BOROUGH OF MOUNTAIN LAKES
BOROUGH HALL
ENERGY ASSESSMENT

for

NEW JERSEY
BUREAU OF PUBLIC UTILITIES

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APPENDICES

1.0 INTRODUCTION & BACKGROUND

This report summarizes the energy audit performed at the Borough of Mountain Lakes Borough Hall building, located at 400 Boulevard in Mountain Lakes, NJ. The building was originally constructed in 1970 as a two-story structure. The facility is approximately 9,340 square feet. The building houses township officials' offices and the Board of Education, lunchrooms, and restrooms on the upper level. The lower level contains the volunteer fire department, the police department, lunchroom, a council meeting room, restrooms, and the utility closets.

New Jersey's Clean Energy Program, funded by the New Jersey Board of Public Utilities, supports energy efficiency and sustainability for Municipal and Local Government Energy Audits. Through the support of a utility trust fund, New Jersey is able to assist state and local authorities in reducing energy consumption while increasing comfort.

This report covers the energy audit for the Borough of Mountain Lakes Borough Hall.

2.0 EXECUTIVE SUMMARY

This report details the results of the Borough of Mountain Lakes Borough Hall building. The, approximately 9,340 square foot, two-story structure houses township officials' offices and the Board of Education, lunch rooms, and restrooms on the upper level. The lower level contains the volunteer fire department, the police department, lunchroom, a council meeting room, restrooms, and the utility closets. The following areas were evaluated for energy conservation measures:

- Lighting upgrades with occupancy sensors
- Replace multi-zone rooftop units with multiple smaller units
- Upgrade HVAC control system
- Replace boiler with high efficiency unit
- Revise boiler controls, install programmable thermostats, and balance air system
- Weather-strip fire bay doors
- Install additional attic insulation

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Measures that are recommended for implementation have a payback of 10 years or less. This threshold is considered a viable return on investment. Potential annual savings of $10,875 for the recommended ECMs may be realized with a payback of 3.5 years.

The ECMs identified in this report will allow for the building to reduce its energy usage and if pursued has the opportunity to qualify for the New Jersey SmartStart Buildings Program. A summary of the costs, savings, and paybacks for the recommended ECMs follows:

ECM-1 Lighting Fixture Modifications

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
19,800	0	26,300	0	4,500	2.4	4,530	4.4	3.4

* There is a $30 per fixture incentive for replacing T12 fixtures with T8 fixtures available through the New Jersey Smart Start program's Prescriptive Lighting Application for this ECM.

ECM-2 Lighting Control Modifications (Fixtures Proposed in ECM-1)

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,400	0	3,400	0	575	5.2	300	2.4	1.9

* Incentive shown is per the New Jersey Smart Start Program, 2010 Lighting Controls Application. Incentive is based on the use of fifteen wall-mounted occupancy sensors.

ECM-5 Revise Boiler Controls, Install Programmable Thermostats, and Balance Air System

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
10,150	-	21,350	350	3,650	4.4	NA	2.9	NA

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

ECM-6 Seal Opening Around Fire Bay Doors

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
300	-	-	150	200	2.3	NA	1.5	NA

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

ECM-7 Install Additional Attic Insulation

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
6,300	0	3,000	1,100	1,950	3.6	NA	3.2	NA

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

3.0 EXISTING CONDITIONS

3.1 Building General

The Borough of Mountain Lakes Borough Hall is a two-story structure, approximately 9,340 square feet. The building was originally constructed in 1970. The building houses township officials' offices and the Board of Education, lunchrooms, and restrooms on the upper level. The lower level contains the volunteer fire department, the police department, lunchroom, a council meeting room, restrooms, and the utility closets.

The Borough of Mountain Lakes has a full service Borough Hall that houses the offices of township officials, the board of education, the fire department, and the police department. As such, the upper floor housing the township offices and the board of education follow a typical 40-hour work week, while the lower level housing the police department is occupied at all times by police personnel. The fire department is a volunteer company and does not have members in the building around the clock.

The original building was constructed in 1970 as a 9,340 square foot facility. The exterior shell is in good condition. The exterior walls are of various constructions. Below grade walls are 12" CMU with no insulation. Above grade walls in unfinished spaces are 4" brick on 8" CMU with no insulation. Above grade walls in finished spaces are 4" brick on 8" CMU with 5/8" sheet rock on furring channels. The main roof is an "A" frame wood truss with shingles on wood sheathing and 3" batt insulation between the roof joist and 2" foam-board insulation (R-10) on the top of the lower cord of the truss. The main roof includes an equipment well where the multi-zone roof top unit is located as well as the flue from the boiler. This equipment well is 32'-0"x14'-0". The engine deck roof is a rubberized flat roof with insulation board on concrete tees.

The lower level windows are bronze tinted, 1/4" single pane with aluminum frames. The top parts of the windows are approximately 36"x64" and fixed in place. The lower parts are approximately 36"x16" and are operable. The upper level windows are bronze tinted, 1/4" single pane from floor to ceiling with aluminum frames. The windows on the upper level are all fixed in place. The main entrance has two 3'-0"x7'-0" insulated glass panels in an aluminum frame. There is a canopy outside of the main entrance. Other entry points to the building include 3-0"'x7'-0" insulated metal doors on the east elevation and the south elevation. Each of those elevations has a single door. The insulated metal door on the south elevation, entering into the firehouse engine deck requires new weather-stripping. The engine deck also has three bays, each with its own glass garage door. The glass garage doors are each single pane, 12'-0"x13'-0", and are not sealed. The weather-stripping on the garage doors is non-existent and large openings were observed.

All other doors and windows appeared to have good weather stripping.

3.2 Utility Usage

Utilities include electricity and natural gas. The borough provides potable water and sewer service and, as a result, no billing is issued to the Borough Hall. Electricity is purchased from Jersey Central Power & Light Company (JCP&L); natural gas is purchased from New Jersey Natural Gas.

During the period of June 2009 to May 2010, electric usage was approximately 269,800 kWh at a total cost of about $45,900. Review of electricity bills during this period determined the building was charged a supply unit cost of $0.15 per kWh, demand unit cost of $5.46 per kW, and blended unit cost of $0.1700 per kWh. Electricity usage was higher in the summer months when cooling equipment is in use. During the same 2009 timeframe, the building heat and domestic hot water (DHW) produced by natural gas-fired

equipment required approximately 11,490 therms. Based on the annual cost of $15,738, the blended price for natural gas was $1.37 per therm. Natural gas consumption is highest in the winter months to produce building heat.

Utility data can be found in Appendix A.

Electricity supply and delivery is presently purchased from JCP&L. Natural gas supply and delivery is presently purchased from New Jersey Natural Gas. The delivery component will always be the responsibility of the utility that connects the facility to the power grid or gas line; however, the supply can be purchased from a third party. The electricity or natural gas commodity supply entity will require submission of one to three years of past energy bills. Contract terms can vary among suppliers. A list of approved electrical and natural gas energy commodity suppliers can be found in Appendix A.

3.3 HVAC Systems

Heating, ventilation, and air conditioning are provided to the facility in 12 zones. Thermostats were observed throughout the facility. On the lower level they were observed in the utility room, police chief office, squad room, kitchen, conference room, and council meeting room. On the upper level they were observed in the Mountain Lakes Borough main office, the Board of Education office, perimeter Borough offices, perimeter Board of Education offices, a large private office, and kitchen. Heat and air conditioning to each of these zones is provided by a single multi-zone rooftop HVAC unit. Additional heat is provided around the perimeter of the upper floor by hot water baseboard units. A gas-fired boiler generates the heating hot water. The lower level does not have hot water baseboard units, but stub-ups were included during the original construction for their installation. Two gas-fired unit heaters suspended from the ceiling provide heat for the engine deck.

The following is a summary of this equipment and areas served:

Equipment	Cooling Tons	Heating/Cooling Efficiency	Heating MBH Input/Output	Area Served
Multi-Zone Roof Top Unit	32	79% / 10.4 EER	474 / 375	6 Zones on the Upper Level and 6 Zones on the Lower Level
Gas-Fired Boiler	-	80% / N/A	192 / 167	Upper Level Baseboard
Gas-Fired Unit Heaters	-	80% / N/A	-	Engine Deck

A single exhaust fan handles all the restrooms, although each individual toilet room has a small, independent fan tied into the light switch. Two exhaust fans are located on the engine deck roof to exhaust the truck bays. This is the only exhaust in the area. There is no dedicated truck exhaust system. In addition, three exhaust fans are located on the pitched “A” frame roof to exhaust heat from the plenum.

The boiler is approximately 35 years old. The New Jersey Pay for Performance program estimates the useful life of a small commercial boiler at 20 years. The installed boiler exceeds this useful life and should be considered for replacement in the future. The roof top unit is 9 years old, installed in 2001. Although the New Jersey Pay for Performance program estimates the life of a rooftop unit to be at least 15 years on average, the unit runs continuously, which increases the apparent age of the equipment. A list of equipment can be found in Appendix B.

3.4 Lighting/Electrical Systems

The majority of lighting fixtures throughout the facility utilize inefficient T-12 fluorescent fixtures and lamps. In addition, there are incandescent lamps located throughout the building for down lights, decorative fixtures, and storage areas. All exit signs within the building use incandescent lamps.

Exterior building lighting consists of pole lights as well as building lights located at police and fire department entry doors. The pole lights utilize 150 watt A-Lamps and the entry lights utilize 75-watt mercury vapor lamps. The exterior lights are controlled by a timer and are either energized from either 5 p.m. through 12:30 a.m. or 5 p.m. through 7 a.m.

Emergency lighting is provided by use of emergency fixtures in all public spaces. An outdoor generator powers the emergency lighting.

3.5 Control Systems

3.5.1 HVAC Controls

A wall-mounted, non-programmable, heating-cooling thermostat controls each zone within the building. The thermostats are located in the utility room, police chief office, squad room, lower level kitchen, conference room, council meting room, Mountain Lakes Borough main office, Board of Education office, perimeter Borough offices, perimeter Board of Education offices, the upper level kitchen, and a large private office.

Following are the existing heating and cooling setpoints for each zone:

Thermostat Location	Heating	Cooling
Utility Room	71°F	75°F
Police Chief Office	71°F	75°F
Squad Room	71°F	75°F
Lower Level Kitchen	71°F	75°F
Conference Room	71°F	75°F
Council Meeting Room	67°F	75°F
Borough Main Offices	67°F	75°F
Board of Education Offices	67°F	75°F
Borough Perimeter Offices	67°F	75°F
Board of Education Perimeter Offices	67°F	75°F
Large Private Office	67°F	65°F
Upper Level Kitchen	67°F	75°F
Fire Department	72°F	NA

*Note: Because air system is not balanced, actual temperatures vary from thermostatic setpoint by room in each zone. The occupant of the "Large Private Office" must have thermostat to a cooler temperature in order to maintain a reasonable comfort level with the out of balance system.

Thermostats have no easy means of a temperature setback. Space is maintained at a constant temperature for both occupied and unoccupied periods.

Toilet room exhaust fans are interlocked with toilet room lights. An additional exhaust fan for all restrooms runs continuously. Manual switches control the two engine deck exhaust fans. The three exhaust fans exhausting the plenum and attic space run continuously during the cooling season.

3.5.2 Lighting Controls

Manual wall switches, except for exit lights and emergency lighting, control all lighting in the Borough Hall. A timer located in the electrical room controls exterior lighting.

3.6 Plumbing Systems

A 50-gallon, 40 MBH, gas-fired, General Electric water heater, produces domestic hot water for the facility. The water heater is located on the lower level in the same mechanical space as the boiler. A hot water return loop is not currently installed. The measured distance to the farthest hot water fixture does not require a circulation loop to be installed. All hot water fixtures within the building utilize water from this water heater.

Plumbing fixtures include 1.6 gallon per flush, flush valve water closets; wall hung restroom sinks; kitchen sinks; service sink; and exterior non-freeze wall hydrants. All flush valves and faucets meet the maximum water flow requirements of the adopted plumbing codes.

4.0 ENERGY CONSERVATION MEASURES

The Carrier Hourly Analysis Program (HAP) used to model the facility's systems does not support the modeling of a hot water reset system, which the facility's boiler utilizes. Hot water reset control reduces the energy consumption of a boiler by approximately 15%. The natural gas input for the boiler plant system for each ECM was manually reduced by 15% after the calculations were performed. This reduction is the reason for the slight discrepancies between the program outputs, and the values noted in each ECM section.

4.1 ECM-1 Lighting Fixture Modifications

The facility has 10 fixtures, which utilize incandescent lamps, and 151 fixtures, which utilize T-12 fluorescent lamps. The incandescent lamps are located throughout the building in storage closets, downlights, and decorative fixtures. The T-12 fluorescent fixtures are located throughout thee rest of the building. Overall energy consumption can be reduced by utilizing more efficient compact fluorescent lamps and T-8 fluorescent lamps. The building also has 8 exit signs that currently have 16-watt fluorescent lamps. Exit sign energy consumption can be greatly reduced by replacing these lamps with energy efficient LED lamps.

Energy savings for this measure were calculated by applying the existing and proposed fixture wattages to the estimated time of operation. The difference resulted in an annual savings of 26,300 kWh per year, or $4,500 per year. Supporting calculations, including all assumptions for lighting hours, and the annual energy usage for each fixture can be found in Appendix C.

Lighting has an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 394,500 kWh and $67,500.

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

ECM-1 Lighting Fixture Modifications

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
19,800	0	26,300	0	4,500	2.4	4,530	4.4	3.4

* There is a $30 per fixture incentive for replacing T12 fixtures with T8 fixtures available through the New Jersey Smart Start program's Prescriptive Lighting Application for this ECM.

This measure is recommended.

4.2 ECM-2 Lighting Control Modifications

Manual wall switches currently control lighting throughout the facility. By equipping individual offices, restrooms, storage rooms, and mechanical areas with motion sensors, unoccupied energy use can be greatly reduced. This ECM proposes the addition of fifteen wall-mounted occupancy sensors in these areas.

The weekly occupied times for each space was determined by taking into account typical traffic patterns for the proposed areas. Applying the existing and proposed operating times to the combined wattage

requirements for each room's lighting fixtures, it was determined that about 3,400 kWh per year, or $575 per year, can be saved through implementation of this ECM.

Occupancy sensors have an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 51,000 kWh and $8,625.

Supporting calculations, including the proposed rooms to install occupancy sensors; assumptions for lighting hours in each space; annual energy usage for each fixture; and the type of occupancy sensor recommended is included in Appendix D. The implementation cost and savings related to this ECM are summarized below:

ECM-2 Lighting Control Modifications (Fixtures Proposed in ECM-1)

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,400	0	3,400	0	575	5.2	300	2.4	1.9

* Incentive shown is per the New Jersey Smart Start Program, 2010 Lighting Controls Application. Incentive is based on the use of fifteen wall-mounted occupancy sensors.

This measure is recommended.

4.3 ECM-3 Replace Multi-Zone Rooftop Unit with Multiple Units

The building is currently occupied by an assortment of departments. Both borough offices and the department of education offices occupy the upper level. These two groups work a typical office schedule from 6:30 A.M. to 6 P.M., Monday through Friday. The police department, volunteer fire department, council meeting room, conference room, and a construction official's office occupy the lower level. The police department operates full time (24 hrs/day) and always has at least two officers on duty at the station. The volunteer fire department is only occupied after a call or during a monthly drill. It is not often occupied. The council meeting room meets approximately four times per month, always in the evening. The conference room is used on an as needed basis and the construction official's office is typically occupied 40 hours per week. Because a single multi-zone rooftop unit conditions the building air and the police department is occupied full time, the rooftop unit runs constantly. By replacing the multi-zone rooftop unit with multiple smaller units, energy consumption can be reduced with programmed setback periods for the various zones. This ECM evaluates removing the lower level from the multi-zone rooftop unit and adding additional HVAC units for the areas downstairs. A grade mounted, packaged unit is recommended for the council room. This unit would also provide outside air into the space. For the police department, conference room, construction office, and lower level corridor areas a variable flow refrigerant system is recommended. A condensing unit can be located on the roof of the fire department with multiple terminal units allowing zone control in the various areas of the lower level. Operable windows would provide ventilation air to these areas.

Implementation of this measure requires modifications to the existing multi-zone rooftop unit, capping of all ductwork except the council room, modification to council room ductwork, thermostat removal, and installation of the new variable flow refrigeration unit with all associated indoor terminal units and thermostatic controls. The cost of this ECM was evaluated based on twelve indoor terminal units for the variable refrigerant flow system.

This ECM was analyzed by modeling both the base building with existing equipment and the building with the proposed HVAC equipment in the Carrier Hourly Analysis Program (HAP). The variable refrigerant flow system was modeled as an air source heat pump due to modeling limitations. The systems act extremely similar with the variable flow refrigerant system allowing zone control and slightly better energy consumption. Using these models, a comparison of the total energy used to condition the air in the building was performed. HAP data for the zone is located in Appendix E. Base building data is located in Appendix N.

The separation of the lower level from the multi-zone rooftop unit, installation of a variable refrigerant flow system, and installation of a packaged outdoor heating and cooling unit could yield an annual energy savings of approximately 700 therms, but an increase of 2,600 kWh for an overall savings of $600.

The new HVAC equipment has an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 10,500 therms and an increase of 39,000 kWh, or a total savings of $9,000.

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

ECM-3 Replace Multi-Zone Rooftop Unit with Multiple Units

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
42,300	-	(2,600)	700	600	(0.8)	1,100	>25	>25

* There is an incentive of $92/ton for HVAC unitary systems less than 5.4 tons and an incentive of $73/ton for air-to-air heat pump systems between 5.4 and 11.25 tons with an EER of 11.5 available through the New Jersey Smart Start program for this ECM.

Although this ECM does not have an adequate payback period, the life cycle cost of the current system must be taken into account. Because the current system has twenty-four hour run time that causes the unit's components to fail more often, frequent maintenance, downtime, and replacement of major components is required. The life cycle costs associated with the operation and maintenance of the current unit will offset much of the replacement system's costs. It is recommended that this system be seriously considered prior to the next failure of the rooftop unit. There will be premium costs of emergency replacement if the unit fails. It is therefore recommended to plan the replacement of the unit prior to failure.

4.4 ECM-4 Replace Existing Boiler with High Efficiency Unit

A boiler located in a lower level mechanical room currently supplies heating hot water to baseboard heating units around the upper level perimeter to offset the large glass window load. The boiler is a natural gas-fired, 80% efficient, American Standard boiler capable of 167 MBH output. The unit is regularly maintained, but is nearing the end of its useful life and could be replaced with a more efficient boiler. By replacing the boiler with a more efficient unit, the same output can be achieved with less input energy. This ECM proposes the installation of a 96% efficient unit to replace the existing 80% efficient unit.

The installation of a 96% efficient boiler could yield an annual energy savings of approximately 400 therms, or $500.

A high efficiency boiler has an expected life of 20 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 8,000 therms or $10,000.

This ECM was analyzed by modeling both the building and the hours of operation in the Carrier Hourly Analysis Program (HAP). Using this model, the energy use of the base building with the existing boiler was compared to the energy use of the building with a more efficient boiler. HAP data for this ECM is located in Appendix F. Base building data is located in Appendix N.

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

ECM-4 Replace Existing Boiler with High Efficiency Unit

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
8,450	-	-	400	500	0.2	NA	16.9	NA

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

This measure is not recommended. A boiler with at least 90% efficiency is recommended as a replacement when the existing boiler fails.

4.5 ECM-5 Revise Boiler Controls, Install Programmable Thermostats, and Balance Air System

The current multi-zone air system is out of balance causing rooms to overheat or overcool, depending on the season. Thermostats controlling these zones are simple heating or cooling thermostats that do not allow for either a manual or automatic setback during unoccupied periods. In addition, the hot water baseboard heaters on the second floor do not have indoor temperature sensors to indicate that the space temperature is satisfied, causing runaway heating. Air balancing allows for uniform temperatures throughout the zone, cooling or heating only enough to satisfy the real temperature setting, and accurate thermostat setting for occupied and unoccupied periods. If the programmable thermostats are installed without indoor baseboard heater controls, the benefits of the temperature setback periods would be negated by the runaway heating of the uncontrolled baseboard heaters.

Heating and cooling by the multi-zone, rooftop HVAC unit is currently controlled by multiple wall mounted, heat/cool thermostats. The zones have varying, but regular operating hours, which allows for the use of programmable thermostats. Currently the zones are set at a temperature for either the heating or cooling season and the temperature is maintained for both occupied and unoccupied periods. By utilizing a programmable thermostat, unoccupied periods can be defined which allows for a decrease in temperature during the heating season and an increase in temperature during the cooling season during the unoccupied times. The thermostat settings utilized for analysis of this ECM are 74°F occupied / 80°F unoccupied for the cooling seasons, and 68°F occupied / 64°F unoccupied during the heating seasons.

An outdoor temperature sensor currently controls the boiler. In the heating season the boiler will energize when the outdoor temperature drops below a certain set-point and begin pumping hot water through the baseboard heaters. The outdoor air temperature currently controls when the boiler begins to run and what temperature water will circulate throughout the building. As the outdoor temperature drops, the temperature of the water flowing through the hot water baseboard heaters increases. This type of control is called outdoor reset.

Currently there are no indoor temperature sensors for the baseboard heating units, causing the boiler to run continuously as long as the outdoor temperature is below the set-point. This ECM proposes a modification of the boiler controls so that both indoor and outdoor temperature sensors are utilized. As the temperature in individual spaces is satisfied, the water is diverted to another space whose temperature has not been satisfied, reducing the overall energy consumption of the boiler. Currently water continues to pass through the baseboard heater even if the space temperature is satisfied, overheating the space. It is recommended that the proposed indoor temperature sensor to be installed on the baseboard heaters be set to a temperature of 68 degrees Fahrenheit. The outdoor air temperature sensor will continue to function with the same outdoor reset controls currently used, increasing the water temperature as the outdoor air temperature is reduced. By reducing the load on the boiler when an indoor space set-point temperature is reached, energy savings are realized because the boiler will not run constantly. Because a flue gas analysis was not performed on the boiler, calculation of the actual boiler efficiency cannot be calculated accurately.

Utilizing both indoor and outdoor temperature sensors throughout the upper level, a potential annual savings of approximately 350 therms and 21,350 kWh, or $3,650 can be realized.

Temperature sensors and modified boiler controls have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 5,250 therms and 59,250 kWh, or $54,750.

This ECM was analyzed by modeling both the building and the hours of operation in the Carrier Hourly Analysis Program (HAP). Using this model, the energy consumption of the building with only outdoor temperature sensors was compared to the energy consumption of the building with both outdoor and indoor temperature sensors. HAP data for this ECM is located in Appendix G. Base building data is located in Appendix N.

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

ECM-5 Revise Boiler Controls, Install Programmable Thermostats, and Balance Air System

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
10,150	-	21,350	350	3,650	4.4	NA	2.9	NA

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

This measure is recommended.

4.6 ECM-6 Seal Openings Around Fire Bay Doors

The fire bay doors are 12’-0”x13’-0” single pane, all glass, garage doors with extremely poor weather-stripping. The gap between the glass and frame/building is extremely large and causes a large amount of heat loss in the winter months. The engine deck is not cooled; two gas-fired unit heaters provide space heat. Because of the large heat losses caused by the transfer of warm air out of the building, the unit heaters run constantly in the winter months to maintain temperature. By modifying the door and frame to provide a tight seal, exfiltration of warm air in the winter months will be minimized. As a result, the unit heaters will not run as frequently to maintain space temperature, reducing energy consumption.

Implementation of this ECM requires application of adequate weather-stripping and modification to the garage doorframe to provide a tight seal.

By providing a tight seal on the fire bay doors a potential annual savings of approximately 150 therms or $200 can be realized.

Weather-stripping has an expected life of approximately 5 years, according to manufacturers, and total energy savings over the life of the project are estimated at 750 therms or $1,000.

This ECM was analyzed by modeling the garage bay with both doors with poor seals and doors with tight seals in the Carrier Hourly Analysis Program (HAP). Using this model, the energy use of replacement equipment can be compared to the existing equipment under equal conditions. HAP data for this ECM is located in Appendix H. Base building data is located in Appendix N.

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

ECM-6 Seal Opening Around Fire Bay Doors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
300	-	-	150	200	2.3	NA	1.5	NA

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

This measure is recommended as part of a maintenance program.

4.7 ECM-7 Install Additional Attic Insulation

Insulation in the attic is currently installed, but there is additional insulatable space that should be filled with insulation to maximize the overall resistance of the system. During the heating season insulation reduces the conduction of heat out of the building and during the cooling season it reduces the conduction of heat into the building. Insulation reduces the energy consumption of both the gas-fired heating section and the condensing unit because the overall load of the building is reduced. A properly insulated building also increases overall comfort by reducing drafts and providing a more uniform temperature throughout. The life expectancy of HVAC equipment can be increased because the demand on the unit is lessened. This ECM proposes the installation of 12” of R-38 batt insulation throughout the attic.

This ECM was analyzed by modeling both the building and the hours of operation in the Carrier Hourly Analysis Program (HAP). Using this model, additional insulation was applied to the attic space and the energy consumption of the HVAC units was compared to the base building. HAP data for the building with insulation is located in Appendix I. Base building data is located in Appendix N. It was determined that about 3,000 kWh per year and 1,100 therms of natural gas, or $1,950 per year, can be saved through implementation of this ECM.

Properly installed insulation has an indefinite life expectancy. For the purposes of calculating long-term savings and a return on investment, a period of 15 years was chosen. The total energy savings over the 15 years noted is estimated at 45,000 kWh and 16,500 therms of natural gas, equaling $29,250.

Supporting calculations, annual energy usage for the HVAC units; and the cost of insulation is included in Appendix I. The implementation cost and savings related to this ECM are summarized below:

ECM-7 Install Additional Attic Insulation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
6,300	0	3,000	1,100	1,950	3.6	NA	3.2	NA

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

This measure is recommended.

5.0 PROJECT INCENTIVES

5.1 Incentives Overview

5.1.1 New Jersey Pay For Performance Program

The building will be eligible for incentives from the New Jersey Office of Clean Energy. The most significant incentives will be from the New Jersey Pay for Performance (P4P) Program. The P4P program is designed for qualified energy conservation projects in facilities whose demand in any of the preceding 12 months exceeds 200 kW. However, the 200 kW/month average minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations. Facilities that meet this criterion must also achieve a minimum performance target of 15% energy reduction by using the EPA Portfolio Manager benchmarking tool before and after implementation of the measure(s). If the participant is a municipal electric company customer, and a customer of a regulated gas New Jersey Utility, only gas measures will be eligible under the Program. American Recovery and Reinvestment Act (ARRA) funding, when available, may allow oil, propane and municipal electric customers to be eligible for the P4P Program. Available incentives are as follows:

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

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

Incentive #3: Post-Construction Benchmarking Report – This incentive is paid after acceptance of a report proving energy savings over one year utilizing the Environmental Protection Agency (EPA) Portfolio Manager benchmarking tool. Incentive #3 base incentives deliver $0.07/kWh and $0.70/therm not to exceed 20% of total project cost.

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

5.1.2 New Jersey Smart Start Program

For this program, specific incentives for energy conservation measures are calculated on an individual basis utilizing the 2010 New Jersey Smart Start incentive program. This program provides incentives dependent upon mechanical and electrical equipment. If applicable, incentives from this program are reflected in the ECM summaries and attached appendices.

If the building qualifies and enters into the New Jersey Pay for Performance Program, all energy savings will be included in the total building energy reduction, and savings will be applied towards the Pay for Performance incentive. A project is not applicable for both New Jersey incentive programs.

5.1.3 Energy Efficient and Conservation Block Grant

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

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

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

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

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

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

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

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

Funding for this program is dispersed on a first come, first serve basis until all funds are exhausted. The program does not limit the municipality to a minimum or maximum incentive, and the availability of funding cannot be determined prior to application. If the municipality meets all qualifications, the application must be submitted to TRC Energy Solutions for review. TRC will then determine the amount

of the incentive based on projected energy savings of the project. It is important to note that all applications for this incentive must be submitted before implementation of energy conservation measures.

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

5.2 Building Incentives

5.2.1 New Jersey Pay For Performance Program

The building is eligible for all three incentives available from the New Jersey P4P program. Incentive #1 is for the development of an energy reduction plan and will pay $.05/ square foot of the building footprint, which equates to about $470. Implementation of the energy conservation measures discussed in this report is expected to reduce the building's energy usage by over 15%, which qualifies it for both incentives #2 and #3. Combining incentives #2 and #3 will provide maximum savings of $0.18/ kWh and $1.80/ therm not to exceed 50% of the total project cost. The building is projected to save about 54,050 kWh, which amounts to about $9,750 in incentives. The building is also projected to save about 1,600 therms of natural gas. With New Jersey's current incentive structure, this would qualify for about $2,900 in incentive money. Combining all incentives in the P4P program would amount to approximately $12,650, reducing the overall payback of the project from 3.5 years to 2.3 years.

5.2.2 New Jersey Smart Start Program

The Borough of Mountain Lakes Borough Hall is eligible for multiple incentives from the New Jersey Smart Start Program.

The lighting replacement measure is eligible for $4,530 in savings if proposed fixtures are replaced. There would also be $300 available for the installation of occupancy sensors. Totaling all these incentives would produce a savings of about $4,830.

5.2.3 Energy Efficient and Conservation Block Grant

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

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

Based on the utility information that was provided by the borough for the administration building, the building pays for the societal benefits charge. The borough hall building is not eligible for additional funding through this program.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

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

The building primarily uses a packaged multi-zone rooftop unit for heating and cooling the interior spaces. This existing equipment is not compatible with a geothermal energy source. Therefore, to take advantage of a GHP system, the existing mechanical equipment would have to be completely removed and a low temperature closed loop water source heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground. Significant site work is also required for the installation of the geothermal pipe loop.

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

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

The facility was evaluated for the potential to install rooftop photovoltaic (PV) solar panels for power generation. Present technology incorporates the use of solar cell arrays that produce direct current (DC) electricity. This DC current is converted to alternating current (AC) with the use of an electrical device known as an inverter. The building's roof has sufficient room to install a large solar cell array. A structural analysis would be required to determine if the roof framing could support a cell array.

The PVWATTS solar power generation model was utilized to calculate PV power generation. The New Jersey Clean Energy Program recommends the use of the PVWATTS program to determine solar grid tied system production. Version 2 of the program was used, allowing the zip code of the Borough Hall to be analyzed. A fixed tilt array type was utilized to calculate energy production. The PVWATTS solar power generation model is provided in Appendix J. Additionally, further financial analysis was provided by www.solar-estimate.org. The result of this analysis is also located in Appendix J.

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

Installation of (PV) arrays in the State of New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to

allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1000-kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. The cost of the ACP penalty for 2009 is $689; this is the amount that must be paid per SERC by the high emission producers. The expected dollar amount that will be paid to the PV producer for 2009 is expected to be $600/SREC credit. Payments that will be received from the PV producer will change from year to year dependent upon supply and demand. Renewable Energy Consultants is a third party SREC broker that has been approved by the New Jersey Clean Energy Program. As stated above there is no definitive way to calculate an exact price that will be received by the PV producer per SREC over the next 15 years. Renewable Energy Consultants estimated an average of $487/ SERC per year and this number was utilized in the cash flow for this report.

The building had a maximum kW demand of 81.4 kW and a minimum of 58.5 kW over the previous 12 months. The monthly average over the observed 12-month period was 69.48 kW. Because the most frequent monthly demand is approximately 70 kW, a 70 kW system size was selected for the calculations. The system costs for PV installations were derived from average installation costs for this area. It should be noted that the cost of installation is currently $8 per watt or $8,000 per kW of installed system. This has increased in the past few years due to the rise in national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

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

Photovoltaic (PV) Rooftop Solar Power Generation – 70 kW System

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive*	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)
	Electricity		Natural Gas	Total					
$	kW	kWh	Therms	$	$	$	$/yr	Years	Years
560,000	0	87,500	0	14,900	14,900	70,000	34,000	>25	~5

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

Based on the above, it is recommended that a third party power purchase agreement (PPA) be considered to take advantage of the ITC, reduce the cost of the system to the Township, and provide a guaranteed reduced cost of power.

6.2.2 Solar Thermal Hot Water Plant

Active solar water-heating systems for buildings use solar collectors to absorb the sun's energy to heat a fluid, either a liquid or air. The collector would then circulate the heated liquid to the normal system. If the liquid is water it may be circulated to the domestic water heater to increase the temperature further prior to entering the hot water supply system. There are also collectors that heat air which is then passed through an air to liquid heat exchanger to increase the temperature of another fluid. 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 for the Town Hall facility would utilize a solar circulation, domestic hot water system that pre-heats incoming water prior to entering the domestic water heater. Although this system is the both the simplest and least expensive to implement, the small amount of hot water used at the facility on an annual basis results in a payback period that greatly exceeds the useful life of the system itself. DHW is presently produced by a natural gas fired water heater and, therefore, this measure would not save site electricity.

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

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

Solar Thermal Domestic Hot Water Plant

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$	$	$	Years	Years
9,305	0	0	225	310	310	NA	>25	NA

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

This measure is not recommended.

6.3 Wind

Wind turbines are part of a renewable energy system that converts the kinetic energy of wind into usable mechanical and electrical energy. Small wind turbines comprise the group of turbines utilized for residential and small business applications.

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

To avoid turbulence and capture greater wind energy, turbines are mounted on towers. Turbines should be mounted at least 30 feet above any structure or natural feature within 300 feet of the installation. Smaller turbines can utilize shorter towers. For example, a 250-watt turbine may be mounted on a 30-50 foot

tower, while a 10 kW turbine will usually need a tower of 80-120 feet. Tower designs include tubular or latticed, guyed or self-supporting. Wind turbine manufacturers also provide towers.

The New Jersey Clean Energy Program for small wind installations has designated numerous pre-approved wind turbines for installation in the State of New Jersey. Incentives for wind turbine installations are based on kilowatt hours saved in the first year. Systems sized under 16,000 kWh per year of production will receive a $3.20 per kWh incentive. Systems producing over 16,000 kWh will receive $51,200 for the first 16,000 kWh of production with an additional $0.50 per kWh up to a maximum cap of 750,000 kWh per year. Federal tax credits are also available for renewable energy projects up to 30% of installation cost for systems less than 100 kW. However, as noted previously, municipalities do not pay federal taxes and is, therefore, not eligible for the tax credit incentive.

The most important part of any small wind generation project is the mean annual wind speed at the height of which the turbine will be installed. In the Mountain Lakes Borough area, the map indicates a mean annual wind speed of less than 4.5 meters per second, approximately 14 miles per hour. Most small wind turbines are not financially viable at such wind speeds. Therefore, the model indicates that a wind turbine installation may not be applicable at this location. The model was designed to provide a good indication of wind speeds at applicable locations throughout the state. Before moving forward with a small wind production project at the facility's location, a wind test tower will need to be installed at the 30 meter tower height and monitored for a year. Consideration must also be given to the effects of the turbine location on the neighbors and local ordinances.

A wind speed map is included in Appendix L.

This measure is not recommended due to the low mean annual wind speed at the proposed location.

6.4 Combined Heat and Power Generation (CHP)

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

Any proposed CHP project will need to consider many factors, such as existing system load, use of thermal energy produced, system size, natural gas fuel availability, and proposed plant location. The facility does not have sufficient need for electrical generation or the ability to use most of the thermal byproduct during the winter or summer months. Thermal energy produced by the CHP plant in the warmer months will be wasted. An absorption chiller could be installed to utilize the heat to produce chilled water; however, there is no chilled water distribution system in the building. The most viable selection for a CHP plant at this location would be a reciprocating engine natural gas-fired unit. Purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

This measure is not recommended.

6.5 Biomass Power Generation

Biomass power generation is a process in which waste organic materials are used to produce electricity or thermal energy. These materials would otherwise be sent to the landfill or expelled to the atmosphere. To participate in NJCEP's Customer On-Site Renewable Energy program, participants must install an on-site sustainable biomass or fuel cell energy generation system. Incentives for bio-power installations are available to support up to 1MW-dc of rated capacity.

*Class I organic residues are eligible for funding through the NJCEP CORE program. Class I wastes include the following renewable supply of organic material:

- Wood wastes not adulterated with chemicals, glues or adhesives
- Agricultural residues (corn stover, rice hulls or nut shells, manures, poultry litter, horse manure, etc) and/or methane gases from landfills
- Food wastes
- Municipal tree trimming and grass clipping wastes
- Paper and cardboard wastes
- Non adulterated construction wood wastes, pallets

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

- Digestion of sewage sludge
- Landfill gas facilities
- Combustion of wood wastes to steam turbine
- Gasification of wood wastes to reciprocating engine
- Gasification or pyrolysis of bio-solid wastes to generation equipment

* from NJOCE Website

This measure is not recommended because of noise issues, potential zoning issues, and the lack of a reliable waste stream that can be utilized.

6.6 Demand Response Curtailment

Presently, electricity is delivered by JCP&L, which receives the electricity from regional power grid RFC. PJM 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, also known as Economic Load Response, is an agreement with the PJM regional transmission organization and an approved Curtailment Service Provider (CSP) to reduce electrical demand 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 PJM 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 PJM pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. The Borough Hall had a monthly average kW demand of 69.5 kW and a maximum demand of 81.4 kW over the previous 12 months.

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

7.0 EPA PORTFOLIO MANAGER

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

The Borough Hall is considered a very high-energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 222 kBTU/ft^2/year. In comparison, a similarly sized site with an energy performance rating of 75 (the minimum to be eligible for ENERGY STAR) has a site EUI of 55 kBTU/ft^2/year and the national average site EUI is 77 kBTU/ft^2/year. The energy consumption of the building is higher than the national average for buildings of similar occupancy. The higher energy consumption than the national average is contributable to the 24 hour per day occupancy of the police station, the constant use of the multi-zone rooftop unit because of the police occupancy times, and the use of energy inefficient lighting throughout the facility.

The EPA Portfolio Manager was not able to calculate an energy performance rating for this building because more than 50% of the floor area is defined as "Other" within the program. Although the Portfolio Manager does not calculate a rating for this building, we are still able to compare the building's performance with the national average for all buildings designated "Other" as follows:

If the recommended measures are implemented, ECM-1, ECM-2, ECM-5, ECM-6, and ECM-7, the facility's EUI will be reduced from 222 kBTU/ft^2/year to 188 kBTU/ft^2/year.

We are able to compare the building's performance with a building rated 75 and the national average for all buildings designated as office space as follows:

Energy Performance Comparison

	Evaluation Period	Comparisons	
Performance Metrics	Baseline (Ending date 05/31/2010)	Rating of 75	National Average
Energy Intensity			
Site (kBtu/ft^2)	222	55	77
Source (kBtu/ft^2)	459	113	182
Energy Cost			
$/year	$60,479.44	$14.920.67	$20,938.43
$/$ft^2$/year	$6.48	$1.60	$2.24
Greenhouse Gas Emissions			
$MtCO_2e$/year	202	50	70
$kgCO_2e/ft^2$/year	22	5	8

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

The user name and password for the facility's EPA Portfolio Manager Account has been provided to Barry R. Lewis, Borough Manager for Mountain Lakes.

8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the Borough of Mountain Lakes Borough Hall, in the Mountain Lakes, New Jersey identified potential ECMs for lighting fixture upgrades, lighting fixture control modifications, the addition of thermostatic control valves on the baseboard heaters, adding weather stripping to the garage doors, and insulating the attic space. Potential annual savings of $10,875 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-1 Lighting Fixture Modifications

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
19,800	0	26,300	0	4,500	2.4	4,530	4.4	3.4

* There is a $30 per fixture incentive for replacing T12 fixtures with T8 fixtures available through the New Jersey Smart Start program's Prescriptive Lighting Application for this ECM.

ECM-2 Lighting Control Modifications (Fixtures Proposed in ECM-1)

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
1,400	0	3,400	0	575	5.2	300	2.4	1.9

* Incentive shown is per the New Jersey Smart Start Program, 2010 Lighting Controls Application. Incentive is based on the use of fifteen wall-mounted occupancy sensors.

ECM-5 Revise Boiler Controls, Install Programmable Thermostats, and Balance Air System

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
10,150	-	21,350	350	3,650	4.4	NA	2.9	NA

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

ECM-6 Seal Opening Around Fire Bay Doors

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
300	-	-	150	200	2.3	NA	1.5	NA

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

ECM-7 Install Additional Attic Insulation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
6,300	0	3,000	1,100	1,950	3.6	NA	3.2	NA

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

APPENDIX A

Utility Usage Analysis

BPU ENERGY AUDIT PROGRAM
Bourough of Mountain Lakes Borough Hall
CHA Project #21795

Electricity Cost Summary: Meter #S36396766											
Period	Coustomer Charge	Delivery kW	RGGI Recovery Charge kWh	Delivery kWh	Societal Benefits kWh	System Control Charge kWh	Delivery Total	Basic Generation kWh	Non-Utility Generation kWh	Supply Total	Total
5/16-6/17/09	$ 11.65	$ 483.72	$ 1.85	$ 285.42	$ 186.62	$ 2.29	$ 971.55	$ 3,678.19	$ 491.16	$ 4,169.35	$ 5,140.90
6/18-7/20/09	$ 11.65	$ 474.00	$ 2.46	$ 360.18	$ 247.71	$ 3.04	$ 1,099.04	$ 4,830.25	$ 651.94	$ 5,482.19	$ 6,581.23
7/21-8/19/09	$ 11.65	$ 495.52	$ 1.90	$ 291.10	$ 191.26	$ 2.34	$ 993.77	$ 3,729.51	$ 503.37	$ 4,232.88	$ 5,226.65
8/20-9/18/09	$ 11.65	$ 471.23	$ 2.12	$ 318.54	$ 213.68	$ 2.62	$ 1,019.84	$ 4,060.90	$ 562.39	$ 4,623.29	$ 5,643.13
9/19-10/20/09	$ 11.65	$ 361.03	$ 0.63	$ 260.92	$ 169.48	$ 2.09	$ 805.80	$ 2,881.62	$ 448.42	$ 3,330.04	$ 4,135.84
10/21-11/19/09	$ 11.65	$ 375.26		$ 68.19	$ 12.64	$ 0.16	$ 467.90	$ 217.98	$ 33.92	$ 251.90	$ 719.80
11/20-12/21/09	$ 11.65	$ 313.80	$ -	$ 210.45	$ 126.69	$ 1.80	$ 664.39	$ 2,262.96	$ 339.88	$ 2,602.84	$ 3,267.23
12/22-1/20/10	$ 11.65	$ 225.62	$ 0.93	$ 162.50	$ 88.26	$ 1.10	$ 490.06	$ 1,592.78	$ 236.76	$ 1,829.54	$ 2,319.60
1/21-2/18/10	$ 11.65	$ 320.27	$ 2.06	$ 214.55	$ 129.98	$ 1.62	$ 680.13	$ 2,350.91	$ 348.70	$ 2,699.61	$ 3,379.74
2/19-3/19/10	$ 11.65	$ 326.74	$ 1.29	$ 154.30	$ 81.68	$ 1.02	$ 576.68	$ 1,464.49	$ 219.12	$ 1,683.61	$ 2,260.29
3/20-4/20/10	$ 11.65	$ 361.03	$ 2.00	$ 210.13	$ 126.44	$ 1.58	$ 712.83	$ 2,252.24	$ 339.20	$ 2,591.44	$ 3,304.27
4/21-5/19/10	$ 11.65	$ 368.14	$ 2.36	$ 238.84	$ 149.45	$ 1.87	$ 772.31	$ 2,710.60	$ 400.93	$ 3,111.53	$ 3,883.84
Totals	$ 139.80	$ 4,576.36	$ 17.60	$ 2,775.12	$ 1,723.89	$ 21.53	$ 9,254.30	$ 32,032.43	$ 4,575.79	$ 36,608.22	$ 45,862.52

JCP&L Rate Schedule "GS Secondary"

BPU ENERGY AUDIT PROGRAM
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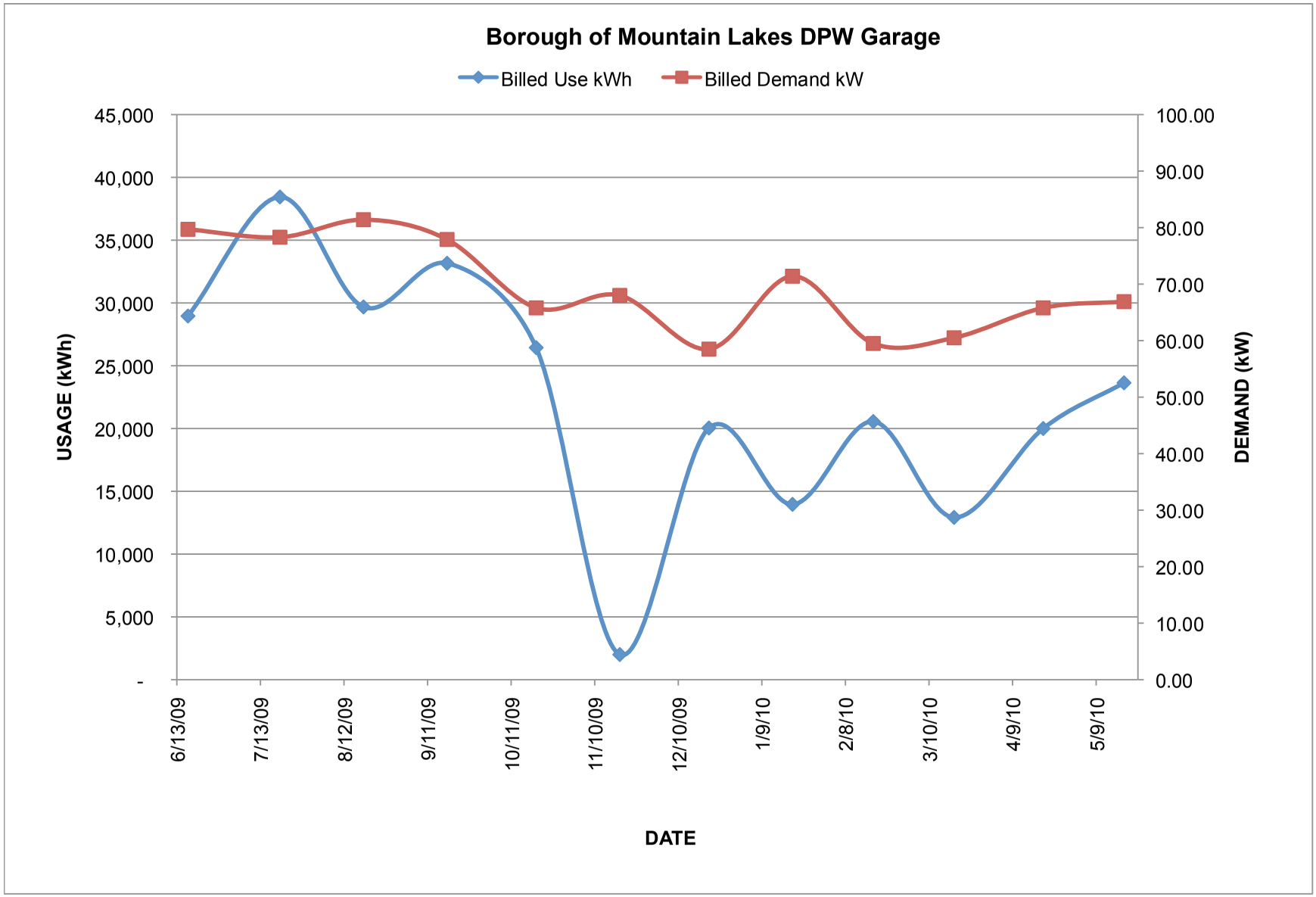
Electricity Cost Summary: Meter # - Various						
Period	Billed Use kWh	Billed Demand kW	Total Cost $	Demand Unit Cost $/kW	Suppy Unit Cost $/kWh	Blended Cost $/kWh
6/17/09	28,960	79.70	$ 5,140.90	$ 6.07	$ 0.16	$ 0.1775
7/20/09	38,440	78.30	$ 6,581.23	$ 6.05	$ 0.16	$ 0.1712
8/19/09	29,680	81.40	$ 5,226.65	$ 6.09	$ 0.16	$ 0.1761
9/18/09	33,160	77.90	$ 5,643.13	$ 6.05	$ 0.16	$ 0.1702
10/20/09	26,440	65.80	$ 4,135.84	$ 5.49	$ 0.14	$ 0.1564
11/19/09	2,000	68.00	$ 719.80	$ 5.52	$ 0.17	$ 0.3599
12/21/09	20,040	58.50	$ 3,267.01	$ 5.36	$ 0.15	$ 0.1630
1/20/10	13,960	71.40	$ 2,319.60	$ 3.16	$ 0.15	$ 0.1662
2/18/10	20,560	59.50	$ 3,379.74	$ 5.38	$ 0.15	$ 0.1644
3/19/10	12,920	60.50	$ 2,260.29	$ 5.40	$ 0.15	$ 0.1749
4/20/10	20,000	65.80	$ 3,304.27	$ 5.49	$ 0.15	$ 0.1652
5/19/10	23,640	66.90	$ 3,883.84	$ 5.50	$ 0.15	$ 0.1643
Totals	269,800	833.70	$ 45,862.30			$ 0.1700
Monthly Ave.	22,483	69.48	$ 3,821.86	$ 5.46	$ 0.15	
Max. Demand		81.40				

Account Number: 10 00 06 6568 94
Meter Number: G21163278
Rate Schedule: General Service Secondary 3 Phase
Utility Company: JCP&L

Notes:
Total Billed Use kWh is the sum of each month's use in kWh.
Total Billed Billed Demand is the highest month's demand.
Total Cost is sum of each month's total billing including all charges.
(See Chart 2 "Total Column".)
Demand Unit Cost per month is kW charges from Chart 2 divided by kW used.
Does not incled Service Charge from Chart 2.
Supply Unit Cost per month is kWh charges from Chart 2 divided by kWh used.
Does not include Service Charge from Chart 2
Total Demand Unit Cost is total kW charges from chart 2 divided by total kW used.
Total Supply Unit Cost per year total kWh charges from chart 2 divided by total kWh.
Blended Rate per month is the Cost divided by the kWh used for that month.
Total Blended Rate is the Total Cost divided by the Total Use for the year.


Borough of Mountain Lakes DPW Garage
Billed Use kWh
Billed Demand kW
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
USAGE (kWh)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
DEMAND (kW)
6/13/09
7/13/09
8/12/09
9/11/09
10/11/09
11/10/09
12/10/09
1/9/10
2/8/10
3/10/10
4/9/10
5/9/10
DATE

Licensed Electric Generation Suppliers

(May 2010)

To sell electric generation service in New Jersey, electric power suppliers must be licensed by the New Jersey Board of Public Utilities (NJ BPU). They must also be registered with the local public utility to sell electric generation service in that utility's service area. Below is a list of suppliers who are licensed with the NJ BPU and are registered to sell electric generation service in the Jersey Central Power & Light Company service territory.

Supplier Name	Phone No.
BOC Energy Services	800-247-2644
Champion Energy Services, Inc.	281-653-5090
Commerce Energy, Inc.	800-556-8457
Con Edison Solutions, Inc.	888-686-1383
Constellation NewEnergy, Inc.	888-635-0827
Direct Energy, LLC	800-260-0300
Dominion Retail, Inc.	800-264-4754
FirstEnergy Solutions Corp.	800-977-0500
Gateway Energy Services Corp.	800-313-8333
Glacial Energy	877-569-2841
Hess Corp	800-437-7872
Integrys Energy Services, Inc.	877-763-9977
Liberty Power Holdings, LLC	866-POWER-99
Palmco Power NJ, LLC	877-726-5862
Pepco Energy Services, Inc.	800-ENERGY-9
PP&L EnergyPlus, LLC	800-281-2000
Sempra Energy Solutions	877-2SEMPRA
South Jersey Energy	800-756-3749
GDF Suez Energy Resources NA	888-644-1014
UGI Energy Services	800-427-8545

Contact the supplier directly to verify whether or not new customers are being accepted.

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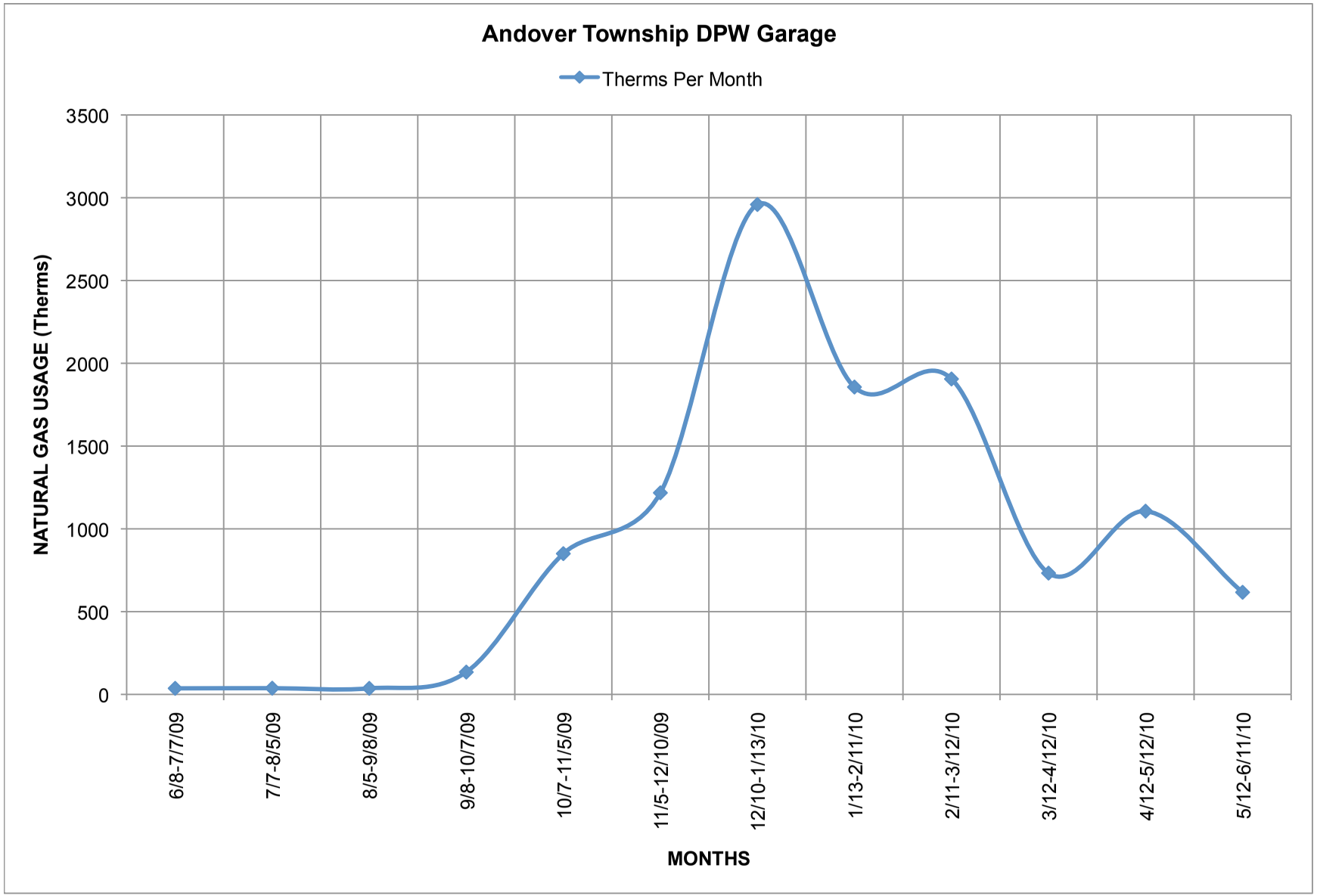
Gas Cost Summary: Meter #00851865										
Period	Service Charge	Therms	Distribution (Therms)	Demand	Basic Charge	CAC	Total Supply	Gas Cost Refund	Total Cost	Blended Cost $/Therm
6/8-7/7/09	$ 40.00	36.67	$ 15.19	$ 195.60	$ 19.21		$ 74.40		$ 270.00	$ 6.27
7/7-8/5/09	$ 40.00	37.66	$ 15.70	$ 195.60	$ 20.65		$ 76.35		$ 271.95	$ 6.16
8/5-9/8/09	$ 40.00	36.61	$ 15.63	$ 195.60	$ 17.56		$ 73.19		$ 268.79	$ 6.25
9/8-10/7/09	$ 40.00	134.82	$ 56.14	$ 195.60	$ 61.57		$ 157.71		$ 353.31	$ 2.32
10/7-11/5/09	$ 40.00	850.27	$ 344.52	$ 195.60	$ 469.57		$ 854.09		$ 1,049.69	$ 1.19
11/5-12/10/09	$ 48.00	1217.63	$ 491.31	$ 234.72	$ 742.06		$ 1,281.37		$ 1,516.09	$ 1.21
12/10-1/13/10	$ 40.00	2959.07	$ 1,193.99	$ 195.60	$ 2,042.47		$ 3,276.46		$ 3,472.06	$ 1.16
1/13-2/11/10	$ 40.00	1856.56	$ 749.12	$ 195.60	$ 1,403.38		$ 2,192.50		$ 2,388.10	$ 1.26
2/11-3/12/10	$ 40.00	1905.31	$ 768.79	$ 195.63	$ 1,321.15		$ 2,129.94		$ 2,325.57	$ 1.20
3/12-4/12/10	$ 40.00	732.69	$ 295.64	$ 195.63	$ 455.72		$ 791.36		$ 986.99	$ 1.29
4/12-5/12/10	$ 40.00	1106.84	$ 450.23	$ 195.63	$ 1,066.55		$ 1,556.78		$ 1,752.41	$ 1.55
5/12-6/11/10	$ 40.00	616.81	$ 253.94	$ 195.63	$ 594.36		$ 888.30		$ 1,083.93	$ 1.69
Totals	$ 488.00	11490.94	$ 4,650.20	$ 2,386.44	$ 8,214.25	$ -	$ 13,352.45	$ -	$ 15,738.89	$ 1.37

Account: 12-1256-5775-1Y
Billing Type: Monthly 006M

Notes: **Chart 4** **Gas Cost Summary**
This chart provides gas cost breakdowns and sums totals. Sum totals are "Total Supply", 1st, 3rd, and 5th columns and Total Cost = Total Supply + Demand.
Blended Cost = Total divided by Therms.
All numbers are in $ except Therms.


Andover Township DPW Garage
Therms Per Month
NATURAL GAS USAGE (Therms)
3500
3000
2500
2000
1500
1000
500
0
6/8-7/7/09
7/7-8/5/09
8/5-9/8/09
9/8-10/7/09
10/7-11/5/09
11/5-12/10/09
12/10-1/13/10
1/13-2/11/10
2/11-3/12/10
3/12-4/12/10
4/12-5/12/10
5/12-6/11/10
MONTHS

The natural gas suppliers listed below have been licensed by the New Jersey Board of Public Utilities (BPU) to operate in the state of New Jersey. The last column indicates the type of customers being served by the suppliers in the specified utility's service territory: residential (R), commercial (C) or both (R/C). A blank indicates the supplier is not currently operating in the respective utility's area.

Suppliers listed may not always have offers available.

Eligible Natural Gas Supplier List for Residential Customers and Commercial Customers within the NJNG Service Territory

NATURAL GAS SUPPLIER	TELEPHONE	NJNG
Core Energy	877-329-3495	R/C
Dominion Retail, Inc.	866-275-4240	R/C
GASMARK	856-273-9995	C
Gateway Energy Services Corp.	800-805-8586	R/C
Great Eastern Energy	888-651-4121	C
Hess Corporation	800-437-7872	C
Hudson Energy Services LLC	877-HUDSON9	R/C
Infinite Energy d/b/a Intelligent Energy	877-483-4684	R/C
Metro Media Energy	732-542-7575	C
MXenergy	800-785-4373	R/C
NATGASCO (Mitchell Supreme)	800-840-4GAS	C
Palmco Energy NJ, LLC	877-726-5862	R/C
Pepco Energy Services	800-363-7499	C
PPL EnergyPlus, LLC	866-505-8825	C
South Jersey Energy Company	609-561-8385	C
Sprague Energy	603-431-1000	C
Systrum Energy	877-797-8786	R/C
U.S. Gas & Electric Inc. d/b/a New Jersey Gas & Electric	866-568-0290	R/C
Woodruff Energy	800-557-1121	R/C

View residential supplier offers.

Updated June 21, 2010

APPENDIX B

HVAC Equipment List

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HVAC Equipment List											
Item	**Quanity**	**Manufacturer**	**Model Number**	**Serial number**	**Cooling Capacity MBH**	**Condition**	**Fuel**	**Heating Input MBH**	**Heating Output MBH**	**Refrigerant**	**Comments**
Boiler - Manufactured in 1974	1	American Standard	G-29	-	-		Natural Gas	210	167	-	Located in Lower Level Boiler Room
Unit Heater	2	Airtherm		-	-		Natural Gas	275	220	-	Located in Fire Bays
Multi-Zone Roof Top Unit	1	Nesbitt	RMA100NG5S3210HB12A4501000D31	N0112006MO200011	384		Natural Gas	484	375	R-22	Most Recent Plans Indicate 12 Zone System

APPENDIX C

ECM-1 Lighting Fixture Modifications

BPU ENERGY AUDIT PROGRAM
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ECM-1 Lighting Fixture Modifications

Item	Budgetary Costs	Annual Utility Savings			Potential Incentive	Payback (Without Incentive)	Payback (With Incentive)
		Electricity	Natural Gas	Total			
	$	KWH	Therms	$	$	Years	Years
Exit Sign Upgrades	$ 700	8700	$ -	$ 1,479	$ -	0.5	0.5
A-Lamp to CFLs	$ 70	4500	$ -	$ 765	$ -	0.1	0.1
T12 Fixtures to T8 Fixtures	$ 19,000	12300	$ -	$ 2,091	$ 4,530	9.1	6.9
Combined	$ 19,770	25500		$ 4,335	$ 4,530	4.6	3.5

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ECM-1 Lighting Fixture Modifications

EXISTING LIGHTING FIXTURES AND CONTROLS										
Location	Fixture Description	No. of Fixture	Lamp Type & No.	Ballast Type & No.	Fixture Watts	Total Watts	Hours of Operation	Control	kwh/Year	Operational Cost/Year
Boiler Room	Compact Fluorescent Screw-In	1	(1) CFL, 25W	-	25	25	52	Switch	1	$0.22
Locker Room	2'x4' Above Ceiling Fluorescent with Plastic Lens in Drop Ceiling	2	(4) T-12, 34W	(2) Magnetic	164	328	8760	Switch	2873	$488.46
Hall	2'x2' Fluorescent	4	(4) T-12, 20W	(2) Magnetic	98	392	8760	Switch	3434	$583.77
Dispatch Room	2'x4' Fluorescent	4	(4) T-12, 34W	(2) Magnetic	164	656	0	Switch	0	$0.00
Dispatch Room	Flood Down Lights	3	(1) Flood, 100W	-	100	300	8760	Switch	2628	$446.76
Support Service Office	2'x4' Fluorescent	4	(4) T-12, 34W	(2) Magnetic	164	656	2080	Switch	1364	$231.96
Evidence Room	Compact Fluorescent Screw-In	1	(1) CFL, 25W	-	25	25	2080	Switch	52	$8.84
Chief's Office	2'x2' Fluorescent	4	(2) T-12 U-Tube, 34W	(1) Magnetic	72	288	2080	Switch	599	$101.84
Entrance Hall	2'x4' Fluorescent	1	(4) T-12, 34W	(2) Magnetic	164	164	8760	Switch	1437	$244.23
Toilet Room	Wall Mounted Fluorescent	1	(1) T-12, 34W	(1) Magnetic	48	48	1040	Switch	50	$8.49
Squad Room	Fluorescent Pendants	5	(4) T-12, 34W	(2) Magnetic	164	820	2080	Switch	1706	$289.95
Men's Room	2'x2' Fluorescent	1	(4) T-12, 20W	(2) Magnetic	98	98	1040	Switch	102	$17.33
Kitchen	2'x2' Fluorescent	6	(2) T-12 U-Tube, 34W	(1) Magnetic	72	432	1040	Switch	449	$76.38
Kitchen	2'x2' Fluorescent	2	(2) T-12 U-Tube, 34W	(1) Magnetic	72	144	1040	Switch	150	$25.46
Fire Bays	Metal Halide	2	MH, 400W	-	461	922	8760	Switch	8077	$1,373.04
Fire Bays	Metal Halide	2	MH, 400W	-	461	922	520	Switch	479	$81.50
Fire Bays	Metal Halide	2	MH, 400W	-	461	922	520	Switch	479	$81.50
Fire Bays	2'x4' Fluorescent	9	(4) T-12, 34W	(2) Magnetic	164	1476	520	Switch	768	$130.48
Hall	2'x2' Fluorescent	2	(4) T-12, 20W	(2) Magnetic	98	196	8760	Switch	1717	$291.88
Construction Office	1'x4' Fluorescent	6	(2) T-12, 20W	(1) Magnetic	56	336	1040	Switch	349	$59.40
Storage Room	Incandescent on Pull String	1	(1) A-Lamp, 100W	-	100	100	52	Switch	5	$0.88
Conference Room	2'x4' Fluorescent	4	(4) T-12, 34W	(2) Magnetic	164	656	520	Switch	341	$57.99
Council Room	2'x4' Fluorescent Pendants	10	(4) T-12, 34W	(2) Magnetic	164	1640	200	Switch	328	$55.76
Council Room	2'x4' Fluorescent Pendants	12	(4) T-12, 34W	(2) Magnetic	164	1968	200	Dual Switch - Inner/Outer Lamps	394	$66.91
Council Room	Flood Down Lights	5	(1) Flood, 100W	-	100	500	200	Switch	100	$17.00
Entry	Drop Light	1	(3) A-Lamp, 100W	-	300	300	8760	Switch	2628	$446.76
Hall at Top of Stair	2'x4' Fluorescent	4	(4) T-12, 34W	(2) Magnetic	164	656	2080	Switch	1364	$231.96
Main Office	2'x4' Fluorescent	11	(4) T-12, 34W	(2) Magnetic	164	1804	2080	Dual Switch - Inner/Outer Lamps	3752	$637.89
Main Office	2'x4' Fluorescent	6	(4) T-12, 34W	(2) Magnetic	164	984	2080	Dual Switch - Inner/Outer Lamps	2047	$347.94
Office	2'x4' Fluorescent	2	(4) T-12, 34W	(2) Magnetic	164	328	2080	Switch	682	$115.98
Office	2'x4' Fluorescent	2	(4) T-12, 34W	(2) Magnetic	164	328	2080	Switch	682	$115.98
Office	2'x4' Fluorescent	2	(4) T-12, 34W	(2) Magnetic	164	328	2080	Switch	682	$115.98
Office	2'x4' Fluorescent	6	(4) T-12, 34W	(2) Magnetic	164	984	2080	Switch	2047	$347.94
Storage	2'x4' Fluorescent	1	(2) T-12, 34W	(1) Magnetic	72	72	52	Switch	4	$0.64
Kitchen/Lunch Room	2'x4' Fluorescent	6	(4) T-12, 34W	(2) Magnetic	164	984	2080	Switch	2047	$347.94
Kitchen/Lunch Room	2'x4' Fluorescent	1	(4) T-12, 34W	(2) Magnetic	164	164	2080	Switch	341	$57.99
Toilet Room	Wall Mounted Fluorescent	1	(1) T-12, 34W	(1) Magnetic	48	48	1040	Switch	50	$8.49
Men's Room	Wall Mounted Fluorescent	1	(1) T-12, 34W	(1) Magnetic	48	48	1040	Switch	50	$8.49
Ladies Room	Wall Mounted Fluorescent	1	(1) T-12, 34W	(1) Magnetic	48	48	1040	Switch	50	$8.49
Board of Education Main Office	2'x4' Fluorescent	6	(4) T-12, 34W	(2) Magnetic	164	984	2080	Switch	2047	$347.94
Board of Education Main Office	2'x4' Fluorescent	5	(4) T-12, 34W	(2) Magnetic	164	820	2080	Switch	1706	$289.95
Board of Education Main Office	2'x4' Fluorescent	5	(4) T-12, 34W	(2) Magnetic	164	820	2080	Switch	1706	$289.95
Office	2'x4' Fluorescent	2	(4) T-12, 34W	(2) Magnetic	164	328	2080	Switch	682	$115.98
Office	2'x4' Fluorescent	2	(4) T-12, 34W	(2) Magnetic	164	328	2080	Switch	682	$115.98
Office	2'x4' Fluorescent	2	(4) T-12, 34W	(2) Magnetic	164	328	2080	Switch	682	$115.98
Office	2'x4' Fluorescent	4	(4) T-12, 34W	(2) Magnetic	164	656	2080	Switch	1364	$231.96
Small Kitchen/Lunch Room	2'x4' Fluorescent	4	(4) T-12, 34W	(2) Magnetic	164	656	2080	Switch	1364	$231.96
Exterior Fire Bays	Decorative Fixture	2	Metal Halide, 75W	(1) Electronic	91	182	2080	Timer	379	$64.36
Exterior Fire Bays	Flood Lights	2	Metal Halide, 400W	(1) Magnetic	461	922	520	Switch	479	$81.50
Exterior Fire Door		1				0	2080	Timer	0	$0.00

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Exterior Police Door		1				0	2080		0	$0.00
Pole Light		6				0	2080		0	$0.00
Flag Pole Light	Flag Pole Light	1	Mercury Vapor, 60W	(1) Magnetic	73	73	2080		152	$25.81
Exit Signs	Standard Exit Signs	8	16W	-	16	128	8760	Breaker	1121	$190.62
TOTAL										

Energy Cost: $0.1700

Notes: **Existing Lighting Fixture Schedule**
Total Watts = No. of Fixture x Fixture Watts
kwh/Year = Total Watts/1000 x Hours of Operation
Operational Cost/Year = kwh/Year x Energy Cost

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Lighting Fixture Replacement Savings

Existing Fixtures					Proposed Replacement Fixture									Savings		
Location	Fixture Description with System Watts	Controls	kwh/Year	Operational Cost/Year	Fixture Description	No. of Fixtures	Fixture Watts	Total Watts	Hours of Operation	kwh/Year	Operational Costs	Installed Cost Per Fixture	Total Installed Cost	kwh/Year	Yearly $ Savings	Payback in Years
Boiler Room	Compact Fluorescent Screw-In, 25W	Switch	1	$0.17		1		0	52	0	$0.00					
Locker Room	2'x4' Fluorescent, 164W	Switch	2873	$488.41	(4) T-8, 32W	2	114	228	8760	1997	$339.54	$98.00	$196.00	876	$148.87	1.3
Hall	2'x2' Fluorescent, 98W	Switch	3434	$583.78	(4) T-8, 17W	4	63	252	8760	2208	$375.28	$89.00	$356.00	1226	$208.50	1.7
Dispatch Room	2'x4' Fluorescent, 164W	Switch	0	$0.00	(4) T-8, 32W	4	114	456	0	0	$0.00	$98.00	$392.00	0	$0.00	0.0
Dispatch Room	Flood Down Lights, 100W	Switch	2628	$446.76	(1) CFL, 25W	3	25	75	8760	657	$111.69	$6.00	$18.00	1971	$335.07	0.1
Support Service Office	2'x4' Fluorescent, 164W	Switch	1364	$231.88	(4) T-8, 32W	4	114	456	2080	948	$161.24	$98.00	$392.00	416	$70.64	5.5
Evidence Room	Compact Fluorescent Screw-In, 25W	Switch	52	$8.84		1			2080							
Chief's Office	2'x2' Fluorescent, 72W	Switch	599	$101.83	(2) T-8 U-Tube, 32W	4	62	248	2080	516	$87.69	$89.00	$356.00	83	$14.14	25.2
Entrance Hall	2'x4' Fluorescent, 164W	Switch	1437	$244.29	(4) T-8, 32W	1	114	114	8760	999	$169.77	$98.00	$98.00	438	$74.52	1.3
Toilet Room	Wall Mounted Fluorescent, 48W	Switch	50	$8.50	(1) T-8, 32W	1	32	32	1040	33	$5.66	$89.00	$89.00	17	$2.84	31.3
Squad Room	Fluorescent Pendants, 164W	Switch	1706	$290.02	(4) T-8, 32W	5	114	570	2080	1186	$201.55	$98.00	$490.00	520	$88.47	5.5
Men's Room	2'x2' Fluorescent, 98W	Switch	102	$17.34	(4) T-8, 17W	1	63	63	1040	66	$11.14	$89.00	$89.00	36	$6.20	14.4
Kitchen	2'x2' Fluorescent, 72W	Switch	449	$76.33	(2) T-8 U-Tube, 32W	6	62	372	1040	387	$65.77	$89.00	$534.00	62	$10.56	50.6
Kitchen	2'x2' Fluorescent, 72W	Switch	150	$25.50	(2) T-8 U-Tube, 32W	2	62	124	1040	129	$21.92	$89.00	$178.00	21	$3.58	49.8
Fire Bays	Metal Halide, 461W	Switch	8077	$1,373.09		2			8760							
Fire Bays	Metal Halide, 461W	Switch	479	$81.43		2			520							
Fire Bays	Metal Halide, 461W	Switch	479	$81.43		2			520							
Fire Bays	2'x4' Fluorescent, 164W	Switch	768	$130.56	(4) T-8, 32W	9	114	1026	520	534	$90.70	$98.00	$882.00	234	$39.86	22.1
Hall	2'x2' Fluorescent, 98W	Switch	1717	$291.89	(4) T-8, 17W	2	63	126	8760	1104	$187.64	$89.00	$178.00	613	$104.25	1.7
Construction Office	1'x4' Fluorescent, 56W	Switch	349	$59.33	(2) T-8, 17W	6	33	198	1040	206	$35.01	$89.00	$534.00	143	$24.32	22.0
Storage Room	Incandescent on Pull String, 100W	Switch	5	$0.85	(1) CFL, 25W	1	25	25	52	1	$0.22	$6.00	$6.00	4	$0.63	9.5
Conference Room	2'x4' Fluorescent, 164W	Switch	341	$57.97	(4) T-8, 32W	4	114	456	520	237	$40.31	$98.00	$392.00	104	$17.66	22.2
Council Room	2'x4' Fluorescent Pendants, 164W	Switch	328	$55.76	(4) T-8, 32W	10	114	1140	200	228	$38.76	$98.00	$980.00	100	$17.00	57.6
Council Room	2'x4' Fluorescent Pendants, 164W	Dual Switch - Inner/Outer Lamps	394	$66.98	(4) T-8, 32W	12	114	1368	200	274	$46.51	$98.00	$1,176.00	120	$20.47	57.5
Council Room	Flood Down Lights, 100W	Switch	100	$17.00	(1) CFL, 25W	5	25	125	200	25	$4.25	$6.00	$30.00	75	$12.75	2.4
Entry	Drop Light, 300W	Switch	2628	$446.76	(3) CFL, 25W	1	25	25	8760	219	$37.23	$18.00	$18.00	2409	$409.53	0.0
Hall at Top of Stair	2'x4' Fluorescent, 164W	Switch	1364	$231.88	(4) T-8, 32W	4	114	456	2080	948	$161.24	$98.00	$392.00	416	$70.64	5.5
Main Office	2'x4' Fluorescent, 164W	Dual Switch - Inner/Outer Lamps	3752	$637.84	(4) T-8, 32W	11	114	1254	2080	2608	$443.41	$98.00	$1,078.00	1144	$194.43	5.5
Main Office	2'x4' Fluorescent, 164W	Dual Switch - Inner/Outer Lamps	2047	$347.99	(4) T-8, 32W	6	114	684	2080	1423	$241.86	$98.00	$588.00	624	$106.13	5.5
Office	2'x4' Fluorescent, 164W	Switch	682	$115.94	(4) T-8, 32W	2	114	228	2080	474	$80.62	$98.00	$196.00	208	$35.32	5.5
Office	2'x4' Fluorescent, 164W	Switch	682	$115.94	(4) T-8, 32W	2	114	228	2080	474	$80.62	$98.00	$196.00	208	$35.32	5.5
Office	2'x4' Fluorescent, 164W	Switch	682	$115.94	(4) T-8, 32W	2	114	228	2080	474	$80.62	$98.00	$196.00	208	$35.32	5.5
Office	2'x4' Fluorescent, 164W	Switch	2047	$347.99	(4) T-8, 32W	6	114	684	2080	1423	$241.86	$98.00	$588.00	624	$106.13	5.5
Storage	2'x4' Fluorescent, 72W	Switch	4	$0.68	(2) T-8, 32W	1	62	62	52	3	$0.55	$89.00	$89.00	1	$0.13	674.7
Kitchen/Lunch Room	2'x4' Fluorescent, 164W	Switch	2047	$347.99	(4) T-8, 32W	6	114	684	2080	1423	$241.86	$98.00	$588.00	624	$106.13	5.5
Kitchen/Lunch Room	2'x4' Fluorescent, 164W	Switch	341	$57.97	(4) T-8, 32W	1	114	114	2080	237	$40.31	$98.00	$98.00	104	$17.66	5.5
Toilet Room	Wall Mounted Fluorescent, 48W	Switch	50	$8.50	(1) T-8, 32W	1	32	32	1040	33	$5.66	$89.00	$89.00	17	$2.84	31.3
Men's Room	Wall Mounted Fluorescent, 48W	Switch	50	$8.50	(1) T-8, 32W	1	32	32	1040	33	$5.66	$89.00	$89.00	17	$2.84	31.3
Ladies Room	Wall Mounted Fluorescent, 48W	Switch	50	$8.50	(1) T-8, 32W	1	32	32	1040	33	$5.66	$89.00	$89.00	17	$2.84	31.3
Board of Education Main Office	2'x4' Fluorescent, 164W	Switch	2047	$347.99	(4) T-8, 32W	6	114	684	2080	1423	$241.86	$98.00	$588.00	624	$106.13	5.5
Board of Education Main Office	2'x4' Fluorescent, 164W	Switch	1706	$290.02	(4) T-8, 32W	5	114	570	2080	1186	$201.55	$98.00	$490.00	520	$88.47	5.5
Board of Education Main Office	2'x4' Fluorescent, 164W	Switch	1706	$290.02	(4) T-8, 32W	5	114	570	2080	1186	$201.55	$98.00	$490.00	520	$88.47	5.5
Office	2'x4' Fluorescent, 164W	Switch	682	$115.94	(4) T-8, 32W	2	114	228	2080	474	$80.62	$98.00	$196.00	208	$35.32	5.5
Office	2'x4' Fluorescent, 164W	Switch	682	$115.94	(4) T-8, 32W	2	114	228	2080	474	$80.62	$98.00	$196.00	208	$35.32	5.5
Office	2'x4' Fluorescent, 164W	Switch	682	$115.94	(4) T-8, 32W	2	114	228	2080	474	$80.62	$98.00	$196.00	208	$35.32	5.5
Office	2'x4' Fluorescent, 164W	Switch	1364	$231.88	(4) T-8, 32W	4	114	456	2080	948	$161.24	$98.00	$392.00	416	$70.64	5.5
Small Kitchen/Lunch Room	2'x4' Fluorescent, 164W	Switch	1364	$231.88	(4) T-8, 32W	4	114	456	2080	948	$161.24	$98.00	$392.00	416	$70.64	5.5
Exterior Fire Bays	Decorative Fixture, 91W	Timer	379	$64.43		2		0	2080	0	$0.00					
Exterior Fire Bays	Flood Lights, 461W	Switch	479	$81.43		2		0	520	0	$0.00					
Exterior Fire Door		Timer	0	$0.00		1		0	2080	0	$0.00					
Exterior Police Door		Timer	0	$0.00		1		0	2080	0	$0.00					
Pole Light		Timer	0	$0.00		6		0	2080	0	$0.00					
Flag Pole Light		Timer	0	$0.00		1		0	2080	0	$0.00					
Exit Signs	Standard Exit Signs, 16W	Breaker	8760	$1,489.20	LED Exit Signs	8	1	10	8760	84	$14.30	$97.00	$776.00	8676	$1,474.90	0.5
												Total	**$15,376.00**	**25475**	**4331**	**3.6**

Energy Cost: $0.1700

* Installed cost per fixture includes $30 per fixture incentive when converting from T-12 to T-8

Notes: **Lighting Fixture Replacement Savings**

Total Watts = No. of Fixture x Fixture Watts
kwh/Year = Total Watts/1000 x Hours of Operation
Operational Cost/Year = kwh/Year x Energy Cost
Total Installed Cost = Number of Fixtures x Installed Cost Per Fixture
Yearly $ Savings = Savings kwh/Year x Energy Cost
Payback in Years = Total Installed Cost/Yearly $ Savings

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ECM-1 Lighting Fixture Modifications
EXIT SIGNS

Multipliers	
Material	0.98
Labor	1.21
Equipment	1.07

Installation Costs											
	Qty	Unit	Unit Costs			Subtotal Costs			Total Cost w/o Incentive	Incentive Available	Remarks
			Material	Labor	Equipment	Material	Labor	Equipment			
Exit Sign Lamps Replacement	8	ea	$15	$50		$118	$484	$0	$602	$0	
and rewiring.						$0	$0	$0	$0		

Subtotal	$602
10% Contingency	$60
10% OH	$60
10% Profit	$60
Total	$782
Incentive	$0
Total Cost with Incentive	$782

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ECM-1 Lighting Fixture Modifications
T-12 to T-8 Fixtures

Multipliers	
Material	1
Labor	1.21
Equipment	1.07

Installation Costs											
	Qty	Unit	Unit Costs			Subtotal Costs			Total Cost w/o Incentive	Incentive Available	Remarks
			Material	Labor	Equipment	Material	Labor	Equipment			
1'x4', T-12 to T-8 Fixture	6	ea	$89	$49	$0	$534	$356	$0	$890	$180	
2'x2', T-12 to T-8 Fixture	19	ea	$89	$49	$0	$1,691	$1,127	$0	$2,818	$570	
2'x4', T-12 to T-8 Fixture	122	ea	$98	$49	$0	$11,956	$7,233	$0	$19,189	$3,660	
Wall Mounted Fluorescent Fixture	4	ea	$89	$49	$0	$356	$237	$0	$593	$120	

Subtotal	$23,490
10% Contingency	$2,349
10% OH	$2,349
10% Profit	$2,349
Total	$30,537
Incentive	$4,530
Total Cost with Incentive	$26,007

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ECM-1 Lighting Fixture Modifications
A-Lamp to CFL

Multipliers	
Material	1
Labor	1.21
Equipment	1.07

Installation Costs											
	Qty	Unit	Unit Costs			Subtotal Costs			Total Cost w/o Incentive	Incentive Available	Remarks
			Material	Labor	Equipment	Material	Labor	Equipment			
Compact Fluorescent Lamp	12	ea	$6	$0	$0	$71	$0	$0	$71	$0	

Subtotal	$71
Total	$71
Incentive	$0
Total Cost with Incentive	$71

APPENDIX D

ECM-2 Lighting Control Modifications

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ECM-2 Lighting Control Modifications

Item	Budgetary Costs	Annual Utility Savings			ROI	Potential Incentive	Payback (Without Incentive)	Payback (With Incentive)
		Electricity	Natural Gas	Total				
	$	KWH	Therms	$		$	Years	Years
Motion Sensor Control								
Areas Indicated	$ 1,400	3,400	0	$ 575	5.2	$ 300	2.4	1.9

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ECM-2 Lighting Control Modifications

LIGHTING FIXTURES AND CONTROLS - AS PROPSOED IN ECM-1										
Location	Fixture Description	No. of Fixture	Lamp Type & No.	Ballast Type & No.	Fixture Watts	Total Watts	Hours of Operation	Control	kwh/Year	Operational Cost/Year
Boiler Room	Compact Fluorescent Screw-In	1	(1) CFL, 25W	-	25	25	52	Switch	1	$0.22
Locker Room	2'x4' Fluorescent	2	(4) T-8, 32W	(1) Electronic	114	228	8760	Switch	1997	$339.54
Hall	2'x2' Fluorescent	4	(4) T-8, 17W	(1) Electronic	63	252	8760	Switch	2208	$375.28
Dispatch Room	2'x4' Fluorescent	4	(4) T-8, 32W	(1) Electronic	114	456	0	Switch	0	$0.00
Dispatch Room	CFL Flood Down Lights	3	(1) CFL, 25W	-	25	75	8760	Switch	657	$111.69
Support Service Office	2'x4' Fluorescent	4	(4) T-8, 32W	(1) Electronic	114	456	2080	Switch	948	$161.24
Evidence Room	Compact Fluorescent Screw-In	1	(1) CFL, 25W	-	25	25	2080	Switch	52	$8.84
Chief's Office	2'x2' Fluorescent	4	(2) T-8 U-Tube, 32W	(1) Electronic	62	248	2080	Switch	516	$87.69
Entrance Hall	2'x4' Fluorescent	1	(4) T-8, 32W	(1) Electronic	114	114	8760	Switch	999	$169.77
Toilet Room	Wall Mounted Fluorescent	1	(1) T-8, 32W	(1) Electronic	32	32	1040	Switch	33	$5.66
Squad Room	Fluorescent Pendants	5	(4) T-8, 32W	(1) Electronic	114	570	2080	Switch	1186	$201.55
Men's Room	2'x2' Fluorescent	1	(4) T-8, 17W	(1) Electronic	63	63	1040	Switch	66	$11.14
Kitchen	2'x2' Fluorescent	6	(2) T-8 U-Tube, 32W	(1) Electronic	62	372	1040	Switch	387	$65.77
Kitchen	2'x2' Fluorescent	2	(2) T-8 U-Tube, 32W	(1) Electronic	62	124	1040	Switch	129	$21.92
Fire Bays	Metal Halide	2	MH, 400W	-	461	922	8760	Switch	8077	$1,373.04
Fire Bays	Metal Halide	2	MH, 400W	-	461	922	520	Switch	479	$81.50
Fire Bays	Metal Halide	2	MH, 400W	-	461	922	520	Switch	479	$81.50
Fire Bays	2'x4' Fluorescent	9	(4) T-8, 32W	(1) Electronic	114	1026	520	Switch	534	$90.70
Hall	2'x2' Fluorescent	2	(4) T-8, 17W	(1) Electronic	63	126	8760	Switch	1104	$187.64
Construction Office	1'x4' Fluorescent	6	(2) T-8, 17W	(1) Electronic	33	198	1040	Switch	206	$35.01
Storage Room	CFL on Pull String	1	(1) CFL, 25W	-	25	25	52	Switch	1	$0.22
Conference Room	2'x4' Fluorescent	4	(4) T-8, 32W	(1) Electronic	114	456	520	Switch	237	$40.31
Council Room	2'x4' Fluorescent Pendants	10	(4) T-8, 32W	(1) Electronic	114	1140	200	Switch	228	$38.76
Council Room	2'x4' Fluorescent Pendants	12	(4) T-8, 32W	(2) Electronic	114	1368	200	Dual Switch - Inner/Outer Lamps	274	$46.51
Council Room	CFL Flood Down Lights	5	(1) CFL, 25W	-	25	125	200	Switch	25	$4.25
Entry	CFL Drop Light	1	(3) CFL, 25W	-	25	25	8760	Switch	219	$37.23
Hall at Top of Stair	2'x4' Fluorescent	4	(4) T-8, 32W	(1) Electronic	114	456	2080	Switch	948	$161.24
Main Office	2'x4' Fluorescent	11	(4) T-8, 32W	(2) Electronic	114	1254	2080	Dual Switch - Inner/Outer Lamps	2608	$443.41
Main Office	2'x4' Fluorescent	6	(4) T-8, 32W	(2) Electronic	114	684	2080	Dual Switch - Inner/Outer Lamps	1423	$241.86
Office	2'x4' Fluorescent	2	(4) T-8, 32W	(1) Electronic	114	228	2080	Switch	474	$80.62
Office	2'x4' Fluorescent	2	(4) T-8, 32W	(1) Electronic	114	228	2080	Switch	474	$80.62
Office	2'x4' Fluorescent	2	(4) T-8, 32W	(1) Electronic	114	228	2080	Switch	474	$80.62
Office	2'x4' Fluorescent	6	(4) T-8, 32W	(1) Electronic	114	684	2080	Switch	1423	$241.86
Storage	2'x4' Fluorescent	1	(2) T-8, 32W	(1) Electronic	62	62	52	Switch	3	$0.55
Kitchen/Lunch Room	2'x4' Fluorescent	6	(4) T-8, 32W	(1) Electronic	114	684	2080	Switch	1423	$241.86
Kitchen/Lunch Room	2'x4' Fluorescent	1	(4) T-8, 32W	(1) Electronic	114	114	2080	Switch	237	$40.31
Toilet Room	Wall Mounted Fluorescent	1	(1) T-8, 32W	(1) Electronic	32	32	1040	Switch	33	$5.66
Men's Room	Wall Mounted Fluorescent	1	(1) T-8, 32W	(1) Electronic	32	32	1040	Switch	33	$5.66
Ladies Room	Wall Mounted Fluorescent	1	(1) T-8, 32W	(1) Electronic	32	32	1040	Switch	33	$5.66
Board of Education Main Office	2'x4' Fluorescent	6	(4) T-8, 32W	(1) Electronic	114	684	2080	Switch	1423	$241.86
Board of Education Main Office	2'x4' Fluorescent	5	(4) T-8, 32W	(1) Electronic	114	570	2080	Switch	1186	$201.55
Board of Education Main Office	2'x4' Fluorescent	5	(4) T-8, 32W	(1) Electronic	114	570	2080	Switch	1186	$201.55
Office	2'x4' Fluorescent	2	(4) T-8, 32W	(1) Electronic	114	228	2080	Switch	474	$80.62
Office	2'x4' Fluorescent	2	(4) T-8, 32W	(1) Electronic	114	228	2080	Switch	474	$80.62

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Office	2'x4' Fluorescent	2	(4) T-8, 32W	(1) Electronic	114	228	2080	Switch	474	$80.62
Office	2'x4' Fluorescent	4	(4) T-8, 32W	(1) Electronic	114	456	2080	Switch	948	$161.24
Small Kitchen/Lunch Room	2'x4' Fluorescent	4	(4) T-8, 32W	(1) Electronic	114	456	2080	Switch	948	$161.24
Exterior Fire Bays	Decorative Fixture	2	Metal Halide, 75W	(1) Electronic	91	182	2080	Timer	379	$64.36
Exterior Fire Bays	Flood Lights	2	Metal Halide, 400W	(1) Magnetic	461	922	520	Switch	479	$81.50
Exterior Fire Door		1				0	2080	Timer	0	$0.00
Exterior Police Door		1				0	2080		0	$0.00
Pole Light		6				0	2080		0	$0.00
Flag Pole Light		1	Mercury Vapor, 60W	(1) Magnetic	73	73	2080		152	$25.81
Exit Signs	LED	8	LED Exit Signs	-	1	9.6	8760	Breaker	84	$14.30
TOTAL										

Energy Cost: $0.1700

Notes:
Total Watts = No. of Fixture x Fixture Watts
kwh/Year = Total Watts/1000 x Hours of Operation
Operational Cost/Year = kwh/Year x Energy Cost

Existing Lighting Fixture Schedule

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ECM-2 Lighting Control Modifications

Multipliers	
Material	0.98
Labor	1.21
Equipment	1.07

Installation Costs											
	Qty	Unit	Unit Costs			Subtotal Costs			Total Cost w/o Incentive	Incentive Available	Remarks
			Material	Labor	Equipment	Material	Labor	Equipment			
Motion Sensor (Wall Mounted)	15	ea	$ 25	$ 40		$ 368	$ 726	$ -	$ 1,094	$ 400	

Subtotal	$ 1,094
10% Contingency	$ 109
10% OH	$ 120
10% Profit	$ 132
Total	$ 1,455
Incentive	$ 400
Total Cost with Incentive	$ 1,055

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Existing Lighting Fixture Controls									**Prooposed Lighting Fixture Controls**					**Savings After Retrofit**	
Location	Fixture Description	No. of Fixtures	Lamp Type & No.	Total Watts	Hours of Operation	Control	kwh/Year	Operational Cost/Year	Modified Control	New Hours of Operation	kwh/Year	Operational Cost/Year	Installation Cost*	Cost Savings/Year	Payback in Years
Boiler Room	Compact Fluorescent Screw-In	1	(1) CFL, 25W	25	52	Switch	1	$0.22		39	1	$0.17			
Locker Room	2'x4' Fluorescent	2	(4) T-8, 32W	228	8760	Switch	1997	$339.54	Motion Sensor	3504	799	$135.82	$93.14	$203.72	0.5
Hall	2'x2' Fluorescent	4	(4) T-8, 17W	252	8760	Switch	2208	$375.28		6570	1656	$281.46			
Dispatch Room	2'x4' Fluorescent	4	(4) T-8, 32W	456	0	Switch	0	$0.00		0	0	$0.00			
Dispatch Room	CFL Flood Down Lights	3	(1) CFL, 25W	75	8760	Switch	657	$111.69		6570	493	$83.77			
Support Service Office	2'x4' Fluorescent	4	(4) T-8, 32W	456	2080	Switch	948	$161.24	Motion Sensor	1560	711	$120.93	$93.14	$40.31	2.3
Evidence Room	Compact Fluorescent Screw-In	1	(1) CFL, 25W	25	2080	Switch	52	$8.84		1560	39	$6.63			
Chief's Office	2'x2' Fluorescent	4	(2) T-8 U-Tube, 32W	248	2080	Switch	516	$87.69	Motion Sensor	1560	387	$65.77	$93.14	$21.92	4.2
Entrance Hall	2'x4' Fluorescent	1	(4) T-8, 32W	114	8760	Switch	999	$169.77		6570	749	$127.33			
Toilet Room	Wall Mounted Fluorescent	1	(1) T-8, 32W	32	1040	Switch	33	$5.66	Motion Sensor	780	25	$4.24	$93.14	$1.41	65.9
Squad Room	Fluorescent Pendants	5	(4) T-8, 32W	570	2080	Switch	1186	$201.55	Motion Sensor	1560	889	$151.16	$93.14	$50.39	1.8
Men's Room	2'x2' Fluorescent	1	(4) T-8, 17W	63	1040	Switch	66	$11.14	Motion Sensor	780	49	$8.35	$93.14	$2.78	33.4
Kitchen	2'x2' Fluorescent	6	(2) T-8 U-Tube, 32W	372	1040	Switch	387	$65.77	Motion Sensor	780	290	$49.33	$93.14	$16.44	5.7
Kitchen	2'x2' Fluorescent	2	(2) T-8 U-Tube, 32W	124	1040	Switch	129	$21.92		780	97	$16.44			
Fire Bays	Metal Halide	2	MH, 400W	922	8760	Switch	8077	$1,373.04		6570	6058	$1,029.78			
Fire Bays	Metal Halide	2	MH, 400W	922	520	Switch	479	$81.50		390	360	$61.13			
Fire Bays	Metal Halide	2	MH, 400W	922	520	Switch	479	$81.50		390	360	$61.13			
Fire Bays	2'x4' Fluorescent	9	(4) T-8, 32W	1026	520	Switch	534	$90.70		390	400	$68.02			
Hall	2'x2' Fluorescent	2	(4) T-8, 17W	126	8760	Switch	1104	$187.64		6570	828	$140.73			
Construction Office	1'x4' Fluorescent	6	(2) T-8, 17W	198	1040	Switch	206	$35.01	Motion Sensor	780	154	$26.25	$93.14	$8.75	10.6
Storage Room	CFL on Pull String	1	(1) CFL, 25W	25	52	Switch	1	$0.22		39	1	$0.17			
Conference Room	2'x4' Fluorescent	4	(4) T-8, 32W	456	520	Switch	237	$40.31	Motion Sensor	390	178	$30.23	$93.14	$10.08	9.2
Council Room	2'x4' Fluorescent Pendants	10	(4) T-8, 32W	1140	200	Switch	228	$38.76		150	171	$29.07			
Council Room	2'x4' Fluorescent Pendants	12	(4) T-8, 32W	1368	200	s - Inner/O	274	$46.51		150	205	$34.88			
Council Room	CFL Flood Down Lights	5	(1) CFL, 25W	125	200	Switch	25	$4.25		150	19	$3.19			
Entry	CFL Drop Light	1	(3) CFL, 25W	25	8760	Switch	219	$37.23		6570	164	$27.92			
Hall at Top of Stair	2'x4' Fluorescent	4	(4) T-8, 32W	456	2080	Switch	948	$161.24		1560	711	$120.93			
Main Office	2'x4' Fluorescent	11	(4) T-8, 32W	1254	2080	s - Inner/O	2608	$443.41		1560	1956	$332.56			
Main Office	2'x4' Fluorescent	6	(4) T-8, 32W	684	2080	s - Inner/O	1423	$241.86		1560	1067	$181.40			
Office	2'x4' Fluorescent	2	(4) T-8, 32W	228	2080	Switch	474	$80.62	Motion Sensor	1560	356	$60.47	$93.14	$20.16	4.6
Office	2'x4' Fluorescent	2	(4) T-8, 32W	228	2080	Switch	474	$80.62	Motion Sensor	1560	356	$60.47	$93.14	$20.16	4.6
Office	2'x4' Fluorescent	2	(4) T-8, 32W	228	2080	Switch	474	$80.62	Motion Sensor	1560	356	$60.47	$93.14	$20.16	4.6
Office	2'x4' Fluorescent	6	(4) T-8, 32W	684	2080	Switch	1423	$241.86	Motion Sensor	1560	1067	$181.40	$93.14	$60.47	1.5
Storage	2'x4' Fluorescent	1	(2) T-8, 32W	62	52	Switch	3	$0.55		39	2	$0.41			
Kitchen/Lunch Room	2'x4' Fluorescent	6	(4) T-8, 32W	684	2080	Switch	1423	$241.86		1560	1067	$181.40			
Kitchen/Lunch Room	2'x4' Fluorescent	1	(4) T-8, 32W	114	2080	Switch	237	$40.31		1560	178	$30.23			
Toilet Room	Wall Mounted Fluorescent	1	(1) T-8, 32W	32	1040	Switch	33	$5.66	Motion Sensor	780	25	$4.24	$93.14	$1.41	65.9
Men's Room	Wall Mounted Fluorescent	1	(1) T-8, 32W	32	1040	Switch	33	$5.66	Motion Sensor	780	25	$4.24	$93.14	$1.41	65.9
Ladies Room	Wall Mounted Fluorescent	1	(1) T-8, 32W	32	1040	Switch	33	$5.66	Motion Sensor	780	25	$4.24	$93.14	$1.41	65.9
Board of Education Main Office	2'x4' Fluorescent	6	(4) T-8, 32W	684	2080	Switch	1423	$241.86		1560	1067	$181.40			
Board of Education Main Office	2'x4' Fluorescent	5	(4) T-8, 32W	570	2080	Switch	1186	$201.55		1560	889	$151.16			
Board of Education Main Office	2'x4' Fluorescent	5	(4) T-8, 32W	570	2080	Switch	1186	$201.55		1560	889	$151.16			
Office	2'x4' Fluorescent	2	(4) T-8, 32W	228	2080	Switch	474	$80.62	Motion Sensor	1560	356	$60.47	$93.14	$20.16	4.6
Office	2'x4' Fluorescent	2	(4) T-8, 32W	228	2080	Switch	474	$80.62	Motion Sensor	1560	356	$60.47	$93.14	$20.16	4.6
Office	2'x4' Fluorescent	2	(4) T-8, 32W	228	2080	Switch	474	$80.62	Motion Sensor	1560	356	$60.47	$93.14	$20.16	4.6
Office	2'x4' Fluorescent	4	(4) T-8, 32W	456	2080	Switch	948	$161.24	Motion Sensor	1560	711	$120.93	$93.14	$40.31	2.3
Small Kitchen/Lunch Room	2'x4' Fluorescent	4	(4) T-8, 32W	456	2080	Switch	948	$161.24		1560	711	$120.93			
Exterior Fire Bays	Decorative Fixture	2	Metal Halide, 75W	182	2080	Timer	379	$64.36		1560	284	$48.27			
Exterior Fire Bays	Flood Lights	2	Metal Halide, 400W	922	520	Switch	479	$81.50		390	360	$61.13			
Exterior Fire Door		1		0	2080	Timer	0	$0.00		1560	0	$0.00			
Exterior Police Door		1		0	2080		0	$0.00		1560	0	$0.00			
Pole Light		6		0	2080		0	$0.00		1560	0	$0.00			
Flag Pole Light		1	Mercury Vapor, 60W	73	2080		152	$25.81		1560	114	$19.36			
Exit Signs	LED	8	LED Exit Signs	9.6	8760	Breaker	84	$14.30		6570	63	$10.72			

Energy Cost: $0.1700

*Installation costs do not include potential incentive.

Notes:
Total Watts = No. of Fixture x Fixture Watts
kwh/Year = Total Watts/1000 x Hours of Operation
Operational Cost/Year = kwh/Year x Energy Cost

Lighting Control Modifications

Motions Sensors with 10 Years or Less Payback

kwh Savings/Year	Installation Cost	Cost Savings/Year	Payback in Years
3372	$1,397.10	$573.32	2.4

APPENDIX E

ECM-3 Replace Multi-Zone Rooftop Unit with Multiple Units

BPU ENERGY AUDIT PROGRAM
Bourough of Mountain Lakes Borough Hall
CHA Project #21795

ECM-3 Replace Multi-Zone Rooftop Unit with Multiple Units

Multipliers	
Material	0.98
Labor	1.21
Equipment	1.07

Installation Costs										
	Qty	Unit	Unit Costs			Subtotal Costs			Total Cost	Remarks
			Material	Labor	Equipment	Material	Labor	Equipment		
New Ductwork and Existing Ductwork Modifications	1	ea	$1,200	$400		$1,176	$484	$0	$1,660	
(2) 3/4 Ton Indoor Units, Electrical Work, and Controls	6	ea	$2,100	$415		$12,348	$3,013	$0	$15,361	
10 Ton Outdoor Air Cooled Heat Pump and Associated Electrical Work	1	ea	$7,900	$1,825		$7,742	$2,208	$0	$9,950	
Refrigerant Tubing, 50' Kits	12	ea	$167	$38		$1,964	$545	$0	$2,508	
VRF System Appurtenances and Curb	1	ea	$50	$75		$49	$91	$0	$140	
Packaged, Outdoor, Heating and Cooling Unit, 3 Ton Cooling, 60 MBH Heating, Economizer, Controls, Curb, Etc.	1	ea	$4,225	$1,225		$4,141	$1,482	$0	$5,623	

Subtotal	$35,242
10% OH, 10% Profit	$3,524
10% Contingency	$3,524
Total	$42,290

BPU ENERGY AUDIT PROGRAM
Bourough of Mountain Lakes Borough Hall
CHA Project #21795

ECM-3 Replace Multi-Zone Rooftop Unit with Multiple Units

Annual Energy Use Comparison			
	Electricity kWh	Natural Gas therms	Cost $
Existing Building HVAC Consumption	261,064	12,010	$ 60,800.00
Multiple Unit Building HVAC Consumption	261,676	11,339	$ 60,000.00
Difference	(612)	671	$ 800.00

ECM-3 Boiler

Boiler Full Load Details

Gross Output	**167.0**	MBH
Overall Efficiency	**80.0**	%
Fuel or Energy Type	**Natural Gas**	
Boiler Accessories	**0.15**	kW
Hot Water Flow Rate	**20.0**	°F

Part Load Model

Part Load Model **Constant Efficiency**

Part Load Performance

% Load	Efficiency (%)
100.0	80.0
90.0	80.0
80.0	80.0
70.0	80.0
60.0	80.0
50.0	80.0
40.0	80.0
30.0	80.0
20.0	80.0
10.0	80.0
0.0	80.0

ECM-3 Existing Multi-Zone HVAC U Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:04AM

1. General Details:

Air System Name ..... **ECM-3 Existing Multi-Zone HVAC U**
Equipment Type ..... **Packaged Rooftop Units**
Air System Type ..... **2-Deck Multizone**
Number of zones **1**

2. System Components:

Ventilation Air Data:

Airflow Control ..... **Constant Ventilation Airflow**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Unocc. Damper Position ..... **Closed**
Damper Leak Rate ..... **5** %
Outdoor Air CO2 Level ..... **400** ppm

Economizer Data:

Control ..... **Integrated enthalpy control**
Upper Cutoff ..... **73.0** °F
Lower Cutoff ..... **-60.0** °F

Central Cooling Data:

Supply Air Temperature ..... **55.0** °F
Coil Bypass Factor **0.100**
Cooling Source ..... **Air-Cooled DX**
Schedule ..... **JFMAMJJASOND**
Capacity Control ..... **Constant Temperature - Fan On**

Central Heating Data:

Supply Temperature ..... **95.0** °F
Heating Source ..... **Combustion - Natural Gas**
Schedule ..... **JFMA* * * * * OND**
Capacity Control ..... **Cycled or Staged Capacity - Fan On**

Supply Fan Data:

Fan Type ..... **Forward Curved**
Configuration ..... **Blow-thru**
Fan Performance ..... **1.50** in wg
Overall Efficiency ..... **54** %

Duct System Data:

Supply Duct Data:

Duct Heat Gain ..... **0** %
Duct Leakage ..... **0** %

Return Duct or Plenum Data:

Return Air Via ..... **Ducted Return**

Return Fan Data:

Fan Type ..... **Forward Curved with Inlet Guide Vanes**
Fan Performance ..... **1.00** in wg
Overall Efficiency ..... **54** %

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-3 Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **69.0** °F
Cooling T-stat: Unocc. ..... **71.0** °F
Heating T-stat: Occ. ..... **64.0** °F
Heating T-stat: Unocc. ..... **64.0** °F
T-stat Throttling Range ..... **1.50** °F
Diversity Factor ..... **100** %
Direct Exhaust Airflow ..... **0.0** CFM
Direct Exhaust Fan kW ..... **0.0** kW

Thermostat Schedule ..... **TStat Scehdule - Upper**
Unoccupied Cooling is ..... **Available**

Supply Terminals Data:

Zone ..... **All**
Terminal Type ..... **Diffuser**
Minimum Airflow ..... **0.00** CFM/person

Zone Heating Units:
Zone ..... **All**
Zone Heating Unit Type ..... **None**

Zone Unit Heat Source ..... **Electric Resistance**
Zone Heating Unit Schedule ..... **JFMAMJJASOND**

4. Sizing Data (Computer-Generated):

System Sizing Data:
Cold Deck Supply Temperature ..... **55.0** °F
Supply Fan Airflow ..... **12444.4** CFM
Ventilation Airflow ..... **320.0** CFM
Hot Deck Supply Temperature ..... **95.0** °F

Hydronic Sizing Specifications:
Chilled Water Delta-T ..... **10.0** °F
Hot Water Delta-T ..... **20.0** °F

Safety Factors:
Cooling Sensible ..... **10** %
Cooling Latent ..... **10** %
Heating ..... **10** %

Zone Sizing Data:
Zone Airflow Sizing Method ..... **Sum of space airflow rates**
Space Airflow Sizing Method ..... **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- (CFM)
1	12444.4	-	-	

5. Equipment Data

Central Cooling Unit - Air-Cooled DX
Estimated Maximum Load ..... **229.9** MBH
Design OAT ..... **95.0** °F
Equipment Sizing ..... **User-Defined**
Gross Cooling Capacity ..... **384.0** MBH
ARI Performance Rating ..... **10.30** EER
Conventional Cutoff OAT ..... **55.0** °F
Low Temperature Operation ..... **Used**
Low Temperature Cutoff OAT ..... **0.0** °F

Central Heating Unit - Combustion
Estimated Maximum Load ..... **120.8** MBH
Equipment Sizing ..... **User-Defined**
Gross Heating Capacity ..... **500.0** MBH
Average Efficiency ..... **79.1** %
Misc. Electric ..... **0.000** kW

ECM-3 Garage Unit Heaters Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:04AM

1. General Details:

Air System Name	**ECM-3 Garage Unit Heaters**	
Equipment Type	**Split AHU**	
Air System Type	**Single Zone CAV**	
Number of zones	**1**	

2. System Components:

Ventilation Air Data:

Airflow Control	**Constant Ventilation Airflow**	
Ventilation Sizing Method	**Sum of Space OA Airflows**	
Unocc. Damper Position	**Closed**	
Damper Leak Rate	**0**	%
Outdoor Air CO2 Level	**400**	ppm

Central Heating Data:

Supply Temperature	**95.0**	°F
Heating Source	**Combustion - Natural Gas**	
Schedule	**JFM* * * * * OND**	
Capacity Control	**Cycled or Staged Capacity - Fan On**	

Supply Fan Data:

Fan Type	**Forward Curved**	
Configuration	**Draw-thru**	
Fan Performance	**0.00**	in wg
Overall Efficiency	**54**	%

Duct System Data:

Supply Duct Data:

Duct Heat Gain	**0**	%
Duct Leakage	**0**	%

Return Duct or Plenum Data:

Return Air Via	**Ducted Return**	

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-3 Garage	x1

Thermostats and Zone Data:

Zone	**All**	
Cooling T-stat: Occ.	**75.0**	°F
Cooling T-stat: Unocc.	**75.0**	°F
Heating T-stat: Occ.	**65.0**	°F
Heating T-stat: Unocc.	**65.0**	°F
T-stat Throttling Range	**1.50**	°F
Diversity Factor	**100**	%
Direct Exhaust Airflow	**0.0**	CFM
Direct Exhaust Fan kW	**0.0**	kW
Thermostat Schedule	**TStat Scehdule - Police**	
Unoccupied Cooling is	**Not Available**	

Supply Terminals Data:

Zone	**All**	
Terminal Type	**Diffuser**	
Minimum Airflow	**0.00**	CFM/person

Zone Heating Units:

Zone	**All**	
Zone Heating Unit Type	**None**	
Zone Unit Heat Source	**Electric Resistance**	
Zone Heating Unit Schedule	**JFMAMJJASOND**	

4. Sizing Data (Computer-Generated):

System Sizing Data:

Supply Fan Airflow	**2838.0**	CFM
Ventilation Airflow	**2838.0**	CFM
Heating Supply Temperature	**95.0**	°F

Hydronic Sizing Specifications:

Chilled Water Delta-T	**10.0**	°F
Hot Water Delta-T	**20.0**	°F

Safety Factors:

Cooling Sensible	**0**	%
Cooling Latent	**0**	%
Heating	**0**	%

Zone Sizing Data:

Zone Airflow Sizing Method	**Sum of space airflow rates**
Space Airflow Sizing Method	**Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- (CFM)
1	2838.0	-	-	

5. Equipment Data

Central Heating Unit - Combustion

Estimated Maximum Load		**218.6**	MBH
Equipment Sizing	**(Auto-Sized)**	**218.6**	MBH
Capacity Oversizing Factor		**0**	%
Average Efficiency		**80.0**	%
Misc. Electric		**0.000**	kW

ECM-3 Baseboard Radiators Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:04AM

1. General Details:

Air System Name ..... **ECM-3 Baseboard Radiators**
Equipment Type ..... **Terminal Units**
Air System Type ..... **2-Pipe Fan Coil**
Number of zones **1**
Ventilation ..... **Direct Ventilation**

2. Ventilation System Components:

(Common Ventilation System not used: no inputs)

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-3 Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **80.0** °F
Cooling T-stat: Unocc. ..... **80.0** °F
Heating T-stat: Occ. ..... **79.0** °F
Heating T-stat: Unocc. ..... **79.0** °F
T-stat Throttling Range ..... **1.50** °F

Thermostat Schedule ..... **TStat Scehdule - Police**
Unoccupied Cooling is ..... **Available**

Common Terminal Unit Data:

Heating Coil:

Design Supply Temperature ..... **95.0** °F
Heating Source ..... **Hot Water**
Schedule ..... **JFMA* * * * * OND**

Fan Control ..... **Fan On**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**

Terminal Units Data:

Zone ..... **All**
Terminal Type ..... **Fan Coil**
Minimum Airflow ..... **0.00** CFM/person
Fan Performance ..... **0.00** in wg
Fan Overall Efficiency ..... **50** %

4. Sizing Data (Computer-Generated):

System Sizing Data:

Heating Supply Temperature ..... **95.0** °F

Hydronic Sizing Specifications:

Chilled Water Delta-T ..... **10.0** °F
Hot Water Delta-T ..... **20.0** °F

Safety Factors:

Cooling Sensible ..... **0** %
Cooling Latent ..... **0** %
Heating ..... **0** %

Zone Sizing Data:

Zone Airflow Sizing Method ..... **Sum of space airflow rates**
Space Airflow Sizing Method ..... **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	Ventilation (CFM)
1	7188.6	-	-	320.0

5. Equipment Data

No Equipment Data required for this system.

ECM-3 Baseboard Radiators Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:04AM

ECM-3 Council Rm Outdoor Unit Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:04AM

1. General Details:

Air System Name ..... **ECM-3 Council Rm Outdoor Unit**
Equipment Type ..... **Packaged Rooftop Units**
Air System Type ..... **Single Zone CAV**
Number of zones **1**

2. System Components:

Ventilation Air Data:

Airflow Control ..... **Constant Ventilation Airflow**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Unocc. Damper Position ..... **Closed**
Damper Leak Rate ..... **0** %
Outdoor Air CO2 Level ..... **400** ppm

Central Cooling Data:

Supply Air Temperature ..... **58.0** °F
Coil Bypass Factor **0.100**
Cooling Source ..... **Air-Cooled DX**
Schedule ..... **JFMAMJJASOND**
Capacity Control ..... **Cycled or Staged Capacity - Fan On**

Central Heating Data:

Supply Temperature ..... **95.0** °F
Heating Source ..... **Combustion - Natural Gas**
Schedule ..... **JFMAMJJASOND**
Capacity Control ..... **Cycled or Staged Capacity - Fan On**

Supply Fan Data:

Fan Type ..... **Forward Curved**
Configuration ..... **Draw-thru**
Fan Performance ..... **1.00** in wg
Overall Efficiency ..... **54** %

Duct System Data:

Supply Duct Data:

Duct Heat Gain ..... **0** %
Duct Leakage ..... **0** %

Return Duct or Plenum Data:

Return Air Via ..... **Ducted Return**

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-3 Council Lower	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **75.0** °F
Cooling T-stat: Unocc. ..... **85.0** °F
Heating T-stat: Occ. ..... **70.0** °F
Heating T-stat: Unocc. ..... **60.0** °F
T-stat Throttling Range ..... **1.50** °F
Diversity Factor ..... **100** %
Direct Exhaust Airflow ..... **0.0** CFM
Direct Exhaust Fan kW ..... **0.0** kW

Thermostat Schedule ..... **TStat Scehdule - Conf**
Unoccupied Cooling is ..... **Available**

Supply Terminals Data:

Zone ..... **All**
Terminal Type ..... **Diffuser**
Minimum Airflow ..... **0.00** CFM/person

Zone Heating Units:

Zone ..... **All**
Zone Heating Unit Type ..... **None**

Zone Unit Heat Source ..... **Electric Resistance**

Zone Heating Unit Schedule ..... **JFMAMJJASOND**

4. Sizing Data (Computer-Generated):

System Sizing Data:

Cooling Supply Temperature ..... **58.0** °F
Supply Fan Airflow ..... **1488.2** CFM
Ventilation Airflow ..... **320.0** CFM
Heating Supply Temperature ..... **95.0** °F

Hydronic Sizing Specifications:

Chilled Water Delta-T ..... **10.0** °F
Hot Water Delta-T ..... **20.0** °F

Safety Factors:

Cooling Sensible ..... **0** %
Cooling Latent ..... **0** %
Heating ..... **0** %

Zone Sizing Data:

Zone Airflow Sizing Method ..... **Sum of space airflow rates**
Space Airflow Sizing Method ..... **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- (CFM)
1	1488.2	-	-	

5. Equipment Data

Central Cooling Unit - Air-Cooled DX

Estimated Maximum Load ..... **48.7** MBH
Design OAT ..... **95.0** °F
Equipment Sizing ..... **(Auto-Sized)** **48.7** MBH
Capacity Oversizing Factor ..... **0** %
ARI Performance Rating ..... **13.00** SEER
Conventional Cutoff OAT ..... **55.0** °F
Low Temperature Operation ..... **Used**
Low Temperature Cutoff OAT ..... **0.0** °F

Central Heating Unit - Combustion

Estimated Maximum Load ..... **38.5** MBH
Equipment Sizing ..... **(Auto-Sized)** **38.5** MBH
Capacity Oversizing Factor ..... **0** %
Average Efficiency ..... **80.5** %
Misc. Electric ..... **0.000** kW

ECM-3 VRF Downstairs Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:04AM

1. General Details:

Air System Name ..... **ECM-3 VRF Downstairs**
Equipment Type ..... **Split AHU**
Air System Type ..... **Single Zone CAV**
Number of zones **1**

2. System Components:

Ventilation Air Data:

Airflow Control ..... **Constant Ventilation Airflow**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Unocc. Damper Position ..... **Closed**
Damper Leak Rate ..... **0** %
Outdoor Air CO2 Level ..... **400** ppm

Central Cooling Data:

Supply Air Temperature ..... **58.0** °F
Coil Bypass Factor **0.100**
Cooling Source ..... **Air-Cooled DX**
Schedule ..... **JFMAMJJASOND**
Capacity Control ..... **Cycled or Staged Capacity - Fan On**

Central Heating Data:

Supply Temperature ..... **95.0** °F
Heating Source ..... **Air Source Heat Pump**
Schedule ..... **JFMAMJJASOND**
Capacity Control ..... **Cycled or Staged Capacity - Fan On**

Supply Fan Data:

Fan Type ..... **Forward Curved**
Configuration ..... **Draw-thru**
Fan Performance ..... **1.00** in wg
Overall Efficiency ..... **54** %

Duct System Data:

Supply Duct Data:

Duct Heat Gain ..... **0** %
Duct Leakage ..... **0** %

Return Duct or Plenum Data:

Return Air Via ..... **Ducted Return**

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-3 Conference Lower	x1
ECM-3 Hall Lower	x1
ECM-3 Permit Lower	x1
ECM-3 Police Lower Level	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **70.0** °F
Cooling T-stat: Unocc. ..... **71.0** °F
Heating T-stat: Occ. ..... **69.0** °F
Heating T-stat: Unocc. ..... **69.0** °F
T-stat Throttling Range ..... **1.50** °F
Diversity Factor ..... **100** %
Direct Exhaust Airflow ..... **0.0** CFM
Direct Exhaust Fan kW ..... **0.0** kW

Thermostat Schedule ..... **TStat Scehdule - Police**
Unoccupied Cooling is ..... **Available**

Supply Terminals Data:

Zone ..... **All**
Terminal Type ..... **Diffuser**
Minimum Airflow ..... **0.00** CFM/person

Zone Heating Units:

Zone ..... **All**
Zone Heating Unit Type ..... **None**

Zone Unit Heat Source ..... **Electric Resistance**
Zone Heating Unit Schedule ..... **JFMAMJJASOND**

4. Sizing Data (Computer-Generated):

System Sizing Data:

Cooling Supply Temperature ..... **58.0** °F
Supply Fan Airflow ..... **6800.8** CFM
Ventilation Airflow ..... **280.0** CFM
Heating Supply Temperature ..... **95.0** °F

Hydronic Sizing Specifications:

Chilled Water Delta-T ..... **10.0** °F
Hot Water Delta-T ..... **20.0** °F

Safety Factors:

Cooling Sensible ..... **0** %
Cooling Latent ..... **0** %
Heating ..... **0** %

Zone Sizing Data:

Zone Airflow Sizing Method ..... **Sum of space airflow rates**
Space Airflow Sizing Method ..... **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- (CFM)
1	6800.8	-	-	

5. Equipment Data

Central Cooling Unit - Air-Cooled DX

Estimated Maximum Load ..... **105.1** MBH
Design OAT ..... **95.0** °F
Equipment Sizing ..... **(Auto-Sized) 105.1** MBH
Capacity Oversizing Factor ..... **0** %
ARI Performance Rating ..... **14.00** SEER
Conventional Cutoff OAT ..... **55.0** °F
Low Temperature Operation ..... **Used**
Low Temperature Cutoff OAT ..... **0.0** °F

Central Heating Unit - ASHP

Estimated Maximum Load ..... **53.9** MBH
Design OAT ..... **47.0** °F
Equipment Sizing ..... **(Auto-Sized) 53.9** MBH
Capacity Oversizing Factor ..... **0** %
ARI Performance Rating ..... **3.30** COP
Cutoff OAT ..... **-15.0** °F
Aux. Htg. Type ..... **Electric Resistance**

Billing Details - Electric - ECM-3 Split MultiZone Unit

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
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1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	3,468	0	0	0	3,468
Feb	3,173	0	0	0	3,173
Mar	3,509	0	0	0	3,509
Apr	3,389	0	0	0	3,389
May	3,608	0	0	0	3,608
Jun	4,145	0	0	0	4,145
Jul	4,510	0	0	0	4,510
Aug	4,468	0	0	0	4,468
Sep	3,878	0	0	0	3,878
Oct	3,408	0	0	0	3,408
Nov	3,355	0	0	0	3,355
Dec	3,573	0	0	0	3,573
Totals	44,485	0	0	0	44,485

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	3,468	20,398	0.1700
Feb	3,173	18,662	0.1700
Mar	3,509	20,643	0.1700
Apr	3,389	19,938	0.1700
May	3,608	21,226	0.1700
Jun	4,145	24,383	0.1700
Jul	4,510	26,528	0.1700
Aug	4,468	26,281	0.1700
Sep	3,878	22,813	0.1700
Oct	3,408	20,045	0.1700
Nov	3,355	19,738	0.1700
Dec	3,573	21,018	0.1700
Totals	44,485	261,674	0.1700

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	20,398
Feb	0	0	0	0	18,662
Mar	0	0	0	0	20,643
Apr	0	0	0	0	19,938
May	0	0	0	0	21,226
Jun	0	0	0	0	24,383
Jul	0	0	0	0	26,528
Aug	0	0	0	0	26,281
Sep	0	0	0	0	22,813
Oct	0	0	0	0	20,045
Nov	0	0	0	0	19,738
Dec	0	0	0	0	21,018
Totals	0	0	0	0	261,674

4. Billing Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	69.2
Feb	0.0	0.0	0.0	0.0	68.6
Mar	0.0	0.0	0.0	0.0	76.6
Apr	0.0	0.0	0.0	0.0	83.9
May	0.0	0.0	0.0	0.0	91.3
Jun	0.0	0.0	0.0	0.0	90.8
Jul	0.0	0.0	0.0	0.0	93.6
Aug	0.0	0.0	0.0	0.0	91.7
Sep	0.0	0.0	0.0	0.0	86.3
Oct	0.0	0.0	0.0	0.0	85.7
Nov	0.0	0.0	0.0	0.0	72.7
Dec	0.0	0.0	0.0	0.0	69.4

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	69.2
Feb	0.0	0.0	0.0	0.0	68.6
Mar	0.0	0.0	0.0	0.0	76.6
Apr	0.0	0.0	0.0	0.0	83.9
May	0.0	0.0	0.0	0.0	91.3
Jun	0.0	0.0	0.0	0.0	90.8
Jul	0.0	0.0	0.0	0.0	93.6
Aug	0.0	0.0	0.0	0.0	91.7
Sep	0.0	0.0	0.0	0.0	86.3
Oct	0.0	0.0	0.0	0.0	85.7
Nov	0.0	0.0	0.0	0.0	72.7
Dec	0.0	0.0	0.0	0.0	69.4

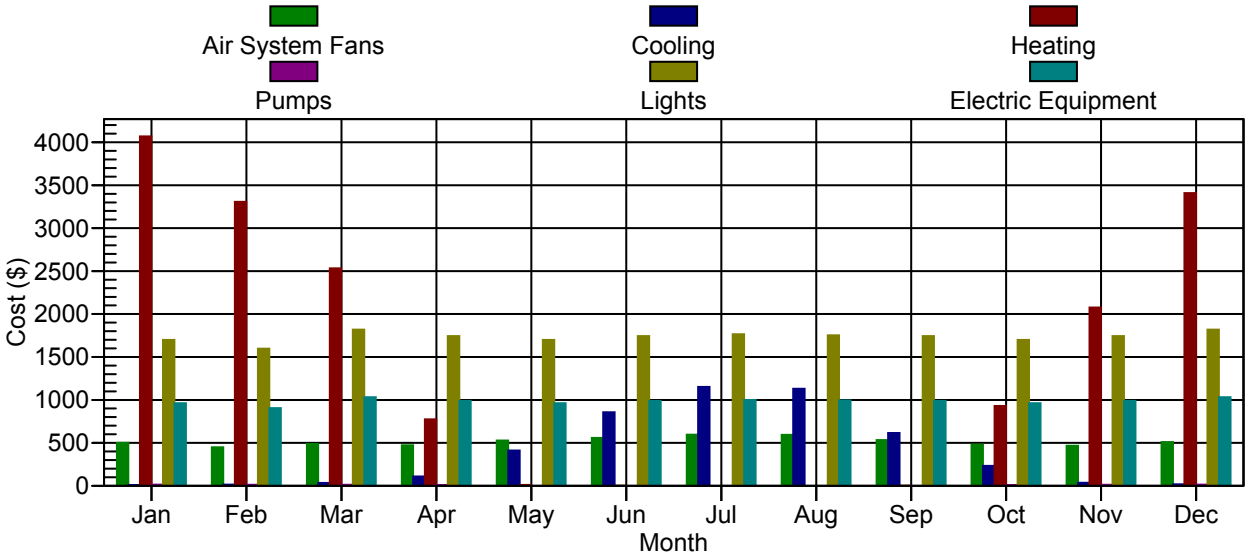
6. Time Of Maximum Demands

Billing Period	Peak (m/d/h)	Mid-Peak (m/d/h)	Normal Peak (m/d/h)	Off-Peak (m/d/h)	Overall (m/d/h)
Jan	n/a	n/a	n/a	n/a	1/25/0800
Feb	n/a	n/a	n/a	n/a	2/10/1500
Mar	n/a	n/a	n/a	n/a	3/5/1600
Apr	n/a	n/a	n/a	n/a	4/19/1600
May	n/a	n/a	n/a	n/a	5/17/1500
Jun	n/a	n/a	n/a	n/a	6/30/1500
Jul	n/a	n/a	n/a	n/a	7/1/1600
Aug	n/a	n/a	n/a	n/a	8/4/1500
Sep	n/a	n/a	n/a	n/a	9/1/1500
Oct	n/a	n/a	n/a	n/a	10/1/1500
Nov	n/a	n/a	n/a	n/a	11/3/1500
Dec	n/a	n/a	n/a	n/a	12/2/1400

Monthly Component Costs - ECM-3 Split MultiZone Unit

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
08:59AM



1. HVAC Component Costs

Month	Air System Fans ($)	Cooling ($)	Heating ($)	Pumps ($)	Cooling Towers ($)	HVAC Total ($)
January	500	9	4,068	14	0	4,591
February	448	13	3,306	12	0	3,779
March	488	33	2,532	12	0	3,065
April	472	108	774	9	0	1,363
May	527	411	10	0	0	948
June	558	856	0	0	0	1,414
July	596	1,151	0	0	0	1,747
August	592	1,130	0	0	0	1,722
September	532	615	0	0	0	1,147
October	479	232	929	7	0	1,647
November	466	36	2,076	12	0	2,590
December	509	17	3,409	13	0	3,948
Total	**6,168**	**4,611**	**17,103**	**80**	**0**	**27,962**

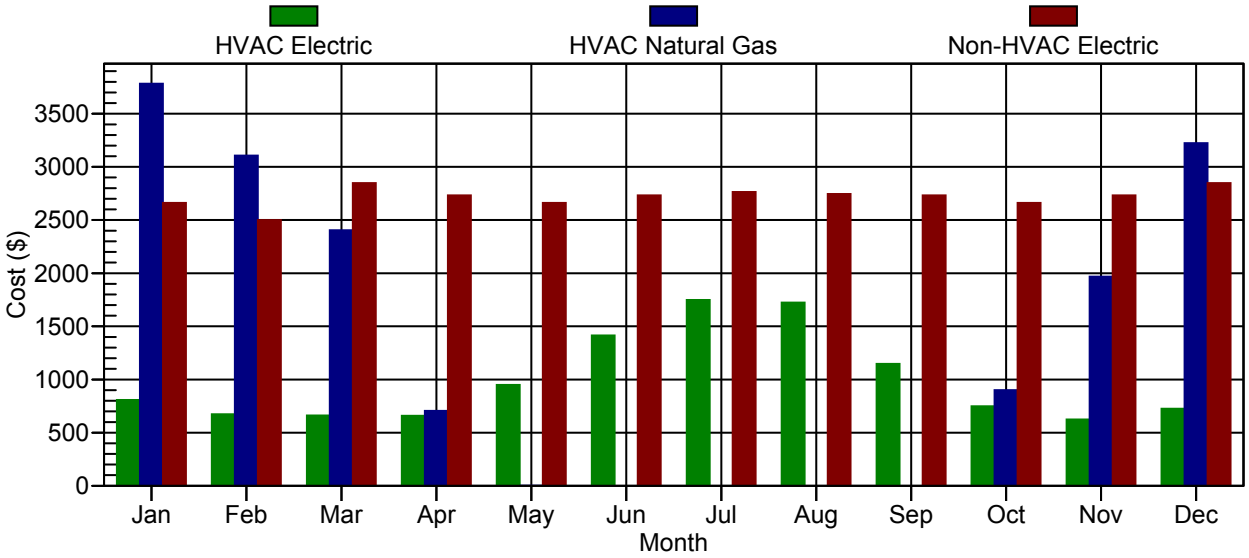
2. Non-HVAC Component Costs

Month	Lights ($)	Electric Equipment ($)	Misc. Electric ($)	Misc. Fuel Use ($)	Non-HVAC Total ($)	Grand Total ($)
January	1,698	962	0	0	2,660	7,251
February	1,595	904	0	0	2,499	6,278
March	1,818	1,030	0	0	2,848	5,913
April	1,744	988	0	0	2,732	4,095
May	1,698	962	0	0	2,660	3,608
June	1,744	988	0	0	2,732	4,146
July	1,763	999	0	0	2,763	4,510
August	1,752	993	0	0	2,745	4,467
September	1,744	988	0	0	2,732	3,879
October	1,698	962	0	0	2,660	4,307
November	1,744	988	0	0	2,732	5,322
December	1,818	1,030	0	0	2,848	6,796
Total	**20,814**	**11,795**	**0**	**0**	**32,609**	**60,572**

Monthly Energy Costs - ECM-3 Split MultiZone Unit

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
08:59AM



1. HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)	Remote Chilled Water ($)
January	807	3,783	0	0	0	0	0
February	673	3,106	0	0	0	0	0
March	662	2,404	0	0	0	0	0
April	658	705	0	0	0	0	0
May	948	0	0	0	0	0	0
June	1,414	0	0	0	0	0	0
July	1,747	0	0	0	0	0	0
August	1,723	0	0	0	0	0	0
September	1,147	0	0	0	0	0	0
October	747	899	0	0	0	0	0
November	624	1,967	0	0	0	0	0
December	725	3,223	0	0	0	0	0
Total	**11,875**	**16,087**	**0**	**0**	**0**	**0**	**0**

2. Non-HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)
January	2,660	0	0	0	0	0
February	2,500	0	0	0	0	0
March	2,848	0	0	0	0	0
April	2,732	0	0	0	0	0
May	2,660	0	0	0	0	0
June	2,732	0	0	0	0	0
July	2,763	0	0	0	0	0
August	2,745	0	0	0	0	0
September	2,732	0	0	0	0	0
October	2,660	0	0	0	0	0
November	2,732	0	0	0	0	0
December	2,848	0	0	0	0	0
Total	**32,610**	**0**	**0**	**0**	**0**	**0**

Monthly Energy Use by Energy Type - ECM-3 Split MultiZone Unit

Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Kitchen and Associates 08:59AM

1. HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)	Remote CW (na)
Jan	4,750	2,761	0	0	0	0	0
Feb	3,960	2,267	0	0	0	0	0
Mar	3,892	1,755	0	0	0	0	0
Apr	3,870	515	0	0	0	0	0
May	5,578	0	0	0	0	0	0
Jun	8,315	0	0	0	0	0	0
Jul	10,277	0	0	0	0	0	0
Aug	10,134	0	0	0	0	0	0
Sep	6,745	0	0	0	0	0	0
Oct	4,397	657	0	0	0	0	0
Nov	3,670	1,436	0	0	0	0	0
Dec	4,267	2,352	0	0	0	0	0
Totals	69,854	11,742	0	0	0	0	0

2. Non-HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)
Jan	15,648	0	0	0	0	0
Feb	14,703	0	0	0	0	0
Mar	16,751	0	0	0	0	0
Apr	16,068	0	0	0	0	0
May	15,648	0	0	0	0	0
Jun	16,068	0	0	0	0	0
Jul	16,252	0	0	0	0	0
Aug	16,147	0	0	0	0	0
Sep	16,068	0	0	0	0	0
Oct	15,648	0	0	0	0	0
Nov	16,068	0	0	0	0	0
Dec	16,751	0	0	0	0	0
Totals	191,822	0	0	0	0	0

Monthly Energy Use by Component - ECM-3 Split MultiZone Unit

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
08:59AM

1. Monthly Energy Use by System Component

Component	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Air System Fans (kWh)	2941	2633	2873	2777	3102	3281	3503	3485	3128	2820	2743	2996
Cooling												
Electric (kWh)	53	78	193	634	2418	5034	6773	6650	3617	1365	211	101
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote CW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Heating												
Electric (kWh)	1675	1177	754	405	59	0	0	0	0	173	643	1092
Natural Gas (Therm)	2761	2267	1755	515	0	0	0	0	0	657	1436	2352
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Pumps (kWh)	80	72	73	54	0	0	0	0	0	39	73	79
Clg. Tower Fans (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Lighting (kWh)	9988	9385	10692	10256	9988	10256	10373	10306	10256	9988	10256	10692
Electric Eqpt. (kWh)	5660	5318	6059	5812	5660	5812	5879	5841	5812	5660	5812	6059
Misc. Electric (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Fuel												
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0

Annual Cost Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
08:59AM

Table 1. Annual Costs

Component	ECM-3 Split MultiZone Unit ($)
Air System Fans	6,168
Cooling	4,611
Heating	17,103
Pumps	80
Cooling Tower Fans	0
HVAC Sub-Total	**27,962**
Lights	20,814
Electric Equipment	11,795
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	**32,609**
Grand Total	**60,572**

Table 2. Annual Cost per Unit Floor Area

Component	ECM-3 Split MultiZone Unit ($/ft²)
Air System Fans	0.472
Cooling	0.353
Heating	1.309
Pumps	0.006
Cooling Tower Fans	0.000
HVAC Sub-Total	**2.140**
Lights	1.593
Electric Equipment	0.903
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.637**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	ECM-3 Split MultiZone Unit (%)
Air System Fans	10.2
Cooling	7.6
Heating	28.2
Pumps	0.1
Cooling Tower Fans	0.0
HVAC Sub-Total	**46.2**
Lights	34.4
Electric Equipment	19.5
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	**53.8**
Grand Total	**100.0**

Annual Energy and Emissions Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
08:59AM

Table 1. Annual Costs

Component	ECM-3 Split MultiZone Unit ($)
HVAC Components	
Electric	11,875
Natural Gas	16,087
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Remote CW	0
HVAC Sub-Total	**27,962**
Non-HVAC Components	
Electric	32,610
Natural Gas	0
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Non-HVAC Sub-Total	**32,610**
Grand Total	**60,572**

Table 2. Annual Energy Consumption

Component	ECM-3 Split MultiZone Unit
HVAC Components	
Electric (kWh)	69,855
Natural Gas (Therm)	11,742
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0
Non-HVAC Components	
Electric (kWh)	191,822
Natural Gas (Therm)	0
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Totals	
Electric (kWh)	261,676
Natural Gas (Therm)	11,742
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0

Table 3. Annual Emissions

Component	ECM-3 Split MultiZone Unit
CO2 Equivalent (lb)	0

Table 4. Annual Cost per Unit Floor Area

Component	ECM-3 Split MultiZone Unit ($/ft²)
HVAC Components	
Electric	0.909
Natural Gas	1.231
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Remote CW	0.000
HVAC Sub-Total	**2.140**
Non-HVAC Components	
Electric	2.496
Natural Gas	0.000
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.637**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 5. Component Cost as a Percentage of Total Cost

Component	ECM-3 Split MultiZone Unit (%)
HVAC Components	
Electric	19.6
Natural Gas	26.6
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Remote CW	0.0
HVAC Sub-Total	**46.2**
Non-HVAC Components	
Electric	53.8
Natural Gas	0.0
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Non-HVAC Sub-Total	**53.8**
Grand Total	**100.0**

APPENDIX F

ECM-4 Replace Existing Boiler with High Efficiency Unit

BPU ENERGY AUDIT PROGRAM
Bourough of Mountain Lakes Borough Hall
CHA Project #21795

ECM-4 Replace Existing Boiler with High Efficiency Unit

Multipliers	
Material	0.98
Labor	1.21
Equipment	1.07

Installation Costs										
	Qty	Unit	Unit Costs			Subtotal Costs			Total Cost	Remarks
			Material	Labor	Equipment	Material	Labor	Equipment		
Existing Boiler Removal	1	ea	$0	$1,975	$0	$0	$2,390	$0	$2,390	
New 96% Efficient Boiler and Associated Electrical and Piping Modifications	1	ea	$2,800	$1,575	$0	$2,744	$1,906	$0	$4,650	

Subtotal	$7,040
10% OH, 10% Profit	$704
10% Contingency	$704
Total	$8,447

BPU ENERGY AUDIT PROGRAM
Bourough of Mountain Lakes Borough Hall
CHA Project #21795

ECM-4 Replace Existing Boiler with High Efficiency Unit

Annual Energy Use Comparison			
	Electricity kWh	Natural Gas therms	Cost $
Existing Boiler	261,064	12,010	$ 60,800.00
New High Efficiency Boiler	261,064	11,629	$ 60,300.00
Difference	0	381	$ 500.00

ECM-4 Boiler

Boiler Full Load Details

Gross Output	**167.0**	MBH
Overall Efficiency	**96.0**	%
Fuel or Energy Type	**Natural Gas**	
Boiler Accessories	**0.15**	kW
Hot Water Flow Rate	**20.0**	°F

Part Load Model

Part Load Model ..... **Constant Efficiency**

Part Load Performance

% Load	Efficiency (%)
100.0	96.0
90.0	96.0
80.0	96.0
70.0	96.0
60.0	96.0
50.0	96.0
40.0	96.0
30.0	96.0
20.0	96.0
10.0	96.0
0.0	96.0

ECM-4 Existing Multi-Zone HVAC Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:06AM

1. General Details:

Air System Name ..... **ECM-4 Existing Multi-Zone HVAC**
Equipment Type ..... **Packaged Rooftop Units**
Air System Type ..... **2-Deck Multizone**
Number of zones **6**

2. System Components:

Ventilation Air Data:

Airflow Control ..... **Constant Ventilation Airflow**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Unocc. Damper Position ..... **Closed**
Damper Leak Rate ..... **5** %
Outdoor Air CO2 Level ..... **400** ppm

Economizer Data:

Control ..... **Integrated enthalpy control**
Upper Cutoff ..... **73.0** °F
Lower Cutoff ..... **-60.0** °F

Central Cooling Data:

Supply Air Temperature ..... **55.0** °F
Coil Bypass Factor **0.100**
Cooling Source ..... **Air-Cooled DX**
Schedule ..... **JFMAMJJASOND**
Capacity Control ..... **Constant Temperature - Fan On**

Central Heating Data:

Supply Temperature ..... **95.0** °F
Heating Source ..... **Combustion - Natural Gas**
Schedule ..... **JFMA* * * * * OND**
Capacity Control ..... **Cycled or Staged Capacity - Fan On**

Supply Fan Data:

Fan Type ..... **Forward Curved**
Configuration ..... **Blow-thru**
Fan Performance ..... **1.50** in wg
Overall Efficiency ..... **54** %

Duct System Data:

Supply Duct Data:

Duct Heat Gain ..... **0** %
Duct Leakage ..... **0** %

Return Duct or Plenum Data:

Return Air Via ..... **Ducted Return**

Return Fan Data:

Fan Type ..... **Forward Curved with Inlet Guide Vanes**
Fan Performance ..... **1.00** in wg
Overall Efficiency ..... **54** %

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-4 Conference Lower	x1
Zone 2: Zone 2	
ECM-4 Council Lower	x1
Zone 3: Zone 3	
ECM-4 Hall Lower	x1
Zone 4: Zone 4	
ECM-4 Permit Lower	x1
Zone 5: Zone 5	
ECM-4 Police Lower Leve	x1
Zone 6: Zone 6	
ECM-4 Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **69.0** °F

Cooling T-stat: Unocc. **71.0** °F
Heating T-stat: Occ. **64.0** °F
Heating T-stat: Unocc. **64.0** °F
T-stat Throttling Range **1.50** °F
Diversity Factor **100** %
Direct Exhaust Airflow **0.0** CFM
Direct Exhaust Fan kW **0.0** kW

Thermostat Schedule **TStat Scehdule - Upper**
Unoccupied Cooling is **Available**

Supply Terminals Data:
Zone **All**
Terminal Type **Diffuser**
Minimum Airflow **0.00** CFM/person

Zone Heating Units:
Zone **All**
Zone Heating Unit Type **None**

Zone Unit Heat Source **Electric Resistance**
Zone Heating Unit Schedule **JFMAMJJASOND**

4. Sizing Data (Computer-Generated):

System Sizing Data:
Cold Deck Supply Temperature **55.0** °F
Supply Fan Airflow **21287.2** CFM
Ventilation Airflow **920.0** CFM
Hot Deck Supply Temperature **95.0** °F

Hydronic Sizing Specifications:
Chilled Water Delta-T **10.0** °F
Hot Water Delta-T **20.0** °F

Safety Factors:
Cooling Sensible **10** %
Cooling Latent **10** %
Heating **10** %

Zone Sizing Data:
Zone Airflow Sizing Method **Sum of space airflow rates**
Space Airflow Sizing Method **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- -
1	619.1	-	-	-
2	2282.8	-	-	-
3	376.0	-	-	-
4	360.0	-	-	-
5	5204.9	-	-	
6	12444.4	-	-	

5. Equipment Data

Central Cooling Unit - Air-Cooled DX
Estimated Maximum Load **414.2** MBH
Design OAT **95.0** °F
Equipment Sizing **(Auto-Sized) 414.2** MBH
Capacity Oversizing Factor **0** %
ARI Performance Rating **10.30** EER
Conventional Cutoff OAT **55.0** °F
Low Temperature Operation **Used**
Low Temperature Cutoff OAT **0.0** °F

Central Heating Unit - Combustion

Estimated Maximum Load		**200.7**	MBH
Equipment Sizing	**(Auto-Sized)**	**200.7**	MBH
Capacity Oversizing Factor		**0**	%
Average Efficiency		**79.1**	%
Misc. Electric		**0.000**	kW

ECM-4 Garage Unit Heaters Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:06AM

1. General Details:

Air System Name	**ECM-4 Garage Unit Heaters**	
Equipment Type	**Split AHU**	
Air System Type	**Single Zone CAV**	
Number of zones	**1**	

2. System Components:

Ventilation Air Data:

Airflow Control	**Constant Ventilation Airflow**	
Ventilation Sizing Method	**Sum of Space OA Airflows**	
Unocc. Damper Position	**Closed**	
Damper Leak Rate	**0**	%
Outdoor Air CO2 Level	**400**	ppm

Central Heating Data:

Supply Temperature	**95.0**	°F
Heating Source	**Combustion - Natural Gas**	
Schedule	**JFM* * * * * OND**	
Capacity Control	**Cycled or Staged Capacity - Fan On**	

Supply Fan Data:

Fan Type	**Forward Curved**	
Configuration	**Draw-thru**	
Fan Performance	**0.00**	in wg
Overall Efficiency	**54**	%

Duct System Data:

Supply Duct Data:

Duct Heat Gain	**0**	%
Duct Leakage	**0**	%

Return Duct or Plenum Data:

Return Air Via	**Ducted Return**	

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-4 Garage	x1

Thermostats and Zone Data:

Zone	**All**	
Cooling T-stat: Occ.	**75.0**	°F
Cooling T-stat: Unocc.	**75.0**	°F
Heating T-stat: Occ.	**65.0**	°F
Heating T-stat: Unocc.	**65.0**	°F
T-stat Throttling Range	**1.50**	°F
Diversity Factor	**100**	%
Direct Exhaust Airflow	**0.0**	CFM
Direct Exhaust Fan kW	**0.0**	kW
Thermostat Schedule	**TStat Scehdule - Police**	
Unoccupied Cooling is	**Not Available**	

Supply Terminals Data:

Zone	**All**	
Terminal Type	**Diffuser**	
Minimum Airflow	**0.00**	CFM/person

Zone Heating Units:

Zone	**All**	
Zone Heating Unit Type	**None**	
Zone Unit Heat Source	**Electric Resistance**	
Zone Heating Unit Schedule	**JFMAMJJASOND**	

4. Sizing Data (Computer-Generated):

System Sizing Data:

Supply Fan Airflow	**2838.0**	CFM
Ventilation Airflow	**2838.0**	CFM
Heating Supply Temperature	**95.0**	°F

Hydronic Sizing Specifications:

Chilled Water Delta-T	**10.0**	°F
Hot Water Delta-T	**20.0**	°F

Safety Factors:

Cooling Sensible	**0**	%
Cooling Latent	**0**	%
Heating	**0**	%

Zone Sizing Data:

Zone Airflow Sizing Method	**Sum of space airflow rates**
Space Airflow Sizing Method	**Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- (CFM)
1	2838.0	-	-	

5. Equipment Data

Central Heating Unit - Combustion

Estimated Maximum Load		**218.6**	MBH
Equipment Sizing	**(Auto-Sized)**	**218.6**	MBH
Capacity Oversizing Factor		**0**	%
Average Efficiency		**80.0**	%
Misc. Electric		**0.000**	kW

ECM-4 Baseboard Radiators Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:05AM

1. General Details:

Air System Name ..... **ECM-4 Baseboard Radiators**
Equipment Type ..... **Terminal Units**
Air System Type ..... **2-Pipe Fan Coil**
Number of zones **1**
Ventilation ..... **Direct Ventilation**

2. Ventilation System Components:

(Common Ventilation System not used: no inputs)

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-4 Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **80.0** °F
Cooling T-stat: Unocc. ..... **80.0** °F
Heating T-stat: Occ. ..... **79.0** °F
Heating T-stat: Unocc. ..... **79.0** °F
T-stat Throttling Range ..... **1.50** °F

Thermostat Schedule ..... **TStat Scehdule - Police**
Unoccupied Cooling is ..... **Available**

Common Terminal Unit Data:

Heating Coil:

Design Supply Temperature ..... **95.0** °F
Heating Source ..... **Hot Water**
Schedule ..... **JFMA* * * * * OND**

Fan Control ..... **Fan On**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**

Terminal Units Data:

Zone ..... **All**
Terminal Type ..... **Fan Coil**
Minimum Airflow ..... **0.00** CFM/person
Fan Performance ..... **0.00** in wg
Fan Overall Efficiency ..... **50** %

4. Sizing Data (Computer-Generated):

System Sizing Data:

Heating Supply Temperature ..... **95.0** °F

Hydronic Sizing Specifications:

Chilled Water Delta-T ..... **10.0** °F
Hot Water Delta-T ..... **20.0** °F

Safety Factors:

Cooling Sensible ..... **0** %
Cooling Latent ..... **0** %
Heating ..... **0** %

Zone Sizing Data:

Zone Airflow Sizing Method ..... **Sum of space airflow rates**
Space Airflow Sizing Method ..... **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	Ventilation (CFM)
1	7188.6	-	-	320.0

5. Equipment Data

No Equipment Data required for this system.

ECM-4 Baseboard Radiators Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:05AM

Billing Details - Electric - ECM-4 Higher Eff Boiler

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:05AM

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	3,218	0	0	0	3,218
Feb	3,002	0	0	0	3,002
Mar	3,397	0	0	0	3,397
Apr	3,326	0	0	0	3,326
May	3,625	0	0	0	3,625
Jun	4,290	0	0	0	4,290
Jul	4,738	0	0	0	4,738
Aug	4,726	0	0	0	4,726
Sep	3,978	0	0	0	3,978
Oct	3,415	0	0	0	3,415
Nov	3,245	0	0	0	3,245
Dec	3,420	0	0	0	3,420
Totals	44,381	0	0	0	44,381

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	3,218	18,930	0.1700
Feb	3,002	17,659	0.1700
Mar	3,397	19,982	0.1700
Apr	3,326	19,563	0.1700
May	3,625	21,321	0.1700
Jun	4,290	25,236	0.1700
Jul	4,738	27,873	0.1700
Aug	4,726	27,801	0.1700
Sep	3,978	23,397	0.1700
Oct	3,415	20,089	0.1700
Nov	3,245	19,091	0.1700
Dec	3,420	20,120	0.1700
Totals	44,381	261,062	0.1700

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	18,930
Feb	0	0	0	0	17,659
Mar	0	0	0	0	19,982
Apr	0	0	0	0	19,563
May	0	0	0	0	21,321
Jun	0	0	0	0	25,236
Jul	0	0	0	0	27,873
Aug	0	0	0	0	27,801
Sep	0	0	0	0	23,397
Oct	0	0	0	0	20,089
Nov	0	0	0	0	19,091
Dec	0	0	0	0	20,120
Totals	0	0	0	0	261,062

4. Billing Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	70.8
Feb	0.0	0.0	0.0	0.0	70.8
Mar	0.0	0.0	0.0	0.0	81.1
Apr	0.0	0.0	0.0	0.0	88.7
May	0.0	0.0	0.0	0.0	96.6
Jun	0.0	0.0	0.0	0.0	95.2
Jul	0.0	0.0	0.0	0.0	98.2
Aug	0.0	0.0	0.0	0.0	94.4
Sep	0.0	0.0	0.0	0.0	90.9
Oct	0.0	0.0	0.0	0.0	90.8
Nov	0.0	0.0	0.0	0.0	75.9
Dec	0.0	0.0	0.0	0.0	71.5

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	70.8
Feb	0.0	0.0	0.0	0.0	70.8
Mar	0.0	0.0	0.0	0.0	81.1
Apr	0.0	0.0	0.0	0.0	88.7
May	0.0	0.0	0.0	0.0	96.6
Jun	0.0	0.0	0.0	0.0	95.2
Jul	0.0	0.0	0.0	0.0	98.2
Aug	0.0	0.0	0.0	0.0	94.4
Sep	0.0	0.0	0.0	0.0	90.9
Oct	0.0	0.0	0.0	0.0	90.8
Nov	0.0	0.0	0.0	0.0	75.9
Dec	0.0	0.0	0.0	0.0	71.5

6. Time Of Maximum Demands

Billing Period	Peak (m/d/h)	Mid-Peak (m/d/h)	Normal Peak (m/d/h)	Off-Peak (m/d/h)	Overall (m/d/h)
Jan	n/a	n/a	n/a	n/a	1/25/0800
Feb	n/a	n/a	n/a	n/a	2/1/0800
Mar	n/a	n/a	n/a	n/a	3/5/1600
Apr	n/a	n/a	n/a	n/a	4/19/1600
May	n/a	n/a	n/a	n/a	5/17/1500
Jun	n/a	n/a	n/a	n/a	6/11/1600
Jul	n/a	n/a	n/a	n/a	7/1/1600
Aug	n/a	n/a	n/a	n/a	8/4/1500
Sep	n/a	n/a	n/a	n/a	9/10/1500
Oct	n/a	n/a	n/a	n/a	10/1/1500
Nov	n/a	n/a	n/a	n/a	11/3/1600
Dec	n/a	n/a	n/a	n/a	12/2/1500

Monthly Component Costs - ECM-4 Higher Eff Boiler

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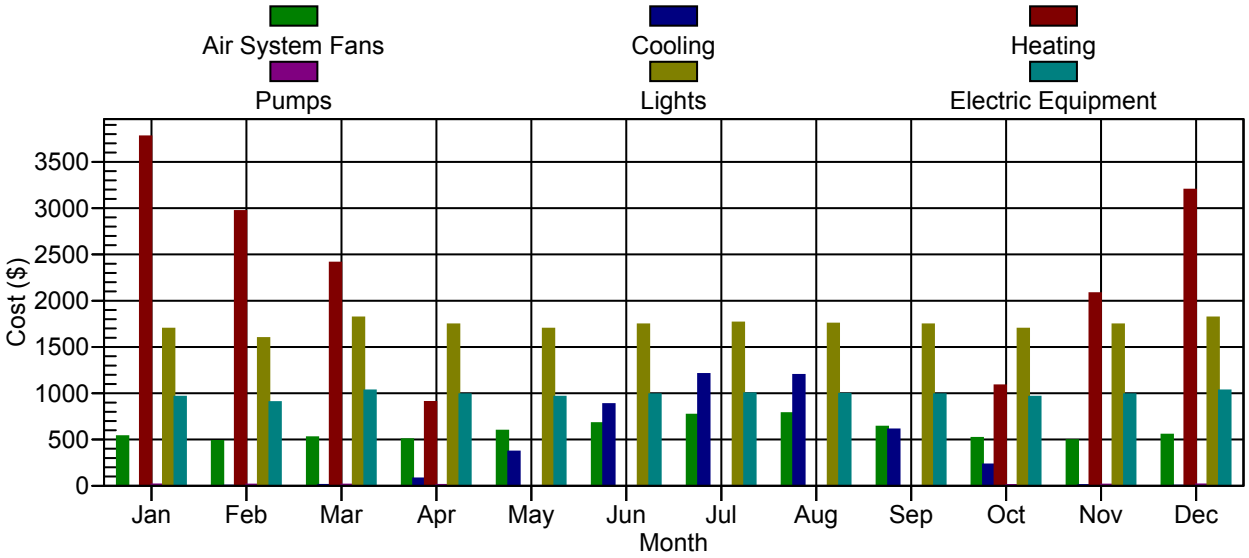

1. HVAC Component Costs

Month	Air System Fans ($)	Cooling ($)	Heating ($)	Pumps ($)	Cooling Towers ($)	HVAC Total ($)
January	536	0	3,775	14	0	4,325
February	484	0	2,968	12	0	3,464
March	523	9	2,412	12	0	2,956
April	503	80	905	9	0	1,497
May	596	369	0	0	0	965
June	677	882	0	0	0	1,559
July	768	1,207	0	0	0	1,975
August	784	1,197	0	0	0	1,981
September	638	608	0	0	0	1,246
October	517	230	1,084	7	0	1,838
November	493	4	2,082	12	0	2,591
December	552	1	3,199	13	0	3,765
Total	**7,072**	**4,587**	**16,425**	**80**	**0**	**28,163**

2. Non-HVAC Component Costs

Month	Lights ($)	Electric Equipment ($)	Misc. Electric ($)	Misc. Fuel Use ($)	Non-HVAC Total ($)	Grand Total ($)
January	1,698	962	0	0	2,660	6,985
February	1,595	904	0	0	2,499	5,963
March	1,818	1,030	0	0	2,848	5,804
April	1,744	988	0	0	2,732	4,229
May	1,698	962	0	0	2,660	3,625
June	1,744	988	0	0	2,732	4,291
July	1,763	999	0	0	2,763	4,738
August	1,752	993	0	0	2,745	4,726
September	1,744	988	0	0	2,732	3,978
October	1,698	962	0	0	2,660	4,498
November	1,744	988	0	0	2,732	5,323
December	1,818	1,030	0	0	2,848	6,613
Total	**20,814**	**11,795**	**0**	**0**	**32,610**	**60,773**

Monthly Energy Costs - ECM-4 Higher Eff Boiler

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
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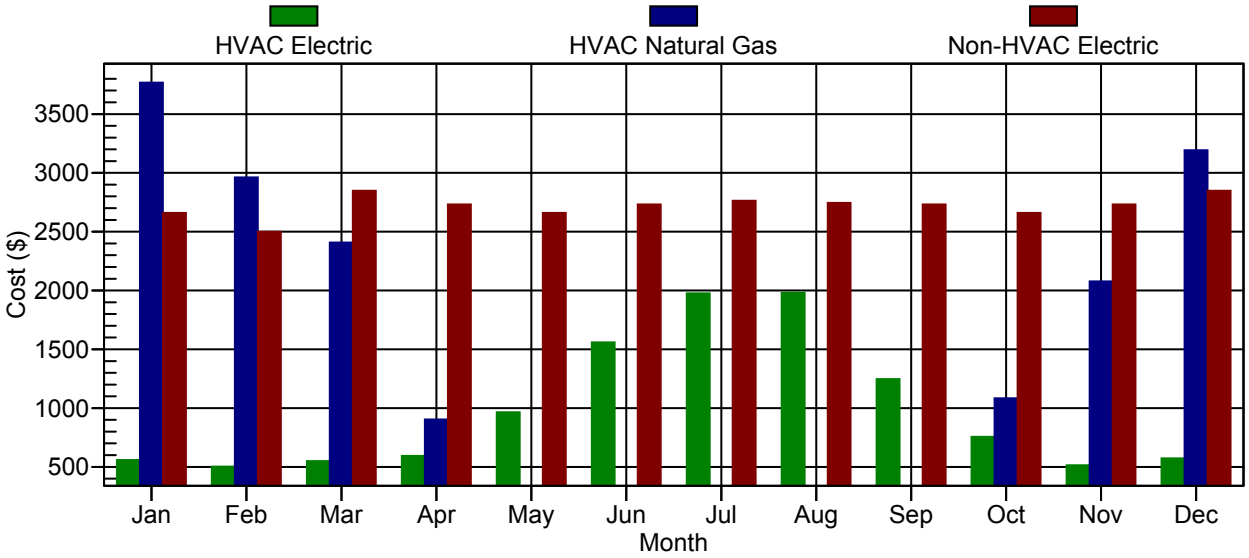

1. HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)	Remote Chilled Water ($)
January	558	3,767	0	0	0	0	0
February	503	2,962	0	0	0	0	0
March	549	2,407	0	0	0	0	0
April	594	903	0	0	0	0	0
May	964	0	0	0	0	0	0
June	1,559	0	0	0	0	0	0
July	1,976	0	0	0	0	0	0
August	1,981	0	0	0	0	0	0
September	1,246	0	0	0	0	0	0
October	755	1,083	0	0	0	0	0
November	514	2,078	0	0	0	0	0
December	573	3,192	0	0	0	0	0
Total	**11,771**	**16,392**	**0**	**0**	**0**	**0**	**0**

2. Non-HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)
January	2,660	0	0	0	0	0
February	2,500	0	0	0	0	0
March	2,848	0	0	0	0	0
April	2,732	0	0	0	0	0
May	2,660	0	0	0	0	0
June	2,732	0	0	0	0	0
July	2,763	0	0	0	0	0
August	2,745	0	0	0	0	0
September	2,732	0	0	0	0	0
October	2,660	0	0	0	0	0
November	2,732	0	0	0	0	0
December	2,848	0	0	0	0	0
Total	**32,610**	**0**	**0**	**0**	**0**	**0**

Monthly Energy Use by Energy Type - ECM-4 Higher Eff Boiler

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1. HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)	Remote CW (na)
Jan	3,282	2,749	0	0	0	0	0
Feb	2,957	2,162	0	0	0	0	0
Mar	3,231	1,757	0	0	0	0	0
Apr	3,495	659	0	0	0	0	0
May	5,673	0	0	0	0	0	0
Jun	9,168	0	0	0	0	0	0
Jul	11,621	0	0	0	0	0	0
Aug	11,654	0	0	0	0	0	0
Sep	7,329	0	0	0	0	0	0
Oct	4,441	790	0	0	0	0	0
Nov	3,023	1,516	0	0	0	0	0
Dec	3,369	2,330	0	0	0	0	0
Totals	69,243	11,965	0	0	0	0	0

2. Non-HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)
Jan	15,648	0	0	0	0	0
Feb	14,703	0	0	0	0	0
Mar	16,751	0	0	0	0	0
Apr	16,068	0	0	0	0	0
May	15,648	0	0	0	0	0
Jun	16,068	0	0	0	0	0
Jul	16,252	0	0	0	0	0
Aug	16,147	0	0	0	0	0
Sep	16,068	0	0	0	0	0
Oct	15,648	0	0	0	0	0
Nov	16,068	0	0	0	0	0
Dec	16,751	0	0	0	0	0
Totals	191,821	0	0	0	0	0

Monthly Energy Use by Component - ECM-4 Higher Eff Boiler

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:05AM

1. Monthly Energy Use by System Component

Component	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Air System Fans (kWh)	3153	2848	3079	2959	3503	3981	4518	4614	3754	3041	2900	3246
Cooling												
Electric (kWh)	0	0	54	470	2170	5186	7103	7040	3575	1355	26	3
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote CW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Heating												
Electric (kWh)	49	36	25	12	0	0	0	0	0	6	24	41
Natural Gas (Therm)	2749	2162	1757	659	0	0	0	0	0	790	1516	2330
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Pumps (kWh)	80	72	73	54	0	0	0	0	0	39	73	79
Clg. Tower Fans (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Lighting (kWh)	9988	9385	10692	10256	9988	10256	10374	10306	10256	9988	10256	10692
Electric Eqpt. (kWh)	5660	5318	6059	5812	5660	5812	5879	5841	5812	5660	5812	6059
Misc. Electric (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Fuel												
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0

Annual Cost Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:05AM

Table 1. Annual Costs

Component	ECM-4 Higher Eff Boiler ($)
Air System Fans	7,072
Cooling	4,587
Heating	16,425
Pumps	80
Cooling Tower Fans	0
HVAC Sub-Total	**28,163**
Lights	20,814
Electric Equipment	11,795
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	**32,610**
Grand Total	**60,773**

Table 2. Annual Cost per Unit Floor Area

Component	ECM-4 Higher Eff Boiler ($/ft²)
Air System Fans	0.541
Cooling	0.351
Heating	1.257
Pumps	0.006
Cooling Tower Fans	0.000
HVAC Sub-Total	**2.156**
Lights	1.593
Electric Equipment	0.903
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.652**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	ECM-4 Higher Eff Boiler (%)
Air System Fans	11.6
Cooling	7.5
Heating	27.0
Pumps	0.1
Cooling Tower Fans	0.0
HVAC Sub-Total	**46.3**
Lights	34.2
Electric Equipment	19.4
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	**53.7**
Grand Total	**100.0**

Annual Energy and Emissions Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:05AM

Table 1. Annual Costs

Component	ECM-4 Higher Eff Boiler ($)
HVAC Components	
Electric	11,771
Natural Gas	16,392
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Remote CW	0
HVAC Sub-Total	**28,163**
Non-HVAC Components	
Electric	32,610
Natural Gas	0
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Non-HVAC Sub-Total	**32,610**
Grand Total	**60,773**

Table 2. Annual Energy Consumption

Component	ECM-4 Higher Eff Boiler
HVAC Components	
Electric (kWh)	69,243
Natural Gas (Therm)	11,965
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0
Non-HVAC Components	
Electric (kWh)	191,821
Natural Gas (Therm)	0
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Totals	
Electric (kWh)	261,064
Natural Gas (Therm)	11,965
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0

Table 3. Annual Emissions

Component	ECM-4 Higher Eff Boiler
CO2 Equivalent (lb)	0

Table 4. Annual Cost per Unit Floor Area

Component	ECM-4 Higher Eff Boiler ($/ft²)
HVAC Components	
Electric	0.901
Natural Gas	1.255
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Remote CW	0.000
HVAC Sub-Total	**2.156**
Non-HVAC Components	
Electric	2.496
Natural Gas	0.000
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.652**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 5. Component Cost as a Percentage of Total Cost

Component	ECM-4 Higher Eff Boiler (%)
HVAC Components	
Electric	19.4
Natural Gas	27.0
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Remote CW	0.0
HVAC Sub-Total	**46.3**
Non-HVAC Components	
Electric	53.7
Natural Gas	0.0
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Non-HVAC Sub-Total	**53.7**
Grand Total	**100.0**

APPENDIX G

ECM-5 Revise Boiler Controls to Utilize Both Outdoor and Indoor Temperatures

BPU ENERGY AUDIT PROGRAM
Bourough of Mountain Lakes Borough Hall
CHA Project #21795

ECM-5 Revise Boiler Controls to Utilize Both Outdoor and Indoor Temperatures

Multipliers	
Material	0.98
Labor	1.21
Equipment	1.07

Installation Costs										
	Qty	Unit	Unit Costs			Subtotal Costs			Total Cost	Remarks
			Material	Labor	Equipment	Material	Labor	Equipment		
Hydronic Heating Control Valve, Nonelectric, Thermostatic	11	ea	$57	$21		$614	$280	$0	$894	

Subtotal	$894
10% OH, 10% Profit	$89
10% Contingency	$89
Total	$1,073

BPU ENERGY AUDIT PROGRAM
Bourough of Mountain Lakes Borough Hall
CHA Project #21795

ECM-5 Revise Boiler Controls to Utilize Both Outdoor and Indoor Temperatures

Annual Energy Use Comparison			
	Electricity kWh	Natural Gas therms	Cost $
Existing Boiler Boiler Controls (Outside Air Sensor Only)	261,064	12,010	$ 60,800.00
New Boiler Controls (Outside and Indoor Sensors Air)	260,870	10,835	$ 59,200.00
Difference	194	1,175	$ 1,600.00

ECM-5 Boiler

Boiler Full Load Details

Gross Output	**167.0**	MBH
Overall Efficiency	**80.0**	%
Fuel or Energy Type	**Natural Gas**	
Boiler Accessories	**0.15**	kW
Hot Water Flow Rate	**20.0**	°F

Part Load Model

Part Load Model ..... **Constant Efficiency**

Part Load Performance

% Load	Efficiency (%)
100.0	80.0
90.0	80.0
80.0	80.0
70.0	80.0
60.0	80.0
50.0	80.0
40.0	80.0
30.0	80.0
20.0	80.0
10.0	80.0
0.0	80.0

ECM-5 Existing Multi-Zone HVAC U Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:07AM

1. General Details:

Air System Name ..... **ECM-5 Existing Multi-Zone HVAC U**
Equipment Type ..... **Packaged Rooftop Units**
Air System Type ..... **2-Deck Multizone**
Number of zones **6**

2. System Components:

Ventilation Air Data:

Airflow Control ..... **Constant Ventilation Airflow**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Unocc. Damper Position ..... **Closed**
Damper Leak Rate ..... **5** %
Outdoor Air CO2 Level ..... **400** ppm

Economizer Data:

Control ..... **Integrated enthalpy control**
Upper Cutoff ..... **73.0** °F
Lower Cutoff ..... **-60.0** °F

Central Cooling Data:

Supply Air Temperature ..... **55.0** °F
Coil Bypass Factor **0.100**
Cooling Source ..... **Air-Cooled DX**
Schedule ..... **JFMAMJJASOND**
Capacity Control ..... **Constant Temperature - Fan On**

Central Heating Data:

Supply Temperature ..... **95.0** °F
Heating Source ..... **Combustion - Natural Gas**
Schedule ..... **JFMA* * * * * OND**
Capacity Control ..... **Cycled or Staged Capacity - Fan On**

Supply Fan Data:

Fan Type ..... **Forward Curved**
Configuration ..... **Blow-thru**
Fan Performance ..... **1.50** in wg
Overall Efficiency ..... **54** %

Duct System Data:

Supply Duct Data:

Duct Heat Gain ..... **0** %
Duct Leakage ..... **0** %

Return Duct or Plenum Data:

Return Air Via ..... **Ducted Return**

Return Fan Data:

Fan Type ..... **Forward Curved with Inlet Guide Vanes**
Fan Performance ..... **1.00** in wg
Overall Efficiency ..... **54** %

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-5 Conference Lower	x1
Zone 2: Zone 2	
ECM-5 Council Lower	x1
Zone 3: Zone 3	
ECM-5 Hall Lower	x1
Zone 4: Zone 4	
ECM-5 Permit Lower	x1
Zone 5: Zone 5	
ECM-5 Police Lower Level	x1
Zone 6: Zone 6	
ECM-5 Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **69.0** °F

Cooling T-stat: Unocc. **71.0** °F
Heating T-stat: Occ. **64.0** °F
Heating T-stat: Unocc. **64.0** °F
T-stat Throttling Range **1.50** °F
Diversity Factor **100** %
Direct Exhaust Airflow **0.0** CFM
Direct Exhaust Fan kW **0.0** kW

Thermostat Schedule **TStat Scehdule - Upper**
Unoccupied Cooling is **Available**

Supply Terminals Data:
Zone **All**
Terminal Type **Diffuser**
Minimum Airflow **0.00** CFM/person

Zone Heating Units:
Zone **All**
Zone Heating Unit Type **None**

Zone Unit Heat Source **Electric Resistance**
Zone Heating Unit Schedule **JFMAMJJASOND**

4. Sizing Data (Computer-Generated):

System Sizing Data:
Cold Deck Supply Temperature **55.0** °F
Supply Fan Airflow **21287.2** CFM
Ventilation Airflow **920.0** CFM
Hot Deck Supply Temperature **95.0** °F

Hydronic Sizing Specifications:
Chilled Water Delta-T **10.0** °F
Hot Water Delta-T **20.0** °F

Safety Factors:
Cooling Sensible **10** %
Cooling Latent **10** %
Heating **10** %

Zone Sizing Data:
Zone Airflow Sizing Method **Sum of space airflow rates**
Space Airflow Sizing Method **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- -
1	619.1	-	-	-
2	2282.8	-	-	-
3	376.0	-	-	-
4	360.0	-	-	-
5	5204.9	-	-	
6	12444.4	-	-	

5. Equipment Data

Central Cooling Unit - Air-Cooled DX
Estimated Maximum Load **414.2** MBH
Design OAT **95.0** °F
Equipment Sizing **(Auto-Sized) 414.2** MBH
Capacity Oversizing Factor **0** %
ARI Performance Rating **10.30** EER
Conventional Cutoff OAT **55.0** °F
Low Temperature Operation **Used**
Low Temperature Cutoff OAT **0.0** °F

Central Heating Unit - Combustion

Estimated Maximum Load		**200.7**	MBH
Equipment Sizing	**(Auto-Sized)**	**200.7**	MBH
Capacity Oversizing Factor		**0**	%
Average Efficiency		**79.1**	%
Misc. Electric		**0.000**	kW

ECM-5 Garage Unit Heaters Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:07AM

1. General Details:

Air System Name	**ECM-5 Garage Unit Heaters**	
Equipment Type	**Split AHU**	
Air System Type	**Single Zone CAV**	
Number of zones	**1**	

2. System Components:

Ventilation Air Data:

Airflow Control	**Constant Ventilation Airflow**	
Ventilation Sizing Method	**Sum of Space OA Airflows**	
Unocc. Damper Position	**Closed**	
Damper Leak Rate	**0**	%
Outdoor Air CO2 Level	**400**	ppm

Central Heating Data:

Supply Temperature	**95.0**	°F
Heating Source	**Combustion - Natural Gas**	
Schedule	**JFM* * * * * OND**	
Capacity Control	**Cycled or Staged Capacity - Fan On**	

Supply Fan Data:

Fan Type	**Forward Curved**	
Configuration	**Draw-thru**	
Fan Performance	**0.00**	in wg
Overall Efficiency	**54**	%

Duct System Data:

Supply Duct Data:

Duct Heat Gain	**0**	%
Duct Leakage	**0**	%

Return Duct or Plenum Data:

Return Air Via	**Ducted Return**	

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-5 Garage	x1

Thermostats and Zone Data:

Zone	**All**	
Cooling T-stat: Occ.	**75.0**	°F
Cooling T-stat: Unocc.	**75.0**	°F
Heating T-stat: Occ.	**65.0**	°F
Heating T-stat: Unocc.	**65.0**	°F
T-stat Throttling Range	**1.50**	°F
Diversity Factor	**100**	%
Direct Exhaust Airflow	**0.0**	CFM
Direct Exhaust Fan kW	**0.0**	kW
Thermostat Schedule	**TStat Scehdule - Police**	
Unoccupied Cooling is	**Not Available**	

Supply Terminals Data:

Zone	**All**	
Terminal Type	**Diffuser**	
Minimum Airflow	**0.00**	CFM/person

Zone Heating Units:

Zone	**All**	
Zone Heating Unit Type	**None**	
Zone Unit Heat Source	**Electric Resistance**	
Zone Heating Unit Schedule	**JFMAMJJASOND**	

4. Sizing Data (Computer-Generated):

System Sizing Data:

Supply Fan Airflow	**2838.0**	CFM
Ventilation Airflow	**2838.0**	CFM
Heating Supply Temperature	**95.0**	°F

Hydronic Sizing Specifications:

Chilled Water Delta-T	**10.0**	°F
Hot Water Delta-T	**20.0**	°F

Safety Factors:

Cooling Sensible	**0**	%
Cooling Latent	**0**	%
Heating	**0**	%

Zone Sizing Data:

Zone Airflow Sizing Method	**Sum of space airflow rates**
Space Airflow Sizing Method	**Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- (CFM)
1	2838.0	-	-	

5. Equipment Data

Central Heating Unit - Combustion

Estimated Maximum Load		**218.6**	MBH
Equipment Sizing	**(Auto-Sized)**	**218.6**	MBH
Capacity Oversizing Factor		**0**	%
Average Efficiency		**80.0**	%
Misc. Electric		**0.000**	kW

ECM-5 Baseboard Radiators Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:07AM

1. General Details:

Air System Name ..... **ECM-5 Baseboard Radiators**
Equipment Type ..... **Terminal Units**
Air System Type ..... **2-Pipe Fan Coil**
Number of zones **1**
Ventilation ..... **Direct Ventilation**

2. Ventilation System Components:

(Common Ventilation System not used: no inputs)

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-5 Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **80.0** °F
Cooling T-stat: Unocc. ..... **80.0** °F
Heating T-stat: Occ. ..... **70.0** °F
Heating T-stat: Unocc. ..... **70.0** °F
T-stat Throttling Range ..... **1.50** °F

Thermostat Schedule ..... **TStat Scehdule - Upper**
Unoccupied Cooling is ..... **Available**

Common Terminal Unit Data:

Heating Coil:

Design Supply Temperature ..... **95.0** °F
Heating Source ..... **Hot Water**
Schedule ..... **JFMA* * * * * OND**

Fan Control ..... **Fan On**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**

Terminal Units Data:

Zone ..... **All**
Terminal Type ..... **Fan Coil**
Minimum Airflow ..... **0.00** CFM/person
Fan Performance ..... **0.00** in wg
Fan Overall Efficiency ..... **50** %

4. Sizing Data (Computer-Generated):

System Sizing Data:

Heating Supply Temperature ..... **95.0** °F

Hydronic Sizing Specifications:

Chilled Water Delta-T ..... **10.0** °F
Hot Water Delta-T ..... **20.0** °F

Safety Factors:

Cooling Sensible ..... **0** %
Cooling Latent ..... **0** %
Heating ..... **0** %

Zone Sizing Data:

Zone Airflow Sizing Method ..... **Sum of space airflow rates**
Space Airflow Sizing Method ..... **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	Ventilation (CFM)
1	3903.9	-	-	320.0

5. Equipment Data

No Equipment Data required for this system.

Billing Details - Electric - ECM-5 Boiler Indoor/Outdoor

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Kitchen and Associates

08/17/2010
09:06AM

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	3,215	0	0	0	3,215
Feb	2,999	0	0	0	2,999
Mar	3,392	0	0	0	3,392
Apr	3,319	0	0	0	3,319
May	3,625	0	0	0	3,625
Jun	4,290	0	0	0	4,290
Jul	4,738	0	0	0	4,738
Aug	4,726	0	0	0	4,726
Sep	3,978	0	0	0	3,978
Oct	3,409	0	0	0	3,409
Nov	3,240	0	0	0	3,240
Dec	3,417	0	0	0	3,417
Totals	44,348	0	0	0	44,348

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	3,215	18,911	0.1700
Feb	2,999	17,641	0.1700
Mar	3,392	19,952	0.1700
Apr	3,319	19,525	0.1700
May	3,625	21,321	0.1700
Jun	4,290	25,236	0.1700
Jul	4,738	27,873	0.1700
Aug	4,726	27,801	0.1700
Sep	3,978	23,397	0.1700
Oct	3,409	20,054	0.1700
Nov	3,240	19,059	0.1700
Dec	3,417	20,099	0.1700
Totals	44,348	260,868	0.1700

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	18,911
Feb	0	0	0	0	17,641
Mar	0	0	0	0	19,952
Apr	0	0	0	0	19,525
May	0	0	0	0	21,321
Jun	0	0	0	0	25,236
Jul	0	0	0	0	27,873
Aug	0	0	0	0	27,801
Sep	0	0	0	0	23,397
Oct	0	0	0	0	20,054
Nov	0	0	0	0	19,059
Dec	0	0	0	0	20,099
Totals	0	0	0	0	260,868

4. Billing Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	70.8
Feb	0.0	0.0	0.0	0.0	70.8
Mar	0.0	0.0	0.0	0.0	81.1
Apr	0.0	0.0	0.0	0.0	88.7
May	0.0	0.0	0.0	0.0	96.6
Jun	0.0	0.0	0.0	0.0	95.2
Jul	0.0	0.0	0.0	0.0	98.2
Aug	0.0	0.0	0.0	0.0	94.4
Sep	0.0	0.0	0.0	0.0	90.9
Oct	0.0	0.0	0.0	0.0	90.8
Nov	0.0	0.0	0.0	0.0	75.9
Dec	0.0	0.0	0.0	0.0	71.6

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	70.8
Feb	0.0	0.0	0.0	0.0	70.8
Mar	0.0	0.0	0.0	0.0	81.1
Apr	0.0	0.0	0.0	0.0	88.7
May	0.0	0.0	0.0	0.0	96.6
Jun	0.0	0.0	0.0	0.0	95.2
Jul	0.0	0.0	0.0	0.0	98.2
Aug	0.0	0.0	0.0	0.0	94.4
Sep	0.0	0.0	0.0	0.0	90.9
Oct	0.0	0.0	0.0	0.0	90.8
Nov	0.0	0.0	0.0	0.0	75.9
Dec	0.0	0.0	0.0	0.0	71.6

6. Time Of Maximum Demands

Billing Period	Peak (m/d/h)	Mid-Peak (m/d/h)	Normal Peak (m/d/h)	Off-Peak (m/d/h)	Overall (m/d/h)
Jan	n/a	n/a	n/a	n/a	1/25/0800
Feb	n/a	n/a	n/a	n/a	2/1/0800
Mar	n/a	n/a	n/a	n/a	3/5/1600
Apr	n/a	n/a	n/a	n/a	4/19/1600
May	n/a	n/a	n/a	n/a	5/17/1500
Jun	n/a	n/a	n/a	n/a	6/11/1600
Jul	n/a	n/a	n/a	n/a	7/1/1600
Aug	n/a	n/a	n/a	n/a	8/4/1500
Sep	n/a	n/a	n/a	n/a	9/10/1500
Oct	n/a	n/a	n/a	n/a	10/1/1500
Nov	n/a	n/a	n/a	n/a	11/3/1600
Dec	n/a	n/a	n/a	n/a	12/2/1500

Monthly Component Costs - ECM-5 Boiler Indoor/Outdoor

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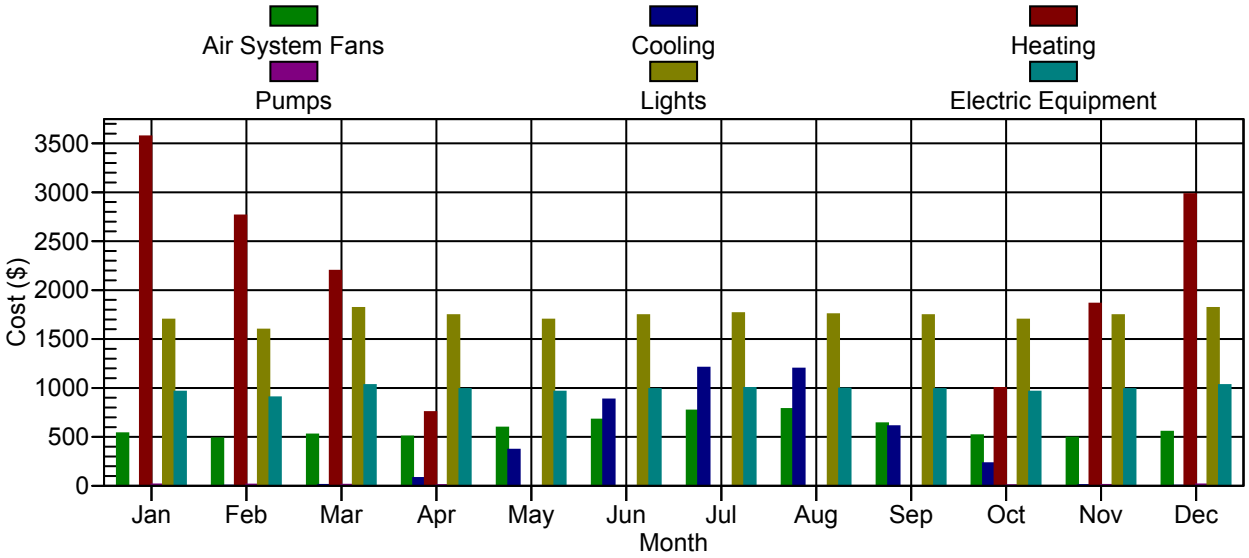

1. HVAC Component Costs

Month	Air System Fans ($)	Cooling ($)	Heating ($)	Pumps ($)	Cooling Towers ($)	HVAC Total ($)
January	536	0	3,571	14	0	4,121
February	484	0	2,762	12	0	3,258
March	523	9	2,198	10	0	2,740
April	503	80	753	4	0	1,340
May	596	369	0	0	0	965
June	677	882	0	0	0	1,559
July	768	1,207	0	0	0	1,975
August	784	1,197	0	0	0	1,981
September	638	608	0	0	0	1,246
October	517	230	1,000	2	0	1,749
November	493	4	1,862	10	0	2,369
December	552	1	2,980	13	0	3,546
Total	**7,072**	**4,587**	**15,128**	**64**	**0**	**26,850**

2. Non-HVAC Component Costs

Month	Lights ($)	Electric Equipment ($)	Misc. Electric ($)	Misc. Fuel Use ($)	Non-HVAC Total ($)	Grand Total ($)
January	1,698	962	0	0	2,660	6,781
February	1,595	904	0	0	2,499	5,757
March	1,818	1,030	0	0	2,848	5,588
April	1,744	988	0	0	2,732	4,072
May	1,698	962	0	0	2,660	3,625
June	1,744	988	0	0	2,732	4,291
July	1,763	999	0	0	2,763	4,738
August	1,752	993	0	0	2,745	4,726
September	1,744	988	0	0	2,732	3,978
October	1,698	962	0	0	2,660	4,409
November	1,744	988	0	0	2,732	5,101
December	1,818	1,030	0	0	2,848	6,394
Total	**20,814**	**11,795**	**0**	**0**	**32,610**	**59,460**

Monthly Energy Costs - ECM-5 Boiler Indoor/Outdoor

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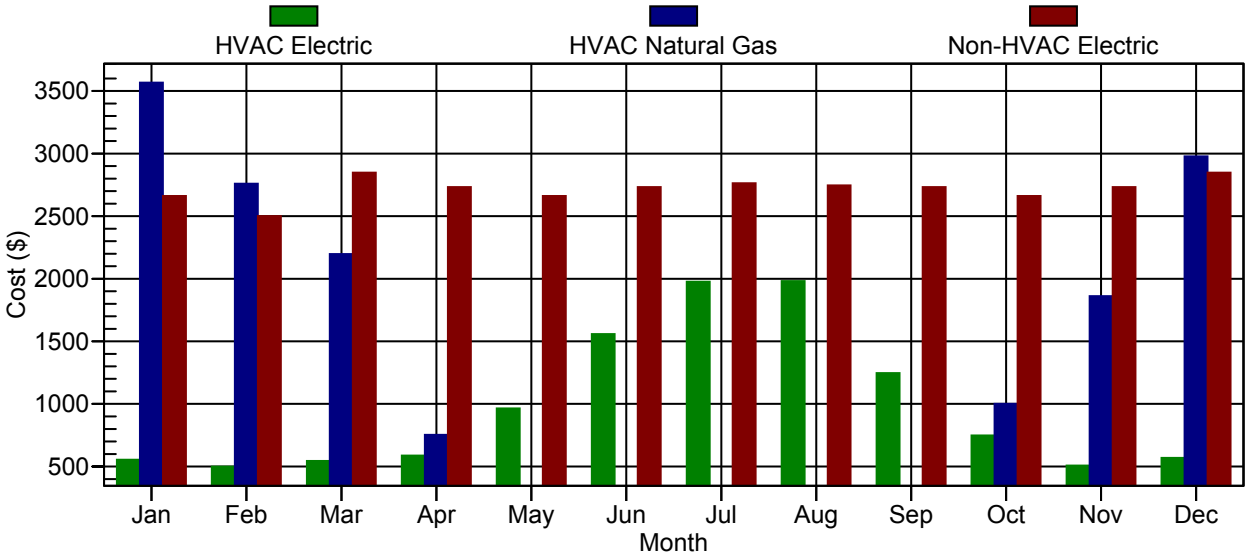

1. HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)	Remote Chilled Water ($)
January	555	3,566	0	0	0	0	0
February	500	2,759	0	0	0	0	0
March	544	2,196	0	0	0	0	0
April	588	753	0	0	0	0	0
May	964	0	0	0	0	0	0
June	1,559	0	0	0	0	0	0
July	1,976	0	0	0	0	0	0
August	1,981	0	0	0	0	0	0
September	1,246	0	0	0	0	0	0
October	749	1,000	0	0	0	0	0
November	508	1,861	0	0	0	0	0
December	569	2,977	0	0	0	0	0
Total	**11,738**	**15,112**	**0**	**0**	**0**	**0**	**0**

2. Non-HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)
January	2,660	0	0	0	0	0
February	2,500	0	0	0	0	0
March	2,848	0	0	0	0	0
April	2,732	0	0	0	0	0
May	2,660	0	0	0	0	0
June	2,732	0	0	0	0	0
July	2,763	0	0	0	0	0
August	2,745	0	0	0	0	0
September	2,732	0	0	0	0	0
October	2,660	0	0	0	0	0
November	2,732	0	0	0	0	0
December	2,848	0	0	0	0	0
Total	**32,610**	**0**	**0**	**0**	**0**	**0**

Monthly Energy Use by Energy Type - ECM-5 Boiler Indoor/Outdoor

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:06AM

1. HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)	Remote CW (na)
Jan	3,263	2,603	0	0	0	0	0
Feb	2,938	2,014	0	0	0	0	0
Mar	3,201	1,603	0	0	0	0	0
Apr	3,457	550	0	0	0	0	0
May	5,673	0	0	0	0	0	0
Jun	9,168	0	0	0	0	0	0
Jul	11,621	0	0	0	0	0	0
Aug	11,654	0	0	0	0	0	0
Sep	7,329	0	0	0	0	0	0
Oct	4,406	730	0	0	0	0	0
Nov	2,991	1,358	0	0	0	0	0
Dec	3,348	2,173	0	0	0	0	0
Totals	69,049	11,031	0	0	0	0	0

2. Non-HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)
Jan	15,648	0	0	0	0	0
Feb	14,703	0	0	0	0	0
Mar	16,751	0	0	0	0	0
Apr	16,068	0	0	0	0	0
May	15,648	0	0	0	0	0
Jun	16,068	0	0	0	0	0
Jul	16,252	0	0	0	0	0
Aug	16,147	0	0	0	0	0
Sep	16,068	0	0	0	0	0
Oct	15,648	0	0	0	0	0
Nov	16,068	0	0	0	0	0
Dec	16,751	0	0	0	0	0
Totals	191,821	0	0	0	0	0

Monthly Energy Use by Component - ECM-5 Boiler Indoor/Outdoor

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:06AM

1. Monthly Energy Use by System Component

Component	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Air System Fans (kWh)	3153	2848	3079	2959	3503	3981	4518	4614	3754	3041	2900	3246
Cooling												
Electric (kWh)	0	0	54	470	2170	5186	7103	7040	3575	1355	26	3
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote CW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Heating												
Electric (kWh)	30	20	10	2	0	0	0	0	0	1	9	23
Natural Gas (Therm)	2603	2014	1603	550	0	0	0	0	0	730	1358	2173
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Pumps (kWh)	80	70	58	25	0	0	0	0	0	9	56	76
Clg. Tower Fans (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Lighting (kWh)	9988	9385	10692	10256	9988	10256	10374	10306	10256	9988	10256	10692
Electric Eqpt. (kWh)	5660	5318	6059	5812	5660	5812	5879	5841	5812	5660	5812	6059
Misc. Electric (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Fuel												
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0

Annual Cost Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:06AM

Table 1. Annual Costs

Component	ECM-5 Boiler Indoor/Outdoor ($)
Air System Fans	7,072
Cooling	4,587
Heating	15,128
Pumps	64
Cooling Tower Fans	0
HVAC Sub-Total	**26,850**
Lights	20,814
Electric Equipment	11,795
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	**32,610**
Grand Total	**59,460**

Table 2. Annual Cost per Unit Floor Area

Component	ECM-5 Boiler Indoor/Outdoor ($/ft²)
Air System Fans	0.541
Cooling	0.351
Heating	1.158
Pumps	0.005
Cooling Tower Fans	0.000
HVAC Sub-Total	**2.055**
Lights	1.593
Electric Equipment	0.903
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.552**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	ECM-5 Boiler Indoor/Outdoor (%)
Air System Fans	11.9
Cooling	7.7
Heating	25.4
Pumps	0.1
Cooling Tower Fans	0.0
HVAC Sub-Total	**45.2**
Lights	35.0
Electric Equipment	19.8
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	**54.8**
Grand Total	**100.0**

Annual Energy and Emissions Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:06AM

Table 1. Annual Costs

Component	ECM-5 Boiler Indoor/Outdoor ($)
HVAC Components	
Electric	11,738
Natural Gas	15,112
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Remote CW	0
HVAC Sub-Total	**26,850**
Non-HVAC Components	
Electric	32,610
Natural Gas	0
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Non-HVAC Sub-Total	**32,610**
Grand Total	**59,460**

Table 2. Annual Energy Consumption

Component	ECM-5 Boiler Indoor/Outdoor
HVAC Components	
Electric (kWh)	69,049
Natural Gas (Therm)	11,031
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0
Non-HVAC Components	
Electric (kWh)	191,821
Natural Gas (Therm)	0
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Totals	
Electric (kWh)	260,870
Natural Gas (Therm)	11,031
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0

Table 3. Annual Emissions

Component	ECM-5 Boiler Indoor/Outdoor
CO2 Equivalent (lb)	0

Table 4. Annual Cost per Unit Floor Area

Component	ECM-5 Boiler Indoor/Outdoor ($/ft²)
HVAC Components	
Electric	0.899
Natural Gas	1.157
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Remote CW	0.000
HVAC Sub-Total	**2.055**
Non-HVAC Components	
Electric	2.496
Natural Gas	0.000
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.551**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 5. Component Cost as a Percentage of Total Cost

Component	ECM-5 Boiler Indoor/Outdoor (%)
HVAC Components	
Electric	19.7
Natural Gas	25.4
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Remote CW	0.0
HVAC Sub-Total	**45.2**
Non-HVAC Components	
Electric	54.8
Natural Gas	0.0
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Non-HVAC Sub-Total	**54.8**
Grand Total	**100.0**

APPENDIX H

ECM-6 Seal Openings Around Fire Bay Doors

BPU ENERGY AUDIT PROGRAM
Bourough of Mountain Lakes Borough Hall
CHA Project #21795

ECM-6 Seal Opening Around Fire Bay Doors

Multipliers	
Material	0.98
Labor	1.21
Equipment	1.07

Installation Costs										
	Qty	Unit	Unit Costs			Subtotal Costs			Total Cost	Remarks
			Material	Labor	Equipment	Material	Labor	Equipment		
15 Feet of Sponge Rubber Weatherstripping*	9	ea	$30			$265	$0	$0	$265	

*Weatherstripping shall be installed as part of a maintenance program, eliminating contractor labor costs

Subtotal	$265
10% OH, 10% Profit	$26
10% Contingency	$26
Total	$318

BPU ENERGY AUDIT PROGRAM
Bourough of Mountain Lakes Borough Hall
CHA Project #21795

ECM-6 Seal Opening Around Fire Bay Doors

Annual Energy Use Comparison			
	Electricity kWh	Natural Gas therms	Cost $
Existing Fire Bay Doors	261,064	12,010	$ 60,800.00
Sealed Fire Bay Doors	261,064	11,875	$ 60,600.00
Difference	0	135	$ 200.00

ECM-6 Boiler

Boiler Full Load Details

Gross Output	**167.0**	MBH
Overall Efficiency	**80.0**	%
Fuel or Energy Type	**Natural Gas**	
Boiler Accessories	**0.15**	kW
Hot Water Flow Rate	**20.0**	°F

Part Load Model

Part Load Model ..... **Constant Efficiency**

Part Load Performance

% Load	Efficiency (%)
100.0	80.0
90.0	80.0
80.0	80.0
70.0	80.0
60.0	80.0
50.0	80.0
40.0	80.0
30.0	80.0
20.0	80.0
10.0	80.0
0.0	80.0

ECM-6 Existing Multi-Zone HVAC U Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:08AM

1. General Details:

Air System Name ..... **ECM-6 Existing Multi-Zone HVAC U**
Equipment Type ..... **Packaged Rooftop Units**
Air System Type ..... **2-Deck Multizone**
Number of zones **6**

2. System Components:

Ventilation Air Data:

Airflow Control ..... **Constant Ventilation Airflow**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Unocc. Damper Position ..... **Closed**
Damper Leak Rate ..... **5** %
Outdoor Air CO2 Level ..... **400** ppm

Economizer Data:

Control ..... **Integrated enthalpy control**
Upper Cutoff ..... **73.0** °F
Lower Cutoff ..... **-60.0** °F

Central Cooling Data:

Supply Air Temperature ..... **55.0** °F
Coil Bypass Factor **0.100**
Cooling Source ..... **Air-Cooled DX**
Schedule ..... **JFMAMJJASOND**
Capacity Control ..... **Constant Temperature - Fan On**

Central Heating Data:

Supply Temperature ..... **95.0** °F
Heating Source ..... **Combustion - Natural Gas**
Schedule ..... **JFMA* * * * * OND**
Capacity Control ..... **Cycled or Staged Capacity - Fan On**

Supply Fan Data:

Fan Type ..... **Forward Curved**
Configuration ..... **Blow-thru**
Fan Performance ..... **1.50** in wg
Overall Efficiency ..... **54** %

Duct System Data:

Supply Duct Data:

Duct Heat Gain ..... **0** %
Duct Leakage ..... **0** %

Return Duct or Plenum Data:

Return Air Via ..... **Ducted Return**

Return Fan Data:

Fan Type ..... **Forward Curved with Inlet Guide Vanes**
Fan Performance ..... **1.00** in wg
Overall Efficiency ..... **54** %

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-6 Conference Lower	x1
Zone 2: Zone 2	
ECM-6 Council Lower	x1
Zone 3: Zone 3	
ECM-6 Hall Lower	x1
Zone 4: Zone 4	
ECM-6 Permit Lower	x1
Zone 5: Zone 5	
ECM-6 Police Lower Level	x1
Zone 6: Zone 6	
ECM-6 Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **69.0** °F

Cooling T-stat: Unocc. ..... **71.0** °F
Heating T-stat: Occ. ..... **64.0** °F
Heating T-stat: Unocc. ..... **64.0** °F
T-stat Throttling Range ..... **1.50** °F
Diversity Factor ..... **100** %
Direct Exhaust Airflow ..... **0.0** CFM
Direct Exhaust Fan kW ..... **0.0** kW

Thermostat Schedule ..... **TStat Scehdule - Upper**
Unoccupied Cooling is ..... **Available**

Supply Terminals Data:
Zone ..... **All**
Terminal Type ..... **Diffuser**
Minimum Airflow ..... **0.00** CFM/person

Zone Heating Units:
Zone ..... **All**
Zone Heating Unit Type ..... **None**

Zone Unit Heat Source ..... **Electric Resistance**
Zone Heating Unit Schedule ..... **JFMAMJJASOND**

4. Sizing Data (Computer-Generated):

System Sizing Data:
Cold Deck Supply Temperature ..... **55.0** °F
Supply Fan Airflow ..... **21287.2** CFM
Ventilation Airflow ..... **920.0** CFM
Hot Deck Supply Temperature ..... **95.0** °F

Hydronic Sizing Specifications:
Chilled Water Delta-T ..... **10.0** °F
Hot Water Delta-T ..... **20.0** °F

Safety Factors:
Cooling Sensible ..... **10** %
Cooling Latent ..... **10** %
Heating ..... **10** %

Zone Sizing Data:
Zone Airflow Sizing Method ..... **Sum of space airflow rates**
Space Airflow Sizing Method ..... **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- -
1	619.1	-	-	-
2	2282.8	-	-	-
3	376.0	-	-	-
4	360.0	-	-	-
5	5204.9	-	-	
6	12444.4	-	-	

5. Equipment Data

Central Cooling Unit - Air-Cooled DX
Estimated Maximum Load ..... **414.2** MBH
Design OAT ..... **95.0** °F
Equipment Sizing ..... **(Auto-Sized) 414.2** MBH
Capacity Oversizing Factor ..... **0** %
ARI Performance Rating ..... **10.30** EER
Conventional Cutoff OAT ..... **55.0** °F
Low Temperature Operation ..... **Used**
Low Temperature Cutoff OAT ..... **0.0** °F

Central Heating Unit - Combustion

Estimated Maximum Load		**200.7**	MBH
Equipment Sizing	**(Auto-Sized)**	**200.7**	MBH
Capacity Oversizing Factor		**0**	%
Average Efficiency		**79.1**	%
Misc. Electric		**0.000**	kW

ECM-6 Garage Unit Heaters Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:08AM

1. General Details:

Air System Name	**ECM-6 Garage Unit Heaters**	
Equipment Type	**Split AHU**	
Air System Type	**Single Zone CAV**	
Number of zones	**1**	

2. System Components:

Ventilation Air Data:

Airflow Control	**Constant Ventilation Airflow**	
Ventilation Sizing Method	**Sum of Space OA Airflows**	
Unocc. Damper Position	**Closed**	
Damper Leak Rate	**0**	%
Outdoor Air CO2 Level	**400**	ppm

Central Heating Data:

Supply Temperature	**95.0**	°F
Heating Source	**Combustion - Natural Gas**	
Schedule	**JFM* * * * * OND**	
Capacity Control	**Cycled or Staged Capacity - Fan On**	

Supply Fan Data:

Fan Type	**Forward Curved**	
Configuration	**Draw-thru**	
Fan Performance	**0.00**	in wg
Overall Efficiency	**54**	%

Duct System Data:

Supply Duct Data:

Duct Heat Gain	**0**	%
Duct Leakage	**0**	%

Return Duct or Plenum Data:

Return Air Via	**Ducted Return**	

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-6 Garage	x1

Thermostats and Zone Data:

Zone	**All**	
Cooling T-stat: Occ.	**75.0**	°F
Cooling T-stat: Unocc.	**75.0**	°F
Heating T-stat: Occ.	**65.0**	°F
Heating T-stat: Unocc.	**65.0**	°F
T-stat Throttling Range	**1.50**	°F
Diversity Factor	**100**	%
Direct Exhaust Airflow	**0.0**	CFM
Direct Exhaust Fan kW	**0.0**	kW
Thermostat Schedule	**TStat Scehdule - Police**	
Unoccupied Cooling is	**Not Available**	

Supply Terminals Data:

Zone	**All**	
Terminal Type	**Diffuser**	
Minimum Airflow	**0.00**	CFM/person

Zone Heating Units:

Zone	**All**	
Zone Heating Unit Type	**None**	
Zone Unit Heat Source	**Electric Resistance**	
Zone Heating Unit Schedule	**JFMAMJJASOND**	

4. Sizing Data (Computer-Generated):

System Sizing Data:

Supply Fan Airflow	**2838.0**	CFM
Ventilation Airflow	**2838.0**	CFM
Heating Supply Temperature	**95.0**	°F

Hydronic Sizing Specifications:

Chilled Water Delta-T	**10.0**	°F
Hot Water Delta-T	**20.0**	°F

Safety Factors:

Cooling Sensible	**0**	%
Cooling Latent	**0**	%
Heating	**0**	%

Zone Sizing Data:

Zone Airflow Sizing Method	**Sum of space airflow rates**
Space Airflow Sizing Method	**Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- (CFM)
1	2838.0	-	-	

5. Equipment Data

Central Heating Unit - Combustion

Estimated Maximum Load		**205.9**	MBH
Equipment Sizing	**(Auto-Sized)**	**205.9**	MBH
Capacity Oversizing Factor		**0**	%
Average Efficiency		**80.0**	%
Misc. Electric		**0.000**	kW

ECM-6 Baseboard Radiators Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:08AM

1. General Details:

Air System Name ..... **ECM-6 Baseboard Radiators**
Equipment Type ..... **Terminal Units**
Air System Type ..... **2-Pipe Fan Coil**
Number of zones **1**
Ventilation ..... **Direct Ventilation**

2. Ventilation System Components:

(Common Ventilation System not used: no inputs)

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-6 Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **80.0** °F
Cooling T-stat: Unocc. ..... **80.0** °F
Heating T-stat: Occ. ..... **79.0** °F
Heating T-stat: Unocc. ..... **79.0** °F
T-stat Throttling Range ..... **1.50** °F

Thermostat Schedule ..... **TStat Scehdule - Police**
Unoccupied Cooling is ..... **Available**

Common Terminal Unit Data:

Heating Coil:

Design Supply Temperature ..... **95.0** °F
Heating Source ..... **Hot Water**
Schedule ..... **JFMA* * * * * OND**

Fan Control ..... **Fan On**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**

Terminal Units Data:

Zone ..... **All**
Terminal Type ..... **Fan Coil**
Minimum Airflow ..... **0.00** CFM/person
Fan Performance ..... **0.00** in wg
Fan Overall Efficiency ..... **50** %

4. Sizing Data (Computer-Generated):

System Sizing Data:

Heating Supply Temperature ..... **95.0** °F

Hydronic Sizing Specifications:

Chilled Water Delta-T ..... **10.0** °F
Hot Water Delta-T ..... **20.0** °F

Safety Factors:

Cooling Sensible ..... **0** %
Cooling Latent ..... **0** %
Heating ..... **0** %

Zone Sizing Data:

Zone Airflow Sizing Method ..... **Sum of space airflow rates**
Space Airflow Sizing Method ..... **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	Ventilation (CFM)
1	7188.6	-	-	320.0

5. Equipment Data

No Equipment Data required for this system.

Billing Details - Electric - ECM-6 Seal Fire Door

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:07AM

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	3,218	0	0	0	3,218
Feb	3,002	0	0	0	3,002
Mar	3,397	0	0	0	3,397
Apr	3,326	0	0	0	3,326
May	3,625	0	0	0	3,625
Jun	4,290	0	0	0	4,290
Jul	4,738	0	0	0	4,738
Aug	4,726	0	0	0	4,726
Sep	3,978	0	0	0	3,978
Oct	3,415	0	0	0	3,415
Nov	3,245	0	0	0	3,245
Dec	3,420	0	0	0	3,420
Totals	44,381	0	0	0	44,381

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	3,218	18,930	0.1700
Feb	3,002	17,659	0.1700
Mar	3,397	19,982	0.1700
Apr	3,326	19,563	0.1700
May	3,625	21,321	0.1700
Jun	4,290	25,236	0.1700
Jul	4,738	27,873	0.1700
Aug	4,726	27,801	0.1700
Sep	3,978	23,397	0.1700
Oct	3,415	20,089	0.1700
Nov	3,245	19,091	0.1700
Dec	3,420	20,120	0.1700
Totals	44,381	261,062	0.1700

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	18,930
Feb	0	0	0	0	17,659
Mar	0	0	0	0	19,982
Apr	0	0	0	0	19,563
May	0	0	0	0	21,321
Jun	0	0	0	0	25,236
Jul	0	0	0	0	27,873
Aug	0	0	0	0	27,801
Sep	0	0	0	0	23,397
Oct	0	0	0	0	20,089
Nov	0	0	0	0	19,091
Dec	0	0	0	0	20,120
Totals	0	0	0	0	261,062

4. Billing Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	70.8
Feb	0.0	0.0	0.0	0.0	70.8
Mar	0.0	0.0	0.0	0.0	81.1
Apr	0.0	0.0	0.0	0.0	88.7
May	0.0	0.0	0.0	0.0	96.6
Jun	0.0	0.0	0.0	0.0	95.2
Jul	0.0	0.0	0.0	0.0	98.2
Aug	0.0	0.0	0.0	0.0	94.4
Sep	0.0	0.0	0.0	0.0	90.9
Oct	0.0	0.0	0.0	0.0	90.8
Nov	0.0	0.0	0.0	0.0	75.9
Dec	0.0	0.0	0.0	0.0	71.5

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	70.8
Feb	0.0	0.0	0.0	0.0	70.8
Mar	0.0	0.0	0.0	0.0	81.1
Apr	0.0	0.0	0.0	0.0	88.7
May	0.0	0.0	0.0	0.0	96.6
Jun	0.0	0.0	0.0	0.0	95.2
Jul	0.0	0.0	0.0	0.0	98.2
Aug	0.0	0.0	0.0	0.0	94.4
Sep	0.0	0.0	0.0	0.0	90.9
Oct	0.0	0.0	0.0	0.0	90.8
Nov	0.0	0.0	0.0	0.0	75.9
Dec	0.0	0.0	0.0	0.0	71.5

6. Time Of Maximum Demands

Billing Period	Peak (m/d/h)	Mid-Peak (m/d/h)	Normal Peak (m/d/h)	Off-Peak (m/d/h)	Overall (m/d/h)
Jan	n/a	n/a	n/a	n/a	1/25/0800
Feb	n/a	n/a	n/a	n/a	2/1/0800
Mar	n/a	n/a	n/a	n/a	3/5/1600
Apr	n/a	n/a	n/a	n/a	4/19/1600
May	n/a	n/a	n/a	n/a	5/17/1500
Jun	n/a	n/a	n/a	n/a	6/11/1600
Jul	n/a	n/a	n/a	n/a	7/1/1600
Aug	n/a	n/a	n/a	n/a	8/4/1500
Sep	n/a	n/a	n/a	n/a	9/10/1500
Oct	n/a	n/a	n/a	n/a	10/1/1500
Nov	n/a	n/a	n/a	n/a	11/3/1600
Dec	n/a	n/a	n/a	n/a	12/2/1500

Monthly Component Costs - ECM-6 Seal Fire Door

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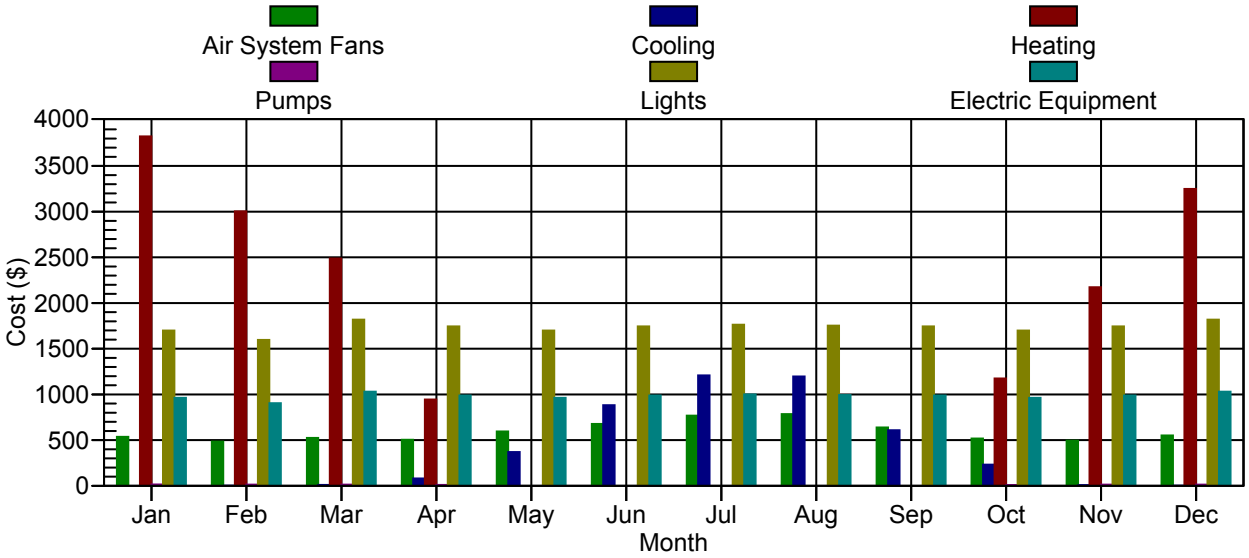
Kitchen and Associates

08/17/2010
09:07AM



1. HVAC Component Costs

Month	Air System Fans ($)	Cooling ($)	Heating ($)	Pumps ($)	Cooling Towers ($)	HVAC Total ($)
January	536	0	3,823	14	0	4,373
February	484	0	3,004	12	0	3,500
March	523	9	2,487	12	0	3,031
April	503	80	945	9	0	1,537
May	596	369	0	0	0	965
June	677	882	0	0	0	1,559
July	768	1,207	0	0	0	1,975
August	784	1,197	0	0	0	1,981
September	638	608	0	0	0	1,246
October	517	230	1,175	7	0	1,929
November	493	4	2,172	12	0	2,681
December	552	1	3,248	13	0	3,814
Total	**7,072**	**4,587**	**16,853**	**80**	**0**	**28,592**

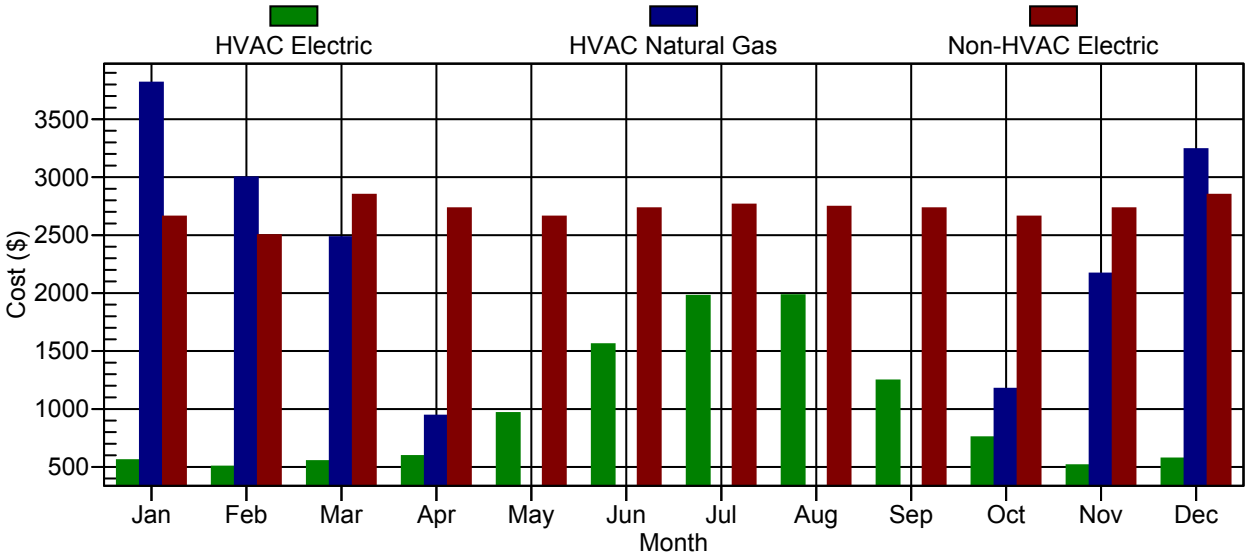
2. Non-HVAC Component Costs

Month	Lights ($)	Electric Equipment ($)	Misc. Electric ($)	Misc. Fuel Use ($)	Non-HVAC Total ($)	Grand Total ($)
January	1,698	962	0	0	2,660	7,033
February	1,595	904	0	0	2,499	5,999
March	1,818	1,030	0	0	2,848	5,879
April	1,744	988	0	0	2,732	4,269
May	1,698	962	0	0	2,660	3,625
June	1,744	988	0	0	2,732	4,291
July	1,763	999	0	0	2,763	4,738
August	1,752	993	0	0	2,745	4,726
September	1,744	988	0	0	2,732	3,978
October	1,698	962	0	0	2,660	4,589
November	1,744	988	0	0	2,732	5,413
December	1,818	1,030	0	0	2,848	6,662
Total	**20,814**	**11,795**	**0**	**0**	**32,610**	**61,201**

Monthly Energy Costs - ECM-6 Seal Fire Door

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:07AM



1. HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)	Remote Chilled Water ($)
January	558	3,815	0	0	0	0	0
February	503	2,998	0	0	0	0	0
March	549	2,483	0	0	0	0	0
April	594	942	0	0	0	0	0
May	964	0	0	0	0	0	0
June	1,559	0	0	0	0	0	0
July	1,976	0	0	0	0	0	0
August	1,981	0	0	0	0	0	0
September	1,246	0	0	0	0	0	0
October	755	1,174	0	0	0	0	0
November	514	2,168	0	0	0	0	0
December	573	3,242	0	0	0	0	0
Total	**11,771**	**16,820**	**0**	**0**	**0**	**0**	**0**

2. Non-HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)
January	2,660	0	0	0	0	0
February	2,500	0	0	0	0	0
March	2,848	0	0	0	0	0
April	2,732	0	0	0	0	0
May	2,660	0	0	0	0	0
June	2,732	0	0	0	0	0
July	2,763	0	0	0	0	0
August	2,745	0	0	0	0	0
September	2,732	0	0	0	0	0
October	2,660	0	0	0	0	0
November	2,732	0	0	0	0	0
December	2,848	0	0	0	0	0
Total	**32,610**	**0**	**0**	**0**	**0**	**0**

Monthly Energy Use by Energy Type - ECM-6 Seal Fire Door

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:07AM

1. HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)	Remote CW (na)
Jan	3,282	2,784	0	0	0	0	0
Feb	2,957	2,188	0	0	0	0	0
Mar	3,231	1,812	0	0	0	0	0
Apr	3,495	688	0	0	0	0	0
May	5,673	0	0	0	0	0	0
Jun	9,168	0	0	0	0	0	0
Jul	11,621	0	0	0	0	0	0
Aug	11,654	0	0	0	0	0	0
Sep	7,329	0	0	0	0	0	0
Oct	4,441	857	0	0	0	0	0
Nov	3,023	1,583	0	0	0	0	0
Dec	3,369	2,366	0	0	0	0	0
Totals	69,243	12,278	0	0	0	0	0

2. Non-HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)
Jan	15,648	0	0	0	0	0
Feb	14,703	0	0	0	0	0
Mar	16,751	0	0	0	0	0
Apr	16,068	0	0	0	0	0
May	15,648	0	0	0	0	0
Jun	16,068	0	0	0	0	0
Jul	16,252	0	0	0	0	0
Aug	16,147	0	0	0	0	0
Sep	16,068	0	0	0	0	0
Oct	15,648	0	0	0	0	0
Nov	16,068	0	0	0	0	0
Dec	16,751	0	0	0	0	0
Totals	191,821	0	0	0	0	0

Monthly Energy Use by Component - ECM-6 Seal Fire Door

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:07AM

1. Monthly Energy Use by System Component

Component	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Air System Fans (kWh)	3153	2848	3079	2959	3503	3981	4518	4614	3754	3041	2900	3246
Cooling												
Electric (kWh)	0	0	54	470	2170	5186	7103	7040	3575	1355	26	3
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote CW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Heating												
Electric (kWh)	49	36	25	12	0	0	0	0	0	6	24	41
Natural Gas (Therm)	2784	2188	1812	688	0	0	0	0	0	857	1583	2366
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Pumps (kWh)	80	72	73	54	0	0	0	0	0	39	73	79
Clg. Tower Fans (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Lighting (kWh)	9988	9385	10692	10256	9988	10256	10374	10306	10256	9988	10256	10692
Electric Eqpt. (kWh)	5660	5318	6059	5812	5660	5812	5879	5841	5812	5660	5812	6059
Misc. Electric (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Fuel												
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0

Annual Cost Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:07AM

Table 1. Annual Costs

Component	ECM-6 Seal Fire Door ($)
Air System Fans	7,072
Cooling	4,587
Heating	16,853
Pumps	80
Cooling Tower Fans	0
HVAC Sub-Total	**28,592**
Lights	20,814
Electric Equipment	11,795
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	**32,610**
Grand Total	**61,201**

Table 2. Annual Cost per Unit Floor Area

Component	ECM-6 Seal Fire Door ($/ft²)
Air System Fans	0.541
Cooling	0.351
Heating	1.290
Pumps	0.006
Cooling Tower Fans	0.000
HVAC Sub-Total	**2.189**
Lights	1.593
Electric Equipment	0.903
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.685**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	ECM-6 Seal Fire Door (%)
Air System Fans	11.6
Cooling	7.5
Heating	27.5
Pumps	0.1
Cooling Tower Fans	0.0
HVAC Sub-Total	**46.7**
Lights	34.0
Electric Equipment	19.3
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	**53.3**
Grand Total	**100.0**

Annual Energy and Emissions Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:07AM

Table 1. Annual Costs

Component	ECM-6 Seal Fire Door ($)
HVAC Components	
Electric	11,771
Natural Gas	16,820
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Remote CW	0
HVAC Sub-Total	**28,592**
Non-HVAC Components	
Electric	32,610
Natural Gas	0
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Non-HVAC Sub-Total	**32,610**
Grand Total	**61,201**

Table 2. Annual Energy Consumption

Component	ECM-6 Seal Fire Door
HVAC Components	
Electric (kWh)	69,243
Natural Gas (Therm)	12,278
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0
Non-HVAC Components	
Electric (kWh)	191,821
Natural Gas (Therm)	0
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Totals	
Electric (kWh)	261,064
Natural Gas (Therm)	12,278
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0

Table 3. Annual Emissions

Component	ECM-6 Seal Fire Door
CO2 Equivalent (lb)	0

Table 4. Annual Cost per Unit Floor Area

Component	ECM-6 Seal Fire Door ($/ft²)
HVAC Components	
Electric	0.901
Natural Gas	1.288
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Remote CW	0.000
HVAC Sub-Total	**2.189**
Non-HVAC Components	
Electric	2.496
Natural Gas	0.000
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.685**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 5. Component Cost as a Percentage of Total Cost

Component	ECM-6 Seal Fire Door (%)
HVAC Components	
Electric	19.2
Natural Gas	27.5
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Remote CW	0.0
HVAC Sub-Total	**46.7**
Non-HVAC Components	
Electric	53.3
Natural Gas	0.0
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Non-HVAC Sub-Total	**53.3**
Grand Total	**100.0**

APPENDIX I

ECM-7 Install Additional Attic Insulation

BPU ENERGY AUDIT PROGRAM
Bourough of Mountain Lakes Borough Hall
CHA Project #21795

ECM-7 Insulate the Attic Space

Multipliers	
Material	0.98
Labor	1.21
Equipment	1.07

Installation Costs										
	Qty	Unit	Unit Costs			Subtotal Costs			Total Cost	Remarks
			Material	Labor	Equipment	Material	Labor	Equipment		
12" R-39 Batt Insulation	3700	sf	$ 1.03	$ 0.34	$ -	$ 3,734.78	$ 1,522.18	$ -	$ 5,256.96	

Subtotal	$ 5,256.96
10% OH, 10% Profit	$ 525.70
10% Contingency	$ 525.70
Total	$ 6,308.35

BPU ENERGY AUDIT PROGRAM
Bourough of Mountain Lakes Borough Hall
CHA Project #21795

ECM-7 Insulate the Attic Space

Annual Energy Use Comparison			
	Electricity kWh	Natural Gas Therms	Cost $
Existing Building with No Attic Insulation	261,064	12,010	$ 60,800
Proposed Building with 12" R-29 Batt Insulation in Attic	257,519	10,863	$ 58,700
Difference	3,545	1,147	$ 2,100

ECM-7 Boiler

Boiler Full Load Details

Gross Output	**167.0**	MBH
Overall Efficiency	**80.0**	%
Fuel or Energy Type	**Natural Gas**	
Boiler Accessories	**0.15**	kW
Hot Water Flow Rate	**20.0**	°F

Part Load Model

Part Load Model ..... **Constant Efficiency**

Part Load Performance

% Load	Efficiency (%)
100.0	80.0
90.0	80.0
80.0	80.0
70.0	80.0
60.0	80.0
50.0	80.0
40.0	80.0
30.0	80.0
20.0	80.0
10.0	80.0
0.0	80.0

ECM-7 Existing Multi-Zone HVAC U Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:09AM

1. General Details:

Air System Name ..... **ECM-7 Existing Multi-Zone HVAC U**
Equipment Type ..... **Packaged Rooftop Units**
Air System Type ..... **2-Deck Multizone**
Number of zones **6**

2. System Components:

Ventilation Air Data:

Airflow Control ..... **Constant Ventilation Airflow**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Unocc. Damper Position ..... **Closed**
Damper Leak Rate ..... **5** %
Outdoor Air CO2 Level ..... **400** ppm

Economizer Data:

Control ..... **Integrated enthalpy control**
Upper Cutoff ..... **73.0** °F
Lower Cutoff ..... **-60.0** °F

Central Cooling Data:

Supply Air Temperature ..... **55.0** °F
Coil Bypass Factor **0.100**
Cooling Source ..... **Air-Cooled DX**
Schedule ..... **JFMAMJJASOND**
Capacity Control ..... **Constant Temperature - Fan On**

Central Heating Data:

Supply Temperature ..... **95.0** °F
Heating Source ..... **Combustion - Natural Gas**
Schedule ..... **JFMA* * * * * OND**
Capacity Control ..... **Cycled or Staged Capacity - Fan On**

Supply Fan Data:

Fan Type ..... **Forward Curved**
Configuration ..... **Blow-thru**
Fan Performance ..... **1.50** in wg
Overall Efficiency ..... **54** %

Duct System Data:

Supply Duct Data:

Duct Heat Gain ..... **0** %
Duct Leakage ..... **0** %

Return Duct or Plenum Data:

Return Air Via ..... **Ducted Return**

Return Fan Data:

Fan Type ..... **Forward Curved with Inlet Guide Vanes**
Fan Performance ..... **1.00** in wg
Overall Efficiency ..... **54** %

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-7 Conference Lower	x1
Zone 2: Zone 2	
ECM-7 Council Lower	x1
Zone 3: Zone 3	
ECM-7 Hall Lower	x1
Zone 4: Zone 4	
ECM-7 Permit Lower	x1
Zone 5: Zone 5	
ECM-7 Police Lower Level	x1
Zone 6: Zone 6	
ECM-7 Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **69.0** °F

Cooling T-stat: Unocc. **71.0** °F
Heating T-stat: Occ. **64.0** °F
Heating T-stat: Unocc. **64.0** °F
T-stat Throttling Range **1.50** °F
Diversity Factor **100** %
Direct Exhaust Airflow **0.0** CFM
Direct Exhaust Fan kW **0.0** kW

Thermostat Schedule **TStat Scehdule - Upper**
Unoccupied Cooling is **Available**

Supply Terminals Data:
Zone **All**
Terminal Type **Diffuser**
Minimum Airflow **0.00** CFM/person

Zone Heating Units:
Zone **All**
Zone Heating Unit Type **None**

Zone Unit Heat Source **Electric Resistance**
Zone Heating Unit Schedule **JFMAMJJASOND**

4. Sizing Data (Computer-Generated):

System Sizing Data:
Cold Deck Supply Temperature **55.0** °F
Supply Fan Airflow **20201.5** CFM
Ventilation Airflow **920.0** CFM
Hot Deck Supply Temperature **95.0** °F

Hydronic Sizing Specifications:
Chilled Water Delta-T **10.0** °F
Hot Water Delta-T **20.0** °F

Safety Factors:
Cooling Sensible **10** %
Cooling Latent **10** %
Heating **10** %

Zone Sizing Data:
Zone Airflow Sizing Method **Sum of space airflow rates**
Space Airflow Sizing Method **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- -
1	619.1	-	-	-
2	2282.8	-	-	-
3	376.0	-	-	-
4	360.0	-	-	-
5	5204.9	-	-	
6	11358.7	-	-	

5. Equipment Data

Central Cooling Unit - Air-Cooled DX
Estimated Maximum Load **396.6** MBH
Design OAT **95.0** °F
Equipment Sizing **(Auto-Sized) 396.6** MBH
Capacity Oversizing Factor **0** %
ARI Performance Rating **10.30** EER
Conventional Cutoff OAT **55.0** °F
Low Temperature Operation **Used**
Low Temperature Cutoff OAT **0.0** °F

Central Heating Unit - Combustion

Estimated Maximum Load		**190.1**	MBH
Equipment Sizing	**(Auto-Sized)**	**190.1**	MBH
Capacity Oversizing Factor		**0**	%
Average Efficiency		**79.1**	%
Misc. Electric		**0.000**	kW

ECM-7 Garage Unit Heaters Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:09AM

1. General Details:

Air System Name	**ECM-7 Garage Unit Heaters**	
Equipment Type	**Split AHU**	
Air System Type	**Single Zone CAV**	
Number of zones	**1**	

2. System Components:

Ventilation Air Data:

Airflow Control	**Constant Ventilation Airflow**	
Ventilation Sizing Method	**Sum of Space OA Airflows**	
Unocc. Damper Position	**Closed**	
Damper Leak Rate	**0**	%
Outdoor Air CO2 Level	**400**	ppm

Central Heating Data:

Supply Temperature	**95.0**	°F
Heating Source	**Combustion - Natural Gas**	
Schedule	**JFM* * * * * OND**	
Capacity Control	**Cycled or Staged Capacity - Fan On**	

Supply Fan Data:

Fan Type	**Forward Curved**	
Configuration	**Draw-thru**	
Fan Performance	**0.00**	in wg
Overall Efficiency	**54**	%

Duct System Data:

Supply Duct Data:

Duct Heat Gain	**0**	%
Duct Leakage	**0**	%

Return Duct or Plenum Data:

Return Air Via	**Ducted Return**	

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-7 Garage	x1

Thermostats and Zone Data:

Zone	**All**	
Cooling T-stat: Occ.	**75.0**	°F
Cooling T-stat: Unocc.	**75.0**	°F
Heating T-stat: Occ.	**65.0**	°F
Heating T-stat: Unocc.	**65.0**	°F
T-stat Throttling Range	**1.50**	°F
Diversity Factor	**100**	%
Direct Exhaust Airflow	**0.0**	CFM
Direct Exhaust Fan kW	**0.0**	kW
Thermostat Schedule	**TStat Scehdule - Police**	
Unoccupied Cooling is	**Not Available**	

Supply Terminals Data:

Zone	**All**	
Terminal Type	**Diffuser**	
Minimum Airflow	**0.00**	CFM/person

Zone Heating Units:

Zone	**All**	
Zone Heating Unit Type	**None**	
Zone Unit Heat Source	**Electric Resistance**	
Zone Heating Unit Schedule	**JFMAMJJASOND**	

4. Sizing Data (Computer-Generated):

System Sizing Data:

Supply Fan Airflow	**2838.0**	CFM
Ventilation Airflow	**2838.0**	CFM
Heating Supply Temperature	**95.0**	°F

Hydronic Sizing Specifications:

Chilled Water Delta-T	**10.0**	°F
Hot Water Delta-T	**20.0**	°F

Safety Factors:

Cooling Sensible	**0**	%
Cooling Latent	**0**	%
Heating	**0**	%

Zone Sizing Data:

Zone Airflow Sizing Method	**Sum of space airflow rates**
Space Airflow Sizing Method	**Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- (CFM)
1	2838.0	-	-	

5. Equipment Data

Central Heating Unit - Combustion

Estimated Maximum Load		**218.6**	MBH
Equipment Sizing	**(Auto-Sized)**	**218.6**	MBH
Capacity Oversizing Factor		**0**	%
Average Efficiency		**80.0**	%
Misc. Electric		**0.000**	kW

ECM-7 Baseboard Radiators Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:09AM

1. General Details:

Air System Name ..... **ECM-7 Baseboard Radiators**
Equipment Type ..... **Terminal Units**
Air System Type ..... **2-Pipe Fan Coil**
Number of zones **1**
Ventilation ..... **Direct Ventilation**

2. Ventilation System Components:

(Common Ventilation System not used: no inputs)

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
ECM-7 Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **80.0** °F
Cooling T-stat: Unocc. ..... **80.0** °F
Heating T-stat: Occ. ..... **79.0** °F
Heating T-stat: Unocc. ..... **79.0** °F
T-stat Throttling Range ..... **1.50** °F

Thermostat Schedule ..... **TStat Scehdule - Police**
Unoccupied Cooling is ..... **Available**

Common Terminal Unit Data:

Heating Coil:

Design Supply Temperature ..... **95.0** °F
Heating Source ..... **Hot Water**
Schedule ..... **JFMA* * * * * OND**

Fan Control ..... **Fan On**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**

Terminal Units Data:

Zone ..... **All**
Terminal Type ..... **Fan Coil**
Minimum Airflow ..... **0.00** CFM/person
Fan Performance ..... **0.00** in wg
Fan Overall Efficiency ..... **50** %

4. Sizing Data (Computer-Generated):

System Sizing Data:

Heating Supply Temperature ..... **95.0** °F

Hydronic Sizing Specifications:

Chilled Water Delta-T ..... **10.0** °F
Hot Water Delta-T ..... **20.0** °F

Safety Factors:

Cooling Sensible ..... **0** %
Cooling Latent ..... **0** %
Heating ..... **0** %

Zone Sizing Data:

Zone Airflow Sizing Method ..... **Sum of space airflow rates**
Space Airflow Sizing Method ..... **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	Ventilation (CFM)
1	5578.7	-	-	320.0

5. Equipment Data

No Equipment Data required for this system.

ECM-7 Baseboard Radiators Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 09:09AM

Billing Details - Electric - ECM-7 Insualte Attic

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:08AM

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	3,179	0	0	0	3,179
Feb	2,973	0	0	0	2,973
Mar	3,370	0	0	0	3,370
Apr	3,303	0	0	0	3,303
May	3,585	0	0	0	3,585
Jun	4,216	0	0	0	4,216
Jul	4,635	0	0	0	4,635
Aug	4,620	0	0	0	4,620
Sep	3,917	0	0	0	3,917
Oct	3,382	0	0	0	3,382
Nov	3,217	0	0	0	3,217
Dec	3,381	0	0	0	3,381
Totals	43,778	0	0	0	43,778

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	3,179	18,699	0.1700
Feb	2,973	17,487	0.1700
Mar	3,370	19,823	0.1700
Apr	3,303	19,430	0.1700
May	3,585	21,089	0.1700
Jun	4,216	24,799	0.1700
Jul	4,635	27,264	0.1700
Aug	4,620	27,179	0.1700
Sep	3,917	23,044	0.1700
Oct	3,382	19,892	0.1700
Nov	3,217	18,921	0.1700
Dec	3,381	19,891	0.1700
Totals	43,778	257,518	0.1700

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	18,699
Feb	0	0	0	0	17,487
Mar	0	0	0	0	19,823
Apr	0	0	0	0	19,430
May	0	0	0	0	21,089
Jun	0	0	0	0	24,799
Jul	0	0	0	0	27,264
Aug	0	0	0	0	27,179
Sep	0	0	0	0	23,044
Oct	0	0	0	0	19,892
Nov	0	0	0	0	18,921
Dec	0	0	0	0	19,891
Totals	0	0	0	0	257,518

4. Billing Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	70.2
Feb	0.0	0.0	0.0	0.0	70.2
Mar	0.0	0.0	0.0	0.0	80.4
Apr	0.0	0.0	0.0	0.0	87.4
May	0.0	0.0	0.0	0.0	94.9
Jun	0.0	0.0	0.0	0.0	93.6
Jul	0.0	0.0	0.0	0.0	96.4
Aug	0.0	0.0	0.0	0.0	92.8
Sep	0.0	0.0	0.0	0.0	89.5
Oct	0.0	0.0	0.0	0.0	89.4
Nov	0.0	0.0	0.0	0.0	75.3
Dec	0.0	0.0	0.0	0.0	71.2

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	70.2
Feb	0.0	0.0	0.0	0.0	70.2
Mar	0.0	0.0	0.0	0.0	80.4
Apr	0.0	0.0	0.0	0.0	87.4
May	0.0	0.0	0.0	0.0	94.9
Jun	0.0	0.0	0.0	0.0	93.6
Jul	0.0	0.0	0.0	0.0	96.4
Aug	0.0	0.0	0.0	0.0	92.8
Sep	0.0	0.0	0.0	0.0	89.5
Oct	0.0	0.0	0.0	0.0	89.4
Nov	0.0	0.0	0.0	0.0	75.3
Dec	0.0	0.0	0.0	0.0	71.2

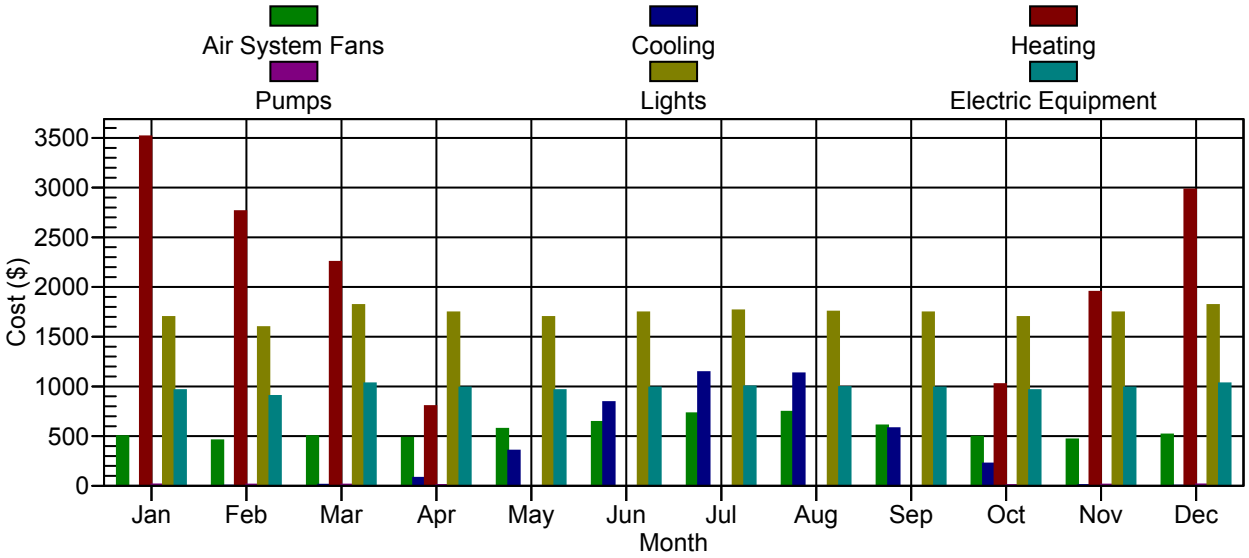
6. Time Of Maximum Demands

Billing Period	Peak (m/d/h)	Mid-Peak (m/d/h)	Normal Peak (m/d/h)	Off-Peak (m/d/h)	Overall (m/d/h)
Jan	n/a	n/a	n/a	n/a	1/25/0800
Feb	n/a	n/a	n/a	n/a	2/1/0800
Mar	n/a	n/a	n/a	n/a	3/5/1600
Apr	n/a	n/a	n/a	n/a	4/19/1600
May	n/a	n/a	n/a	n/a	5/17/1500
Jun	n/a	n/a	n/a	n/a	6/11/1600
Jul	n/a	n/a	n/a	n/a	7/1/1600
Aug	n/a	n/a	n/a	n/a	8/4/1500
Sep	n/a	n/a	n/a	n/a	9/10/1500
Oct	n/a	n/a	n/a	n/a	10/1/1500
Nov	n/a	n/a	n/a	n/a	11/3/1600
Dec	n/a	n/a	n/a	n/a	12/2/1500

Monthly Component Costs - ECM-7 Insualte Attic

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:08AM



1. HVAC Component Costs

Month	Air System Fans ($)	Cooling ($)	Heating ($)	Pumps ($)	Cooling Towers ($)	HVAC Total ($)
January	499	0	3,515	14	0	4,028
February	457	0	2,763	12	0	3,232
March	498	10	2,253	12	0	2,773
April	483	80	802	7	0	1,372
May	572	353	0	0	0	925
June	643	841	0	0	0	1,484
July	729	1,143	0	0	0	1,872
August	744	1,131	0	0	0	1,875
September	606	579	0	0	0	1,185
October	494	223	1,023	5	0	1,745
November	466	4	1,951	11	0	2,432
December	515	1	2,981	13	0	3,510
Total	**6,706**	**4,366**	**15,288**	**74**	**0**	**26,434**

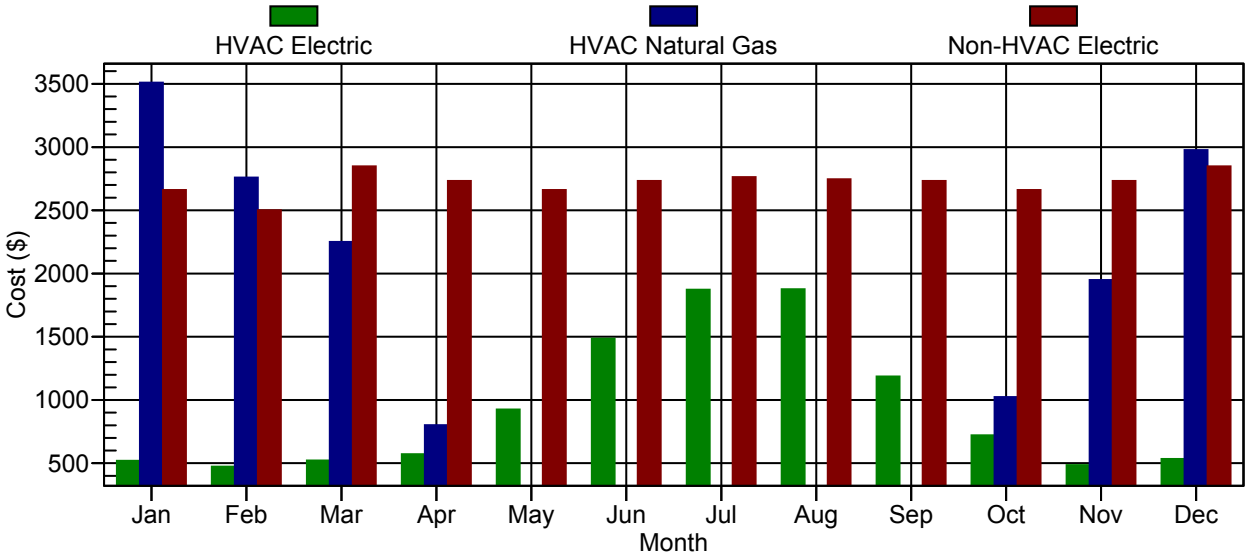
2. Non-HVAC Component Costs

Month	Lights ($)	Electric Equipment ($)	Misc. Electric ($)	Misc. Fuel Use ($)	Non-HVAC Total ($)	Grand Total ($)
January	1,698	962	0	0	2,660	6,688
February	1,595	904	0	0	2,499	5,731
March	1,818	1,030	0	0	2,848	5,621
April	1,744	988	0	0	2,732	4,104
May	1,698	962	0	0	2,660	3,585
June	1,744	988	0	0	2,732	4,216
July	1,763	999	0	0	2,763	4,635
August	1,752	993	0	0	2,745	4,620
September	1,744	988	0	0	2,732	3,917
October	1,698	962	0	0	2,660	4,405
November	1,744	988	0	0	2,732	5,164
December	1,818	1,030	0	0	2,848	6,358
Total	**20,814**	**11,795**	**0**	**0**	**32,610**	**59,043**

Monthly Energy Costs - ECM-7 Insualte Attic

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:08AM



1. HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)	Remote Chilled Water ($)
January	519	3,509	0	0	0	0	0
February	473	2,758	0	0	0	0	0
March	522	2,250	0	0	0	0	0
April	572	801	0	0	0	0	0
May	925	0	0	0	0	0	0
June	1,484	0	0	0	0	0	0
July	1,872	0	0	0	0	0	0
August	1,875	0	0	0	0	0	0
September	1,186	0	0	0	0	0	0
October	721	1,023	0	0	0	0	0
November	485	1,948	0	0	0	0	0
December	534	2,976	0	0	0	0	0
Total	**11,169**	**15,265**	**0**	**0**	**0**	**0**	**0**

2. Non-HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)
January	2,660	0	0	0	0	0
February	2,500	0	0	0	0	0
March	2,848	0	0	0	0	0
April	2,732	0	0	0	0	0
May	2,660	0	0	0	0	0
June	2,732	0	0	0	0	0
July	2,763	0	0	0	0	0
August	2,745	0	0	0	0	0
September	2,732	0	0	0	0	0
October	2,660	0	0	0	0	0
November	2,732	0	0	0	0	0
December	2,848	0	0	0	0	0
Total	**32,610**	**0**	**0**	**0**	**0**	**0**

Monthly Energy Use by Energy Type - ECM-7 Insualte Attic

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:08AM

1. HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)	Remote CW (na)
Jan	3,051	2,561	0	0	0	0	0
Feb	2,784	2,013	0	0	0	0	0
Mar	3,072	1,642	0	0	0	0	0
Apr	3,362	585	0	0	0	0	0
May	5,441	0	0	0	0	0	0
Jun	8,730	0	0	0	0	0	0
Jul	11,012	0	0	0	0	0	0
Aug	11,032	0	0	0	0	0	0
Sep	6,976	0	0	0	0	0	0
Oct	4,244	747	0	0	0	0	0
Nov	2,853	1,422	0	0	0	0	0
Dec	3,140	2,172	0	0	0	0	0
Totals	65,698	11,142	0	0	0	0	0

2. Non-HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)
Jan	15,648	0	0	0	0	0
Feb	14,703	0	0	0	0	0
Mar	16,751	0	0	0	0	0
Apr	16,068	0	0	0	0	0
May	15,648	0	0	0	0	0
Jun	16,068	0	0	0	0	0
Jul	16,252	0	0	0	0	0
Aug	16,147	0	0	0	0	0
Sep	16,068	0	0	0	0	0
Oct	15,648	0	0	0	0	0
Nov	16,068	0	0	0	0	0
Dec	16,751	0	0	0	0	0
Totals	191,821	0	0	0	0	0

Monthly Energy Use by Component - ECM-7 Insualte Attic

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:08AM

1. Monthly Energy Use by System Component

Component	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Air System Fans (kWh)	2935	2686	2931	2842	3363	3781	4288	4379	3568	2904	2743	3028
Cooling												
Electric (kWh)	0	0	57	469	2078	4949	6724	6653	3408	1310	26	4
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote CW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Heating												
Electric (kWh)	36	26	16	7	0	0	0	0	0	3	17	30
Natural Gas (Therm)	2561	2013	1642	585	0	0	0	0	0	747	1422	2172
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Pumps (kWh)	80	72	68	44	0	0	0	0	0	27	67	78
Clg. Tower Fans (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Lighting (kWh)	9988	9385	10692	10256	9988	10256	10374	10306	10256	9988	10256	10692
Electric Eqpt. (kWh)	5660	5318	6059	5812	5660	5812	5879	5841	5812	5660	5812	6059
Misc. Electric (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Fuel												
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0

Annual Cost Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:08AM

Table 1. Annual Costs

Component	ECM-7 Insualte Attic ($)
Air System Fans	6,706
Cooling	4,366
Heating	15,288
Pumps	74
Cooling Tower Fans	0
HVAC Sub-Total	**26,434**
Lights	20,814
Electric Equipment	11,795
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	**32,610**
Grand Total	**59,043**

Table 2. Annual Cost per Unit Floor Area

Component	ECM-7 Insualte Attic ($/ft²)
Air System Fans	0.513
Cooling	0.334
Heating	1.170
Pumps	0.006
Cooling Tower Fans	0.000
HVAC Sub-Total	**2.023**
Lights	1.593
Electric Equipment	0.903
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.520**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	ECM-7 Insualte Attic (%)
Air System Fans	11.4
Cooling	7.4
Heating	25.9
Pumps	0.1
Cooling Tower Fans	0.0
HVAC Sub-Total	**44.8**
Lights	35.3
Electric Equipment	20.0
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	**55.2**
Grand Total	**100.0**

Annual Energy and Emissions Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
09:08AM

Table 1. Annual Costs

Component	ECM-7 Insualte Attic ($)
HVAC Components	
Electric	11,169
Natural Gas	15,265
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Remote CW	0
HVAC Sub-Total	**26,434**
Non-HVAC Components	
Electric	32,610
Natural Gas	0
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Non-HVAC Sub-Total	**32,610**
Grand Total	**59,043**

Table 2. Annual Energy Consumption

Component	ECM-7 Insualte Attic
HVAC Components	
Electric (kWh)	65,698
Natural Gas (Therm)	11,142
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0
Non-HVAC Components	
Electric (kWh)	191,821
Natural Gas (Therm)	0
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Totals	
Electric (kWh)	257,519
Natural Gas (Therm)	11,142
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0

Table 3. Annual Emissions

Component	ECM-7 Insualte Attic
CO2 Equivalent (lb)	0

Table 4. Annual Cost per Unit Floor Area

Component	ECM-7 Insualte Attic ($/ft²)
HVAC Components	
Electric	0.855
Natural Gas	1.169
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Remote CW	0.000
HVAC Sub-Total	**2.023**
Non-HVAC Components	
Electric	2.496
Natural Gas	0.000
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.520**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 5. Component Cost as a Percentage of Total Cost

Component	ECM-7 Insualte Attic (%)
HVAC Components	
Electric	18.9
Natural Gas	25.9
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Remote CW	0.0
HVAC Sub-Total	**44.8**
Non-HVAC Components	
Electric	55.2
Natural Gas	0.0
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Non-HVAC Sub-Total	**55.2**
Grand Total	**100.0**

APPENDIX J

Photovoltaic (PV) Rooftop Solar Power Generation

PVWatts ***** 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:	0267370
State:	New Jersey
Latitude:	40.9 ° N
Longitude:	74.7 ° W
PV System Specifications	
DC Rating:	70.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	53.9 kW
Array Type:	Fixed Tilt
Array Tilt:	40.9 °
Array Azimuth:	180.0 °
Energy Specifications	
Cost of Electricity:	17.0 ¢/kWh

Results

Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	3.13	5438	924.46
2	3.93	6134	1042.78
3	5.04	8333	1416.61
4	5.30	8161	1387.37
5	5.57	8667	1473.39
6	5.80	8511	1446.87
7	5.48	8137	1383.29
8	5.46	8185	1391.45
9	5.29	7868	1337.56
10	4.74	7566	1286.22
11	3.43	5442	925.14
12	2.98	5074	862.58
Year	4.68	87517	14877.89

Output Results as Text

Saving Text from a Browser

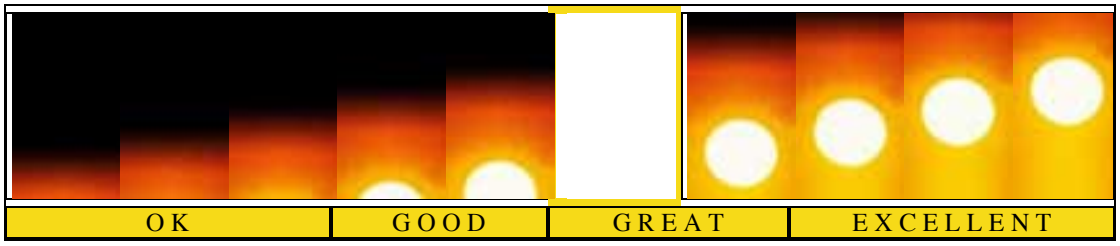
Run PVWATTS v.2 for another location

Run PVWATTS v.1

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

Your Solar Electric Estimate

YOUR SOLAR RATING



The solar rating of your area is **Great** for adopting a solar system. (4.68 kWh/m^2 per day).
You may want to change some of the information to better match your situation.

Customize Your Assumptions

Price Installed $ 8 per watt DC.
This is a user-entered cost. Enter 0 to return to default.

Provide 32 % of my electricity, on average, over the course of a year.

Electric Rate: $	0.17 /kWh More
Monthly Electric Usage:	22,500 kWh/Month More
Utility Annual Inflation Rate:	3.78%
Utility Savings Method:	Net Metering (common)
Federal ITC Based Upon:	Gross Cost
Federal Income Tax Rate:	28%
State Income Tax Rate:	7.8% (Low: 1.40% - High: 8.97%) help

Loan Modeling: Borrow 0 % of $383,376 estimated cost
at % interest (apr) re-paid over years

---

f you agree **this is a smart investment**, we encourage ou to work with a Professional to help you install your ery own system.

http://www.solar-estimate.org/index.php?page=solar-installer&subpage=show&wantsolar=1&zipcode=07046

lick on the buttons to learn about our assumptions and other important information used to generate your estimate. Also, please review the otes below.

elp us improve. We rely on feedback from our users to help keep our service accurate and useful:
› Send us your Feedback

Your Solar Electric Estimate by the Numbers

Building Type:	Commercial/Business
State & County:	NJ - Morris
Utility:	Jersey Central Power & Lt Co

Utility Type:	Investor-Owned Utility
Your Average Monthly Electricity Bill: (Assumed rate x average monthly useage)	$ 3,825 / Month
Tiered Rates Apply:	No
Time-of-Use Metering Offered:	No
Net-Metering Available:	Yes - See Notes, below!

ESTIMATED SYSTEM SIZE

The system size best for your situation will vary based upon product, building, geographic and other variables. We encourage you to work with a Solar Pro who can better estimate the system size best for your situation. We estimate your building will need a system sized between 54.77 kW and 82.15 kW of peak power. This estimate assumes the mid-point of this range.

Solar Rating:	**Good** 4.68 kWh/sq-m/day
Solar System Capacity Required:	68.46 kW of peak power (DC watts)
Roof Area Needed:	6,846 sq-ft
Equivalent Annual Production:	86,397 kWh electricity

ESTIMATED SYSTEM COST

This is only an estimate based upon many assumptions. Installation costs can vary considerably. We encourage you to work with a Solar Pro who can provide you with a more detailed cost estimate. We estimate that a 68 kW peak DC power system will cost between $438,144 and $657,216. This estimate assumes the mid-point of this cost range.

Assumed Installation Gross Cost: "Gross Cost" is the cost before any rebates, incentives, tax credits, etc. are applied. See the Cost Notes, below!	**$547,680** assuming $8 per watt DC

FINANCIAL INCENTIVES

Financial incentives shown are totals across all years. So, if an incentive spans multiple years then the value shown is the total of all years. For details, please refer to the table below "Cash Flow by Year and Cumulative Across Years"

NJ: Solar Renewable Energy Certificates (SREC) » link	$ 665,441
Federal Tax Credit (30% of Gross Cost at Installation) » link	$ 164,304

Modified Accelerated Cost Recovery System (MACRS) Depreciation (5 yr) » link	**YES**
ESTIMATED NET COST:	**$ -282,065**
ESTIMATED NET COST AT INSTALLATION:	**$ 383,376**
Cash & Loan Amounts:	$ 383,376 Cash $ 0 Borrowed
Loan Monthly Payment (6.5% apr, 30 years):	$ 0

CASH FLOW

Cash Flow Breakeven is where the chart crosses the $0 point - this is when your investment has paid itself back in cash.

The chart above is a summary of the net cash flow you can expect over time. Net Cash Flow is the total cash after all costs (out-flows of cash) are reduced by financial incentives, annual utility savings and tax effects (in-flows of cash).

Average values are used together with your assumed income tax rate (36%). Any property appreciation has not been included, as this is generally not a cash flow (it's an investment). The loan modeled, if any, is included. Because this is a business, we have assumed utility savings result in loss of some expense write offs against income, but Modified Accelerated Cost Recovery System (MACRS) Depreciation applies (an income tax benefit). Because individual tax situations vary, we have not included Federal income tax liabilities that may result from having received non-federal incentives, if any (e.g. state rebate programs) as they are usually not taxed as earned income.

SAVINGS & BENEFITS

First-year Utility Savings:	**$14,688**
Average Monthly Utility Savings: *over 25-year expected life of system*	**$2,054**
Average Annual Utility Savings: *over 25-year expected life of system*	**$24,653**
25-year Utility Savings:	**$616,332**
Return on Investment (ROI):	**204%**
Internal Rate of Return (IRR):	**20.2%**
Net Present Value (NPV):	**$409,175**
Profitability Index:	**2.1**
Greenhouse Gas (CO_2) Saved: *over 25-year system life*	**1,771 tons** **3,542,000 auto miles**

Cash Flow by Year and Cumulative Across Years

This cash flow table includes tax effects applied to utility savings and loan interest payments (if any). For commercial (business) situations we assume utility savings result in loss of some expense write offs against income: Utility Savings = ($'s saved on utility bill) x (1 - Income Tax Rate). "Tax Savings from MACRS depreciation" (below) is the net cash saved on income taxes after the depreciation expense is written off. So the amount that was depreciated would be the cash value shown divided by the Income Tax Rate (more info.). Because individual tax situations vary, we have not included Federal income tax liabilities that may result from having received non-federal incentives, if any (e.g. state rebate programs) as they are usually

not taxed as earned income. Any income from your system (e.g. performance-based incentives and "SREC's") may be taxed as income (also not shown).

Year of Operation:	**at Install**	**1**	**2**	**3**	**4**	**5**
Gross Cost	($547,680)					
NJ: Solar Renewable Energy Certificates (SREC)	$0	$54,468	$52,829	$51,239	$49,696	$48,201
Federal Tax Credit (30% of Gross Cost at Installation)	$164,304	$0	$0	$0	$0	$0
Tax savings from MACRS Depreciation	$0	$33,332	$53,331	$31,999	$19,199	$19,199
Utility Savings	$0	$9,786	$10,156	$10,540	$10,938	$11,352
ANNUAL CASH FLOW	$-383,376	$97,586	$116,316	$93,777	$79,833	$78,752
Cumulative Cash Flow	$-383,376	$-285,790	$-169,474	$-75,697	$**4,136** **Breakeven**	$82,888

Year of Operation:	**6**	**7**	**8**	**9**	**10**	**11**
Gross Cost						
NJ: Solar Renewable Energy Certificates (SREC)	$46,750	$45,343	$43,978	$42,655	$41,371	$40,126
Federal Tax Credit (30% of Gross Cost at Installation)	$0	$0	$0	$0	$0	$0
Tax savings from MACRS Depreciation	$9,600	$0	$0	$0	$0	$0
Utility Savings	$11,781	$12,226	$12,688	$13,168	$13,666	$14,182
ANNUAL CASH FLOW	$68,130	$57,569	$56,666	$55,823	$55,037	$54,308
Cumulative Cash Flow	$151,018	$208,587	$265,253	$321,076	$376,113	$430,421

Year of Operation:	**12**	**13**	**14**	**15**	**16**	**17**
Gross Cost				($61,614) Inverter Replaced		
NJ: Solar Renewable Energy Certificates (SREC)	$38,918	$37,747	$36,611	$35,509	$0	$0
Federal Tax Credit (30% of Gross Cost at Installation)	$0	$0	$0	$0	$0	$0
Tax savings from MACRS Depreciation	$0	$0	$0	$0	$0	$0
Utility Savings	$14,718	$15,275	$15,852	$16,451	$17,073	$17,719
ANNUAL CASH FLOW	$53,636	$53,022	$52,463	$-9,654	$17,073	$17,719
Cumulative Cash Flow	$484,057	$537,079	$589,542	$579,888	$596,961	$614,680

Year of Operation:	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Gross Cost								
NJ: Solar	$0	$0	$0	$0	$0	$0	$0	$0

Renewable Energy Certificates (SREC)								
Federal Tax Credit (30% of Gross Cost at Installation)	$0	$0	$0	$0	$0	$0	$0	$0
Tax savings from MACRS Depreciation	$0	$0	$0	$0	$0	$0	$0	$0
Utility Savings	$18,388	$19,083	$19,805	$20,553	$21,330	$22,137	$22,973	$23,842
ANNUAL CASH FLOW	$18,388	$19,083	$19,805	$20,553	$21,330	$22,137	$22,973	$23,842
Cumulative Cash Flow	$633,068	$652,151	$671,956	$692,509	$713,839	$735,976	$758,949	$782,791

FAQ's: Frequently Asked Questions for NJ:

- Are renewable energy systems exempt from sales tax in New Jersey?
- Can I sell Solar Renewable Energy Certificates (SREC) in New Jersey?
- Where can I find more information about New Jersey Renewable energy programs and incentives?

Notes & Assumptions: Solar Electric (PV) Systems

* HOW TO REDUCE THE SYSTEM SIZE NEEDED & INCREASE SAVINGS

The estimate provided above assumes "base" electric rates apply. Other taxes and surcharges may be applied to your utility bill. We suggest you review a recent utility bill and change the "Assumed Electric Rate", above, as needed to better match your situation.

You may have other metered-rate options with your utility. Options such as Tiered billing rates, Time-Of-Use (TOU) metering, and Net-Metering, if available, can help reduce the system size you need to provide a "net-zero" energy bill. Sometimes people also reduce the size of their solar system to accommodate planned improvements in their building's energy efficiency, or to match a budget and/or the available space for installing a solar system.

Energy production from a solar electric (PV) system is a function of several factors, including the following. Our assumptions are:

Factor	Assumption
Solar resources	Assumed solar availability: As per Solar Radiance chart
Soiling or contamination of the PV panels	Clean, washed frequently: 100% design sunlight transmission
Temperature	25C, calm wind
System configuration (battery or non-battery)	Non-battery
Orientation to the sun	tilted at your latitude, full sun
Shading	None

PV Energy delivered as % of manufacturer's rating	95%
Soiling, wiring & power point tracking losses	9% (91% delivered)
Inverter Efficiency	90%
Total Energy Delivered	95% x 91% x 90% = 78%

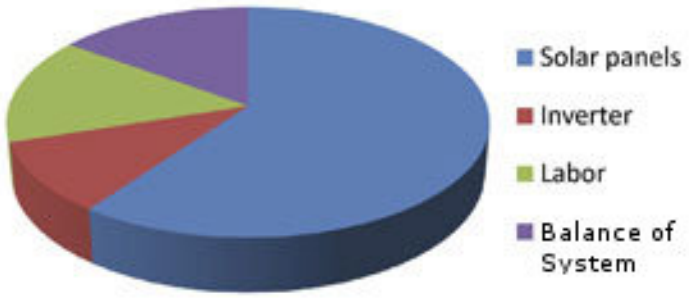
Energy Efficiency: Improving your building's energy efficiency will reduce the system size you need to attain a "net-zero" energy bill.
Tiered Rates: Often people are paying a "Tiered" rate for their electricity. This is a higher rate (higher than the "Base" rate) for electricity charged when a home or building uses more that a "Base" amount allocated for the building. Installing a solar system will reduce your electrical demand from the utility. This can result in a lower utility rate because you stay within the "Base" rate level. In this case, the more expensive "Tiered" rate electricity is eliminated, reducing your average electricity rate.
TOU Metering: Many utilities offer Time-of-Use (TOU) meters. This allows the price of electricity to vary by time of day (called "Peak" or "Off-Peak" periods) and by season (usually "Winter" versus "Summer" rates). If TOU metering is offered by your utility, a solar system may result in additional savings. This is because peak (more expensive electricity) rates often occur during the daytime. This is usually when a solar system is producing the most output, thus reducing your demand for peak-rate electricity from the utility.
Most utilities do charge for the purchase and installation of a time-of-use meter (normally a few hundred dollars). We have assumed the cost for this is part of the "Estimated Installation cost" shown above.
Net-Metering: With Net-Metering, surplus electricity generated by your renewable energy system will be credited back to your utility account. So if your solar system makes more electricity than you are using, the "meter spins backwards". You are not actually "selling" electricity, since in most states the utility will not reimburse you for excess electricity. But, if your utility offers "Net-Metering" you may be able to get credit for electricity provided back to the grid during peak periods. Combined with TOU metering, Net-Metering can result in multiplied savings since your electricity account may be gaining electricity credits during the time of peak utility rates -- Think of a hot, sunny summer day ... your solar system is producing power, spinning your electric meter backwards, and supplying the grid with electricity to run other people's air conditioners -- you're "spinning back" cost at peak rates! That's the savings power of Net-metering, combined with TOU rates.
Solar Power "Fixes" Energy Costs: The cost of sunshine is free. While the sun rises every morning, the cost of sunshine does not. Utility rates, on the other hand, tend to rise steadily in cost. So, the value of your savings from a solar system are likely to increase as time goes on. If you are on a fixed income (e.g. nearing or in retirement) this may be of particular interest to you.

THE COST TO GO SOLAR

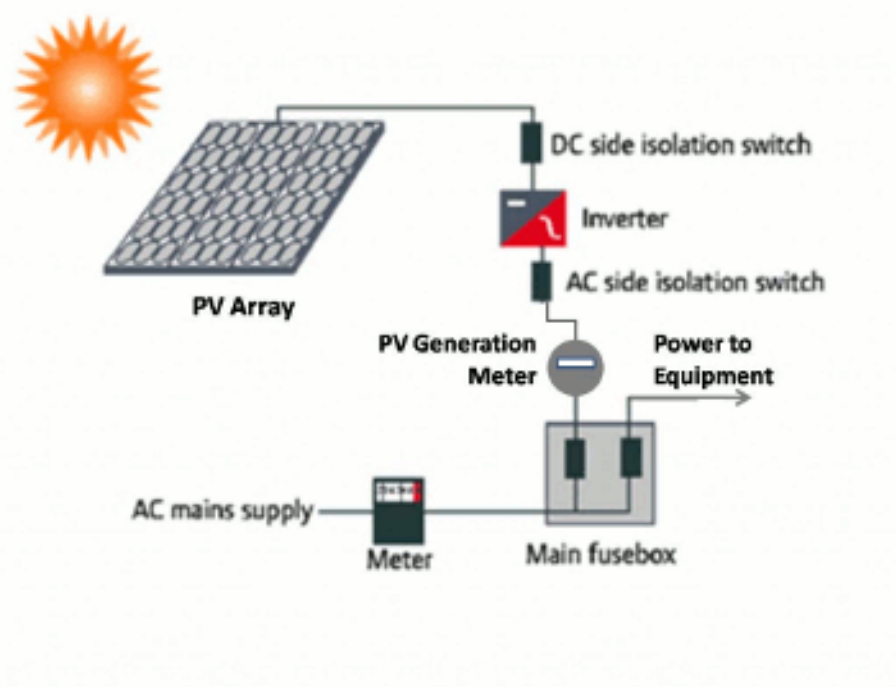
This is only an estimate based upon many assumptions and limited data entered by you: Installation costs can vary considerably. The cost to purchase and install a complete grid-tied solar photovoltaic (PV) system on a residential home is typically as further defined in the table, below. This includes the PV array, inverter and associated balance of system costs. It does not include the cost of options you may select, such as battery backup power storage, or the costs of building preparation work, like new shingles. Costs can also be higher if you add other features or have special installation needs (such as application over tile roofing) or you choose to use special mounting systems (such as sun tracking systems). Other factors may also affect price, including, but not limited to, your location, the building condition, type and location, its wiring, and warrantees offered.

	Assumed Cost, per Watt DC	
Item	**System Size < 2kW**	**System Size ≥ 2kW**
Assumed Total	$10 per watt DC	$9 per watt DC

(+/- 20%) (+/- 20%)



About 60% of the cost to install a solar-electric (PV) system goes to the solar photovoltaic (PV) panels, 10% to an inverter, 15% to direct labor, and 15% to the "balance of system" (BOS) costs.



OTHER ASSUMPTIONS

This summary is based upon many assumptions and the limited data you entered. An actual site assessment by a qualified solar system retailer or contractor will be needed to determine the actual costs and benefits of installing a solar electric system.

HELPFUL PDF's & Links

Report on Solar-Estimate.org Estimator: Comparisons, Methods & Assumptions

Payback & Other Financial Test for Solar on Your Home

The Dept. of Energy's: **PVWatts Online PV Calculator**

Natural Resources Canada's: **RETScreen Renewable Energy Calculators**

A Free Public Service of the Solar & Wind Communities since 2000

contractorcheck.com℠

Contractor verification assisted by **» ContractorCheck.com**

Pre-Screened SOLAR PRO

Pre-screened, Customer-recommended Solar Pros
See: **» How it Works**

Your privacy is important. We will not release or disclose your personal information to others without your permission. Privacy Policy

SOLAR-ESTIMATE.ORG is a free, public service. We believe the efficient use of energy and renewable energy systems makes for comfortable living and a more secure future. So we want to help you reduce your energy demands, increase your energy efficiency and help you utilize more energy from renewable energy systems and sources -- like solar electric (PV - photovoltaics), solar space (air), water & pool heating, wind turbines, biomass furnaces and ground-source heat pumps. Our mission is to serve as a convenient, user-friendly means for home and small commercial building owners to make preliminary evaluations of renewable and solar energy options for their location, run financial analysis and help find and verify the experience, quality and business status of certified solar contractors, and other professionals who can design, install and service renewable and solar energy and energy efficient power systems. (See How It Works). As a business verification service, we maintain the largest directory of current local solar installer and solar contractor profiles including extensive customer reviews and ratings of these professionals. Profiles are not limited to solar energy professionals, but include many other renewable energy, design, engineering and support professional services. We also serve as a consolidator of national and region-specific solar and energy efficiency programs, and utility information about renewable energy, solar energy and energy efficient measures. Our software tools and content include: Online solar estimator (solar calculator, analysis) to help you determine the costs and benefits of a renewable or solar energy system for your particular location and building needs, including financial analysis tools. We also provide a trusted means by which you, as a consumer, can review and access solar panel installers, solar contractors, solar pros and other solar, renewable energy and energy efficiency professional services. And we offer answers to frequently asked questions about renewable and solar power, links and resources to current information about solar power, solar energy, renewable energy, energy bill savings, energy efficiency data, solar incentives, tax credits, rebates and other programs and helpful information so you can learn about solar energy, help us promote renewable and solar power adoption and, hopefully, install a solar system for your home, building, company or community and/or improve your energy efficiency and use. **Site Map**

A solar-powered site and service of Energy Matters LLC.

APPENDIX K

Solar Thermal Domestic Hot Water Plant

Home

What Can I Do?

Electric Choice

Home Energy

FAQs

LEARN
Fact Sheets
Lesson Plans

PLAY
Calculators

NETWORK
Organizations
Businesses
Events Calendar

BROWSE
Resources
- Solar
- Wind
- Biomass
- Geothermal
- Water

Projects

TX Energy - Past and Present

Financial Help

About Us

About SECO

RARE

Interactive Energy Calculators

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

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

Solar Water Heating Calculator

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

Water Heater Characteristics			
Physical		**Thermal**	
? Diameter (feet)	1.6	? Water Inlet Temperature (Degrees F)	50
? Capacity (gallons)	50	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	20.73	? Hot Water Temperature (Degrees F)	140
? Effective R-value	7	? Hot Water Usage (Gallons per Day)	64.3
Energy Use			
1980		? Heat Delivered in Hot Water (BTU/hr)	
207.3		? Heat loss through insulation (BTU/hr)	

Gas vs. Electric Water Heating		
Gas		**Electric**
0.5401	? Overall Efficiency	0.8871
0.5966	? Conversion Efficiency	0.98

3666 BTU/hr	? Power Into Water Heater	2232 BTU/hr
Cost		
$ 1.37 /Therm	? Utility Rates	$ 0 /kWh
$ 439.963	? Yearly Water Heating Cost	$ 0
How Does Solar Compare?		
? Solar Water Heater Cost: $ 9300		? Percentage Solar: 70
30.1972 years for gas	? Payback Time for Solar System	Infinity years for electric

More information on solar water heating:

Fact sheet - Solar Water Heaters
Fact sheet - Solar Water Heaters for Swimming Pools
Kids fact sheet - Heat from the Sun

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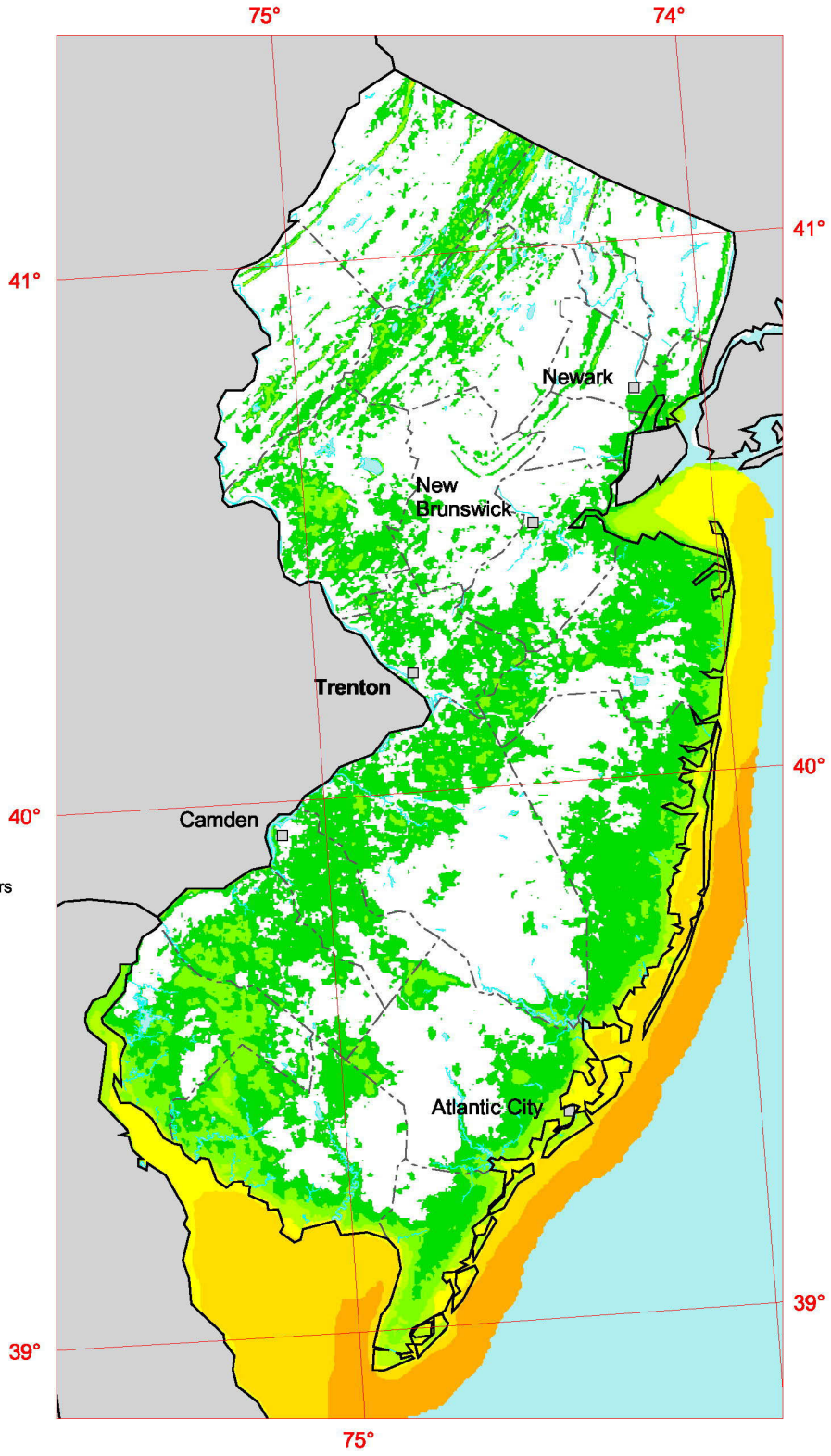
APPENDIX L

Wind

New Jersey

30 m Wind Speed Map

The annual wind speed estimates for this map were produced by TrueWind Solutions using their Mesomap system and historical weather data. It has been validated with available surface data by NREL and wind energy meteorological consultants.



15 0 15 30 45 Kilometers

10 0 10 20 30 Miles

Wind Speed at 30 Meters
m/s

- < 4.5
- 4.5 - 5.0
- 5.0 - 5.5
- 5.5 - 6.0
- 6.0 - 6.5
- 6.5 - 7.0
- 7.0 - 7.5
- 7.5 - 8.0
- 8.0 - 8.5
- > 8.5

U.S. Department of Energy
National Renewable Energy Laboratory

NREL

10-JAN-2003 1.1.8

APPENDIX M

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of Mountain Lakes Borough Hall

Building ID: 2395535
For 12-month Period Ending: May 31, 2010[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: August 02, 2010

Facility
Borough of Mountain Lakes Borough Hall
400 Boulevard
Mountain Lakes, NJ 07046

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1970
Gross Floor Area (ft²): 9,340

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	919,988
Natural Gas (kBtu)[4]	1,157,362
Total Energy (kBtu)	2,077,350

Energy Intensity[5]

Site (kBtu/ft²/yr)	222
Source (kBtu/ft²/yr)	459

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	202

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	77
National Average Source EUI	182
% Difference from National Average Source EUI	152%
Building Type	Office

Stamp of Certifying Professional

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

Certifying Professional
N/A

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

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

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	
Building Name	Borough of Mountain Lakes Borough Hall	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Office	Is this an accurate description of the space in question?		☐
Location	400 Boulevard, Mountain Lakes, NJ 07046	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Office Areas (Office)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	
Gross Floor Area	5,240 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Weekly operating hours	40 Hours	Is this the total number of hours per week that the Office space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	18	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100. The normal worker density ranges between 0.3 and 10 workers per 1000 square feet (92.8 square meters)		☐
Number of PCs	18	Is this the number of personal computers in the Office?		☐
Percent Cooled	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Police/Fire (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	

Gross Floor Area	4,100 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		
Number of PCs	6(Optional)	Is this the number of personal computers in the space?		
Weekly operating hours	24Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		
Workers on Main Shift	4(Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: FirstEnergy - Jersey Central Power & Lt Co

Fuel Type: Electricity

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

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
04/08/2010	05/07/2010	20,000.00
03/08/2010	04/07/2010	12,920.00
02/08/2010	03/07/2010	20,560.00
01/08/2010	02/07/2010	13,960.00
12/08/2009	01/07/2010	20,040.00
11/08/2009	12/07/2009	2,000.00
10/08/2009	11/07/2009	26,440.00
09/08/2009	10/07/2009	33,160.00
08/08/2009	09/07/2009	29,680.00
07/08/2009	08/07/2009	38,440.00
06/08/2009	07/07/2009	28,960.00
Electric Meter Consumption (kWh (thousand Watt-hours))		**246,160.00**
Electric Meter Consumption (kBtu (thousand Btu))		**839,897.92**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**839,897.92**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

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

Start Date	End Date	Energy Use (therms)
04/08/2010	05/07/2010	1,106.84
03/08/2010	04/07/2010	732.69
02/08/2010	03/07/2010	1,905.31
01/08/2010	02/07/2010	1,856.56
12/08/2009	01/07/2010	2,959.07
11/08/2009	12/07/2009	1,217.63
10/08/2009	11/07/2009	850.27
09/08/2009	10/07/2009	134.82
08/08/2009	09/07/2009	36.61
07/08/2009	08/07/2009	37.66
06/08/2009	07/07/2009	36.67

Natural Gas Meter Consumption (therms)	**10,874.13**
Natural Gas Meter Consumption (kBtu (thousand Btu))	**1,087,413.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**1,087,413.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	☐

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

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

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same PE or RA that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
Borough of Mountain Lakes Borough Hall
400 Boulevard
Mountain Lakes, NJ 07046

Facility Owner
N/A

Primary Contact for this Facility
N/A

General Information

Borough of Mountain Lakes Borough Hall	
Gross Floor Area Excluding Parking: (ft^2)	9,340
Year Built	1970
For 12-month Evaluation Period Ending Date:	May 31, 2010

Facility Space Use Summary

Office Areas	
Space Type	Office
Gross Floor Area(ft^2)	5,240
Weekly operating hours	40
Workers on Main Shift	18
Number of PCs	18
Percent Cooled	50% or more
Percent Heated	50% or more

Police/Fire	
Space Type	Other - Fire Station/Police Station
Gross Floor Area(ft^2)	4,100
Number of PCs[o]	6
Weekly operating hours[o]	24
Workers on Main Shift[o]	4

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 05/31/2010)	**Baseline** (Ending Date 05/31/2010)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft^2)	222	222	55	N/A	77
Source (kBtu/ft^2)	459	459	113	N/A	182
Energy Cost					
$/year	$ 60,479.44	$ 60,479.44	$ 14,920.67	N/A	$ 20,938.43
$/$ft^2$/year	$ 6.48	$ 6.48	$ 1.60	N/A	$ 2.24
Greenhouse Gas Emissions					
$MtCO_2e$/year	202	202	50	N/A	70
$kgCO_2e/ft^2$/year	22	22	5	N/A	8

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

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

APPENDIX N

Carrier Hourly Analysis
Program Base Building Data

Boiler

Boiler Full Load Details

Gross Output	**167.0**	MBH
Overall Efficiency	**80.0**	%
Fuel or Energy Type	**Natural Gas**	
Boiler Accessories	**0.15**	kW
Hot Water Flow Rate	**20.0**	°F

Part Load Model

Part Load Model ..... **Constant Efficiency**

Part Load Performance

% Load	Efficiency (%)
100.0	80.0
90.0	80.0
80.0	80.0
70.0	80.0
60.0	80.0
50.0	80.0
40.0	80.0
30.0	80.0
20.0	80.0
10.0	80.0
0.0	80.0

Existing Multi-Zone HVAC Unit Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 08:58AM

1. General Details:

Air System Name ..... **Existing Multi-Zone HVAC Unit**
Equipment Type ..... **Packaged Rooftop Units**
Air System Type ..... **2-Deck Multizone**
Number of zones **6**

2. System Components:

Ventilation Air Data:

Airflow Control ..... **Constant Ventilation Airflow**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Unocc. Damper Position ..... **Closed**
Damper Leak Rate ..... **5** %
Outdoor Air CO2 Level ..... **400** ppm

Economizer Data:

Control ..... **Integrated enthalpy control**
Upper Cutoff ..... **73.0** °F
Lower Cutoff ..... **-60.0** °F

Central Cooling Data:

Supply Air Temperature ..... **55.0** °F
Coil Bypass Factor **0.100**
Cooling Source ..... **Air-Cooled DX**
Schedule ..... **JFMAMJJASOND**
Capacity Control ..... **Constant Temperature - Fan On**

Central Heating Data:

Supply Temperature ..... **95.0** °F
Heating Source ..... **Combustion - Natural Gas**
Schedule ..... **JFMA* * * * * OND**
Capacity Control ..... **Cycled or Staged Capacity - Fan On**

Supply Fan Data:

Fan Type ..... **Forward Curved**
Configuration ..... **Blow-thru**
Fan Performance ..... **1.50** in wg
Overall Efficiency ..... **54** %

Duct System Data:

Supply Duct Data:

Duct Heat Gain ..... **0** %
Duct Leakage ..... **0** %

Return Duct or Plenum Data:

Return Air Via ..... **Ducted Return**

Return Fan Data:

Fan Type ..... **Forward Curved with Inlet Guide Vanes**
Fan Performance ..... **1.00** in wg
Overall Efficiency ..... **54** %

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
Conference Lower	x1
Zone 2: Zone 2	
Council Lower	x1
Zone 3: Zone 3	
Hall Lower	x1
Zone 4: Zone 4	
Permit Lower	x1
Zone 5: Zone 5	
Police Lower Level	x1
Zone 6: Zone 6	
Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **69.0** °F

Cooling T-stat: Unocc. ..... **71.0** °F
Heating T-stat: Occ. ..... **64.0** °F
Heating T-stat: Unocc. ..... **64.0** °F
T-stat Throttling Range ..... **1.50** °F
Diversity Factor ..... **100** %
Direct Exhaust Airflow ..... **0.0** CFM
Direct Exhaust Fan kW ..... **0.0** kW

Thermostat Schedule ..... **TStat Scehdule - Upper**
Unoccupied Cooling is ..... **Available**

Supply Terminals Data:
Zone ..... **All**
Terminal Type ..... **Diffuser**
Minimum Airflow ..... **0.00** CFM/person

Zone Heating Units:
Zone ..... **All**
Zone Heating Unit Type ..... **None**

Zone Unit Heat Source ..... **Electric Resistance**
Zone Heating Unit Schedule ..... **JFMAMJJASOND**

4. Sizing Data (Computer-Generated):

System Sizing Data:
Cold Deck Supply Temperature ..... **55.0** °F
Supply Fan Airflow ..... **21287.2** CFM
Ventilation Airflow ..... **920.0** CFM
Hot Deck Supply Temperature ..... **95.0** °F

Hydronic Sizing Specifications:
Chilled Water Delta-T ..... **10.0** °F
Hot Water Delta-T ..... **20.0** °F

Safety Factors:
Cooling Sensible ..... **10** %
Cooling Latent ..... **10** %
Heating ..... **10** %

Zone Sizing Data:
Zone Airflow Sizing Method ..... **Sum of space airflow rates**
Space Airflow Sizing Method ..... **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- -
1	619.1	-	-	-
2	2282.8	-	-	-
3	376.0	-	-	-
4	360.0	-	-	-
5	5204.9	-	-	
6	12444.4	-	-	

5. Equipment Data

Central Cooling Unit - Air-Cooled DX
Estimated Maximum Load ..... **414.2** MBH
Design OAT ..... **95.0** °F
Equipment Sizing ..... **(Auto-Sized) 414.2** MBH
Capacity Oversizing Factor ..... **0** %
ARI Performance Rating ..... **10.30** EER
Conventional Cutoff OAT ..... **55.0** °F
Low Temperature Operation ..... **Used**
Low Temperature Cutoff OAT ..... **0.0** °F

Existing Multi-Zone HVAC Unit Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 08:58AM

Central Heating Unit - Combustion

Estimated Maximum Load		**200.7**	MBH
Equipment Sizing	**(Auto-Sized)**	**200.7**	MBH
Capacity Oversizing Factor		**0**	%
Average Efficiency		**79.1**	%
Misc. Electric		**0.000**	kW

Garage Unit Heaters Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 08:58AM

1. General Details:

Air System Name	**Garage Unit Heaters**	
Equipment Type	**Split AHU**	
Air System Type	**Single Zone CAV**	
Number of zones	**1**	

2. System Components:

Ventilation Air Data:

Airflow Control	**Constant Ventilation Airflow**	
Ventilation Sizing Method	**Sum of Space OA Airflows**	
Unocc. Damper Position	**Closed**	
Damper Leak Rate	**0**	%
Outdoor Air CO2 Level	**400**	ppm

Central Heating Data:

Supply Temperature	**95.0**	°F
Heating Source	**Combustion - Natural Gas**	
Schedule	**JFM* * * * * OND**	
Capacity Control	**Cycled or Staged Capacity - Fan On**	

Supply Fan Data:

Fan Type	**Forward Curved**	
Configuration	**Draw-thru**	
Fan Performance	**0.00**	in wg
Overall Efficiency	**54**	%

Duct System Data:

Supply Duct Data:

Duct Heat Gain	**0**	%
Duct Leakage	**0**	%

Return Duct or Plenum Data:

Return Air Via	**Ducted Return**	

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
Garage	x1

Thermostats and Zone Data:

Zone	**All**	
Cooling T-stat: Occ.	**75.0**	°F
Cooling T-stat: Unocc.	**75.0**	°F
Heating T-stat: Occ.	**65.0**	°F
Heating T-stat: Unocc.	**65.0**	°F
T-stat Throttling Range	**1.50**	°F
Diversity Factor	**100**	%
Direct Exhaust Airflow	**0.0**	CFM
Direct Exhaust Fan kW	**0.0**	kW
Thermostat Schedule	**TStat Scehdule - Police**	
Unoccupied Cooling is	**Not Available**	

Supply Terminals Data:

Zone	**All**	
Terminal Type	**Diffuser**	
Minimum Airflow	**0.00**	CFM/person

Zone Heating Units:

Zone	**All**	
Zone Heating Unit Type	**None**	
Zone Unit Heat Source	**Electric Resistance**	
Zone Heating Unit Schedule	**JFMAMJJASOND**	

4. Sizing Data (Computer-Generated):

System Sizing Data:

Supply Fan Airflow	**2838.0**	CFM
Ventilation Airflow	**2838.0**	CFM
Heating Supply Temperature	**95.0**	°F

Garage Unit Heaters Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 08:58AM

Hydronic Sizing Specifications:

Chilled Water Delta-T	**10.0**	°F
Hot Water Delta-T	**20.0**	°F

Safety Factors:

Cooling Sensible	**0**	%
Cooling Latent	**0**	%
Heating	**0**	%

Zone Sizing Data:

Zone Airflow Sizing Method	**Sum of space airflow rates**
Space Airflow Sizing Method	**Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- (CFM)
1	2838.0	-	-	

5. Equipment Data

Central Heating Unit - Combustion

Estimated Maximum Load		**218.6**	MBH
Equipment Sizing	**(Auto-Sized)**	**218.6**	MBH
Capacity Oversizing Factor		**0**	%
Average Efficiency		**80.0**	%
Misc. Electric		**0.000**	kW

Baseboard Radiators Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 08:58AM

1. General Details:

Air System Name ..... **Baseboard Radiators**
Equipment Type ..... **Terminal Units**
Air System Type ..... **2-Pipe Fan Coil**
Number of zones **1**
Ventilation ..... **Direct Ventilation**

2. Ventilation System Components:

(Common Ventilation System not used: no inputs)

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
Upper Floor	x1

Thermostats and Zone Data:

Zone ..... **All**
Cooling T-stat: Occ. ..... **80.0** °F
Cooling T-stat: Unocc. ..... **80.0** °F
Heating T-stat: Occ. ..... **79.0** °F
Heating T-stat: Unocc. ..... **79.0** °F
T-stat Throttling Range ..... **1.50** °F

Thermostat Schedule ..... **TStat Scehdule - Police**
Unoccupied Cooling is ..... **Available**

Common Terminal Unit Data:

Heating Coil:

Design Supply Temperature ..... **95.0** °F
Heating Source ..... **Hot Water**
Schedule ..... **JFMA* * * * * OND**

Fan Control ..... **Fan On**
Ventilation Sizing Method ..... **Sum of Space OA Airflows**

Terminal Units Data:

Zone ..... **All**
Terminal Type ..... **Fan Coil**
Minimum Airflow ..... **0.00** CFM/person
Fan Performance ..... **0.00** in wg
Fan Overall Efficiency ..... **50** %

4. Sizing Data (Computer-Generated):

System Sizing Data:

Heating Supply Temperature ..... **95.0** °F

Hydronic Sizing Specifications:

Chilled Water Delta-T ..... **10.0** °F
Hot Water Delta-T ..... **20.0** °F

Safety Factors:

Cooling Sensible ..... **0** %
Cooling Latent ..... **0** %
Heating ..... **0** %

Zone Sizing Data:

Zone Airflow Sizing Method ..... **Sum of space airflow rates**
Space Airflow Sizing Method ..... **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	Ventilation (CFM)
1	7188.6	-	-	320.0

5. Equipment Data

No Equipment Data required for this system.

Baseboard Radiators Input Data

Project Name: Mountian Lakes - Borough Hall-TrueUP 08/17/2010
Prepared by: Kitchen and Associates 08:58AM

Billing Details - Electric - Base Building

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
08:58AM

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	3,218	0	0	0	3,218
Feb	3,002	0	0	0	3,002
Mar	3,397	0	0	0	3,397
Apr	3,326	0	0	0	3,326
May	3,625	0	0	0	3,625
Jun	4,290	0	0	0	4,290
Jul	4,738	0	0	0	4,738
Aug	4,726	0	0	0	4,726
Sep	3,978	0	0	0	3,978
Oct	3,415	0	0	0	3,415
Nov	3,245	0	0	0	3,245
Dec	3,420	0	0	0	3,420
Totals	44,381	0	0	0	44,381

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	3,218	18,930	0.1700
Feb	3,002	17,659	0.1700
Mar	3,397	19,982	0.1700
Apr	3,326	19,563	0.1700
May	3,625	21,321	0.1700
Jun	4,290	25,236	0.1700
Jul	4,738	27,873	0.1700
Aug	4,726	27,801	0.1700
Sep	3,978	23,397	0.1700
Oct	3,415	20,089	0.1700
Nov	3,245	19,091	0.1700
Dec	3,420	20,120	0.1700
Totals	44,381	261,062	0.1700

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	18,930
Feb	0	0	0	0	17,659
Mar	0	0	0	0	19,982
Apr	0	0	0	0	19,563
May	0	0	0	0	21,321
Jun	0	0	0	0	25,236
Jul	0	0	0	0	27,873
Aug	0	0	0	0	27,801
Sep	0	0	0	0	23,397
Oct	0	0	0	0	20,089
Nov	0	0	0	0	19,091
Dec	0	0	0	0	20,120
Totals	0	0	0	0	261,062

4. Billing Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	70.8
Feb	0.0	0.0	0.0	0.0	70.8
Mar	0.0	0.0	0.0	0.0	81.1
Apr	0.0	0.0	0.0	0.0	88.7
May	0.0	0.0	0.0	0.0	96.6
Jun	0.0	0.0	0.0	0.0	95.2
Jul	0.0	0.0	0.0	0.0	98.2
Aug	0.0	0.0	0.0	0.0	94.4
Sep	0.0	0.0	0.0	0.0	90.9
Oct	0.0	0.0	0.0	0.0	90.8
Nov	0.0	0.0	0.0	0.0	75.9
Dec	0.0	0.0	0.0	0.0	71.5

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	70.8
Feb	0.0	0.0	0.0	0.0	70.8
Mar	0.0	0.0	0.0	0.0	81.1
Apr	0.0	0.0	0.0	0.0	88.7
May	0.0	0.0	0.0	0.0	96.6
Jun	0.0	0.0	0.0	0.0	95.2
Jul	0.0	0.0	0.0	0.0	98.2
Aug	0.0	0.0	0.0	0.0	94.4
Sep	0.0	0.0	0.0	0.0	90.9
Oct	0.0	0.0	0.0	0.0	90.8
Nov	0.0	0.0	0.0	0.0	75.9
Dec	0.0	0.0	0.0	0.0	71.5

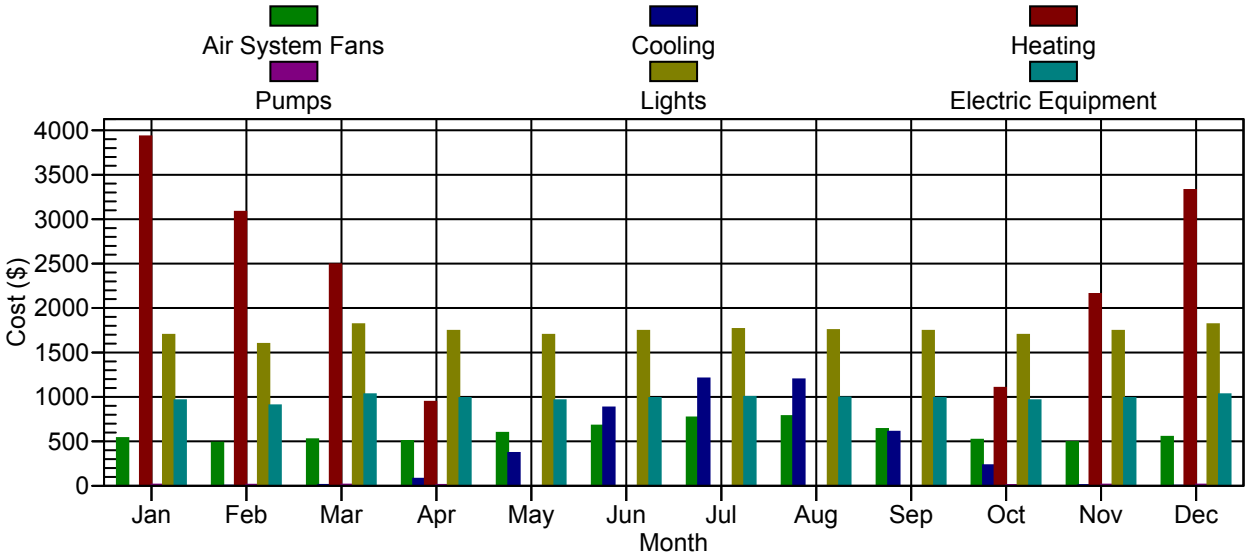
6. Time Of Maximum Demands

Billing Period	Peak (m/d/h)	Mid-Peak (m/d/h)	Normal Peak (m/d/h)	Off-Peak (m/d/h)	Overall (m/d/h)
Jan	n/a	n/a	n/a	n/a	1/25/0800
Feb	n/a	n/a	n/a	n/a	2/1/0800
Mar	n/a	n/a	n/a	n/a	3/5/1600
Apr	n/a	n/a	n/a	n/a	4/19/1600
May	n/a	n/a	n/a	n/a	5/17/1500
Jun	n/a	n/a	n/a	n/a	6/11/1600
Jul	n/a	n/a	n/a	n/a	7/1/1600
Aug	n/a	n/a	n/a	n/a	8/4/1500
Sep	n/a	n/a	n/a	n/a	9/10/1500
Oct	n/a	n/a	n/a	n/a	10/1/1500
Nov	n/a	n/a	n/a	n/a	11/3/1600
Dec	n/a	n/a	n/a	n/a	12/2/1500

Monthly Component Costs - Base Building

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
08:58AM



1. HVAC Component Costs

Month	Air System Fans ($)	Cooling ($)	Heating ($)	Pumps ($)	Cooling Towers ($)	HVAC Total ($)
January	536	0	3,931	14	0	4,481
February	484	0	3,083	12	0	3,579
March	523	9	2,491	12	0	3,035
April	503	80	945	9	0	1,537
May	596	369	0	0	0	965
June	677	882	0	0	0	1,559
July	768	1,207	0	0	0	1,975
August	784	1,197	0	0	0	1,981
September	638	608	0	0	0	1,246
October	517	230	1,103	7	0	1,857
November	493	4	2,158	12	0	2,667
December	552	1	3,329	13	0	3,895
Total	**7,072**	**4,587**	**17,038**	**80**	**0**	**28,776**

2. Non-HVAC Component Costs

Month	Lights ($)	Electric Equipment ($)	Misc. Electric ($)	Misc. Fuel Use ($)	Non-HVAC Total ($)	Grand Total ($)
January	1,698	962	0	0	2,660	7,141
February	1,595	904	0	0	2,499	6,078
March	1,818	1,030	0	0	2,848	5,883
April	1,744	988	0	0	2,732	4,269
May	1,698	962	0	0	2,660	3,625
June	1,744	988	0	0	2,732	4,291
July	1,763	999	0	0	2,763	4,738
August	1,752	993	0	0	2,745	4,726
September	1,744	988	0	0	2,732	3,978
October	1,698	962	0	0	2,660	4,517
November	1,744	988	0	0	2,732	5,399
December	1,818	1,030	0	0	2,848	6,743
Total	**20,814**	**11,795**	**0**	**0**	**32,610**	**61,386**

Monthly Energy Costs - Base Building

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
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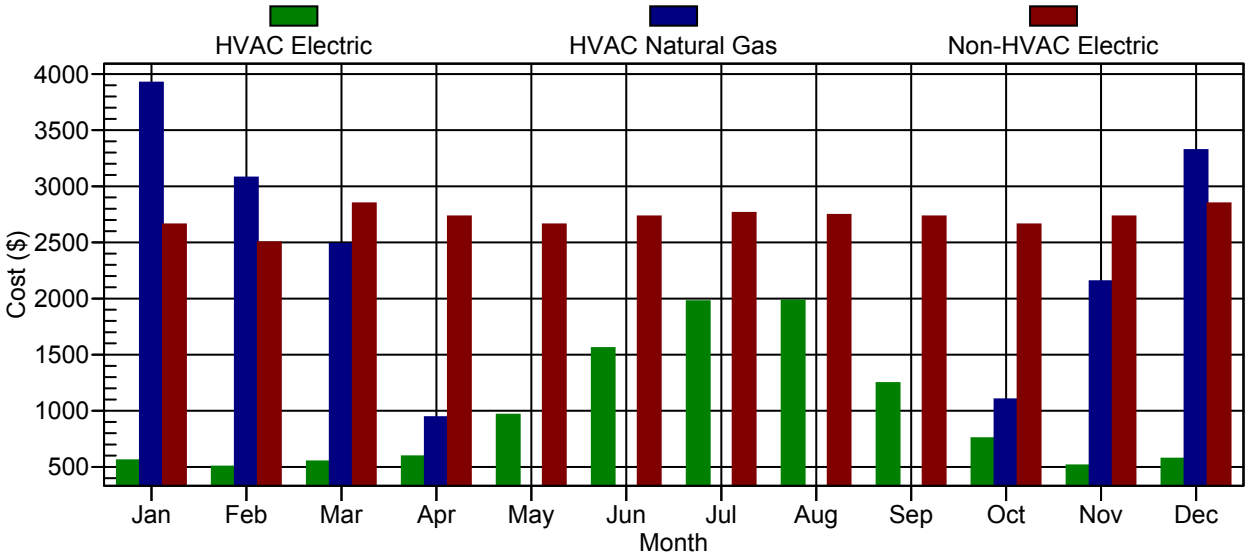

1. HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)	Remote Chilled Water ($)
January	558	3,922	0	0	0	0	0
February	503	3,077	0	0	0	0	0
March	549	2,487	0	0	0	0	0
April	594	942	0	0	0	0	0
May	964	0	0	0	0	0	0
June	1,559	0	0	0	0	0	0
July	1,976	0	0	0	0	0	0
August	1,981	0	0	0	0	0	0
September	1,246	0	0	0	0	0	0
October	755	1,102	0	0	0	0	0
November	514	2,154	0	0	0	0	0
December	573	3,322	0	0	0	0	0
Total	**11,771**	**17,005**	**0**	**0**	**0**	**0**	**0**

2. Non-HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)
January	2,660	0	0	0	0	0
February	2,500	0	0	0	0	0
March	2,848	0	0	0	0	0
April	2,732	0	0	0	0	0
May	2,660	0	0	0	0	0
June	2,732	0	0	0	0	0
July	2,763	0	0	0	0	0
August	2,745	0	0	0	0	0
September	2,732	0	0	0	0	0
October	2,660	0	0	0	0	0
November	2,732	0	0	0	0	0
December	2,848	0	0	0	0	0
Total	**32,610**	**0**	**0**	**0**	**0**	**0**

Monthly Energy Use by Energy Type - Base Building

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
08:58AM

1. HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)	Remote CW (na)
Jan	3,282	2,863	0	0	0	0	0
Feb	2,957	2,246	0	0	0	0	0
Mar	3,231	1,815	0	0	0	0	0
Apr	3,495	688	0	0	0	0	0
May	5,673	0	0	0	0	0	0
Jun	9,168	0	0	0	0	0	0
Jul	11,621	0	0	0	0	0	0
Aug	11,654	0	0	0	0	0	0
Sep	7,329	0	0	0	0	0	0
Oct	4,441	804	0	0	0	0	0
Nov	3,023	1,572	0	0	0	0	0
Dec	3,369	2,425	0	0	0	0	0
Totals	69,243	12,413	0	0	0	0	0

2. Non-HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)
Jan	15,648	0	0	0	0	0
Feb	14,703	0	0	0	0	0
Mar	16,751	0	0	0	0	0
Apr	16,068	0	0	0	0	0
May	15,648	0	0	0	0	0
Jun	16,068	0	0	0	0	0
Jul	16,252	0	0	0	0	0
Aug	16,147	0	0	0	0	0
Sep	16,068	0	0	0	0	0
Oct	15,648	0	0	0	0	0
Nov	16,068	0	0	0	0	0
Dec	16,751	0	0	0	0	0
Totals	191,821	0	0	0	0	0

Monthly Energy Use by Component - Base Building

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
08:58AM

1. Monthly Energy Use by System Component

Component	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Air System Fans (kWh)	3153	2848	3079	2959	3503	3981	4518	4614	3754	3041	2900	3246
Cooling												
Electric (kWh)	0	0	54	470	2170	5186	7103	7040	3575	1355	26	3
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote CW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Heating												
Electric (kWh)	49	36	25	12	0	0	0	0	0	6	24	41
Natural Gas (Therm)	2863	2246	1815	688	0	0	0	0	0	804	1572	2425
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Pumps (kWh)	80	72	73	54	0	0	0	0	0	39	73	79
Clg. Tower Fans (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Lighting (kWh)	9988	9385	10692	10256	9988	10256	10374	10306	10256	9988	10256	10692
Electric Eqpt. (kWh)	5660	5318	6059	5812	5660	5812	5879	5841	5812	5660	5812	6059
Misc. Electric (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Fuel												
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0

Annual Cost Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
08:58AM

Table 1. Annual Costs

Component	Base Building ($)
Air System Fans	7,072
Cooling	4,587
Heating	17,038
Pumps	80
Cooling Tower Fans	0
HVAC Sub-Total	**28,776**
Lights	20,814
Electric Equipment	11,795
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	**32,610**
Grand Total	**61,386**

Table 2. Annual Cost per Unit Floor Area

Component	Base Building ($/ft²)
Air System Fans	0.541
Cooling	0.351
Heating	1.304
Pumps	0.006
Cooling Tower Fans	0.000
HVAC Sub-Total	**2.203**
Lights	1.593
Electric Equipment	0.903
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.699**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	Base Building (%)
Air System Fans	11.5
Cooling	7.5
Heating	27.8
Pumps	0.1
Cooling Tower Fans	0.0
HVAC Sub-Total	**46.9**
Lights	33.9
Electric Equipment	19.2
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	**53.1**
Grand Total	**100.0**

Annual Energy and Emissions Summary

Mountian Lakes - Borough Hall-TrueUP
Kitchen and Associates

08/17/2010
08:58AM

Table 1. Annual Costs

Component	Base Building ($)
HVAC Components	
Electric	11,771
Natural Gas	17,005
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Remote CW	0
HVAC Sub-Total	**28,777**
Non-HVAC Components	
Electric	32,610
Natural Gas	0
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Non-HVAC Sub-Total	**32,610**
Grand Total	**61,386**

Table 2. Annual Energy Consumption

Component	Base Building
HVAC Components	
Electric (kWh)	69,243
Natural Gas (Therm)	12,413
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0
Non-HVAC Components	
Electric (kWh)	191,821
Natural Gas (Therm)	0
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Totals	
Electric (kWh)	261,064
Natural Gas (Therm)	12,413
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0

Table 3. Annual Emissions

Component	Base Building
CO2 Equivalent (lb)	0

Table 4. Annual Cost per Unit Floor Area

Component	Base Building ($/ft²)
HVAC Components	
Electric	0.901
Natural Gas	1.302
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Remote CW	0.000
HVAC Sub-Total	**2.203**
Non-HVAC Components	
Electric	2.496
Natural Gas	0.000
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Non-HVAC Sub-Total	**2.496**
Grand Total	**4.699**
Gross Floor Area (ft²)	13064.0
Conditioned Floor Area (ft²)	13064.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 5. Component Cost as a Percentage of Total Cost

Component	Base Building (%)
HVAC Components	
Electric	19.2
Natural Gas	27.7
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Remote CW	0.0
HVAC Sub-Total	**46.9**
Non-HVAC Components	
Electric	53.1
Natural Gas	0.0
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Non-HVAC Sub-Total	**53.1**
Grand Total	**100.0**

APPENDIX O

Site Aerial Image


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