0	1.1	$ 770	Y	$ 4,200	$ 770	17.1	0.0	39,680	0	0	$ 5,833	(0.0)	($1,570)	-1.6%
ECM-L3	Lighting Replacements with Controls (Occupany Sensors)	1.5	4,920	0	0	772	$ 11,765	15.2	15.0	2.1	$ 1,230	Y	$ 8,200	$ 1,230	13.6	22.4	73,802	0	0	$ 14,017	0.2	($1,318)	1.2%
	Total (Does Not Include ECM-L1 & ECM-L2)	**6.0**	**9,692**	**(102)**	**26**	**$ 2,255**	**$ 44,470**	19.7	16.2	6.3	$ 1,830		$ 22,000	$ 1,830	18.9	89.9	152,218	(342)	385	$ 39,221	(0.1)	($14,320)	-1.9%
	Total Measures with Payback <15	**1.5**	**5,633**	**0**	**0**	**$ 863**	**$ 12,416**	14.4	15.0	**2.5**	$ -		$ -	$ -	14.4	0.0	0	1,181	0	$ 1,358	(0.9)	($2,118)	0.5%
	% of Existing	**6%**	**3%**	**0%**	**8%**																		

City:		Philadelphia, PA	108	Occupied Hours/Week			
	Enthalpy		Occupied	Occupied	Occupied	Occupied	Occupied
Temp	h (Btu/lb)	Bin Hours	Hours	Hours	Hours	Hours	Hours
102.5		0	0	0	0	0	0
97.5	33.1	3	2	1	0	0	0
92.5	38.0	33	21	12	4	2	1
87.5	36.2	123	79	44	16	6	2
82.5	33.8	477	307	170	61	22	8
77.5	32.7	656	422	234	84	30	11
72.5	31.0	742	477	265	95	34	12
67.5	28.1	784	504	280	100	36	13
62.5	24.6	983	632	351	125	45	16
57.5	21.2	625	402	223	80	28	10
52.5	18.3	540	347	193	69	25	9
47.5	16.0	457	294	163	58	21	7
42.5	14.4	671	431	240	86	31	11
37.5	12.5	1,067	686	381	136	49	17
32.5	10.5	685	440	245	87	31	11
27.5	8.5	369	237	132	47	17	6
22.5	7.0	321	206	115	41	15	5
17.5	5.3	184	118	66	23	8	3
12.5	3.8	40	26	14	5	2	1
7.5		0	0	0	0	0	0
2.5		0	0	0	0	0	0
-2.5		0	0	0	0	0	0
-7.5		0	0	0	0	0	0
		8,760					

Multipliers	
Material:	1.1
Labor:	1.35
Equipment:	1.1

Exist Heating Efficiency	80%
Cooling Eff (kW/ton)	1.2

City of Woodbury - NJBPU
CHA Project #27751
Fire House

ECM-3: Cover Window A/C Units in Winter

Existing: Lack of window A/C covers which allows for infiltration of outdoor air during the heating months
Proposed: Installwindow A/C covers and/or weather-stripping to reduce air infiltration

Heating System Efficiency	92%		Ex Occupied Clng Temp.	72	*F	Ex Occupied Htg Temp.	68	*F
Cooling System Efficiency	1.20	kW/ton	Ex Unoccupied Clng Temp.	80	*F	Ex Unoccupied Htg Temp.	68	*F
Linear Feet of Door Edge	44	LF	Cooling Occ Enthalpy Setpoint	27.5	Btu/lb	Electricity	$ 0.15	$/kWh
Existing Infiltration Factor*	1.5	cfm/LF	Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb	Natural Gas	$ 1.15	$/therm
Proposed Infiltration Factor*	0.45	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	Window A/C Infiltration Load BTUH	Window A/C Infiltration Load BTUH	Window A/C Infiltration Load BTUH	Window A/C 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	8,168	8,168	2,450	2,450	0	0	0	0
97.5	33.1	3	2	1	-1,674	-1,674	-502	-502	1	0	0	0
92.5	38.0	33	21	12	-3,111	-3,111	-933	-933	10	3	0	0
87.5	36.2	123	79	44	-2,599	-2,599	-780	-780	32	10	0	0
82.5	33.8	477	307	170	-1,881	-1,881	-564	-564	90	27	0	0
77.5	32.7	656	422	234	-1,531	0	-459	0	65	19	0	0
72.5	31.0	742	477	265	-1,036	0	-311	0	49	15	0	0
67.5	28.1	784	504	280	36	36	11	11	0	0	0	0
62.5	24.6	983	632	351	392	392	118	118	0	0	4	1
57.5	21.2	625	402	223	748	748	225	225	0	0	5	2
52.5	18.3	540	347	193	1,105	1,105	331	331	0	0	6	2
47.5	16.0	457	294	163	1,461	1,461	438	438	0	0	7	2
42.5	14.4	671	431	240	1,818	1,818	545	545	0	0	13	4
37.5	12.5	1,067	686	381	2,174	2,174	652	652	0	0	25	8
32.5	10.5	685	440	245	2,530	2,530	759	759	0	0	19	6
27.5	8.5	369	237	132	2,887	2,887	866	866	0	0	12	3
22.5	7.0	321	206	115	3,243	3,243	973	973	0	0	11	3
17.5	5.3	184	118	66	3,600	3,600	1,080	1,080	0	0	7	2
12.5	3.8	40	26	14	3,956	3,956	1,187	1,187	0	0	2	1
7.5		0	0	0	4,312	4,312	1,294	1,294	0	0	0	0
2.5		0	0	0	4,669	4,669	1,401	1,401	0	0	0	0
-2.5		0	0	0	5,025	5,025	1,508	1,508	0	0	0	0
-7.5		0	0	0	5,382	5,382	1,614	1,614	0	0	0	0
TOTALS		**8,760**	**5,631**	**3,129**					**246**	**74**	**112**	**34**

Existing Window A/C Infiltration	**66**	**cfm**
Existing Unoccupied Window A/C Infiltration	**66**	**cfm**
Proposed Window A/C Infiltration	**20**	**cfm**
Proposed Unoccupied Window A/C Infiltration	**20**	**cfm**

Savings	**79**	**therms**	**$ 91**
	0	**kWh**	**$ -**
			$ 91

Window A/C	Width (ft)	Height (ft)	Linear Feet (LF)	gap (in)	gap location	LF of gap	% door w/ gap	Average gap for door (in)
1	2	1.5	7	0.25	all sides	5.5	79%	0.196
2	2	1.5	7	0.25	all sides	5.5	79%	0.196
3	2	1.5	7	0.25	all sides	5.5	79%	0.196
4	2	1.5	7	0.25	all sides	5.5	79%	0.196
5	2	1.5	7	0.25	all sides	5.5	79%	0.196
6	2	1.5	7	0.25	all sides	5.5	79%	0.196
7	2	1.5	7	0.25	all sides	5.5	79%	0.196
8	2	1.5	7	0.125	all sides	5.5	79%	0.098
Total	**16**	**12**	**56**	**0.234**		**44**	**79%**	**0.184**

City of Woodbury - NJBPU
CHA Project #27751
Fire House

ECM-3: Cover Window A/C Units in Winter - Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Installation of window AC unit covers	8	EA	$ 56	$ -		$ 493	$ -	$ -	$ 493	Vendor quote
						$ -	$ -	$ -	$ -	

Note: pricing is for energy calculations only -do not use for procurement

$ 493	Subtotal
$ 49	10% Contingency
$ 108	20% Contractor O&P
$ -	0% Engineering
$ 650	**Total**

City of Woodbury - NJBPU
CHA Project #27751
Fire House

ECM-7: Replace Window A/C units with Energy Star Units

ECM Description Summary
By replacing older DX window unit air conditioners with newer equipment which have EER ratings, significant electrical energy can be saved. It is recommended these units be replaced by more modern Energy Star rated window units.

ASSUMPTIONS			Comments
Electric Cost	$0.147	/ kWh	
Average run hours per Week	50	Hours	Unit is manually turned on (even if after hours)
Space Balance Point	55	F	
Space Temperature Setpoint	70	deg F	setpoint
Avg. BTU / Hr Rating of existing RTU	18,000	Btu / Hr	(typical size for cooling spaces in this type of building)
Average EER	9.4		

Item	Value	Units	Comments
Total Number of Units	8		
Existing Annual Electric Usage	4,437	kWh	
Proposed EER	11.2		New Energy Star Unit (per Energy webpage)
Proposed Annual Electric Usage	3,724	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Savings	713	kWh
Annual Cost Savings	$105	

OAT - DB Bin Temp F	Annual Hours	Cooling Hrs at Temp Above balance point	Assumed % of time of operation	Assumed hrs of Operation
102.5	0	0	100%	0
97.5	3	1	89%	1
92.5	33	10	79%	8
87.5	123	37	68%	25
82.5	477	142	58%	82
77.5	656	195	47%	92
72.5	742	221	37%	81
67.5	784	0	0%	0
62.5	983	0	0%	0
57.5	625	0	0%	0
52.5	540	0	0%	0
47.5	457	0	0%	0
42.5	671	0	0%	0
37.5	1,067	0	0%	0
32.5	685	0	0%	0
27.5	369	0	0%	0
22.5	321	0	0%	0
17.5	184	0	0%	0
12.5	40	0	0%	0
7.5	0	0	0%	0
2.5	0	0	0%	0
-2.5	0	0	0%	0
-7.5	0	0	0%	0
Total	8,760	605	48%	290

City of Woodbury - NJBPU
CHA Project #27751
Fire House

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-7: Replace Window A/C units with Energy Star Units - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
18,000 MBH Energy Star A/C unit	8	EA	$ 350			$ 3,080	$ -	$ -	$ 3,080	Home Depot. Assumes Staff can install units
						$ -	$ -	$ -	$ -	

$	3,080	Subtotal
$	308.00	10% Contingency
$	-	0% Contractor O&P
$	-	0% Engineering
$	**3,400**	**Total**

Note: pricing is for energy calculations only -do not use for procurement

City of Woodbury - NJBPU
CHA Project #27751
Fire House

ECM-9: Replace Electric DHW Heater w/ Tankless Condensing Gas-Fired DHW Heater

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

Item	Value	Units	Formula/Comments
Occupied days per week	5	days/wk	
Occupied weeks per year	52	week/yr	
Water supply Temperature	60	˚F	Termperature of water coming into building
Hot Water Temperature	120	˚F	
Hot Water Usage per day	75	gal/day	Calculated from usage below
Annual Hot Water Energy Demand	9,746	MBTU/yr	Energy required to heat annual quantity of hot water to setpoint
Existing Tank Size	40	Gallons	Per manufacturer nameplate
Hot Water Temperature	120	˚F	Per building personnel
Average Room Temperature	72	˚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	3,504	MBTU/yr	
Total Annual Hot Water Demand (w/ standby losses)	13,250	Mbtu/yr	Building demand plus standby losses
Existing Water Heater Efficiency	98%		Per Manufacturer
Total Annual Energy Required	13,521	Mbtu/yr	
Total Annual Electric Required	**3,961**	**kWh/yr**	**Electrical Savings**
Average Annual Electric Demand	0.45	kW	
Peak Electric Demand	**4.50**	**kW**	**Per Manufacturer's Nameplate (Demand Savings)**
New Tank Size	0	Gallons	tankless
Hot Water Temperature	120	˚F	
Average Room Temperature	72	˚F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.0	MBH	
Annual Standby Hot Water Load	0	MBTU/yr	
Prop Annual Hot Water Demand (w/ standby losses)	9,746	MBTU/yr	
Proposed Avg. Hot water heater efficiency	96%		Based on Navien CR180 instantaneous, condensing DHW Heater
Proposed Total Annual Energy Required	10,152	MBTU/yr	
Proposed Fuel Use	102	Therms/yr	Standby Losses and inefficient DHW heater eliminated
Elec Utility Demand Unit Cost	$11.79	$/kW	
Elec Utility Supply Unit Cost	$0.11	$/kWh	
NG Utility Unit Cost	$1.15	$/Therm	
Existing Operating Cost of DHW	$1,088	$/yr	
Proposed Operating Cost of DHW	$117	$/yr	
Annual Utility Cost Savings	**$972**	**$/yr**	

Daily Hot Water Demand

			#USES PER DAY		FULL TIME OCCUPANTS**				
FIXTURE	*BASE WATER USE GPM	DURATION OF USE (MIN)	MALE	FEMALE	MALE	FEMALE	TOTAL GAL/DAY	% HOT WATER	TOTAL HW GAL/DAY
LAVATORY (Low-Flow Lavs use 0.5 GPM)	2.5	0.25	15	15	8	0	75	50%	38
SHOWER	2.5	5	1	0	4	0	50	75%	38
KITCHEN SINK	2.5	0.5	0	1	1	0	0	75%	0
MOP SINK	2.5	2	1	1	0	0	0	75%	0
Dishwasher (gal per use)	10	1	0	0	0	0	0	100%	0
						TOTAL	125		**75**

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

City of Woodbury - NJBPU
CHA Project #27751
Fire House

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-9: Replace Electric DHW Heater w/ Tankless Condensing Gas-Fired DHW Heater - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Gas-Fired DHW Heater Removal	2	EA		$ 50		$ -	$ 135	$ -	$ 135	RS Means 2012
High Efficiency Gas-Fired DHW Heater	2	LS	$ 4,000	$ 280		$ 8,800	$ 756	$ -	$ 9,556	Vendor Quote
Miscellaneous Electrical	2	LS	$ 300			$ 660	$ -	$ -	$ 660	RS Means 2012
Venting Kit	2	EA	$ 450	$ 650		$ 990	$ 1,755	$ -	$ 2,745	RS Means 2012
Miscellaneous Piping and Valves	2	EA	$ 200			$ 440	$ -	$ -	$ 440	RS Means 2012
						$ -	$ -	$ -	$ -	

$ 13,536	Subtotal
$ 1,354	10% Contingency
$ 2,978	20% Contractor O&P
$ 1,787	10% Engineering Fees
$ 19,654	**Total**

Note: pricing is for energy calculations only -do not use for procurement

City of Woodbury - NJBPU
CHA Project #27751
Fire House

ECM-10: Replace Appliances w/ Energy Star Alternatives

Refrigerator Calculations for the ENERGY STAR Appliance Calculator

Inputs - *to edit these values go to the INPUTS tab*

			DEFAULT	USER ENTRY	
ENERGY STAR model total volume	*2*	selected model: Top-mounted freezer or refrigerator only (automatic defrost)	17.9	17.9	cubic feet
	1	Refrigerator-freezer or refrigerator only (manual or partial-auto defrost)	12.2	-	
	2	Top-mounted freezer or refrigerator only (automatic defrost)	17.9		
	3	Side-by-side (automatic defrost)	22.7		
	4	Side-by-side with through-the-door ice (automatic defrost)	24.6		
	5	Bottom-mounted freezer (automatic defrost)	20.0		
	6	Bottom-mounted freezer with through-the-door ice (automatic defrost)	25.4		
ENERGY STAR type & unit energy consumption		selected model: Top-mounted freezer or refrigerator only (automatic defrost)	389	389	kWh/year
	1	Refrigerator-freezer or refrigerator only (manual or partial-auto defrost)	350	-	
	2	Top-mounted freezer or refrigerator only (automatic defrost)	389		
	3	Side-by-side (automatic defrost)	490		
	4	Side-by-side with through-the-door ice (automatic defrost)	498		
	5	Bottom-mounted freezer (automatic defrost)	446		
	6	Bottom-mounted freezer with through-the-door ice (automatic defrost)	517		
Incremental cost			$40	$40	

Assumptions - *users can edit the highlighted values to modify the assumptions*

ENERGY STAR model volume	refrigerator		12.27	cubic feet
	freezer		5.63	
	adjusted		21.44	
Conventional model volume	total		17.90	
	refrigerator		12.27	
	freezer		5.63	
	adjusted		21.44	
Conventional type & unit energy consumption		Top-mounted freezer or refrigerator only (automatic defrost)	486	kWh/year
	1	Refrigerator-freezer or refrigerator only (manual or partial-auto defrost)	438	
	2	Top-mounted freezer or refrigerator only (automatic defrost)	486	
	3	Side-by-side (automatic defrost)	613	
	4	Side-by-side with through-the-door ice (automatic defrost)	623	
	5	Bottom-mounted freezer (automatic defrost)	558	
	6	Bottom-mounted freezer with through-the-door ice (automatic defrost)	646	
Annual days of operation			365	days
Equipment lifetime			12	years

Annual energy consumption per refrigerator

Conventional	ENERGY STAR	Savings	
486	389	97	kWh

References

Volume:	- EPA research on available models, 2012
Energy consumption:	- ENERGY STAR - ENERGY STAR specification
	- Conventional - Federal standard, Technical Support Document, Table 3.2.9
Incremental cost:	- EPA research on available models, 2010
Equipment lifetime:	- Appliance Magazine, Market Research Report, January 2011

Refrigerator Calculations for the ENERGY STAR Appliance Calculator

Inputs - *to edit these values go to the INPUTS tab*

			DEFAULT	USER ENTRY	
ENERGY STAR model total volume	*2*	selected model: Top-mounted freezer or refrigerator o	17.9	0.0	cubic feet
	1	Refrigerator-freezer or refrigerator only (m	12.2	-	
	2	Top-mounted freezer or refrigerator only (a	17.9		
	3	Side-by-side (automatic defrost)	22.7		
	4	Side-by-side with through-the-door ice (au	24.6		
	5	Bottom-mounted freezer (automatic defros	20.0		
	6	Bottom-mounted freezer with through-the-	25.4		
ENERGY STAR type & unit energy consumption		selected model: Top-mounted freezer or refrigerator o	221	389	kWh/year
	1	Refrigerator-freezer or refrigerator only (m	199	-	
	2	Top-mounted freezer or refrigerator only (a	221		
	3	Side-by-side (automatic defrost)	406		
	4	Side-by-side with through-the-door ice (au	325		
	5	Bottom-mounted freezer (automatic defros	367		
	6	Bottom-mounted freezer with through-the-	431		
Incremental cost			$40	$40	

Assumptions - *users can edit the highlighted values to modify the assumptions*

ENERGY STAR model volume	refrigerator		0.00	cubic feet
	freezer		0.00	
	adjusted		0.00	
Conventional model volume	total		0.00	
	refrigerator		0.00	
	freezer		0.00	
	adjusted		0.00	
Conventional type & unit energy consumption		Top-mounted freezer or refrigerator o	276	kWh/year
	1	Refrigerator-freezer or refrigerator only (m	248	
	2	Top-mounted freezer or refrigerator only (a	276	
	3	Side-by-side (automatic defrost)	508	
	4	Side-by-side with through-the-door ice (au	406	
	5	Bottom-mounted freezer (automatic defros	459	
	6	Bottom-mounted freezer with through-the-	539	
Annual days of operation			365	days
Equipment lifetime			12	years

Annual energy consumption per refrigerator

Conventional	NERGY STA	Savings	
276	389	-113	kWh

City of Woodbury - NJBPU
CHA Project #27751
Fire House

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-10: Replace Appliances w/ Energy Star Alternatives - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
20.6 Cu FT Energy Star Refrigerator	1	EA	$ 800			$ 880	$ -	$ -	$ 880	Frigidaire Price on Bestbuy
						$ -	$ -	$ -	$ -	

$ 880	Subtotal
$ 88.00	10% Contingency
$ -	0% Contractor O&P
$ -	0% Engineering
$ 1,000	**Total**

Note: pricing is for energy calculations only -do not use for procurement

City of Woodbury - NJBPU
CHA Project #27751
Fire House

ECM-11: Replace urinals and flush valves with low flow

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$11.74	$ / kGal
Urinals in Building to be replaced	1	
Average Flushes / Urinal (per Day)	9	
Average Gallons / Flush	2.5	Gal

PROPOSED CONDITIONS		
Proposed Urinals to be Replaced	1	
Proposed Gallons / Flush	0.125	Gal
Proposed Material Cost of new urinal & valve	$1,200	RS Means 2012
Proposed Installation Cost of new urinal & valve	$1,000	RS Means 2012
Total cost of new urinals & valves	$2,200	

SAVINGS		
Current Urinal Water Use	8	kGal / year
Proposed Urinal Water Use	0	kGal / year
Water Savings	8	kGal / year
Cost Savings	$92	/ year
Simple Payback	24.0	years

City of Woodbury - NJBPU
CHA Project #27751
Fire House

ECM-11: Replace toilets and flush valves with low flow

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$11.74	$ / kGal
Toilets in Building	2	
Average Flushes / Toilet (per Day)	9	
Average Gallons / Flush	3.5	Gal

PROPOSED CONDITIONS		
Proposed Toilets to be Replaced	2	
Proposed Gallons / Flush	1.28	Gal
Proposed Material Cost of new toilet & valve	$1,400	RS Means 2012
Proposed Installation cost of new toilet & valve	$1,000	RS Means 2012
Total cost of new toilets & valves	$4,800	

SAVINGS		
Current Toilet Water Use	23	kGal / year
Proposed Toilet Water Use	8	kGal / year
Water Savings	15	kGal / year
Cost Savings	$171	/ year
Simple Payback	28.0	years

City of Woodbury - NJBPU
CHA Project #27751
Fire House

ECM-11: Replace faucets with low flow

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$11.74	$ / kGal
Faucets in Building	1	
Average Uses / Faucet (per day)	9	# Uses
Average Time of Use	0.5	min
Average Flowrate	2.5	gpm

PROPOSED CONDITIONS		
Proposed Faucets to be Replaced	1	
Proposed Flowrate	0.5	gpm
Proposed Material Cost of new Faucets	$700	RS Means 2012
Proposed Installation cost of new Faucets	$300	RS Means 2012
Total cost of new faucets	$1,000	

SAVINGS		
Current Faucet Water Use	4	kGal / year
Proposed Faucet Water Use	1	kGal / year
Water Savings	3	kGal / year
Cost Savings	$39	/ year
Simple Payback	25.9	years

City of Woodbury - NJBPU
CHA Project #27751
Fire House

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 2012. Building must have a minimum average electric demand of 100 kW. This minimum is waived for buildings owned by local governements or non-profit organizations.
Values used in this calculation are for measures with a ROI greater than 10%

Total Building Area (Square Feet)	29,300
Is this audit funded by NJ BPU (Y/N)	Yes

Board of Public Utilites (BPU)

Incentive #1		
Audit is funded by NJ BPU	$0.10	$/sqft

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$48,716	$27,497
Existing Usage (from utility)	331,950	23,888
Proposed Savings	713	0
Existing Total MMBtus	3,522	
Proposed Savings MMBtus	2	
% Energy Reduction	**0.1%**	
Proposed Annual Savings	$863	

	Min (Savings = 15%)		Increase (Savings > 15%)		Max Incentive		Achieved Incentive	
	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm
Incentive #2	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.00	$0.00
Incentive #3	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.00	$0.00

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$0
Incentive #2	$0	$0	$0
Incentive #3	$0	$0	$0
Total All Incentives	**$0**	**$0**	**$0**

Total Project Cost	$0

		Allowable Incentive
% Incentives #1 of Utility Cost*	0.0%	$0
% Incentives #2 of Project Cost**	#DIV/0!	#DIV/0!
% Incentives #3 of Project Cost**	#DIV/0!	#DIV/0!
Total Eligible Incentives***	**#DIV/0!**	
Project Cost w/ Incentives	#DIV/0!	

Project Payback (years)	
w/o Incentives	w/ Incentives
0.0	#DIV/0!

* 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 25% of total project cost.
Maximum allowable amount of Incentive #3 is 25% 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; maximum 2 million per project

City of Woodbury - NJBPU
CHA Project #27751

Rate of Discount (used for NPV) 3.0%

Utility Costs		Yearly Usage	Metric Ton Carbon Dioxide Equivalent	Building Area	Annual Utility Cost	
$ 0.147	$/kWh blended		0.000420205	29,300	Electric	Natural Gas
$ 0.114	$/kWh supply	331,950	0.000420205		48,716	27,497
$ 11.79	$/kW	102.3	0			
$ 1.15	$/Therm	23,888	0.00533471			
$ 11.74	$/kgals	316	0			

Library

	Item	Savings					Cost	Simple Payback	Life Expectancy	Equivalent CO_2 (Metric tons)	NJ Smart Start Incentives	Direct Install Eligible (Y/N)	Direct Install Incentives	Max Incentives	Payback w/ Incentives	Simple Projected Lifetime Savings					ROI	NPV	IRR
		kW	kWh	therms	Water kgal	$										kW	kWh	therms	kgal/yr	$			
ECM-5	Replacement of Existing HVAC Rooftop Units	0.0	4,900	0	0	720	$ 197,800	274.6	25	2.1	$ 4,937	Y	$ 75,000	$ 4,937	267.7	0.0	122,507	0	0	$ 18,008	(0.9)	($180,319)	-13.5%
ECM-9	Replace Electric DHW Heater w/ Tankless Condensing Gas-Fired	9.0	1,630	(20)	0	1,436	$ 19,556	13.6	15	0.6	$ 600	Y	$ 13,700	$ 600	13.2	135.0	24,456	(305)	0	$ 22,345	0.1	($1,815)	1.6%
ECM-10	Replace Appliances w/ Energy Star Alternatives	0.0	97	0	0	14	$ 1,000	70.0	15	0.0	$ -	N	$ -	$ -	70.0	0.0	1,458	0	0	$ 214	(0.8)	($829)	-15.0%
ECM-L1	Lighting Replacements / Upgrades	4.9	21,329	0	0	3,120	$ 31,197	10.0	15.0	9.0	$ 3,370	Y	$ 21,800	$ 3,370	8.9	73.0	319,928	0	0	$ 57,354	0.8	$9,416	7.3%
ECM-L2	Install Lighting Controls (Add Occupancy Sensors)	0.0	5,538	0	0	631	$ 5,400	8.6	15.0	2.3	$ 700	Y	$ 3,800	$ 700	7.4	0.0	83,070	0	0	$ 12,211	1.3	$2,837	10.4%
ECM-L3	Lighting Replacements with Controls (Occupany Sensors)	4.9	25,797	0	0	3,629	$ 36,597	10.1	15.0	10.8	$ 4,070	Y	$ 25,600	$ 4,070	9.0	73.0	386,951	0	0	$ 67,206	0.8	$10,797	7.3%
	Total (Does Not Include ECM-L1 & ECM-L2)	**13.9**	**32,425**	**(20)**	**0**	**$ 5,800**	**$ 254,953**	44.0	17.5	24.8	$ 9,607		$ 114,300	$ 9,607	42.3	208.0	535,372	(305)	0	$ 107,774	(0.6)	($168,988)	-8.7%
	Total Measures with Payback <15	**13.9**	**27,427**	**(20)**	**0**	**$ 5,065**	**$ 56,153**	11.1	15.0	**11.4**	$ 4,070		$ 25,600	$ 4,070	10.3	73.0	386,951	0	0	$ 67,206	0.2	$8,382	5.1%
	% of Existing	**14%**	**10%**	**0%**	**0%**																		

City:		**Philadelphia, PA**	**108**	Occupied Hours/Week			
	Enthalpy		Occupied	Occupied	Occupied	Occupied	Occupied
Temp	h (Btu/lb)	Bin Hours	Hours	Hours	Hours	Hours	Hours
102.5		0	0	0	0	0	0
97.5	33.1	3	2	1	0	0	0
92.5	38.0	33	21	12	4	2	1
87.5	36.2	123	79	44	16	6	2
82.5	33.8	477	307	170	61	22	8
77.5	32.7	656	422	234	84	30	11
72.5	31.0	742	477	265	95	34	12
67.5	28.1	784	504	280	100	36	13
62.5	24.6	983	632	351	125	45	16
57.5	21.2	625	402	223	80	28	10
52.5	18.3	540	347	193	69	25	9
47.5	16.0	457	294	163	58	21	7
42.5	14.4	671	431	240	86	31	11
37.5	12.5	1,067	686	381	136	49	17
32.5	10.5	685	440	245	87	31	11
27.5	8.5	369	237	132	47	17	6
22.5	7.0	321	206	115	41	15	5
17.5	5.3	184	118	66	23	8	3
12.5	3.8	40	26	14	5	2	1
7.5		0	0	0	0	0	0
2.5		0	0	0	0	0	0
-2.5		0	0	0	0	0	0
-7.5		0	0	0	0	0	0
		8,760					

Multipliers	
Material:	1.1
Labor:	1.35
Equipment:	1.1

Exist Heating Efficiency	80%
Cooling Eff (kW/ton)	1.2

City of Woodbury - NJBPU
CHA Project #27751
Library

ECM-5: Replacement of Existing HVAC Rooftop Units

Tag Information	Area Served	Cooling Capacity (MBH)
RTU-1	Library	161.5
RTU-2	Library	161.5
RTU-3	Library	161.5
RTU-4	Library	161.5

Total Electric DX Cooling: 646

ASSUMPTIONS				Comments
Electric Cost		$0.147	/ kWh	
Average run hours per Week		60	Hours	Unit is manually turned on (even if after hours)
Space Balance Point		55	F	
Space Temperature Setpoint		72	deg F	setpoint
Avg. BTU / Hr Rating of existing RTU		646,000	Btu / Hr	(typical size for cooling spaces in this type of building)
Average EER		9.0		

Item	Value	Units	Comments
Total Number of Units	1		
Existing Annual Electric Usage	24,947	kWh	
Proposed EER	11.2		New York Rooftop Unit (per manufacturer)
Proposed Annual Electric Usage	20,047	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Savings	4,900	kWh
Annual Cost Savings	$720	

OAT - DB Bin Temp F	Annual Hours	Cooling Hrs at Temp Above balance point	Assumed % of time of operation	Assumed hrs of Operation
102.5	0	0	100%	0
97.5	3	1	89%	1
92.5	33	12	79%	9
87.5	123	44	68%	30
82.5	477	170	58%	99
77.5	656	234	47%	111
72.5	742	265	37%	98
67.5	784	0	0%	0
62.5	983	0	0%	0
57.5	625	0	0%	0
52.5	540	0	0%	0
47.5	457	0	0%	0
42.5	671	0	0%	0
37.5	1,067	0	0%	0
32.5	685	0	0%	0
27.5	369	0	0%	0
22.5	321	0	0%	0
17.5	184	0	0%	0
12.5	40	0	0%	0
7.5	0	0	0%	0
2.5	0	0	0%	0
-2.5	0	0	0%	0
-7.5	0	0	0%	0
Total	8,760	726	48%	348

City of Woodbury - NJBPU
CHA Project #27751
Library

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-5: Replacement of Existing HVAC Rooftop Units - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Existing (4) RTUs demolition	4	EA	$ 100	$ 1,500		$ 440	$ 8,100	$ -	$ 8,540	RS Means 2012
(4) RTU, 15.0 tons with DX cooling and gas heating	11500	SF	$ 5	$ 5		$ 61,732	$ 71,726	$ -	$ 133,458	RS Means 2012
- DX Cooling, Packaged Unit						$ -	$ -	$ -	$ -	
Electrical - misc.	1	LS	$ 1,000	$ 5,000		$ 1,100	$ 6,750	$ -	$ 7,850	RS Means 2012
						$ -	$ -	$ -	$ -	

$ 149,848	Subtotal
$ 14,985	10% Contingency
$ 32,966	20% Contractor O&P
$ -	0% Engineering
$ 197,800	**Total**

Note: pricing is for energy calculations only -do not use for procurement

City of Woodbury - NJBPU
CHA Project #27751
Library

ECM-8: Replace Electric DHW Heater w/ Tankless Condensing Gas-Fired DHW Heater

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

Item	Value	Units	Formula/Comments
Occupied days per week	5	days/wk	
Occupied weeks per year	52	week/yr	
Water supply Temperature	60	˚F	Termperature of water coming into building
Hot Water Temperature	120	˚F	
Hot Water Usage per day	15	gal/day	Calculated from usage below
Annual Hot Water Energy Demand	1,949	MBTU/yr	Energy required to heat annual quantity of hot water to setpoint
Existing Tank Size	40	Gallons	Per manufacturer nameplate
Hot Water Temperature	120	˚F	Per building personnel
Average Room Temperature	72	˚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	3,504	MBTU/yr	
Total Annual Hot Water Demand (w/ standby losses)	5,453	Mbtu/yr	Building demand plus standby losses
Existing Water Heater Efficiency	98%		Per Manufacturer
Total Annual Energy Required	5,565	Mbtu/yr	
Total Annual Electric Required	**1,630**	**kWh/yr**	**Electrical Savings**
Average Annual Electric Demand	0.19	kW	
Peak Electric Demand	**9.00**	**kW**	**Per Manufacturer's Nameplate (Demand Savings)**
New Tank Size	0	Gallons	tankless
Hot Water Temperature	120	˚F	
Average Room Temperature	72	˚F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.0	MBH	
Annual Standby Hot Water Load	0	MBTU/yr	
Prop Annual Hot Water Demand (w/ standby losses)	1,949	MBTU/yr	
Proposed Avg. Hot water heater efficiency	96%		Based on Navien CR180 instantaneous, condensing DHW Heater
Proposed Total Annual Energy Required	2,030	MBTU/yr	
Proposed Fuel Use	20	Therms/yr	Standby Losses and inefficient DHW heater eliminated
Elec Utility Demand Unit Cost	$11.79	$/kW	
Elec Utility Supply Unit Cost	$0.11	$/kWh	
NG Utility Unit Cost	$1.15	$/Therm	
Existing Operating Cost of DHW	$1,459	$/yr	
Proposed Operating Cost of DHW	$23	$/yr	
Annual Utility Cost Savings	**$1,436**	**$/yr**	

Daily Hot Water Demand

			#USES PER DAY		FULL TIME OCCUPANTS**				
FIXTURE	*BASE WATER USE GPM	DURATION OF USE (MIN)	MALE	FEMALE	MALE	FEMALE	TOTAL GAL/DAY	% HOT WATER	TOTAL HW GAL/DAY
LAVATORY (Low-Flow Lavs use 0.5 GPM)	0.5	0.25	3	3	15	25	15	50%	8
SHOWER	2.5	5	1	1	0	0	0	75%	0
KITCHEN SINK	2.5	0.5	1	1	0	4	5	75%	4
MOP SINK	2.5	2	1	1	0	1	5	75%	4
Dishwasher (gal per use)	10	1	1	0	0	0	0	100%	0
						TOTAL	25		**15**

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

City of Woodbury - NJBPU
CHA Project #27751
Library

Multipliers	
Material:	1.10
Labor:	1.35
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		$ -	$ 68	$ -	$ 68	RS Means 2012
High Efficiency Gas-Fired DHW Heater	2	LS	$ 4,000	$ 280		$ 8,800	$ 756	$ -	$ 9,556	Vendor Quote
Miscellaneous Electrical	2	LS	$ 300			$ 660	$ -	$ -	$ 660	RS Means 2012
Venting Kit	2	EA	$ 450	$ 650		$ 990	$ 1,755	$ -	$ 2,745	RS Means 2012
Miscellaneous Piping and Valves	2	LS	$ 200			$ 440	$ -	$ -	$ 440	RS Means 2012

$ 13,469	Subtotal
$ 1,347	10% Contingency
$ 2,963	20% Contractor O&P
$ 1,778	10% Engineering Fees
$ 19,556	**Total**

Note: pricing is for energy calculations only -do not use for procurement

City of Woodbury - NJBPU
CHA Project #27751
Library

ECM-9: Replace Appliances w/ Energy Star Alternatives

Refrigerator Calculations for the ENERGY STAR Appliance Calculator

Inputs - *to edit these values go to the INPUTS tab*

			DEFAULT	USER ENTRY	
ENERGY STAR model total volume	*2*	selected model: Top-mounted freezer or refrigerator only (automatic defrost)	17.9	17.9	cubic feet
	1	Refrigerator-freezer or refrigerator only (manual or partial-auto defrost)	12.2	-	
	2	Top-mounted freezer or refrigerator only (automatic defrost)	17.9		
	3	Side-by-side (automatic defrost)	22.7		
	4	Side-by-side with through-the-door ice (automatic defrost)	24.6		
	5	Bottom-mounted freezer (automatic defrost)	20.0		
	6	Bottom-mounted freezer with through-the-door ice (automatic defrost)	25.4		
ENERGY STAR type & unit energy consumption		selected model: Top-mounted freezer or refrigerator only (automatic defrost)	389	389	kWh/year
	1	Refrigerator-freezer or refrigerator only (manual or partial-auto defrost)	350	-	
	2	Top-mounted freezer or refrigerator only (automatic defrost)	389		
	3	Side-by-side (automatic defrost)	490		
	4	Side-by-side with through-the-door ice (automatic defrost)	498		
	5	Bottom-mounted freezer (automatic defrost)	446		
	6	Bottom-mounted freezer with through-the-door ice (automatic defrost)	517		
Incremental cost			$40	$40	

Assumptions - *users can edit the highlighted values to modify the assumptions*

ENERGY STAR model volume	refrigerator		12.27	cubic feet
	freezer		5.63	
	adjusted		21.44	
Conventional model volume	total		17.90	
	refrigerator		12.27	
	freezer		5.63	
	adjusted		21.44	
Conventional type & unit energy consumption		Top-mounted freezer or refrigerator only (automatic defrost)	486	kWh/year
	1	Refrigerator-freezer or refrigerator only (manual or partial-auto defrost)	438	
	2	Top-mounted freezer or refrigerator only (automatic defrost)	486	
	3	Side-by-side (automatic defrost)	613	
	4	Side-by-side with through-the-door ice (automatic defrost)	623	
	5	Bottom-mounted freezer (automatic defrost)	558	
	6	Bottom-mounted freezer with through-the-door ice (automatic defrost)	646	
Annual days of operation			365	days
Equipment lifetime			12	years

Annual energy consumption per refrigerator

Conventional	ENERGY STAR	Savings	
486	389	97	kWh

References

Volume: - EPA research on available models, 2012

Energy consumption: - ENERGY STAR - ENERGY STAR specification
- Conventional - Federal standard, Technical Support Document, Table 3.2.9

Incremental cost: - EPA research on available models, 2010

Equipment lifetime: - Appliance Magazine, Market Research Report, January 2011

City of Woodbury - NJBPU
CHA Project #27751
Library

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-9: Replace Appliances w/ Energy Star Alternatives - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
20.6 Cu FT Energy Star Refrigerator	1	EA	$ 800			$ 880	$ -	$ -	$ 880	Frigidaire Price on Bestbuy
						$ -	$ -	$ -	$ -	

Note: pricing is for energy calculations only -do not use for procurement

$ 880	Subtotal
$ 88.00	10% Contingency
$ -	0% Contractor O&P
$ -	0% Engineering
$ 1,000	**Total**

City of Woodbury - NJBPU
CHA Project #27751
Library

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 2012. Building must have a minimum average electric demand of 100 kW. This minimum is waived for buildings owned by local governements or non-profit organizations.
Values used in this calculation are for measures with a ROI greater than 10%

Total Building Area (Square Feet)	29,300
Is this audit funded by NJ BPU (Y/N)	Yes

Board of Public Utilites (BPU)

Incentive #1		
Audit is funded by NJ BPU	$0.10	$/sqft

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$48,716	$27,497
Existing Usage (from utility)	331,950	23,888
Proposed Savings	0	0
Existing Total MMBtus	3,522	
Proposed Savings MMBtus	0	
% Energy Reduction	**0.0%**	
Proposed Annual Savings	$5,065	

	Min (Savings = 15%)		Increase (Savings > 15%)		Max Incentive		Achieved Incentive	
	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm
Incentive #2	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.00	$0.00
Incentive #3	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.00	$0.00

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$0
Incentive #2	$0	$0	$0
Incentive #3	$0	$0	$0
Total All Incentives	**$0**	**$0**	**$0**

Total Project Cost	$0

		Allowable Incentive
% Incentives #1 of Utility Cost*	0.0%	$0
% Incentives #2 of Project Cost**	#DIV/0!	#DIV/0!
% Incentives #3 of Project Cost**	#DIV/0!	#DIV/0!
Total Eligible Incentives***	**#DIV/0!**	
Project Cost w/ Incentives	#DIV/0!	

Project Payback (years)	
w/o Incentives	w/ Incentives
0.0	#DIV/0!

* 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 25% of total project cost.
Maximum allowable amount of Incentive #3 is 25% 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; maximum 2 million per project

Energy Audit of City Hall
CHA Project No. 27751
Existing Lighting & Audit Input

Cost of Electricity: **$0.114** **$/kWh**
$11.79 **$/kW**

			EXISTING CONDITIONS								Retrofit Control	
	Area Description	Usage	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh		
Field Code	**Unique description of the location - Room number/Room name: Floor number (if applicable)**	**Describe Usage Type using Operating Hours**	**No. of fixtures before the retrofit**	**Lighting Fixture Code**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Fixt No.)**	**Pre-inst. control device**	**Estimated annual hours for the usage group**	**(kW/space) * (Annual Hours)**	**Retrofit control device**	**Notes**
172	Basement Storage (Back)	Storage Areas	3	1T 34 R F 2 (MAG)	F42EE	72	0.22	SW	1000	216	C-OCC	
191	Basement Storage (Back)	Storage Areas	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.37	SW	1000	369	C-OCC	
191	Boiler Room	Boiler Room	5	S 60 C F 2 (ELE) 8'	F82EE	123	0.62	SW	1820	1,119	NONE	
13	Boiler Room	Boiler Room	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	1820	109	NONE	
191	Storage	Storage Areas	8	S 60 C F 2 (ELE) 8'	F82EE	123	0.98	SW	1000	984	C-OCC	
191	Storage	Storage Areas	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.25	SW	1000	246	C-OCC	
191	Directors Room	Offices	1	S 60 C F 2 (ELE) 8'	F82EE	123	0.12	SW	2000	246	C-OCC	
71	Directors Room	Offices	1	I 60	I60/1	60	0.06	SW	2000	120	C-OCC	
172	Directors Room	Offices	6	1T 34 R F 2 (MAG)	F42EE	72	0.43	SW	2000	864	C-OCC	
191	Directors Room	Offices	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.37	SW	2000	738	C-OCC	
172	Control Room	Offices	4	1T 34 R F 2 (MAG)	F42EE	72	0.29	SW	2000	576	C-OCC	
172	Storage	Storage Areas	23	1T 34 R F 2 (MAG)	F42EE	72	1.66	SW	1000	1,656	C-OCC	
13	Stair	Stairway	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	240	C-OCC	
13	Code Enforcement	Offices	10	S 32 P F 2 (ELE)	F42LL	60	0.60	SW	2000	1,200	C-OCC	
44	Service Desk	Offices	6	DC 26 W CF 2	CFQ26/2-L	50	0.30	SW	2000	600	C-OCC	
13	Construction Offical Office	Offices	4	S 32 P F 2 (ELE)	F42LL	60	0.24	SW	2000	480	C-OCC	
13	Inspector Office 1	Offices	4	S 32 P F 2 (ELE)	F42LL	60	0.24	SW	2000	480	C-OCC	
201	Inspector Office 2	Offices	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.27	SW	2000	540	C-OCC	
13	Kitchen	Staff Lounge	3	S 32 P F 2 (ELE)	F42LL	60	0.18	SW	2000	360	C-OCC	
13	Men's TR	Restroom	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	2000	120	C-OCC	
13	Women's TR	Restroom	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	2000	120	C-OCC	
7	Corridor	Hallways	4	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.24	SW	2000	480	C-OCC	
13	Storage	Storage Areas	3	S 32 P F 2 (ELE)	F42LL	60	0.18	SW	1000	180	C-OCC	
201	Tax Collector	Offices	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.27	SW	2000	540	C-OCC	
201	Municipal Services	Offices	19	T 32 R F 3 (ELE)	F43ILL/2	90	1.71	SW	2000	3,420	C-OCC	
44	Municipal Services	Offices	19	DC 26 W CF 2	CFQ26/2-L	50	0.95	SW	2000	1,900	C-OCC	
7	Municipal Services	Offices	2	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.12	SW	2000	240	C-OCC	
201	CFO Office	Offices	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.27	SW	2000	540	C-OCC	
13	City Clerk Office	Offices	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	240	C-OCC	
201	Administrator Office	Offices	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	2000	720	C-OCC	
172	Safe	Storage Areas	1	1T 34 R F 2 (MAG)	F42EE	72	0.07	SW	1000	72	C-OCC	
201	Lobby	Hallways	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.27	SW	2000	540	C-OCC	
220	TR	Restroom	1	S 17 C F 1(ELE)	F21ILL	20	0.02	SW	2000	40	C-OCC	
220	Janitor Closet	Storage/Janitor	1	S 17 C F 1(ELE)	F21ILL	20	0.02	SW	500	10	C-OCC	
13	Office	Offices	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	240	C-OCC	
59	Stairs	Stairway	5	S 13 R CF 2	CFQ13/2-L	28	0.14	SW	2000	280	C-OCC	
80	Stairs	Stairway	2	SP 36 R CF 1	CFT36/1	51	0.10	SW	2000	204	C-OCC	
59	Stairs	Stairway	5	S 13 R CF 2	CFQ13/2-L	28	0.14	SW	2000	280	C-OCC	
80	Stairs	Stairway	2	SP 36 R CF 1	CFT36/1	51	0.10	SW	2000	204	C-OCC	
59	2nd Floor Corridor	Hallways	7	S 13 R CF 2	CFQ13/2-L	28	0.20	SW	2000	392	C-OCC	
201	Council Chambers	Municipal Chambers	18	T 32 R F 3 (ELE)	F43ILL/2	90	1.62	SW	520	842	C-OCC	
13	Men's TR	Restroom	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	240	C-OCC	
13	Women's TR	Restroom	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	240	C-OCC	
201	Mayor's Office	Offices	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.27	SW	2000	540	C-OCC	
	Total		**207**				**15.02**			**23,768**		

Energy Audit of City Hall
CHA Project No. 27751
ECM-L1 Lighting Replacements

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	**Unique description of the location - Room number/Room name: Floor number (if applicable)**	**No. of fixtures before the retrofit**	**"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Fixt No.)**	**Pre-inst. control device**	**Estimated daily hours for the usage group**	**(kW/space) * (Annual Hours)**	**No. of fixtures after the retrofit**	**"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Number of Fixtures)**	**Retrofit control device**	**Estimated annual hours for the usage group**	**(kW/space) * (Annual Hours)**	**(Original Annual kWh) - (Retrofit Annual kWh)**	**(Original Annual kW) - (Retrofit Annual kW)**	**(kWh Saved) * ($/kWh)**	**Cost for renovations to lighting system**	**Prescriptive Lighting Measures**	**Length of time for renovations cost to be recovered**	**Length of time for renovations cost to be recovered**
172	Basement Storage (Back)	3	1T 34 R F 2 (MAG)	F42EE	72	0.2	SW	1000	216	3	1T 28 R F 2	F42SSILL	48	0.1	SW	1,000	144	72	0.1	$ 18.39	$ 344.25	$0	18.7	18.7
191	Basement Storage (Back)	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	SW	1000	369	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	SW	1,000	369	-	0.0	$ -	$ -	$0		#DIV/0!
191	Boiler Room	5	S 60 C F 2 (ELE) 8'	F82EE	123	0.6	SW	1820	1,119	5	S 60 C F 2 (ELE) 8'	F82EE	123	0.6	SW	1,820	1,119	-	0.0	$ -	$ -	$0		#DIV/0!
13	Boiler Room	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1820	109	1	T 28 R F 2	F42SSILL	48	0.0	SW	1,820	87	22	0.0	$ 4.19	$ 114.75	$10	27.4	25.0
191	Storage	8	S 60 C F 2 (ELE) 8'	F82EE	123	1.0	SW	1000	984	8	S 60 C F 2 (ELE) 8'	F82EE	123	1.0	SW	1,000	984	-	0.0	$ -	$ -	$0		#DIV/0!
191	Storage	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	SW	1000	246	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	SW	1,000	246	-	0.0	$ -	$ -	$0		#DIV/0!
191	Directors Room	1	S 60 C F 2 (ELE) 8'	F82EE	123	0.1	SW	2000	246	1	S 60 C F 2 (ELE) 8'	F82EE	123	0.1	SW	2,000	246	-	0.0	$ -	$ -	$0		#DIV/0!
71	Directors Room	1	I 60	I60/1	60	0.1	SW	2000	120	1	CF 26	CFQ26/1-L	27	0.0	SW	2,000	54	66	0.0	$ 12.19	$ 6.75	$0	0.6	0.6
172	Directors Room	6	1T 34 R F 2 (MAG)	F42EE	72	0.4	SW	2000	864	6	1T 28 R F 2	F42SSILL	48	0.3	SW	2,000	576	288	0.1	$ 53.21	$ 688.50	$0	12.9	12.9
191	Directors Room	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	SW	2000	738	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	SW	2,000	738	-	0.0	$ -	$ -	$0		#DIV/0!
172	Control Room	4	1T 34 R F 2 (MAG)	F42EE	72	0.3	SW	2000	576	4	1T 28 R F 2	F42SSILL	48	0.2	SW	2,000	384	192	0.1	$ 35.47	$ 459.00	$0	12.9	12.9
172	Storage	23	1T 34 R F 2 (MAG)	F42EE	72	1.7	SW	1000	1,656	23	1T 28 R F 2	F42SSILL	48	1.1	SW	1,000	1,104	552	0.6	$ 141.02	$ 2,639.25	$0	18.7	18.7
13	Stair	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.87	$ 229.50	$20	25.9	23.6
13	Code Enforcement	10	S 32 P F 2 (ELE)	F42LL	60	0.6	SW	2000	1,200	10	T 28 R F 2	F42SSILL	48	0.5	SW	2,000	960	240	0.1	$ 44.34	$ 1,147.50	$100	25.9	23.6
44	Service Desk	6	DC 26 W CF 2	CFQ26/2-L	50	0.3	SW	2000	600	6	DC 26 W CF 2	CFQ26/2-L	50	0.3	SW	2,000	600	-	0.0	$ -	$ -	$0		#DIV/0!
13	Construction Office Office	4	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	480	4	T 28 R F 2	F42SSILL	48	0.2	SW	2,000	384	96	0.0	$ 17.74	$ 459.00	$40	25.9	23.6
13	Inspector Office 1	4	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	480	4	T 28 R F 2	F42SSILL	48	0.2	SW	2,000	384	96	0.0	$ 17.74	$ 459.00	$40	25.9	23.6
201	Inspector Office 2	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540	3	T 28 R F 3	F43SSILL	72	0.2	SW	2,000	432	108	0.1	$ 19.95	$ 344.25	$30	17.3	15.8
13	Kitchen	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360	3	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	288	72	0.0	$ 13.30	$ 344.25	$30	25.9	23.6
13	Men's TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	SW	2,000	96	24	0.0	$ 4.43	$ 114.75	$10	25.9	23.6
13	Women's TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	SW	2,000	96	24	0.0	$ 4.43	$ 114.75	$10	25.9	23.6
7	Corridor	4	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.2	SW	2000	480	4	2T 17 R F 2 (ELE)	F22ILL	33	0.1	SW	2,000	264	216	0.1	$ 39.90	$ 432.00	$0	10.8	10.8
13	Storage	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	1000	180	3	T 28 R F 2	F42SSILL	48	0.1	SW	1,000	144	36	0.0	$ 9.20	$ 344.25	$30	37.4	34.2
201	Tax Collector	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540	3	T 28 R F 3	F43SSILL	72	0.2	SW	2,000	432	108	0.1	$ 19.95	$ 344.25	$30	17.3	15.8
201	Municipal Services	19	T 32 R F 3 (ELE)	F43ILL/2	90	1.7	SW	2000	3,420	19	T 28 R F 3	F43SSILL	72	1.4	SW	2,000	2,736	684	0.3	$ 126.36	$ 2,180.25	$190	17.3	15.8
44	Municipal Services	19	DC 26 W CF 2	CFQ26/2-L	50	1.0	SW	2000	1,900	19	DC 26 W CF 2	CFQ26/2-L	50	1.0	SW	2,000	1,900	-	0.0	$ -	$ -	$0		#DIV/0!
7	Municipal Services	2	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	SW	2000	240	2	2T 17 R F 2 (ELE)	F22ILL	33	0.1	SW	2,000	132	108	0.1	$ 19.95	$ 216.00	$0	10.8	10.8
201	CFO Office	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540	3	T 28 R F 3	F43SSILL	72	0.2	SW	2,000	432	108	0.1	$ 19.95	$ 344.25	$30	17.3	15.8
13	City Clerk Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.87	$ 229.50	$20	25.9	23.6
201	Administrator Office	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	2000	720	4	T 28 R F 3	F43SSILL	72	0.3	SW	2,000	576	144	0.1	$ 26.60	$ 459.00	$40	17.3	15.8
172	Safe	1	1T 34 R F 2 (MAG)	F42EE	72	0.1	SW	1000	72	1	1T 28 R F 2	F42SSILL	48	0.0	SW	1,000	48	24	0.0	$ 6.13	$ 114.75	$0	18.7	18.7
201	Lobby	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540	3	T 28 R F 3	F43SSILL	72	0.2	SW	2,000	432	108	0.1	$ 19.95	$ 344.25	$30	17.3	15.8
220	TR	1	S 17 C F 1(ELE)	F21ILL	20	0.0	SW	2000	40	1	S 17 C F 1(ELE)	F21ILL	20	0.0	SW	2,000	40	-	0.0	$ -	$ -	$0		#DIV/0!
220	Janitor Closet	1	S 17 C F 1(ELE)	F21ILL	20	0.0	SW	500	10	1	S 17 C F 1(ELE)	F21ILL	20	0.0	SW	500	10	-	0.0	$ -	$ -	$0		#DIV/0!
13	Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.87	$ 229.50	$20	25.9	23.6
59	Stairs	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2000	280	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2,000	280	-	0.0	$ -	$ -	$0		#DIV/0!
80	Stairs	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2,000	204	-	0.0	$ -	$ -	$0		#DIV/0!
59	Stairs	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2000	280	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2,000	280	-	0.0	$ -	$ -	$0		#DIV/0!
80	Stairs	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2,000	204	-	0.0	$ -	$ -	$0		#DIV/0!
59	2nd Floor Corridor	7	S 13 R CF 2	CFQ13/2-L	28	0.2	SW	2000	392	7	S 13 R CF 2	CFQ13/2-L	28	0.2	SW	2,000	392	-	0.0	$ -	$ -	$0		#DIV/0!
201	Council Chambers	18	2T 32 R F 3 (ELE)	F43ILL/2	90	1.6	SW	520	842	18	T 28 R F 3	F43SSILL	72	1.3	SW	520	674	168	0.3	$ 65.05	$ 2,065.50	$180	31.8	29.2
13	Men's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.87	$ 229.50	$20	25.9	23.6
13	Women's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.87	$ 229.50	$20	25.9	23.6
201	Mayor's Office	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540	3	T 28 R F 3	F43SSILL	72	0.2	SW	2,000	432	108	0.1	$ 19.95	$ 344.25	$30	17.3	15.8
	Total	**207**				**15.0**			**23,768**	**207**			**2,597**	**12.5**			**19,864**	**3,904**	**2.5**	**$804**	**$15,572**	**$930**		
																	Demand Savings			**2.5**	**$359**			
																	kWh Savings			**3,904**	**$445**			
																	Total savings				**$804**		**19.4**	**18.2**

Energy Audit of City Hall
CHA Project No. 27751
ECM-L2 Install Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	**Unique description of the location - Room number/Room name: Floor number (if applicable)**	**No. of fixtures before the retrofit**	**Lighting Fixture Code**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Fixt No.)**	**Pre-inst. control device**	**Estimated annual hours for the usage group**	**(kW/space) * (Annual Hours)**	**No. of fixtures after the retrofit**	**"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Number of Fixtures)**	**Retrofit control device**	**Estimated annual hours for the usage group**	**(kW/space) * (Annual Hours)**	**(Original Annual kWh) - (Retrofit Annual kWh)**	**(Original Annual kW) - (Retrofit Annual kW)**	**(kW Saved) * ($/kWh)**	**Cost for renovations to lighting system**	**Length of time for renovations cost to be recovered**	**Length of time for renovations cost to be recovered**
172	Basement Storage (Back)	3	1T 34 R F 2 (MAG)	F42EE	72	0.2	SW	1000	216.0	3	1T 34 R F 2 (MAG)	F42EE	72	0.2	C-OCC	250	54.0	162.0	0.0	$18.47	$270.00	$35.00	14.6	12.7
191	Basement Storage (Back)	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	SW	1000	369.0	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	C-OCC	250	92.3	276.8	0.0	$31.55	$270.00	$35.00	8.6	7.4
191	Boiler Room	5	S 60 C F 2 (ELE) 8'	F82EE	123	0.6	SW	1820	1,119.3	5	S 60 C F 2 (ELE) 8'	F82EE	123	0.6	NONE	1820	1,119.3	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
13	Boiler Room	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1820	109.2	1	S 32 P F 2 (ELE)	F42LL	60	0.1	NONE	1820	109.2	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
191	Storage	8	S 60 C F 2 (ELE) 8'	F82EE	123	1.0	SW	1000	984.0	8	S 60 C F 2 (ELE) 8'	F82EE	123	1.0	C-OCC	250	246.0	738.0	0.0	$84.13	$270.00	$35.00	3.2	2.8
191	Storage	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	SW	1000	246.0	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	C-OCC	250	61.5	184.5	0.0	$21.03	$270.00	$35.00	12.8	11.2
191	Directors Room	1	S 60 C F 2 (ELE) 8'	F82EE	123	0.1	SW	2000	246.0	1	S 60 C F 2 (ELE) 8'	F82EE	123	0.1	C-OCC	1000	123.0	123.0	0.0	$14.02	$270.00	$35.00	19.3	16.8
71	Directors Room	1	I 60	I60/1	60	0.1	SW	2000	120.0	1	I 60	I60/1	60	0.1	C-OCC	1000	60.0	60.0	0.0	$6.84	$270.00	$35.00	39.5	34.4
172	Directors Room	6	1T 34 R F 2 (MAG)	F42EE	72	0.4	SW	2000	864.0	6	1T 34 R F 2 (MAG)	F42EE	72	0.4	C-OCC	1000	432.0	432.0	0.0	$49.25	$270.00	$35.00	5.5	4.8
191	Directors Room	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	SW	2000	738.0	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	C-OCC	1000	369.0	369.0	0.0	$42.07	$270.00	$35.00	6.4	5.6
172	Control Room	4	1T 34 R F 2 (MAG)	F42EE	72	0.3	SW	2000	576.0	4	1T 34 R F 2 (MAG)	F42EE	72	0.3	C-OCC	1000	288.0	288.0	0.0	$32.83	$270.00	$35.00	8.2	7.2
172	Storage	23	1T 34 R F 2 (MAG)	F42EE	72	1.7	SW	1000	1,656.0	23	1T 34 R F 2 (MAG)	F42EE	72	1.7	C-OCC	250	414.0	1,242.0	0.0	$141.59	$270.00	$35.00	1.9	1.7
13	Stair	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1200	144.0	96.0	0.0	$10.94	$270.00	$35.00	24.7	21.5
13	Code Enforcement	10	S 32 P F 2 (ELE)	F42LL	60	0.6	SW	2000	1,200.0	10	S 32 P F 2 (ELE)	F42LL	60	0.6	C-OCC	1000	600.0	600.0	0.0	$68.40	$270.00	$35.00	3.9	3.4
44	Service Desk	6	DC 26 W CF 2	CFQ26/2-L	50	0.3	SW	2000	600.0	6	DC 26 W CF 2	CFQ26/2-L	50	0.3	C-OCC	1000	300.0	300.0	0.0	$34.20	$270.00	$35.00	7.9	6.9
13	Construction Offical Office	4	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	480.0	4	S 32 P F 2 (ELE)	F42LL	60	0.2	C-OCC	1000	240.0	240.0	0.0	$27.36	$270.00	$35.00	9.9	8.6
13	Inspector Office 1	4	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	480.0	4	S 32 P F 2 (ELE)	F42LL	60	0.2	C-OCC	1000	240.0	240.0	0.0	$27.36	$270.00	$35.00	9.9	8.6
201	Inspector Office 2	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540.0	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	C-OCC	1000	270.0	270.0	0.0	$30.78	$270.00	$35.00	8.8	7.6
13	Kitchen	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360.0	3	S 32 P F 2 (ELE)	F42LL	60	0.2	C-OCC	800	144.0	216.0	0.0	$24.62	$270.00	$35.00	11.0	9.5
13	Men's TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1000	60.0	60.0	0.0	$6.84	$270.00	$35.00	39.5	34.4
13	Women's TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1000	60.0	60.0	0.0	$6.84	$270.00	$35.00	39.5	34.4
7	Corridor	4	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.2	SW	2000	480.0	4	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.2	C-OCC	1400	336.0	144.0	0.0	$16.42	$270.00	$35.00	16.4	14.3
13	Storage	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	1000	180.0	3	S 32 P F 2 (ELE)	F42LL	60	0.2	C-OCC	250	45.0	135.0	0.0	$15.39	$270.00	$35.00	17.5	15.3
201	Tax Collector	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540.0	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	C-OCC	1000	270.0	270.0	0.0	$30.78	$270.00	$35.00	8.8	7.6
201	Municipal Services	19	T 32 R F 3 (ELE)	F43ILL/2	90	1.7	SW	2000	3,420.0	19	T 32 R F 3 (ELE)	F43ILL/2	90	1.7	C-OCC	1000	1,710.0	1,710.0	0.0	$194.94	$270.00	$35.00	1.4	1.2
44	Municipal Services	19	DC 26 W CF 2	CFQ26/2-L	50	1.0	SW	2000	1,900.0	19	DC 26 W CF 2	CFQ26/2-L	50	1.0	C-OCC	1000	950.0	950.0	0.0	$108.30	$270.00	$35.00	2.5	2.2
7	Municipal Services	2	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	SW	2000	240.0	2	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	C-OCC	1000	120.0	120.0	0.0	$13.68	$270.00	$35.00	19.7	17.2
201	CFO Office	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540.0	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	C-OCC	1000	270.0	270.0	0.0	$30.78	$270.00	$35.00	8.8	7.6
13	City Clerk Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1000	120.0	120.0	0.0	$13.68	$270.00	$35.00	19.7	17.2
201	Administrator Office	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	2000	720.0	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	C-OCC	1000	360.0	360.0	0.0	$41.04	$270.00	$35.00	6.6	5.7
172	Safe	1	1T 34 R F 2 (MAG)	F42EE	72	0.1	SW	1000	72.0	1	1T 34 R F 2 (MAG)	F42EE	72	0.1	C-OCC	250	18.0	54.0	0.0	$6.16	$270.00	$35.00	43.9	38.2
201	Lobby	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540.0	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	C-OCC	1400	378.0	162.0	0.0	$18.47	$270.00	$35.00	14.6	12.7
220	TR	1	S 17 C F 1(ELE)	F21ILL	20	0.0	SW	2000	40.0	1	S 17 C F 1(ELE)	F21ILL	20	0.0	C-OCC	1000	20.0	20.0	0.0	$2.28	$270.00	$35.00	118.4	103.1
220	Janitor Closet	1	S 17 C F 1(ELE)	F21ILL	20	0.0	SW	500	10.0	1	S 17 C F 1(ELE)	F21ILL	20	0.0	C-OCC	500	10.0	0.0	0.0	$0.00	$270.00	$35.00		#DIV/0!
13	Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1000	120.0	120.0	0.0	$13.68	$270.00	$35.00	19.7	17.2
59	Stairs	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2000	280.0	5	S 13 R CF 2	CFQ13/2-L	28	0.1	C-OCC	1200	168.0	112.0	0.0	$12.77	$270.00	$35.00	21.1	18.4
80	Stairs	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204.0	2	SP 36 R CF 1	CFT36/1	51	0.1	C-OCC	1200	122.4	81.6	0.0	$9.30	$270.00	$35.00	29.0	25.3
59	Stairs	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2000	280.0	5	S 13 R CF 2	CFQ13/2-L	28	0.1	C-OCC	1200	168.0	112.0	0.0	$12.77	$270.00	$35.00	21.1	18.4
80	Stairs	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204.0	2	SP 36 R CF 1	CFT36/1	51	0.1	C-OCC	1200	122.4	81.6	0.0	$9.30	$270.00	$35.00	29.0	25.3
59	2nd Floor Corridor	7	S 13 R CF 2	CFQ13/2-L	28	0.2	SW	2000	392.0	7	S 13 R CF 2	CFQ13/2-L	28	0.2	C-OCC	1400	274.4	117.6	0.0	$13.41	$270.00	$35.00	20.1	17.5
201	Council Chambers	18	T 32 R F 3 (ELE)	F43ILL/2	90	1.6	SW	520	842.4	18	T 32 R F 3 (ELE)	F43ILL/2	90	1.6	C-OCC	390	631.8	210.6	0.0	$24.01	$270.00	$35.00	11.2	9.8
13	Men's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1000	120.0	120.0	0.0	$13.68	$270.00	$35.00	19.7	17.2
13	Women's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1000	120.0	120.0	0.0	$13.68	$270.00	$35.00	19.7	17.2
201	Mayor's Office	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540.0	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	C-OCC	1000	270.0	270.0	0.0	$30.78	$270.00	$35.00	8.8	7.6
															0	#N/A	#VALUE!	#VALUE!	#N/A	#VALUE!			#VALUE!	#VALUE!
	Total	**207**				**15.0**			**23767.9**	**207.0**				**15.0**			**12150.3**	**11617.7**	**0.0**	**1324.4**	**11340.0**	**1470.0**		
																	Demand Savings			**0.0**	**$0**			
																	kWh Savings			**11,618**	**$1,324**			
																	Total Savings				**$1,324**		**8.6**	**7.5**

Energy Audit of City Hall
CHA Project No. 27751
ECM-L3 Lighting Replacements with Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	**Unique description of the location - Room number/Room name: Floor number (if applicable)**	**No. of fixtures before the retrofit**	**Lighting Fixture Code**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Fixt No.)**	**Pre-inst. control device**	**Estimated daily hours for the usage group**	**(kW/space) * (Annual Hours)**	**No. of fixtures after the retrofit**	**Lighting Fixture Code**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Number of Fixtures)**	**Retrofit control device**	**Estimated annual hours for the usage group**	**(kW/space) * (Annual Hours)**	**(Original Annual kWh) - (Retrofit Annual kWh)**	**(Original Annual kW) - (Retrofit Annual kW)**	**(kWh Saved) * ($/kWh)**	**Cost for renovations to lighting system**	**Prescriptive Lighting Measures**	**Length of time for renovations cost to be recovered**	**Length of time for renovations cost to be recovered**
172	Basement Storage (Back)	3	1T 34 R F 2 (MAG)	F42EE	72	0.2	SW	1000	216	3	1T 28 R F 2	F42SSILL	48	0.1	C-OCC	250	36	180	0.1	$ 30.71	$ 614.25	$ 35	20.0	18.9
191	Basement Storage (Back)	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	SW	1000	369	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	C-OCC	250	92	277	0.0	$ 31.55	$ 270.00	$ 35	8.6	7.4
191	Boiler Room	5	S 60 C F 2 (ELE) 8'	F82EE	123	0.6	SW	1820	1,119	5	S 60 C F 2 (ELE) 8'	F82EE	123	0.6	NONE	1,820	1,119	-	0.0	$ -	$ -	$ -		
13	Boiler Room	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1820	109	1	T 28 R F 2	F42SSILL	48	0.0	NONE	1,820	87	22	0.0	$ 4.19	$ 114.75	$ 10	27.4	25.0
191	Storage	8	S 60 C F 2 (ELE) 8'	F82EE	123	1.0	SW	1000	984	8	S 60 C F 2 (ELE) 8'	F82EE	123	1.0	C-OCC	250	246	738	0.0	$ 84.13	$ 270.00	$ 35	3.2	2.8
191	Storage	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	SW	1000	246	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	C-OCC	250	62	185	0.0	$ 21.03	$ 270.00	$ 35	12.8	11.2
191	Directors Room	1	S 60 C F 2 (ELE) 8'	F82EE	123	0.1	SW	2000	246	1	S 60 C F 2 (ELE) 8'	F82EE	123	0.1	C-OCC	1,000	123	123	0.0	$ 14.02	$ 270.00	$ 35	19.3	16.8
71	Directors Room	1	I 60	I60/1	60	0.1	SW	2000	120	1	CF 26	CFQ26/1-L	27	0.0	C-OCC	1,000	27	93	0.0	$ 15.27	$ 276.75	$ 35	18.1	15.8
172	Directors Room	6	1T 34 R F 2 (MAG)	F42EE	72	0.4	SW	2000	864	6	1T 28 R F 2	F42SSILL	48	0.3	C-OCC	1,000	288	576	0.1	$ 86.04	$ 958.50	$ 35	11.1	10.7
191	Directors Room	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	SW	2000	738	3	S 60 C F 2 (ELE) 8'	F82EE	123	0.4	C-OCC	1,000	369	369	0.0	$ 42.07	$ 270.00	$ 35	6.4	5.6
172	Control Room	4	1T 34 R F 2 (MAG)	F42EE	72	0.3	SW	2000	576	4	1T 28 R F 2	F42SSILL	48	0.2	C-OCC	1,000	192	384	0.1	$ 57.36	$ 729.00	$ 35	12.7	12.1
172	Storage	23	1T 34 R F 2 (MAG)	F42EE	72	1.7	SW	1000	1,656	23	1T 28 R F 2	F42SSILL	48	1.1	C-OCC	250	276	1,380	0.6	$ 235.42	$ 2,909.25	$ 35	12.4	12.2
13	Stair	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,200	115	125	0.0	$ 17.62	$ 499.50	$ 55	28.3	25.2
13	Code Enforcement	10	S 32 P F 2 (ELE)	F42LL	60	0.6	SW	2000	1,200	10	T 28 R F 2	F42SSILL	48	0.5	C-OCC	1,000	480	720	0.1	$ 99.06	$ 1,417.50	$ 135	14.3	12.9
44	Service Desk	6	DC 26 W CF 2	CFQ26/2-L	50	0.3	SW	2000	600	6	DC 26 W CF 2	CFQ26/2-L	50	0.3	C-OCC	1,000	300	300	0.0	$ 34.20	$ 270.00	$ 35	7.9	6.9
13	Construction Offical Office	4	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	480	4	T 28 R F 2	F42SSILL	48	0.2	C-OCC	1,000	192	288	0.0	$ 39.62	$ 729.00	$ 75	18.4	16.5
13	Inspector Office 1	4	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	480	4	T 28 R F 2	F42SSILL	48	0.2	C-OCC	1,000	192	288	0.0	$ 39.62	$ 729.00	$ 75	18.4	16.5
201	Inspector Office 2	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540	3	T 28 R F 3	F43SSILL	72	0.2	C-OCC	1,000	216	324	0.1	$ 44.58	$ 614.25	$ 65	13.8	12.3
13	Kitchen	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360	3	T 28 R F 2	F42SSILL	48	0.1	C-OCC	800	115	245	0.0	$ 33.00	$ 614.25	$ 65	18.6	16.6
13	Men's TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	C-OCC	1,000	48	72	0.0	$ 9.91	$ 384.75	$ 45	38.8	34.3
13	Women's TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	C-OCC	1,000	48	72	0.0	$ 9.91	$ 384.75	$ 45	38.8	34.3
7	Corridor	4	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.2	SW	2000	480	4	2T 17 R F 2 (ELE)	F22ILL	33	0.1	C-OCC	1,400	185	295	0.1	$ 48.93	$ 702.00	$ 35	14.3	13.6
13	Storage	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	1000	180	3	T 28 R F 2	F42SSILL	48	0.1	C-OCC	250	36	144	0.0	$ 21.51	$ 614.25	$ 65	28.6	25.5
201	Tax Collector	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540	3	T 28 R F 3	F43SSILL	72	0.2	C-OCC	1,000	216	324	0.1	$ 44.58	$ 614.25	$ 65	13.8	12.3
201	Municipal Services	19	T 32 R F 3 (ELE)	F43ILL/2	90	1.7	SW	2000	3,420	19	T 28 R F 3	F43SSILL	72	1.4	C-OCC	1,000	1,368	2,052	0.3	$ 282.31	$ 2,450.25	$ 225	8.7	7.9
44	Municipal Services	19	DC 26 W CF 2	CFQ26/2-L	50	1.0	SW	2000	1,900	19	DC 26 W CF 2	CFQ26/2-L	50	1.0	C-OCC	1,000	950	950	0.0	$ 108.30	$ 270.00	$ 35	2.5	2.2
7	Municipal Services	2	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	SW	2000	240	2	2T 17 R F 2 (ELE)	F22ILL	33	0.1	C-OCC	1,000	66	174	0.1	$ 27.48	$ 486.00	$ 35	17.7	16.4
201	CFO Office	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540	3	T 28 R F 3	F43SSILL	72	0.2	C-OCC	1,000	216	324	0.1	$ 44.58	$ 614.25	$ 65	13.8	12.3
13	City Clerk Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,000	96	144	0.0	$ 19.81	$ 499.50	$ 55	25.2	22.4
201	Administrator Office	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	2000	720	4	T 28 R F 3	F43SSILL	72	0.3	C-OCC	1,000	288	432	0.1	$ 59.43	$ 729.00	$ 75	12.3	11.0
172	Safe	1	1T 34 R F 2 (MAG)	F42EE	72	0.1	SW	1000	72	1	1T 28 R F 2	F42SSILL	48	0.0	C-OCC	250	12	60	0.0	$ 10.24	$ 384.75	$ 35	37.6	34.2
201	Lobby	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540	3	T 28 R F 3	F43SSILL	72	0.2	C-OCC	1,400	302	238	0.1	$ 34.73	$ 614.25	$ 65	17.7	15.8
220	TR	1	S 17 C F 1(ELE)	F21ILL	20	0.0	SW	2000	40	1	S 17 C F 1(ELE)	F21ILL	20	0.0	C-OCC	1,000	20	20	0.0	$ 2.28	$ 270.00	$ 35	118.4	103.1
220	Janitor Closet	1	S 17 C F 1(ELE)	F21ILL	20	0.0	SW	500	10	1	S 17 C F 1(ELE)	F21ILL	20	0.0	C-OCC	500	10	-	0.0	$ -	$ 270.00	$ 35		
13	Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,000	96	144	0.0	$ 19.81	$ 499.50	$ 55	25.2	22.4
59	Stairs	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2000	280	5	S 13 R CF 2	CFQ13/2-L	28	0.1	C-OCC	1,200	168	112	0.0	$ 12.77	$ 270.00	$ 35	21.1	18.4
80	Stairs	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204	2	SP 36 R CF 1	CFT36/1	51	0.1	C-OCC	1,200	122	82	0.0	$ 9.30	$ 270.00	$ 35	29.0	25.3
59	Stairs	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2000	280	5	S 13 R CF 2	CFQ13/2-L	28	0.1	C-OCC	1,200	168	112	0.0	$ 12.77	$ 270.00	$ 35	21.1	18.4
80	Stairs	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204	2	SP 36 R CF 1	CFT36/1	51	0.1	C-OCC	1,200	122	82	0.0	$ 9.30	$ 270.00	$ 35	29.0	25.3
59	2nd Floor Corridor	7	S 13 R CF 2	CFQ13/2-L	28	0.2	SW	2000	392	7	S 13 R CF 2	CFQ13/2-L	28	0.2	C-OCC	1,400	274	118	0.0	$ 13.41	$ 270.00	$ 35	20.1	17.5
201	Council Chambers	18	T 32 R F 3 (ELE)	F43ILL/2	90	1.6	SW	2000	520	842	T 28 R F 3	F43SSILL	72	1.3	C-OCC	390	505	337	0.3	$ 84.25	$ 2,335.50	$ 215	27.7	25.2
13	Men's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,000	96	144	0.0	$ 19.81	$ 499.50	$ 55	25.2	22.4
13	Women's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,000	96	144	0.0	$ 19.81	$ 499.50	$ 55	25.2	22.4
201	Mayor's Office	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2000	540	3	T 28 R F 3	F43SSILL	72	0.2	C-OCC	1,000	216	324	0.1	$ 44.58	$ 614.25	$ 65	13.8	12.3
															0	#N/A								#VALUE!
	Total	**207**				**15.0**			**23,768**	**207**				**12.5**			**10,254**		**2.5**	**1,899**	**26,912**	**$2,400**		
																	Demand Savings			**2.5**	**$359**			
																	kWh Savings			**13,514**	**$1,541**			
																	Total Savings				**$1,899**		**14.2**	**12.9**

Energy Audit of Fire House
CHA Project No. 27751
Existing Lighting

Cost of Electricity: **$0.114** **$/kWh**
$11.79 **$/kW**

			EXISTING CONDITIONS									
	Area Description	**Usage**	**No. of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Retrofit Control**	**Annual kWh**	
Field Code	**Unique description of the location - Room number/Room name: Floor number (if applicable)**	**Describe Usage Type using Operating Hours**	**No. of fixtures before the retrofit**	**Lighting Fixture Code**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Fixt No.)**	**Pre-inst. control device**	**Estimated annual hours for the usage group**	**Retrofit control device**	**(kW/space) * (Annual Hours)**	**Notes**
108	Fireman Museum	Museum	16	I 65	I65/1	65	1.04	SW	520	NONE	541	
13	Garage	Garage	20	S 32 P F 2 (ELE)	F42LL	60	1.20	SW	5000	C-OCC	6,000	
117	Command Center	Offices	5	CF 23	CFS23/1	23	0.12	SW	2000	C-OCC	230	
13	Coat Room	Storage Areas	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	1000	C-OCC	120	
13	TR	Restroom	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	2000	C-OCC	120	
13	Lobby	Hallways	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	C-OCC	240	
13	Storage	Storage Areas	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	1000	C-OCC	120	
13	Stairs	Stairway	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	2000	C-OCC	120	
13	Office	Offices	3	S 32 P F 2 (ELE)	F42LL	60	0.18	SW	2000	C-OCC	360	
117	Kitchen / Dining	Staff Lounge	4	CF 23	CFS23/1	23	0.09	SW	2000	C-OCC	184	
129	Kitchen / Dining	Staff Lounge	5	SP 75 I	I75/1	75	0.38	SW	2000	C-OCC	750	
117	Kitchen / Dining	Staff Lounge	6	CF 23	CFS23/1	23	0.14	SW	2000	C-OCC	276	
7	Kitchen / Dining	Staff Lounge	1	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.06	SW	2000	C-OCC	120	
13	Vestibule	Hallways	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	C-OCC	240	
117	TR	Restroom	2	CF 23	CFS23/1	23	0.05	SW	2000	C-OCC	92	
71	Pool Table Room	Game Room	2	I 60	I60/1	60	0.12	SW	5000	C-OCC	600	
117	Pool Table Room	Game Room	1	CF 23	CFS23/1	23	0.02	SW	5000	C-OCC	115	
198	Pool Table Room	Game Room	4	2T 17 R F 2 (ELE) REFLECTOR	F22LL	31	0.12	SW	5000	C-OCC	620	
117	TR	Restroom	2	CF 23	CFS23/1	23	0.05	SW	2000	C-OCC	92	
13	Meeting Room	Offices	8	S 32 P F 2 (ELE)	F42LL	60	0.48	SW	2000	C-OCC	960	
13	Fire Marshall	Offices	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	C-OCC	240	
13	Chief Office	Offices	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	C-OCC	240	
13	Stair	Stairway	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	2000	C-OCC	120	
	Total		**94**				**4.94**				**12,500**	

Energy Audit of Fire House
CHA Project No. 27751
ECM-L1 Lighting Replacements

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
108	Fireman Museum	16	I 65	I65/1	65	1.0	SW	520	541	16	CF 26	CFQ26/1-L	27	0.4	SW	520	225	316	0.6	$ 122.06	$ 324.00	$0	2.7	2.7
13	Garage	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	5000	6,000	20	T 28 R F 2	F42SSILL	48	1.0	SW	5,000	4,800	1,200	0.2	$ 170.76	$ 2,295.00	$200	13.4	12.3
117	Command Center	5	CF 23	CFS23/1	23	0.1	SW	2000	230	5	CF 23	CFS23/1	23	0.1	SW	2,000	230	-	0.0	$ -	$ -	$0		#DIV/0!
13	Coat Room	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1000	120	2	T 28 R F 2	F42SSILL	48	0.1	SW	1,000	96	24	0.0	$ 6.13	$ 229.50	$20	37.4	34.2
13	TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	SW	2,000	96	24	0.0	$ 4.43	$ 114.75	$10	25.9	23.6
13	Lobby	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.87	$ 229.50	$20	25.9	23.6
13	Storage	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1000	120	2	T 28 R F 2	F42SSILL	48	0.1	SW	1,000	96	24	0.0	$ 6.13	$ 229.50	$20	37.4	34.2
13	Stairs	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	SW	2,000	96	24	0.0	$ 4.43	$ 114.75	$10	25.9	23.6
13	Office	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360	3	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	288	72	0.0	$ 13.30	$ 344.25	$30	25.9	23.6
117	Kitchen / Dining	4	CF 23	CFS23/1	23	0.1	SW	2000	184	4	CF 23	CFS23/1	23	0.1	SW	2,000	184	-	0.0	$ -	$ -	$0		#DIV/0!
129	Kitchen / Dining	5	SP 75 I	I75/1	75	0.4	SW	2000	750	5	CF 26	CFQ26/1-L	27	0.1	SW	2,000	270	480	0.2	$ 88.68	$ 101.25	$0	1.1	1.1
117	Kitchen / Dining	6	CF 23	CFS23/1	23	0.1	SW	2000	276	6	CF 23	CFS23/1	23	0.1	SW	2,000	276	-	0.0	$ -	$ -	$0		#DIV/0!
7	Kitchen / Dining	1	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	SW	2000	120	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	SW	2,000	66	54	0.0	$ 9.98	$ 108.00	$0	10.8	10.8
13	Vestibule	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.87	$ 229.50	$20	25.9	23.6
117	TR	2	CF 23	CFS23/1	23	0.0	SW	2000	92	2	CF 23	CFS23/1	23	0.0	SW	2,000	92	-	0.0	$ -	$ -	$0		#DIV/0!
71	Pool Table Room	2	I 60	I60/1	60	0.1	SW	5000	600	2	CF 26	CFQ26/1-L	27	0.1	SW	5,000	270	330	0.1	$ 46.96	$ 113.50	$0	0.3	0.3
117	Pool Table Room	1	CF 23	CFS23/1	23	0.0	SW	5000	115	1	CF 23	CFS23/1	23	0.0	SW	5,000	115	-	0.0	$ -	$ -	$0		#DIV/0!
198	Pool Table Room	4	2T 17 R F 2 (ELE) REFLECTOR	F22LL	31	0.1	SW	5000	620	4	2T 17 R F 2 (ELE) REFLECTOR	F22LL	31	0.1	SW	5,000	620	-	0.0	$ -	$ -	$0		#DIV/0!
117	TR	2	CF 23	CFS23/1	23	0.0	SW	2000	92	2	CF 23	CFS23/1	23	0.0	SW	2,000	92	-	0.0	$ -	$ -	$0		#DIV/0!
13	Meeting Room	8	S 32 P F 2 (ELE)	F42LL	60	0.5	SW	2000	960	8	T 28 R F 2	F42SSILL	48	0.4	SW	2,000	768	192	0.1	$ 35.47	$ 918.00	$80	25.9	23.6
13	Fire Marshall	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.87	$ 229.50	$20	25.9	23.6
13	Chief Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.87	$ 229.50	$20	25.9	23.6
13	Stair	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	SW	2,000	96	24	0.0	$ 4.43	$ 114.75	$10	25.9	23.6
	Total	**94**				**4.9**			**12,500**	**94**			**859**	**3.4**			**9,544**	**2,956**	**1.5**	**$548**	**$5,825**	**$460**		
																Demand Savings				**1.5**	**$211**			
																kWh Savings				**2,956**	**$337**			
																Total savings					**$548**		**10.6**	**9.8**

Energy Audit of Fire House
CHA Project No. 27751
ECM-L2 Install Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
108	Fireman Museum	16	I 65	I65/1	65	1.0	SW	520	540.8	16	I 65	I65/1	65	1.0	NONE	520	540.8	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
13	Garage	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	5000	6,000.0	20	S 32 P F 2 (ELE)	F42LL	60	1.2	C-OCC	5000	6,000.0	0.0	0.0	$0.00	$270.00	$35.00		#DIV/0!
117	Command Center	5	CF 23	CFS23/1	23	0.1	SW	2000	230.0	5	CF 23	CFS23/1	23	0.1	C-OCC	1000	115.0	115.0	0.0	$13.11	$270.00	$35.00	20.6	17.9
13	Coat Room	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1000	120.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	250	30.0	90.0	0.0	$10.26	$270.00	$35.00	26.3	22.9
13	TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	600	36.0	84.0	0.0	$9.58	$270.00	$35.00	28.2	24.5
13	Lobby	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1400	168.0	72.0	0.0	$8.21	$270.00	$35.00	32.9	28.6
13	Storage	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1000	120.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	250	30.0	90.0	0.0	$10.26	$270.00	$35.00	26.3	22.9
13	Stairs	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1200	72.0	48.0	0.0	$5.47	$270.00	$35.00	49.3	42.9
13	Office	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360.0	3	S 32 P F 2 (ELE)	F42LL	60	0.2	C-OCC	1000	180.0	180.0	0.0	$20.52	$270.00	$35.00	13.2	11.5
117	Kitchen / Dining	4	CF 23	CFS23/1	23	0.1	SW	2000	184.0	4	CF 23	CFS23/1	23	0.1	C-OCC	500	46.0	138.0	0.0	$15.73	$270.00	$35.00	17.2	14.9
129	Kitchen / Dining	5	SP 75 I	I75/1	75	0.4	SW	2000	750.0	5	SP 75 I	I75/1	75	0.4	C-OCC	500	187.5	562.5	0.0	$64.13	$270.00	$35.00	4.2	3.7
117	Kitchen / Dining	6	CF 23	CFS23/1	23	0.1	SW	2000	276.0	6	CF 23	CFS23/1	23	0.1	C-OCC	500	69.0	207.0	0.0	$23.60	$270.00	$35.00	11.4	10.0
7	Kitchen / Dining	1	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	SW	2000	120.0	1	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	C-OCC	500	30.0	90.0	0.0	$10.26	$270.00	$35.00	26.3	22.9
13	Vestibule	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1400	168.0	72.0	0.0	$8.21	$270.00	$35.00	32.9	28.6
117	TR	2	CF 23	CFS23/1	23	0.0	SW	2000	92.0	2	CF 23	CFS23/1	23	0.0	C-OCC	600	27.6	64.4	0.0	$7.34	$270.00	$35.00	36.8	32.0
71	Pool Table Room	2	I 60	I60/1	60	0.1	SW	5000	600.0	2	I 60	I60/1	60	0.1	C-OCC	5000	600.0	0.0	0.0	$0.00	$270.00	$35.00		#DIV/0!
117	Pool Table Room	1	CF 23	CFS23/1	23	0.0	SW	5000	115.0	1	CF 23	CFS23/1	23	0.0	C-OCC	5000	115.0	0.0	0.0	$0.00	$270.00	$35.00		#DIV/0!
198	Pool Table Room	4	2T 17 R F 2 (ELE) REFLECTOR	F22LL	31	0.1	SW	5000	620.0	4	2T 17 R F 2 (ELE) REFLECTOR	F22LL	31	0.1	C-OCC	5000	620.0	0.0	0.0	$0.00	$270.00	$35.00		#DIV/0!
117	TR	2	CF 23	CFS23/1	23	0.0	SW	2000	92.0	2	CF 23	CFS23/1	23	0.0	C-OCC	600	27.6	64.4	0.0	$7.34	$270.00	$35.00	36.8	32.0
13	Meeting Room	8	S 32 P F 2 (ELE)	F42LL	60	0.5	SW	2000	960.0	8	S 32 P F 2 (ELE)	F42LL	60	0.5	C-OCC	1000	480.0	480.0	0.0	$54.72	$270.00	$35.00	4.9	4.3
13	Fire Marshall	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1000	120.0	120.0	0.0	$13.68	$270.00	$35.00	19.7	17.2
13	Chief Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1000	120.0	120.0	0.0	$13.68	$270.00	$35.00	19.7	17.2
13	Stair	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1200	72.0	48.0	0.0	$5.47	$270.00	$35.00	49.3	42.9
															0	#N/A	#VALUE!	#VALUE!	#N/A	#VALUE!			#VALUE!	#VALUE!
															0	#N/A	#VALUE!	#VALUE!	#N/A	#VALUE!			#VALUE!	#VALUE!
	Total	94				4.9			12499.8	94.0				4.9			9854.5	2645.3	0.0	301.6	5940.0	770.0		
																	Demand Savings			0.0	$0			
																	kWh Savings			2,645	$302			
																	Total Savings				$302		19.7	17.1

Energy Audit of Fire House
CHA Project No. 27751
ECM-L3 Lighting Replacements with Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
108	Fireman Museum	16	I 65	I65/1	65	1.0	SW	520	541	16	CF 26	CFQ26/1-L	27	0.4	NONE	520	225	316	0.6	$ 122.06	$ 324.00	$ -	2.7	2.7
13	Garage	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	5000	6,000	20	T 28 R F 2	F42SSILL	48	1.0	C-OCC	5,000	4,800	1,200	0.2	$ 170.76	$ 2,565.00	$ 235	15.0	13.6
117	Command Center	5	CF 23	CFS23/1	23	0.1	SW	2000	230	5	CF 23	CFS23/1	23	0.1	C-OCC	1,000	115	115	0.0	$ 13.11	$ 270.00	$ 35	20.6	17.9
13	Coat Room	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1000	120	2	T 28 R F 2	F42SSILL	48	0.1	C-OCC	250	24	96	0.0	$ 14.34	$ 499.50	$ 55	34.8	31.0
13	TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	C-OCC	600	29	91	0.0	$ 12.09	$ 384.75	$ 45	31.8	28.1
13	Lobby	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,400	134	106	0.0	$ 15.43	$ 499.50	$ 55	32.4	28.8
13	Storage	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1000	120	2	T 28 R F 2	F42SSILL	48	0.1	C-OCC	250	24	96	0.0	$ 14.34	$ 499.50	$ 55	34.8	31.0
13	Stairs	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	C-OCC	1,200	58	62	0.0	$ 8.81	$ 384.75	$ 45	43.7	38.6
13	Office	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360	3	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,000	144	216	0.0	$ 29.72	$ 614.25	$ 65	20.7	18.5
117	Kitchen / Dining	4	CF 23	CFS23/1	23	0.1	SW	2000	184	4	CF 23	CFS23/1	23	0.1	C-OCC	500	46	138	0.0	$ 15.73	$ 270.00	$ 35	17.2	14.9
129	Kitchen / Dining	5	SP 75 I	I75/1	75	0.4	SW	2000	750	5	CF 26	CFQ26/1-L	27	0.1	C-OCC	500	68	683	0.2	$ 111.76	$ 371.25	$ 35	3.3	3.0
117	Kitchen / Dining	6	CF 23	CFS23/1	23	0.1	SW	2000	276	6	CF 23	CFS23/1	23	0.1	C-OCC	500	69	207	0.0	$ 23.60	$ 270.00	$ 35	11.4	10.0
7	Kitchen / Dining	1	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	SW	2000	120	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	C-OCC	500	17	104	0.0	$ 15.62	$ 378.00	$ 35	24.2	22.0
13	Vestibule	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,400	134	106	0.0	$ 15.43	$ 499.50	$ 55	32.4	28.8
117	TR	2	CF 23	CFS23/1	23	0.0	SW	2000	92	2	CF 23	CFS23/1	23	0.0	C-OCC	600	28	64	0.0	$ 7.34	$ 270.00	$ 35	36.8	32.0
71	Pool Table Room	2	I 60	I60/1	60	0.1	SW	5000	600	2	CF 26	CFQ26/1-L	27	0.1	C-OCC	5,000	270	330	0.1	$ 46.96	$ 283.50	$ 35	6.0	5.3
117	Pool Table Room	1	CF 23	CFS23/1	23	0.0	SW	5000	115	1	CF 23	CFS23/1	23	0.0	C-OCC	5,000	115	-	0.0	$ -	$ -	$ 35		
198	Pool Table Room	4	2T 17 R F 2 (ELE) REFLECTOR	F22LL	31	0.1	SW	5000	620	4	2T 17 R F 2 (ELE) REFLECTOR	F22LL	31	0.1	C-OCC	5,000	620	-	0.0	$ -	$ 270.00	$ 35		
117	TR	2	CF 23	CFS23/1	23	0.0	SW	2000	92	2	CF 23	CFS23/1	23	0.0	C-OCC	600	28	64	0.0	$ 7.34	$ 270.00	$ 35	36.8	32.0
13	Meeting Room	8	S 32 P F 2 (ELE)	F42LL	60	0.5	SW	2000	960	8	T 28 R F 2	F42SSILL	48	0.4	C-OCC	1,000	384	576	0.1	$ 79.25	$ 1,188.00	$ 115	15.0	13.5
13	Fire Marshall	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,000	96	144	0.0	$ 19.81	$ 499.50	$ 55	25.2	22.4
13	Chief Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,000	96	144	0.0	$ 19.81	$ 499.50	$ 55	25.2	22.4
13	Stair	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	C-OCC	1,200	58	62	0.0	$ 8.81	$ 384.75	$ 45	43.7	38.6
															0	#N/A								#VALUE!
															0	#N/A								#VALUE!
	Total	**94**				**4.9**			**12,500**	**94**				**3.4**			**7,580**		**1.5**	**772**	**11,765**	**$1,230**		
																	Demand Savings			**1.5**	**$211**			
																	kWh Savings			**4,920**	**$561**			
																	Total Savings				**$772**		**15.2**	**13.6**

Energy Audit of Library
CHA Project No. 27751
Existing Lighting & Audit Input

Cost of Electricity: **$0.114** **$/kWh**
$11.79 **$/kW**

			EXISTING CONDITIONS								Retrofit Control	
	Area Description	Usage	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh		
Field Code	**Unique description of the location - Room number/Room name: Floor number (if applicable)**	**Describe Usage Type using Operating Hours**	**No. of fixtures before the retrofit**	**Lighting Fixture Code**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Fixt No.)**	**Pre-inst. control device**	**Estimated annual hours for the usage group**	**(kW/space) * (Annual Hours)**	**Retrofit control device**	**Notes**
59	Corridor	Hallways	8	S 13 R CF 2	CFQ13/2-L	28	0.22	SW	2000	448	C-OCC	
13	Meeting Room	Offices	6	S 32 P F 2 (ELE)	F42LL	60	0.36	SW	2000	720	C-OCC	
13	Director	Offices	4	S 32 P F 2 (ELE)	F42LL	60	0.24	SW	2000	480	C-OCC	
13	Tech Services	Offices	5	S 32 P F 2 (ELE)	F42LL	60	0.30	SW	2000	600	C-OCC	
13	Meeting Room	Offices	12	S 32 P F 2 (ELE)	F42LL	60	0.72	SW	2000	1,440	C-OCC	
201	Conference Room B	Conference	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	1600	288	C-OCC	
201	Conference Room A	Conference	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	1600	288	C-OCC	
201	Reference	Reference	67	T 32 R F 3 (ELE)	F43ILL/2	90	6.03	SW	2000	12,060	C-OCC	
7	Reference Desk	Reference	8	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.48	SW	2000	960	C-OCC	
44	Reference Desk	Reference	5	DC 26 W CF 2	CFQ26/2-L	50	0.25	SW	2000	500	C-OCC	
13	TR	Restroom	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	2000	120	C-OCC	
201	Break Room	Staff Lounge	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	2000	720	C-OCC	
13	TR	Restroom	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	2000	120	C-OCC	
80	Stair	Stairway	2	SP 36 R CF 1	CFT36/1	51	0.10	SW	2000	204	C-OCC	
13	1st Floor	Reference	75	S 32 P F 2 (ELE)	F42LL	60	4.50	SW	2000	9,000	NONE	
80	1st Floor	Reference	1	SP 36 R CF 1	CFT36/1	51	0.05	SW	2000	102	NONE	
7	1st Floor	Reference	1	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.06	SW	2000	120	NONE	
59	1st Floor	Reference	5	S 13 R CF 2	CFQ13/2-L	28	0.14	SW	2000	280	NONE	
44	1st Floor	Reference	8	DC 26 W CF 2	CFQ26/2-L	50	0.40	SW	2000	800	NONE	
59	TR Vest	Hallways	1	S 13 R CF 2	CFQ13/2-L	28	0.03	SW	2000	56	C-OCC	
13	Men's TR	Restroom	3	S 32 P F 2 (ELE)	F42LL	60	0.18	SW	2000	360	C-OCC	
13	Women's TR	Restroom	3	S 32 P F 2 (ELE)	F42LL	60	0.18	SW	2000	360	C-OCC	
201	Activity Room	Offices	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	2000	720	C-OCC	
201	Office Area	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	2000	360	C-OCC	
201	Electrical Room	Mechanical Room	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	1000	540	NONE	
80	Lobby	Hallways	2	SP 36 R CF 1	CFT36/1	51	0.10	SW	2000	204	C-OCC	
169LED	Exterior	Site Lighting	8	SP 250 MH ROOF	MH250/1	295	2.36	SW	8760	20,674	NONE	
	Total		**246**				**18.63**			**52,524**		

Energy Audit of Library
CHA Project No. 27751
ECM-L1 Lighting Replacements

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
59	Corridor	8	S 13 R CF 2	CFQ13/2-L	28	0.2	SW	2000	448	8	S 13 R CF 2	CFQ13/2-L	28	0.2	SW	2,000	448	-	0.0	$ -	$ -	$0		#DIV/0!
13	Meeting Room	6	S 32 P F 2 (ELE)	F42LL	60	0.4	SW	2000	720	6	T 28 R F 2	F42SSILL	48	0.3	SW	2,000	576	144	0.1	$ 26.60	$ 688.50	$60	25.9	23.6
13	Director	4	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	480	4	T 28 R F 2	F42SSILL	48	0.2	SW	2,000	384	96	0.0	$ 17.74	$ 459.00	$40	25.9	23.6
13	Tech Services	5	S 32 P F 2 (ELE)	F42LL	60	0.3	SW	2000	600	5	T 28 R F 2	F42SSILL	48	0.2	SW	2,000	480	120	0.1	$ 22.17	$ 573.75	$50	25.9	23.6
13	Meeting Room	12	S 32 P F 2 (ELE)	F42LL	60	0.7	SW	2000	1,440	12	T 28 R F 2	F42SSILL	48	0.6	SW	2,000	1,152	288	0.1	$ 53.21	$ 1,377.00	$120	25.9	23.6
201	Conference Room B	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	1600	288	2	T 28 R F 3	F43SSILL	72	0.1	SW	1,600	230	58	0.0	$ 11.66	$ 229.50	$20	19.7	18.0
201	Conference Room A	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	1600	288	2	T 28 R F 3	F43SSILL	72	0.1	SW	1,600	230	58	0.0	$ 11.66	$ 229.50	$20	19.7	18.0
201	Reference	67	T 32 R F 3 (ELE)	F43ILL/2	90	6.0	SW	2000	12,060	67	T 28 R F 3	F43SSILL	72	4.8	SW	2,000	9,648	2,412	1.2	$ 445.59	$ 7,688.25	$670	17.3	15.8
7	Reference Desk	8	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.5	SW	2000	960	8	2T 17 R F 2 (ELE)	F22ILL	33	0.3	SW	2,000	528	432	0.2	$ 79.81	$ 864.00	$0	10.8	10.8
44	Reference Desk	5	DC 26 W CF 2	CFQ26/2-L	50	0.3	SW	2000	500	5	DC 26 W CF 2	CFQ26/2-L	50	0.3	SW	2,000	500	-	0.0	$ -	$ -	$0		#DIV/0!
13	TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	SW	2,000	96	24	0.0	$ 4.43	$ 114.75	$10	25.9	23.6
201	Break Room	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	2000	720	4	T 28 R F 3	F43SSILL	72	0.3	SW	2,000	576	144	0.1	$ 26.60	$ 459.00	$40	17.3	15.8
13	TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	SW	2,000	96	24	0.0	$ 4.43	$ 114.75	$10	25.9	23.6
80	Stair	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2,000	204	-	0.0	$ -	$ -	$0		#DIV/0!
13	1st Floor	75	S 32 P F 2 (ELE)	F42LL	60	4.5	SW	2000	9,000	75	T 28 R F 2	F42SSILL	48	3.6	SW	2,000	7,200	1,800	0.9	$ 332.53	$ 8,606.25	$750	25.9	23.6
80	1st Floor	1	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	102	1	SP 36 R CF 1	CFT36/1	51	0.1	SW	2,000	102	-	0.0	$ -	$ -	$0		#DIV/0!
7	1st Floor	1	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	SW	2000	120	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	SW	2,000	66	54	0.0	$ 9.98	$ 108.00	$0	10.8	10.8
59	1st Floor	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2000	280	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2,000	280	-	0.0	$ -	$ -	$0		#DIV/0!
44	1st Floor	8	DC 26 W CF 2	CFQ26/2-L	50	0.4	SW	2000	800	8	DC 26 W CF 2	CFQ26/2-L	50	0.4	SW	2,000	800	-	0.0	$ -	$ -	$0		#DIV/0!
59	TR Vest	1	S 13 R CF 2	CFQ13/2-L	28	0.0	SW	2000	56	1	S 13 R CF 2	CFQ13/2-L	28	0.0	SW	2,000	56	-	0.0	$ -	$ -	$0		#DIV/0!
13	Men's TR	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360	3	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	288	72	0.0	$ 13.30	$ 344.25	$30	25.9	23.6
13	Women's TR	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360	3	T 28 R F 2	F42SSILL	48	0.1	SW	2,000	288	72	0.0	$ 13.30	$ 344.25	$30	25.9	23.6
201	Activity Room	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	2000	720	4	T 28 R F 3	F43SSILL	72	0.3	SW	2,000	576	144	0.1	$ 26.60	$ 459.00	$40	17.3	15.8
201	Office Area	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	2000	360	2	T 28 R F 3	F43SSILL	72	0.1	SW	2,000	288	72	0.0	$ 13.30	$ 229.50	$20	17.3	15.8
201	Electrical Room	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	1000	540	6	T 28 R F 3	F43SSILL	72	0.4	SW	1,000	432	108	0.1	$ 27.59	$ 688.50	$60	25.0	22.8
80	Lobby	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2,000	204	-	0.0	$ -	$ -	$0		#DIV/0!
169LED	Exterior	8	SP 250 MH ROOF	MH250/1	295	2.4	SW	8760	20,674	8	FXLED78	FXLED78/1	78	0.6	SW	8,760	5,466	15,207	1.7	$ 1,979.25	$ 7,619.40	$1,400	3.8	3.1
	Total	**246**				**18.6**			**52,524**	**246**			**1,417**	**13.8**			**31,195**	**21,329**	**4.9**	**$3,120**	**$31,197**	**$3,370**		
																	Demand Savings			**4.9**	**$688**			
																	kWh Savings			**21,329**	**$2,431**			
																	Total savings				**$3,120**		**10.0**	**8.9**

Energy Audit of Library
CHA Project No. 27751
ECM-L2 Install Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
59	Corridor	8	S 13 R CF 2	CFQ13/2-L	28	0.2	SW	2000	448.0	8	S 13 R CF 2	CFQ13/2-L	28	0.2	C-OCC	1400	313.6	134.4	0.0	$15.32	$270.00	$35.00	17.6	15.3
13	Meeting Room	6	S 32 P F 2 (ELE)	F42LL	60	0.4	SW	2000	720.0	6	S 32 P F 2 (ELE)	F42LL	60	0.4	C-OCC	1000	360.0	360.0	0.0	$41.04	$270.00	$35.00	6.6	5.7
13	Director	4	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	480.0	4	S 32 P F 2 (ELE)	F42LL	60	0.2	C-OCC	1000	240.0	240.0	0.0	$27.36	$270.00	$35.00	9.9	8.6
13	Tech Services	5	S 32 P F 2 (ELE)	F42LL	60	0.3	SW	2000	600.0	5	S 32 P F 2 (ELE)	F42LL	60	0.3	C-OCC	1000	300.0	300.0	0.0	$34.20	$270.00	$35.00	7.9	6.9
13	Meeting Room	12	S 32 P F 2 (ELE)	F42LL	60	0.7	SW	2000	1,440.0	12	S 32 P F 2 (ELE)	F42LL	60	0.7	C-OCC	1000	720.0	720.0	0.0	$82.08	$270.00	$35.00	3.3	2.9
201	Conference Room B	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	1600	288.0	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	C-OCC	1200	216.0	72.0	0.0	$8.21	$270.00	$35.00	32.9	28.6
201	Conference Room A	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	1600	288.0	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	C-OCC	1200	216.0	72.0	0.0	$8.21	$270.00	$35.00	32.9	28.6
201	Reference	67	T 32 R F 3 (ELE)	F43ILL/2	90	6.0	SW	2000	12,060.0	67	T 32 R F 3 (ELE)	F43ILL/2	90	6.0	C-OCC	1700	10,251.0	1,809.0	0.0	$206.23	$270.00	$35.00	1.3	1.1
7	Reference Desk	8	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.5	SW	2000	960.0	8	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.5	C-OCC	1700	816.0	144.0	0.0	$16.42	$270.00	$35.00	16.4	14.3
44	Reference Desk	5	DC 26 W CF 2	CFQ26/2-L	50	0.3	SW	2000	500.0	5	DC 26 W CF 2	CFQ26/2-L	50	0.3	C-OCC	1700	425.0	75.0	0.0	$8.55	$270.00	$35.00	31.6	27.5
13	TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1000	60.0	60.0	0.0	$6.84	$270.00	$35.00	39.5	34.4
201	Break Room	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	2000	720.0	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	C-OCC	800	288.0	432.0	0.0	$49.25	$270.00	$35.00	5.5	4.8
13	TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1000	60.0	60.0	0.0	$6.84	$270.00	$35.00	39.5	34.4
80	Stair	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204.0	2	SP 36 R CF 1	CFT36/1	51	0.1	C-OCC	1200	122.4	81.6	0.0	$9.30	$270.00	$35.00	29.0	25.3
13	1st Floor	75	S 32 P F 2 (ELE)	F42LL	60	4.5	SW	2000	9,000.0	75	S 32 P F 2 (ELE)	F42LL	60	4.5	NONE	2000	9,000.0	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
80	1st Floor	1	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	102.0	1	SP 36 R CF 1	CFT36/1	51	0.1	NONE	2000	102.0	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
7	1st Floor	1	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	SW	2000	120.0	1	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	NONE	2000	120.0	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
59	1st Floor	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2000	280.0	5	S 13 R CF 2	CFQ13/2-L	28	0.1	NONE	2000	280.0	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
44	1st Floor	8	DC 26 W CF 2	CFQ26/2-L	50	0.4	SW	2000	800.0	8	DC 26 W CF 2	CFQ26/2-L	50	0.4	NONE	2000	800.0	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
59	TR Vest	1	S 13 R CF 2	CFQ13/2-L	28	0.0	SW	2000	56.0	1	S 13 R CF 2	CFQ13/2-L	28	0.0	C-OCC	1400	39.2	16.8	0.0	$1.92	$270.00	$35.00	141.0	122.7
13	Men's TR	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360.0	3	S 32 P F 2 (ELE)	F42LL	60	0.2	C-OCC	1000	180.0	180.0	0.0	$20.52	$270.00	$35.00	13.2	11.5
13	Women's TR	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360.0	3	S 32 P F 2 (ELE)	F42LL	60	0.2	C-OCC	1000	180.0	180.0	0.0	$20.52	$270.00	$35.00	13.2	11.5
201	Activity Room	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	2000	720.0	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	C-OCC	1000	360.0	360.0	0.0	$41.04	$270.00	$35.00	6.6	5.7
201	Office Area	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	2000	360.0	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	C-OCC	1000	180.0	180.0	0.0	$20.52	$270.00	$35.00	13.2	11.5
201	Electrical Room	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	1000	540.0	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	NONE	1000	540.0	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
80	Lobby	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204.0	2	SP 36 R CF 1	CFT36/1	51	0.1	C-OCC	1400	142.8	61.2	0.0	$6.98	$270.00	$35.00	38.7	33.7
169LED	Exterior	8	SP 250 MH ROOF	MH250/1	295	2.4	SW	8760	20,673.6	8	SP 250 MH ROOF	MH250/1	295	2.4	NONE	8760	20,673.6	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
															0	#N/A	#VALUE!	#VALUE!	#N/A	#VALUE!			#VALUE!	#VALUE!
	Total	246				18.6			52523.6	246.0				18.6			46985.6	5538.0	0.0	631.3	5400.0	700.0		
																	Demand Savings	0.0			$0			
																	kWh Savings			5,538	$631			
																	Total Savings				$631		8.6	7.4

Energy Audit of Library
CHA Project No. 27751
ECM-L3 Lighting Replacements with Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
59	Corridor	8	S 13 R CF 2	CFQ13/2-L	28	0.2	SW	2000	448	8	S 13 R CF 2	CFQ13/2-L	28	0.2	C-OCC	1,400	314	134	0.0	$ 15.32	$ 270.00	$ 35	17.6	15.3
13	Meeting Room	6	S 32 P F 2 (ELE)	F42LL	60	0.4	SW	2000	720	6	T 28 R F 2	F42SSILL	48	0.3	C-OCC	1,000	288	432	0.1	$ 59.43	$ 958.50	$ 95	16.1	14.5
13	Director	4	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	480	4	T 28 R F 2	F42SSILL	48	0.2	C-OCC	1,000	192	288	0.0	$ 39.62	$ 729.00	$ 75	18.4	16.5
13	Tech Services	5	S 32 P F 2 (ELE)	F42LL	60	0.3	SW	2000	600	5	T 28 R F 2	F42SSILL	48	0.2	C-OCC	1,000	240	360	0.1	$ 49.53	$ 843.75	$ 85	17.0	15.3
13	Meeting Room	12	S 32 P F 2 (ELE)	F42LL	60	0.7	SW	2000	1,440	12	T 28 R F 2	F42SSILL	48	0.6	C-OCC	1,000	576	864	0.1	$ 118.87	$ 1,647.00	$ 155	13.9	12.6
201	Conference Room B	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	1600	288	2	T 28 R F 3	F43SSILL	72	0.1	C-OCC	1,200	173	115	0.0	$ 18.23	$ 499.50	$ 55	27.4	24.4
201	Conference Room A	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	1600	288	2	T 28 R F 3	F43SSILL	72	0.1	C-OCC	1,200	173	115	0.0	$ 18.23	$ 499.50	$ 55	27.4	24.4
201	Reference	67	T 32 R F 3 (ELE)	F43ILL/2	90	6.0	SW	2000	12,060	67	T 28 R F 3	F43SSILL	72	4.8	C-OCC	1,700	8,201	3,859	1.2	$ 610.57	$ 7,958.25	$ 705	13.0	11.9
7	Reference Desk	8	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.5	SW	2000	960	8	2T 17 R F 2 (ELE)	F22ILL	33	0.3	C-OCC	1,700	449	511	0.2	$ 88.84	$ 1,134.00	$ 35	12.8	12.4
44	Reference Desk	5	DC 26 W CF 2	CFQ26/2-L	50	0.3	SW	2000	500	5	DC 26 W CF 2	CFQ26/2-L	50	0.3	C-OCC	1,700	425	75	0.0	$ 8.55	$ 270.00	$ 35	31.6	27.5
13	TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	C-OCC	1,000	48	72	0.0	$ 9.91	$ 384.75	$ 45	38.8	34.3
201	Break Room	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	2000	720	4	T 28 R F 3	F43SSILL	72	0.3	C-OCC	800	230	490	0.1	$ 66.00	$ 729.00	$ 75	11.0	9.9
13	TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 28 R F 2	F42SSILL	48	0.0	C-OCC	1,000	48	72	0.0	$ 9.91	$ 384.75	$ 45	38.8	34.3
80	Stair	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204	2	SP 36 R CF 1	CFT36/1	51	0.1	C-OCC	1,200	122	82	0.0	$ 9.30	$ 270.00	$ 35	29.0	25.3
13	1st Floor	75	S 32 P F 2 (ELE)	F42LL	60	4.5	SW	2000	9,000	75	T 28 R F 2	F42SSILL	48	3.6	NONE	2,000	7,200	1,800	0.9	$ 332.53	$ 8,606.25	$ 750	25.9	23.6
80	1st Floor	1	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	102	1	SP 36 R CF 1	CFT36/1	51	0.1	NONE	2,000	102	-	0.0	$ -	$ -	$ -		
7	1st Floor	1	2T 32 R F 2 (u) (ELE) Thin Tube	FU2LL	60	0.1	SW	2000	120	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	NONE	2,000	66	54	0.0	$ 9.98	$ 108.00	$ -	10.8	10.8
59	1st Floor	5	S 13 R CF 2	CFQ13/2-L	28	0.1	SW	2000	280	5	S 13 R CF 2	CFQ13/2-L	28	0.1	NONE	2,000	280	-	0.0	$ -	$ -	$ -		
44	1st Floor	8	DC 26 W CF 2	CFQ26/2-L	50	0.4	SW	2000	800	8	DC 26 W CF 2	CFQ26/2-L	50	0.4	NONE	2,000	800	-	0.0	$ -	$ -	$ -		
59	TR Vest	1	S 13 R CF 2	CFQ13/2-L	28	0.0	SW	2000	56	1	S 13 R CF 2	CFQ13/2-L	28	0.0	C-OCC	1,400	39	17	0.0	$ 1.92	$ 270.00	$ 35	141.0	122.7
13	Men's TR	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360	3	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,000	144	216	0.0	$ 29.72	$ 614.25	$ 65	20.7	18.5
13	Women's TR	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	2000	360	3	T 28 R F 2	F42SSILL	48	0.1	C-OCC	1,000	144	216	0.0	$ 29.72	$ 614.25	$ 65	20.7	18.5
201	Activity Room	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	2000	720	4	T 28 R F 3	F43SSILL	72	0.3	C-OCC	1,000	288	432	0.1	$ 59.43	$ 729.00	$ 75	12.3	11.0
201	Office Area	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	2000	360	2	T 28 R F 3	F43SSILL	72	0.1	C-OCC	1,000	144	216	0.0	$ 29.72	$ 499.50	$ 55	16.8	15.0
201	Electrical Room	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	1000	540	6	T 28 R F 3	F43SSILL	72	0.4	NONE	1,000	432	108	0.1	$ 27.59	$ 688.50	$ 60	25.0	22.8
80	Lobby	2	SP 36 R CF 1	CFT36/1	51	0.1	SW	2000	204	2	SP 36 R CF 1	CFT36/1	51	0.1	C-OCC	1,400	143	61	0.0	$ 6.98	$ 270.00	$ 35	38.7	33.7
169LED	Exterior	8	SP 250 MH ROOF	MH250/1	295	2.4	SW	8760	20,674	8	FXLED78	FXLED78/1	78	0.6	NONE	8,760	5,466	15,207	1.7	$ 1,979.25	$ 7,619.40	$ 1,400	3.8	3.1
															0	#N/A								#VALUE!
	Total	**246**				**18.6**			**52,524**	**246**				**13.8**			**26,727**		**4.9**	**3,629**	**36,597**	**$4,070**		
																	Demand Savings			**4.9**	**$688**			
																	kWh Savings			**25,797**	**$2,941**			
																	Total Savings				**$3,629**		**10.1**	**9.0**

APPENDIX D

New Jersey Board of Public Utilities Incentives

i. **Smart Start**

ii. **Direct Install**

iii. **Pay for Performance (P4P)**

iv. **Energy Savings Improvement Plan (ESIP)**

I. SMART START

COMMERCIAL, INDUSTRIAL AND LOCAL GOVERNMENT

PROGRAMS

NJ SMARTSTART BUILDINGS

EQUIPMENT INCENTIVES

APPLICATION FORMS

TOOLS AND RESOURCES

PAY FOR PERFORMANCE

COMBINED HEAT & POWER AND FUEL CELLS

LOCAL GOVERNMENT ENERGY AUDIT

LARGE ENERGY USERS PILOT

ENERGY SAVINGS IMPROVEMENT PROGRAM

DIRECT INSTALL

ENERGY BENCHMARKING

OIL, PROPANE & MUNICIPAL ELECTRIC CUSTOMERS

EDA PROGRAMS

T-12 SCHOOLS LIGHTING INITIATIVE

TEACH

ARRA

TECHNOLOGIES

TOOLS AND RESOURCES

PROGRAM UPDATES

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Home » Commercial & Industrial » Programs

NJ SmartStart Buildings

Program Overview

With New Jersey SmartStart Buildings ...

... A smart start now means better performance later! Whether you're starting a commercial or industrial project from the ground up, renovating existing space, or upgrading equipment, you have unique opportunities to upgrade the energy efficiency of the project.

New Jersey SmartStart Buildings can provide a range of support — at no cost to you — to yield substantial energy savings, both now and for the future. Learn more about:

- Project Categories
- Custom Measures
- Incentives for Qualifying Equipment and Projects
- Program Terms and Conditions
- Find a Trade Ally

Please note: pre-approval is required for almost all energy efficiency incentives. This means you must submit an application form (and applicable worksheets) and receive an approval letter from the program before any equipment is installed (click here for complete Terms and Conditions.) Upon receipt of an approval letter, you may proceed to install the equipment listed on your approved application. Equipment installed prior to the date of the approval letter is not eligible for an incentive. **Any customer and/or agent who purchases equipment prior to the receipt of an incentive approval letter does so at his/her own risk.**

Getting Started

Submit your project application form as soon as you know you will be doing a construction project, or replacing/adding equipment.

Smart-Growth Eligibility: *Check to make sure your project is eligible for incentives.*

Incentives for new construction are available only for projects in areas designated for growth in the NJ State Development and Redevelopment Plan. Public school (K-12) new construction projects are exempted from this restriction and are eligible for incentives throughout the State.

Customers, or their trade allies, can determine if a location is in a designated growth area by referring to the Smart Growth Site Evaluator Tool available from the HMFA website. Contact a program representative if you are uncertain about project eligibility. The Smart Growth policies will be implemented consistent with Board Orders as described more fully in the C&I Operational Procedure Manual.

Apply for pre-approval by submitting an application for the type of equipment you have chosen to install. The application should be accompanied by a related worksheet, where applicable, and a manufacturer's specification sheet (refer to the specific program requirements on the back of the application for specs needed for your project) for the equipment you are planning to install. (Program representatives will review your application package and approve it, reject it, and/or advise you of upgrades in equipment that will save energy costs and/or increase your incentives.)

Support for Custom Energy-Efficiency Measures

Custom measures allows program participants the opportunity to receive an incentive for unique energy-efficiency measures that are not on the prescriptive equipment incentive list, but are project/facility specific.

Incentives for Qualifying Equipment and Projects

Financial incentives are available for large and small projects. These incentives offset some — or maybe even all! — of the added cost to purchase qualifying energy-efficient equipment, which provides significant long-term energy savings. Ranges of incentives are available for qualifying equipment (depending on type, size, and efficiency) in several categories.

Find out more about equipment incentives!

For specific details on equipment requirements and financial incentives, including incentives for equipment not listed here, contact a program representative. Annual financial incentives may be

Program Updates

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Other updates posted.

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NJ SmartStart Buildings custom measures case study presented at Globalcon Conference

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PROGRAMS

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ENERGY BENCHMARKING

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EDA PROGRAMS

T-12 SCHOOLS LIGHTING INITIATIVE

TEACH

ARRA

TECHNOLOGIES

TOOLS AND RESOURCES

PROGRAM UPDATES

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Equipment Incentives

More reasons for a smart start on your next project!

New Jersey SmartStart Buildings provides **financial incentives for qualifying equipment**. These incentives were developed to help our customers offset some of the added cost to purchase qualifying energy-efficient equipment, which provides significant long-term energy savings. A wide range of incentives are available for qualifying equipment (depending on type, size and efficiency).

Listed below are the types of qualifying equipment and ranges of incentives. For details on equipment requirements and full listings of incentives, refer to the **online application forms**.

Please note that almost all equipment incentives require pre-approval before equipment is installed. (click for exceptions) To start the pre-approval process, submit an Equipment Application, and appropriate Equipment Worksheets, for the type or types of equipment you are planning to install along with equipment specification sheets (refer to the specific program requirements on the back of the application for specifications needed for your project) and a current utility bill(s).

In order to be eligible to receive financial incentives under this Program, Applicants must receive electric and/or gas service from one of the regulated electric and/or gas utilities in the State of New Jersey. They are: Atlantic City Electric, Jersey Central Power & Light, Rockland Electric Company, New Jersey Natural Gas, Elizabethtown Gas, PSE&G, and South Jersey Gas.

Electric Chillers

Water-cooled chillers ($12 - $170 per ton)
Air-cooled chillers ($8 - $52 per ton)

Gas Cooling

Gas absorption chillers ($185-$450 per ton)
Gas Engine-Driven Chillers (Calculated through Custom Measure Path)

Desiccant Systems ($1.00 per cfm - gas or electric)

Electric Unitary HVAC

Unitary AC and split systems ($73 - $92 per ton)
Air-to-air heat pumps ($73 - $92 per ton)
Water-source heat pumps ($81 per ton)
Packaged terminal AC & HP ($65 per ton)
Central DX AC Systems ($40 - $72 per ton)
Dual Enthalpy Economizer Controls ($250)
Occupancy Controlled Thermostats ($75 each)

Ground Source Heat Pumps

Closed Loop ($450-750 per ton)

Gas Heating

Gas-fired boilers < 300 MBH ($300 per unit)
Gas-fired boilers ≥ 300 MBH - 1500 MBH ($1.75 per MBH)
Gas-fired boilers ≥ 1500 MBH - ≤ 4000 MBH ($1.00 per MBH)
Gas-fired boilers > 4000 MBH (Calculated through Custom Measure Path)
Gas furnaces ($300-$400 per unit)

Variable Frequency Drives

Variable air volume ($65 - $155 per hp)
Chilled-water pumps ($60 per hp)
Compressors ($5,250 to $12,500 per drive)

Natural Gas Water Heating

Program Updates

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II. DIRECT INSTALL

COMMERCIAL, INDUSTRIAL AND LOCAL GOVERNMENT

- PROGRAMS
  - NJ SMARTSTART BUILDINGS
  - PAY FOR PERFORMANCE
  - COMBINED HEAT & POWER AND FUEL CELLS
  - LOCAL GOVERNMENT ENERGY AUDIT
  - LARGE ENERGY USERS PILOT
  - ENERGY SAVINGS IMPROVEMENT PROGRAM
  - DIRECT INSTALL
    - PARTICIPATION STEPS
    - PARTICIPATING CONTRACTORS
    - SUSTAINABLE JERSEY
  - ENERGY BENCHMARKING
  - OIL, PROPANE & MUNICIPAL ELECTRIC CUSTOMERS
  - EDA PROGRAMS
  - T-12 SCHOOLS LIGHTING INITIATIVE
  - TEACH
  - ARRA
- TECHNOLOGIES
- TOOLS AND RESOURCES
- PROGRAM UPDATES
- CONTACT US

Direct Install - Steps to Participation

New Jersey SmartStart BUILDINGS

NEW JERSEY'S CLEAN ENERGY PROGRAM DIRECT Install

SIX SIMPLE STEPS TO PARTICIPATION

CONTACT THE PARTICIPATING CONTRACTOR IN YOUR AREA

Identify the contractor assigned and trained to provide Direct Install services in the county where your project is located. Using the contact information provided, call or send an e-mail to the participating contractor to discuss your project. The contractor will schedule an energy assessment and work with you to complete the program application and participation agreement.

If you're unable to contact the participating contractor or have questions, you may contact us at 866-NJSMART or send an e-mail to DirectInstall@NJCleanEnergy.com..

REVIEW RESULTS

After the energy assessment, the contractor will review the results with you, including what measures qualify and your share of the project cost.

MOVE FORWARD

You will sign a scope of work document to proceed with implementation of qualifying measures.

ARRANGE INSTALLATION

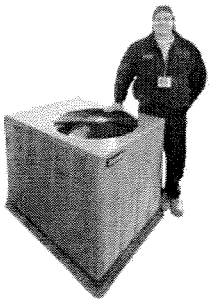
You and the participating contractor will set a convenient start date for the installation.

CONFIRM INSTALLATION

Once the participating contractor completes the installation, you accept the work by signing a project completion form.

COMPLETE TRANSACTION

You pay the participating contractor your share of the project cost and New Jersey's Clean Energy Program pays the rest.



Program Updates

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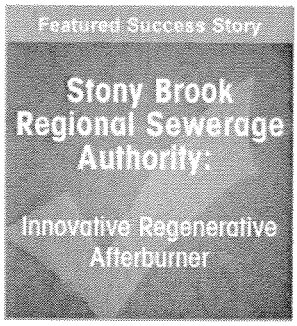

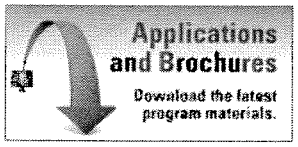

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III. PAY FOR PERFORMANCE (P4P)

New Jersey's Clean Energy PROGRAM
Your Power to Save
njcleanenergy.com

New Jersey SmartStart BUILDINGS®

BPU

2012 PAY FOR PERFORMANCE PROGRAM
Existing Buildings Incentive Structure

Incentive #1: Energy Reduction Plan

Incentive Amount:.....$0.10 per sq ft
Minimum Incentive:.....$5,000
Maximum Incentive::.....$50,000 or 50% of facility annual energy cost (whichever is less)

This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP) and is paid upon ERP approval. Incentive is contingent on implementation of recommended measures outlined in the ERP.

Incentive #2: Installation of Recommended Measures

Minimum Performance Target:.....15%

Electric Incentives
Base Incentive based on 15% savings:.....$0.09 per projected kWh saved
For each % over 15% add:.....$0.005 per projected kWh saved
Maximum Incentive:.....$0.11 per projected kWh saved

Gas Incentives
Base Incentive based on 15% savings:.....$0.90 per projected Therm saved
For each % over 15% add:.....$0.05 per projected Therm saved
Maximum Incentive:.....$1.25 per projected Therm saved

Incentive Cap:.....25% of total project cost

This incentive is based on projected energy savings outlined in the ERP. Incentive is paid upon successful installation of recommended measures.

Incentive #3: Post-Construction Benchmarking Report

Minimum Performance Target:.....15%

Electric Incentives
Base Incentive based on 15% savings:.....$0.09 per actual kWh saved
For each % over 15% add:.....$0.005 per actual kWh saved
Maximum Incentive:.....$0.11 per actual kWh saved

Gas Incentives
Base Incentive based on 15% savings:.....$0.90 per actual Therm saved
For each % over 15% add:.....$0.05 per actual Therm saved
Maximum Incentive:.....$1.25 per actual Therm saved

Incentive Cap:.....25% of total project cost

This incentive will be released upon submittal of a Post-Construction Benchmarking Report that verifies that the level of savings actually achieved by the installed measures meets or exceeds the minimum performance threshold. To validate the savings and achievement of the Energy Target, the EPA Portfolio Manager shall be used. Savings should be rounded to the nearest percent. Total value of Incentive #2 and Incentive #3 may not exceed 50% of the total project cost. Incentives will be limited to $1 million per gas and electric account per building; maximum of $2 million per project. See Participation Agreement for details.

IV. ENERGY SAVINGS IMPROVEMENT PLAN (ESIP)

COMMERCIAL, INDUSTRIAL AND LOCAL GOVERNMENT

PROGRAMS

NJ SMARTSTART BUILDINGS

PAY FOR PERFORMANCE

COMBINED HEAT & POWER AND FUEL CELLS

LOCAL GOVERNMENT ENERGY AUDIT

LARGE ENERGY USERS PILOT

ENERGY SAVINGS IMPROVEMENT PROGRAM

DIRECT INSTALL

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Energy Savings Improvement Program

A new State law allows government agencies to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. Under the recently enacted Chapter 4 of the Laws of 2009 (the law), the "Energy Savings Improvement Program" (ESIP), provides all government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources.

This Local Finance Notice outlines how local governments can develop and implement an ESIP for their facilities. Below are two sample RFPs:

Local Government
School Districts (K-12)

The Board also adopted protocols to measure energy savings.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Local units should carefully consider all alternatives to develop an approach that best meets their needs. Local units considering an ESIP should carefully review the Local Finance Notice, the law, and consult with qualified professionals to determine how they should approach the task.

FIRST STEP – ENERGY AUDIT

For local governments interested in pursuing an ESIP, the first step is to perform an energy audit. As explained in the Local Finance Notice, this may be done internally if an agency has qualified staff to conduct the audit. If not, the audit must be implemented by an independent contractor and not by the energy savings company producing the Energy Reduction Plan.

Pursuing a Local Government Energy Audit through New Jersey's Clean Energy Program is a valuable first step to the ESIP approach - and it's free. **Incentives provide 100% of the cost of the audit.**

ENERGY REDUCTION PLANS

If you have an ESIP plan you would like to submit to the Board of Public Utilities, please email it to ESIP@bpu.state.nj.us. Please limit the file size to 3MB (or break it into smaller files).

Frankford Township School District
Northern Hunterdon-Voorhees Regional High School
Manalapan Township ***(180 MB** - Right Click, Save As)*

Program Updates

Notice of 2013 Changes to C&I Programs

Warranty and Lease Terms for CHP/Fuel Cells Increased to 10 Years

Large Combined Heat & Power/Fuel Cell Program Update

Board Order - Standby Charges for Distributed Generation Customers

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Continued Commitment to Saving Energy

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LFN 2011-17

June 16, 2011

Local Finance Notice

Chris Christie, *Governor* | Kim Guadagno, *Lt. Governor* | Lori Grifa, *Commissioner* | Thomas H. Neff, *Director*

Contact Information

Director's Office
V. 609.292.6613
F. 609.292.9073

Local Government Research
V. 609.292.6110
F. 609.292.9073

Financial Regulation and Assistance
V. 609.292.4806
F. 609.984.7388

Local Finance Board
V. 609.292.0479
F. 609.633.6243

Local Management Services
V. 609.292.7842
F. 609.633.6243

Authority Regulation
V. 609.984.0132
F. 609.984.7388

Mail and Delivery
101 South Broad St.
PO Box 803
Trenton, New Jersey
08625-0803
Web: www.nj.gov/dca/lgs
E-mail: dlgs@dca.state.nj.us

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Update on Implementing Energy Savings Improvement Programs

This Local Finance Notice provides guidance concerning Energy Savings Improvement Program (ESIP) matters that affect local units covered under the Local Public Contracts Law (LPCL, N.J.S.A. 40A:11) and the Public School Contracts Law (PSCL, N.J.S.A. 18A:18A).

The Notice covers a model ESCO (Energy Services Company) Request for Proposal document and provides information on using the "Do-It-Yourself" process for implementing an ESIP. This Notice supplements Local Finance Notice 2009-11 concerning ESIPs.

Model ESCO Request for Proposal Document

General Issues

The Division of Local Government Services and the Board of Public Utilities have completed development of a model ESCO Request for Proposal Document. It is designed to assist all organizations (contracting units) covered by the LPCL and PSCL hire an energy services company (ESCO) to develop and implement an Energy Savings Plan (ESP) as part of an Energy Savings Improvement Program as authorized under N.J.S.A. 40A:11-4.6 and 18A:18A-4.6.

Specifically, the document serves as the starting point for these government agencies to select an ESCO through the competitive contracting procedure (N.J.S.A. 40A:11-4.1 et seq. and 18A:18A-4.1 et seq.).

Notwithstanding the efforts of the State agencies to ensure that the RFP is consistent with all relevant procurement procedures, laws, and regulations, there are several issues contracting unit personnel should keep in mind:

1) Local legal advisors should review the document to ensure it is consistent with any allowable local practices and legal considerations.
2) The individual responsible for managing the project should review the entire RFP in order to be able to answer questions and ensure the document meets local needs.
3) Forms have been carefully designed to meet the need of this specific process. Care should be taken if proposed forms are removed and replaced with ones normally used by the contracting unit.

The RFP also uses a formal process for potential proposers to submit questions and requests for clarifications. Appendix B is a form for the submission of these requests and is referred to throughout the text.

Contracting units are also reminded the Competitive Contracting process does not allow for negotiating proposals. While legal elements of the contract (project development agreement) may require legal determinations and modifications, the process does not allow for negotiation of price or related substantive elements and any element that would have provided less than a level playing field for proposers.

Contracting units are also cautioned that setting qualification standards that arbitrarily limit competition is inconsistent with public bidding requirements.

Office of State Comptroller Filing: Contracting units are also reminded of their obligations to meet State Comptroller requirements for public contracts. In accordance with N.J.S.A 52:15C-10, contracting units must notify OSC as early as practicable, but no later than 30 days before advertisement, of any negotiation or solicitation of a contract that may exceed $10 million. Contracting units must also provide post-award notification for any contract for an amount exceeding $2 million. Notification must be given within 20 days of the award.

Substantive Edits:

Several sections are highlighted in green. These sections should be carefully edited to meet contracting unit needs. This has important application to evaluation criteria in Section D. Once finalized, the green highlight should be removed.

Section B-16; Insurance should be reviewed by the contracting unit's Risk Management professionals to be sure the standards are appropriate to the contracting unit and the work to be done.

The following Sections also require local decisions and editing:

- A-3: # of copies of proposal and # of CDs to be submitted
- A-4: Web posting address, if desired
- A-5: If extra credit is to be provided on evaluation scoring for attending site walk through
- B-11: Delete LPCL or PSCL section as appropriate
- B-34: Use only if PSCL
- C-1: Explanation of type of audit information
- C-3(k): Include if ESCO is to provide financing option
- Use of Appendix F and Proposal Requirements #8: These forms are related to submission of Political Contribution Disclosure forms. Only PSCL agencies are required to use these forms as pursuant to Public School Fiscal Accountability Procedures (N.J.A.C. 6A23A-6.3). The forms and references to it should be removed for all LPCL users.

Under the ESIP DIY approach, there would be no conflict in a properly procured single organization conducting the audit, developing the ESP, then preparing plans and specifications. This does not apply when using the ESCO approach, where the auditor and ESCO must be independent.

Once construction plans and specifications are complete, the contracting unit would then conduct the bidding process as it would any public works construction project: manage the project as it sees fit (the firm that did the plans could also serve as construction manager), and then contract as necessary for commissioning and final third party verification. The two verification steps (the ESP and verifying implementation) must be performed by an organization independent of the ones preparing the ESP, overseeing construction and commissioning.

By following this process, the contracting unit can then apply to the Local Finance Board for the issuance of ESIP-based energy saving obligations or enter into appropriate lease financing.

The ESIP approach to energy improvement provides a range of options for contracting units to accrue energy savings while improving the environment, taking advantage of low-cost financing and state and federal incentives. DLGS and the BPU encourage comments and questions (through the ESIP web page) on this new opportunity so we can improve it as time goes on.

Approved: Thomas H. Neff, Director, Division of Local Government Services

Table of Web Links

Page	Shortcut text	Internet Address
1, 4	Local Finance Notice 2009-11	http://www.nj.gov/dca/lgs/lfns/09lfns/2009-11.doc
2	ESIP webpage	http://www.nj.gov/dca/lgs/lpcl/esip.htm
2	email comments	mailto:lpcl@dca.state.nj.us
2	to register (via email	mailto:lpcl@dca.state.nj.us
2	GovConnect Local Procurement	http://www.nj.gov/dca/surveys/ppsurvey.htm
3	State Comptroller requirements.	http://www.nj.gov/comptroller/compliance/index.html

New Jersey's Clean Energy PROGRAM
Your Power to Save
njcleanenergy.com

New Jersey SmartStart BUILDINGS

BPU

2012 PAY FOR PERFORMANCE PROGRAM
Existing Buildings Incentive Structure

Incentive #1: Energy Reduction Plan

Incentive Amount: ..... **$0.10 per sq ft**
Minimum Incentive: **$5,000**
Maximum Incentive:: ..... **$50,000 or 50% of facility annual energy cost (whichever is less)**

This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP) and is paid upon ERP approval. Incentive is contingent on implementation of recommended measures outlined in the ERP.

Incentive #2: Installation of Recommended Measures

Minimum Performance Target: **15%**

Electric Incentives

Base Incentive based on 15% savings: ..... **$0.09 per projected kWh saved**
For each % over 15% add: ..... **$0.005 per projected kWh saved**
Maximum Incentive: ..... **$0.11 per projected kWh saved**

Gas Incentives

Base Incentive based on 15% savings: ..... **$0.90 per projected Therm saved**
For each % over 15% add: ..... **$0.05 per projected Therm saved**
Maximum Incentive: ..... **$1.25 per projected Therm saved**

Incentive Cap: ..... **25% of total project cost**

This incentive is based on projected energy savings outlined in the ERP. Incentive is paid upon successful installation of recommended measures.

Incentive #3: Post-Construction Benchmarking Report

Minimum Performance Target: **15%**

Electric Incentives

Base Incentive based on 15% savings: ..... **$0.09 per actual kWh saved**
For each % over 15% add: ..... **$0.005 per actual kWh saved**
Maximum Incentive: ..... **$0.11 per actual kWh saved**

Gas Incentives

Base Incentive based on 15% savings: ..... **$0.90 per actual Therm saved**
For each % over 15% add: ..... **$0.05 per actual Therm saved**
Maximum Incentive: ..... **$1.25 per actual Therm saved**

Incentive Cap: ..... **25% of total project cost**

This incentive will be released upon submittal of a Post-Construction Benchmarking Report that verifies that the level of savings actually achieved by the installed measures meets or exceeds the minimum performance threshold. To validate the savings and achievement of the Energy Target, the EPA Portfolio Manager shall be used. Savings should be rounded to the nearest percent. Total value of Incentive #2 and Incentive #3 may not exceed 50% of the total project cost. Incentives will be limited to $1 million per gas and electric account per building; maximum of $2 million per project. See Participation Agreement for details.

APPENDIX E

Photovoltaic Analysis

City of Woodbury
Municipal Complex

Cost of Electricity	$0.150	/kWh
Electricity Usage	117,900	kWh/yr
System Unit Cost	$4,000	/kW

Photovoltaic (PV) Solar Power Generation - Screening Assessment

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	Federal Tax Credit	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$80,000	**20.0**	**26,275**	**0**	**$3,941**	**0**	**$3,941**	**$0**	**$4,467**	**20.3**	**9.5**

** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $170 /1000kwh

Area Output*
1,020 m2
10,979 ft2

Perimeter Output*
211 m
691 ft

Available Roof Space for PV:
(Area Output - 10 ft x Perimeter) x 85%
3,461 ft2

Approximate System Size: Is the roof flat? (Yes/No) Yes

8	watt/ft2	
27,692	DC watts	
20	kW	Enter into PV Watts

PV Watts Inputs***

Array Tilt Angle	20	Enter into PV Watts (always 20 if flat, if pitched - enter estimated roof angle)
Array Azimuth	180	Enter into PV Watts (default)
Zip Code	08096	Enter into PV Watts
DC/AC Derate Factor	0.83	Enter info PV Watts

PV Watts Output
13,137 annual kWh calculated in PV Watts program

% Offset Calc

Usage	117,900	(from utilities)
PV Generation	13,137	(generated using PV Watts)
% offset	11%	

* http://www.freemaptools.com/area-calculator.htm
** http://www.flettexchange.com
*** http://gisatnrel.nrel.gov/PVWatts_Viewer/index.html

AC Energy & Cost Savings

Cautions for Interpreting the Results

(Type comments here to appear on printout; maximum 1 row of 90 characters.)

Station Identification

Cell ID:	0266373
State:	New Jersey
Latitude:	39.8 ° N
Longitude:	75.3 ° W

PV System Specifications

DC Rating:	20.0 kW
DC to AC Derate Factor:	0.830
AC Rating:	16.6 kW
Array Type:	Fixed Tilt
Array Tilt:	20.0 °
Array Azimuth:	180.0 °

Energy Specifications

Cost of Electricity:	14.7 ¢/kWh

Results

Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	2.80	1450	213.15
2	3.53	1669	245.34
3	4.96	2500	367.50
4	5.39	2560	376.32
5	5.96	2845	418.21
6	6.25	2801	411.75
7	5.95	2729	401.16
8	5.75	2629	386.46
9	5.17	2342	344.27
10	4.19	2037	299.44
11	2.96	1431	210.36
12	2.55	1281	188.31
Year	4.63	26275	3862.42

Output Hourly Performance Data

(Gridded data is monthly, hourly output not available.)

Output Results as Text

Saving Text from a Browser

Run PVWATTS v.2 for another location

Run PVWATTS v.1

Please send questions and comments to Webmaster
Disclaimer and copyright notice.

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

APPENDIX F

EPA Portfolio Manager

ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

Municipal Complex

Primary Property Function: Fire Station
Gross Floor Area (ft²): 7,000
Built: 1774

For Year Ending: November 30, 2013
Date Generated: February 05, 2014

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Municipal Complex 29 Delaware Street Woodbury, New Jersey 08096	City of Woodbury 33 Delaware Street Woodbury, NJ 08096 (____)____-_____	Randi Woerner 33 Delaware Street Woodbury, NJ 08096 856-845-1300 x143 rwoerner@woodbury.nj.us

Property ID: 3950375

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
352.7 kBtu/ft²

Source EUI
705 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	1,121,023 (45%)
Natural Gas (kBtu)	1,347,900 (55%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	77.2
National Median Source EUI (kBtu/ft²)	154.4
% Diff from National Median Source EUI	357%
Annual Emissions	
Greenhouse Gas Emissions (MtCO2e/year)	214

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____Date: _____

Licensed Professional

Gary Edmerson
6 Campus Drive
Parsippany, NJ 07054
973-267-9029
gedmerson@chacompanies.com

Professional Engineer Stamp
(if applicable)