

**SADDLE RIVER
BOROUGH HALL
ENERGY ASSESSMENT**

for

**NEW JERSEY
BOARD OF PUBLIC UTILITIES**

CHA PROJECT NO. 21351

NOVEMBER 2010

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1.0 INTRODUCTION AND BACKGROUND

The Saddle River Borough Hall is a two story 7,700 square foot facility located at 100 East Allendale Road. Originally constructed in 1937 as a fire hall and municipal building, the facility underwent a major renovation in 1992 when it was converted into the Borough Hall. The building now houses the local court, court offices, and Mayor's office on the second floor; and municipal offices with supporting spaces on the first floor. The municipal and court offices are open Monday through Friday from 8:30 AM to 4:00 PM. Court sessions are held on the first and third Tuesdays of the month from about 2:00 PM to 6:00 PM.

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

2.0 EXECUTIVE SUMMARY

This report details the results of the Saddle River Borough Hall, a two story 7,700 square foot facility constructed in 1937. The building contains the local court, court offices, and Mayor's office on the second floor; and municipal offices with supporting spaces on the first. The following areas were evaluated for energy conservation measures:

- Night setback
- Lighting replacement w/occupancy sensors
- Boiler replacement w/hot water temperature reset
- Domestic hot water heater replacement
- Window replacement

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Potential annual savings of \$4,000 for the recommended ECMs may be realized with a payback of 1.7 years.

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

ECM-4 Night Setback

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
\$	kW	kWh	Therms	kGals	\$	\$	\$		\$	Years	Years
1,400	0	3,510	1,440	0	2,300	0	2,300	24.3	NA	0.6	NA

*Incentive shown is per the New Jersey Smart Start Program, 2010 Electric Unitary HVAC Application.

ECM-7 Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
\$	kW	kWh	Therms	kGals	\$	\$	\$		\$	Years	Years
6,300	4.3	8,930	0	0	1,700	0	1,700	3.0	1,000	3.7	3.1

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

3.0 EXISTING CONDITIONS

3.1 Building - General

The Saddle River Borough Hall, a 7,700 square foot, two story facility, was constructed in 1937 as a fire hall and municipal building. A major renovation in 1992 converted the facility into the current Borough Hall housing the courtroom, court offices, Mayor's office, and municipal offices. The third floor attic area is used for storage and mechanical space.

It should be noted that the building is currently scheduled for a major renovation; the south wing of the building will be completely demolished and rebuilt; only the historic building section along the front will remain. When the renovation occurs, only energy conservation measures associated with the remaining historic building section will be applicable.

The municipal and court offices are open Monday through Friday from 8:30 AM to 4:00 PM, and typically occupied by about 20 people. Court sessions are held on the first and third Tuesdays of the month from about 2:00 PM to 6:00 PM with approximately 100 people attending. The courtroom and conference room are used several times a week for town and employee meetings. The number of attendees and duration of each gathering varies depending on meeting specifics.

The building's exterior wall construction consists of 1" plaster over 2" wood lathes and furring, 12" block and finished outside with 4" cut stone. A stucco finish with 2" rigid insulation was added to the south wing of the building during the renovation in the early 1990s. The Borough Hall's roof is pitched with slate shingles over felt paper and plywood sheathing, and furred out with a plaster ceiling. The front section of the building has a gable roof. Acoustic tile drop ceilings with lay-in batt insulation were added throughout the building.

Windows on the first floor are single hung with wooden frames and double pane glass, and are in good condition. Second floor windows are also single hung and wooden frame but with single pane glass and are in poor condition. Second floor windows at the front section of the building have aluminum frame exterior storms. Most exterior doors are solid wood. The rear vestibule has two, 15 lite wood doors; there is also a steel security door at the bottom of the stairwell and bilco basement doors to the boiler room.

3.2 Utility Usage

Utilities include electricity, natural gas, and potable water. Electricity is purchased from Orange & Rockland (O&R) and natural gas is purchased from Public Service Electric & Gas Company (PSE&G). Potable water is provided by an on-site well and wastewater is collected in a septic tank.

In 2009, electric usage was approximately 80,940 kWh at a cost of about \$14,800. Analyzing electricity bills during this period showed that the building was charged at the following rates: supply unit cost of \$0.143 per kWh; demand unit cost of \$9.19 per kW; and a blended unit cost of \$0.183 per kWh. Electricity usage was highest during the peak heating and cooling months. During the same timeframe, the building heat and domestic hot water (DHW) produced by natural gas-fired equipment required about 5,430 therms. Based on the annual cost of about \$6,100, the blended price for natural gas was \$1.128 per therm. Natural gas consumption is highest in the winter months when the building is in heating mode. Utility data can be found in Appendix A.

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

3.3 HVAC Systems

The Hall's primary heating plant consists of three Caravan Slant/Fin hot water (HW) boilers. Installed in 1995, the three cast-iron boilers are gas-fired with a combined input of 900,000 Btuh and operate with a thermal efficiency of about 80%. Heating hot water (HHW) is distributed to zones via three inline circulating pumps with varying motor sizes (1/8, 1/2 and 3/4 HP). The boilers and pumps are in good condition. Terminal hydronic heating equipment includes fintube radiators, upright convection radiator units, cabinet unit heaters, and cabinet style convection radiator units. Fintube radiators were added along the first floor within the past several years in response to occupant issues with areas being excessively cold.

Five Carrier air handling units (AHUs) with hot water heating coils and direct expansion (DX) cooling are utilized to provide a majority of HVAC to the building. Two units are located in the attic, one in the ceiling above the second floor conference room, and two in the ceilings above the first floor restrooms. Downstream of the AHU serving the west side of the first floor is a variable air volume (VAV) unit with a hot water reheat coil. This VAV box serves the breakroom and copy center. Each AHU is connected to a remote condensing unit for cooling. The five condensers are located outside on grade and provide about 38 tons of cooling capacity.

Other HVAC equipment includes electric baseboard heaters in the downstairs and upstairs restrooms; three exhaust fans serving the restroom areas; and a 3/4 ton split system heat pump unit in the second floor court office. Most HVAC equipment was installed during the 1992 renovation and is in fair condition.

3.4 Lighting/Electrical Systems

3.4.1 Interior Lighting Systems

Most interior lighting fixtures utilize energy efficient 'U' shape T-8 lamps and electronic ballasts. Other lighting includes several T-12 strip lights; mini-fluorescent lamps in recessed ceiling fixtures with magnetic ballasts; and round pendant style fixtures with three 100W incandescent bulbs. Wall-mounted uplights with 40W incandescent bulbs and 4', four lamp T-12 fluorescent fixtures with magnetic ballasts are also utilized. Exit signs throughout the building are energy efficient LED technology.

3.4.2 Exterior Lighting Systems

Exterior lighting fixtures are mounted at the corners of the building and entrances. The rear entrance is lit by two decorative brass fixtures, each with four 60W incandescent bulbs. The remaining entrances and emergency exits utilize 100W incandescent screw-type bulbs. Two building corners are equipped with dual light 100W flood lamps. All exterior lighting is controlled by a timer located in the boiler room.

3.4.3 Emergency Power Systems

Emergency backup power is provided by a gas-fired Winco generator located in the generator house along the east side of the building. The generator unit is rated at 55 kW, 88.75 kVA and 191 amps, and supplies 120/208 volt, 3 phase power. Building maintenance personnel run the unit monthly to verify proper operation and exercise the motor.

3.5 Control Systems

Each AHU is controlled by a programmable thermostat located within the units' corresponding space. Thermostats have not been programmed for night setback and the occupants often adjust them for comfort. Temperature setpoints found during the time of the energy audit are outlined below.

Equipment	Area Served	Setpoint	
		Heating	Cooling
AHU-1	2nd Flr Conf Room	72°F	72°F
AHU-2	1st Flr West Side	68°F	72°F
AHU-3	1st Flr East Side	68°F	72°F
AHU-4	Offices, Foyer, Storage	70°F	73°F
AHU-5	Court Room	70°F	75°F

Hot water terminal equipment is controlled by mechanical dial type thermostats. This includes the single VAV box which serves the breakroom and copy center that was set to 70°F. One thermostat, set to 68°F, is used to control all fintube radiator units on the first floor. Building occupants stated that this causes many areas to become overheated and creates comfort issues. Other dial type thermostats controlling hydronic equipment were set at either 68 or 72°F.

The boilers are operated by a Tekmar controller with hot water temperature reset. The controller fires the boiler units when the outdoor air (OA) temperature drops below 70°F and increases the water temperature to a maximum of 225°F as the OA temperature declines.

3.6 Plumbing Systems

Domestic hot water (DHW) is generated by a 75 gallon, Ruud gas-fired water heater with an input of 75,500 Btuh. This unit, located in the boiler room, is very old and in poor condition. Also located in the boiler room are two, 350 gallon Extrol Amtrol well tanks for storage of potable water pumped from the well. Plumbing fixtures include standard toilets, urinals, hand sinks, and kitchen sinks.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Boiler Replacement with HW Temperature Reset

Heating hot water is provided by three 1995 Caravan Slant/Fin gas-fired boilers. The overall boiler system is rated at 900 MBH input, 720 MBH output, with a thermal efficiency of 80%. This ECM evaluated replacing the original unit with a high efficiency, condensing boiler with a HW temperature reset control system. By installing a HW reset system, heat losses from the building's HHW piping system can be reduced. Additionally, combining the control system with a condensing boiler can improve firing efficiency up to 95%, or higher.

The savings of applying HW temperature reset were evaluated by generating a spreadsheet that compared the existing piping system losses to those of the proposed system (Appendix B). Using estimated dimensions of the existing HHW hydronic system and weather bin data, with an average HHW temperature of 193°F, the current annual heat loss by the system was found to be about 76,060 MBh. With a HW reset control system in place, the average HHW temperature can be reduced to about 138°F. The resulting annual heat loss from the HHW piping system is reduced to approximately 38,590 MBh.

Piping heat losses calculated for the existing system, and with HW reset in place, were then applied to the proposed boiler efficiency rates to determine the required therms to overcome the losses. Since the efficiency of the proposed condensing boiler varies based on the return water temperature, the efficiency curve for an Aerco KC-1000 boiler was used to input the different firing efficiencies with the HW reset system. Averaging the boiler firing efficiencies yielded an annual thermal efficiency of 93%. The difference between the existing and proposed therms required to overcome heat losses result in an annual energy savings of about 400 therms of natural gas.

The proposed ECM also projected savings for boiler replacement. Evaluation of utility bills determined that the existing boiler system consumes about 5,270 therms annually. Applying the 80% boiler efficiency to its annual natural gas usage established a baseline boiler load of approximately 421,600 MBH per year. With the improved efficiency determined in the HW reset calculation, the proposed condensing boiler will require 4,540 therms to meet this load, resulting in a savings of about 730 therms of natural gas per year. As previously stated, the proposed boiler efficiency rating is based on the use of an Aerco KC-1000 boiler for the calculation. Exact boiler selection and sizing cannot be completed without a detailed analysis of the building's hydronic heating system and generation of a load profile.

For implementation of this measure, a new gas-fired, condensing, hot water boiler would be installed, along with an integral HW temperature reset control system. New immediate HW supply and return piping must also be installed; valves would be reused where possible. A new exhaust flue system will also be required.

Condensing boilers have an expected life of 25 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 28,500 therms and \$32,500.

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

ECM-1 Boiler Replacement with HW Temperature Reset

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
\$	kW	kWh	Therms	kGals	\$	\$	\$		\$	Years	Years
29,500	0	0	1,140	0	1,300	0	1,300	0.1	1.800	22.7	21.3

*Incentive shown is per the New Jersey Smart Start Program, 2010 Gas Heating Application.

This measure is not recommended.

4.2 ECM-2 Replace Domestic Hot Water Heater

Domestic hot water is generated by a gas-fired, 75 gallon, Ruud water heater with an input of 75,500 Btuh and estimated thermal efficiency of about 75%. This unit is very old and in poor condition. Due to a minimal demand for hot water in the building, there are extended periods of time with little or no use. However, the unit must still heat the water within the storage tank. Energy required to maintain the hot water temperature setpoint during times of zero demand are known as standby losses. This measure evaluated replacing the existing DHW heater with a tankless, gas-fired, condensing hot water heater to eliminate standby losses.

According to the U.S. Department of Energy, 2.5% of stored capacity is lost every hour during hot water heater standby. This value was applied to the total volume of the existing hot water heater storage tank to determine the annual standby losses. Proposed efficiency was based on the Takagi Flash TH-1 tankless, condensing hot water heater. Following review of natural gas utility data over a one year period, it was determined that the existing DHW heater consumes about 10 therms per month, or 120 therms per year. Elimination of standby losses combined with efficiency improvements yielded an annual savings of about 110 therms. A more detailed hot water demand analysis may be necessary to verify proper sizing. The new water heater will require gas piping, venting, electrical connections, and minor water piping.

Condensing hot water heaters have an expected life of 13 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 1,430 therms and \$1,300.

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

ECM-2 Replace Domestic Hot Water Heater

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
\$	kW	kWh	Therms	kGals	\$	\$	\$		\$	Years	Years
3,000	0	0	110	0	100	0	100	(0.5)	300	>25	>25

*Incentive shown is per the New Jersey Smart Start Program, 2010 Gas Water Heating Application.

This measure is not recommended.

4.3 ECM-3 Window Replacement – Courtroom

Windows in the courtroom are single hung style, with wooden frames and single pane glass, and are in poor condition. Due to age and construction type, the windows incur increased infiltration, cold drafts, and excess heating and cooling energy loss. This ECM evaluated replacement with new, energy efficient double hung windows to decrease heating and cooling energy lost through the windows.

Per the building energy audit and engineering knowledge, it was estimated that the existing windows have a U-value of 1.1 and an infiltration rate of about 0.35 CFM/LF. To calculate the savings for this measure, the baseline energy loss was found by applying these values to the total square footage and perimeter length of the existing windows in conjunction with weather bin data. The proposed energy loss was then determined using the expected U-value of 0.50, and infiltration rate of 0.2 CFM/LF, for the new energy efficient windows. The difference in heating and cooling losses through the windows results in an annual savings of about 260 therms and 150 kWh.

As with most window replacement projects, long paybacks do not justify implementation for energy savings alone. Therefore, occupant comfort and building aesthetics may also be a consideration when determining if the measure should be implemented.

Windows have an expected life of 30 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 7,800 therms and 4,500 kWh, totaling \$9,000.

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

ECM-3 Window Replacement – Courtroom

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water						
\$	kW	kWh	Therms	kGals	\$	\$		\$	Years	Years
4,500	0	150	260	0	300	0	300	1.1	NA	15.0

*There is no incentive available per the New Jersey Smart Start Program for this measure.

This measure is not recommended.

4.4 ECM-4 Night Setback

Each of the five AHUs is controlled by a programmable thermostat located within the units' corresponding space and hot water terminal equipment is controlled by mechanical dial type thermostats. Overall, the building can be broken up into three areas: the front second floor historic section, courtroom and large conference room, and first floor offices. None of the thermostats in these areas have been set up for nighttime temperature setback. The average heating and cooling setpoints for each area are as follows: 70°F during heating and 73°F during cooling in the front historic section; 70°F during heating and 74°F during cooling in the courtroom and conference room; and 68°F during heating and 72°F during cooling in the first floor offices. By programming existing electronic thermostats and replacing the older thermostats with new programmable models, all thermostats can be programmed to set back the unoccupied space temperature to save heating and cooling energy. This ECM models the expected savings of adjusting the unoccupied temperature setpoints to 60°F during heating and 80°F during cooling

periods. In the calculations for this measure, occupied temperature setpoints were maintained per those in use at the time of the energy audit.

To calculate the benefits of night setback, a block load building model was created to approximate the existing energy load for the building. Since the three building areas have differing setpoints, a block load was created for each space. The block loads, provided in Appendix E, model the maximum overall cooling and heating loads for each space, taking into account various parameters such as roof, wall, and window construction; total envelope surface area; ventilation and infiltration loads; building occupancy; internal heat generation; and other sources of heat gains and losses. By entering this calculated maximum load into a spreadsheet containing bin temperature data, the total accumulated year-round cooling and heating energy requirements were determined for each space. The heating and cooling loads for the three areas were then combined and reconciled to building utility data and HVAC equipment energy requirements to confirm the model's accuracy. Bin data for Saddle River, NJ was not available; therefore, data from Newark, NJ was used. The bin temperature spreadsheets are included in Appendix E.

To determine the proposed energy usage in the three areas during temperature setback, a second bin spreadsheet was created for the new accumulated heating and cooling loads for each space. These models were identical to the existing usage spreadsheets except the unoccupied temperatures were adjusted as noted above. The difference in heating therms and cooling kWh between the initial and proposed models is taken as the savings. Following implementation of this measure, the building's annual natural gas and electricity consumption may be reduced by approximately 1,440 therms and 3,510 kWh, respectively.

Programmable thermostats have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 21,600 therms, 52,650 kWh, and \$34,500.

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

ECM-4 Night Setback

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
\$	kW	kWh	Therms	kGals	\$	\$	\$		\$	Years	Years
1,400	0	3,510	1,440	0	2,300	0	2,300	24.3	NA	0.6	NA

*Incentive shown is per the New Jersey Smart Start Program, 2010 Electric Unitary HVAC Application.

This measure is recommended.

4.5 ECM-5 Lighting Replacements

A comprehensive fixture survey was conducted of the entire building. Each switch and circuit were identified, and the number of fixtures, locations, and existing wattage established. Inefficient lighting fixtures include those that utilize T-12 fluorescent lamps and incandescent screw type bulbs. Upgrading these lighting fixtures to more efficient technology provides energy savings.

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 6,500 kWh per year. Supporting calculations, including assumptions for lighting hours and annual energy usage for each fixture, are provided in Appendix F.

Retrofitting fixtures that utilize T-12 lamps would require replacement with electronic ballasts and T-8 lamps. Incandescent lamps would be replaced with compact fluorescent spiral lightbulbs or flood lamps, where applicable.

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 97,500 kWh, totaling \$21,000.

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

ECM-5 Lighting Replacements

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
\$	kW	kWh	Therms	kGals	\$	\$	\$		\$	Years	Years
4,500	4.3	6,500	0	0	1,400	0	1,400	3.7	600	3.2	2.8

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

This measure is not recommended in lieu of ECM-7.

4.6 ECM-6 Install Occupancy Sensors

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

Using a process similar to that utilized in section 4.5, the energy savings for this measure were calculated by applying the known fixture wattages in the space to the estimated existing and proposed times of operation for each fixture. The difference between the two values resulted in an annual savings of 2,540 kWh per year. One ceiling mounted, (14) wall-mounted occupancy sensors, and some electrical work are required for this measure.

Occupancy sensors have an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 38,100 kWh and \$7,500.

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

ECM-6 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
\$	kW	kWh	Therms	kGals	\$	\$	\$		\$	Years	Years
1,900	0	2,540	0	0	500	0	500	3.0	300	3.8	3.2

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

This measure is not recommended in lieu of ECM-7.

4.7 ECM-7 Lighting Replacements with Occupancy Sensors

This measure is a combination of ECMs-5 and 6 to allow for maximum energy and demand reduction. Due to interactive effects, the energy and cost savings for occupancy sensors and lighting upgrades are not cumulative.

The lighting retrofits and controls have an expected lifetime of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 133,950 kWh, totaling \$22,500.

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

ECM-7 Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
\$	kW	kWh	Therms	kGals	\$	\$	\$		\$	Years	Years
6,300	4.3	8,930	0	0	1,700	0	1,700	3.0	1,000	3.7	3.1

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

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 \$1.80/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

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

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

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

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

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

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

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

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

Funding for this program is dispersed on a first come, first serve basis until all funds are exhausted. The program does not limit the municipality to a minimum or maximum incentive, and the availability of

funding cannot be determined prior to application. If the municipality meets all qualifications, the application must be submitted to TRC Energy Solutions for review. TRC will then determine the amount of the incentive based on projected energy savings of the project. It is important to note that all applications for this incentive must be submitted before implementation of energy conservation measures.

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

5.1.5 Direct Install Program

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

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

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

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

5.2 Building Incentives

5.2.1 New Jersey Pay For Performance Program

Under incentive #1 of the New Jersey Pay for Performance Program, the 7,700 square foot building is eligible for about \$400 towards the development of an Energy Reduction Plan. When calculating the total amount under Incentives #2 and #3, all energy conservation measures are applicable as the amount received is based on building wide energy improvements. Since the overall energy reduction for the building is estimated to exceed the 15% minimum, the building is eligible to receive monies based as discussed above in section 5.1.1. All together, incentives through the NJ P4P program are expected to total about \$7,900, reducing the total project payback from 7.8 years to 6.4 years. See Appendix I for calculations.

5.2.2 New Jersey Smart Start Program

The Borough Hall building is eligible for several incentives available under New Jersey Smart Start Programs. The total amount of all qualified incentives is about \$3,100 and includes installing a high efficiency gas-fired boiler, a new gas-fired DHW heater and upgrades to the lighting system.

5.2.3 Energy Efficient and Conservation Block Grant

Borough Hall 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”

Borough Hall pays the Societal Benefits charge on their monthly utility bill and therefore is not eligible for this incentive.

5.2.5 Direct Install Program

The building will be eligible to receive funding from the Direct Install Program. This money will be in conjunction with the Energy Efficiency and Conservation Block Grant. The total implementation cost for all ECMs in Borough Hall is about \$44,700. This program would pay 60%, or about \$26,800 of these initial costs. This funding has the potential to significantly affect the payback periods of all energy conservation measures, bringing the simple payback from about 7.8 years, to approximately 3.1 years.

In order to apply for this program the borough must contact their local Direct Install contractor. Contact information is available on the New Jersey Clean Energy Website.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

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

The building uses a gas-fired, hot water boiler and split system AHUs with DX cooling and hot water coils to meet the HVAC requirements. With exception to the hydronic heating system, most of the 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 removed or overhauled; and either a low temperature closed loop water source heat pump system or a water to water heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground.

This measure is not recommended due to the extent of HVAC system renovations needed for implementation.

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

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

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

entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1000 kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. The cost of the ACP penalty for 2009 is \$700; this is the amount that must be paid per SERC by the high emission producers. The expected dollar amount that will be paid to the PV producer for 2010 is expected to be \$600/SREC credit. Payments that will be received from the PV producer will change from year to year dependent upon supply and demand. Renewable Energy Consultants is a third party SREC broker that has been approved by the New Jersey Clean Energy Program. As stated above there is no definitive way to calculate an exact price that will be received by the PV producer per SREC over the next 15 years. Renewable Energy Consultants estimated an average of \$487/ SERC per year and this number was utilized in the cash flow for this report.

In 2009 the building had a maximum electricity demand of 40.2 kW and a minimum of 19.2 kW. The monthly average over the observed 12 month period was 29.0 kW. The existing load does justify the use of the maximum incentive cap of 30 kW of installed PV solar array. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development Authority) estimates of total cost of system installation. 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 as follows:

Photovoltaic (PV) Rooftop Solar Power Generation – 30 kW System

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive*	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)
	Electricity		Natural Gas	Total					
\$	kW	kWh	Therms	\$	\$	\$	\$	Years	Years
240,000	0	35,490	0	6,500	6,500	22,500	17,300	>25	9.1

*Incentive based on New Jersey Renewable Energy Program for non-residential applications of \$0.75 per Watt of installed capacity

** Estimated Solar Renewable Energy Certificate Program (SREC) for 15 years at \$487/1000 kWh

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

6.2.2 Solar Thermal Hot Water Plant

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

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

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

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 Saddle River 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 below:

Solar Thermal Domestic Hot Water Plant

Budgetary Cost	Annual Utility Savings			Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas				
\$	kW	kWh	Therms	\$	\$	Years	Years
27,100	0	0	70	100	NA	>25	NA

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

This measure is not recommended.

6.3 Wind

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

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

The New Jersey Clean Energy Program for small wind installations has designated numerous pre-approved wind turbines for installation in the State of New Jersey. Incentives for wind turbine

installations are based on kilowatt hours saved in the first year. Systems sized under 16,000 kWh per year of production will receive a \$3.20 per kWh incentive. Systems producing over 16,000 kWh will receive \$51,200 for the first 16,000 kWh of production with an additional \$0.50 per kWh up to a maximum cap of 750,000 kWh per year. Federal tax credits are also available for renewable energy projects up to 30% of installation cost for systems less than 100 kW. However, as noted previously, municipalities do not pay federal taxes and is, therefore, not eligible for the tax credit incentive.

The most important part of any small wind generation project is the mean annual wind speed at the height of which the turbine will be installed. In the Saddle River area, the map indicates a mean annual wind speed of 10 miles per hour. For Borough Hall, there are site restrictions such as parking lots, trees and surrounding structures would greatly affect a tower location.

A wind speed map and aerial site photo are included in Appendix L.

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

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 building has sufficient need for electrical generation and the ability to use most of the thermal byproduct during the winter, thermal usage during the summer months is low. Thermal energy produced by the CHP plant in the warmer months will be wasted. An absorption chiller could be installed to utilize the heat to produce chilled water; however, there is no chilled water distribution system in the building. The most viable selection for a CHP plant at this location would be a reciprocating engine natural gas-fired unit. Purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

This measure is not recommended.

6.5 Biomass Power Generation

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

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

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

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

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

* from NJOCE Website

This measure is not recommended due to initial cost, noise issues and because Borough Hall does not have a steady waste stream to use as a fuel source. Purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

6.6 Demand Response Curtailment

Presently, electricity is delivered by PSE&G, which receives the electricity from regional power grid RFC. PSE&G is the regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia including the State of New Jersey.

Utility Curtailment is an agreement with the PSE&G regional transmission organization and an approved Curtailment Service Provider (CSP) to shed electrical load by either turning major equipment off or energizing all or part of a facility utilizing an emergency generator; therefore, reducing the electrical demand on the utility grid. This program is to benefit the utility company during high demand periods and PSE&G offers incentives to the CSP to participate in this program. Enrolling in the program will require program participants to drop electrical load or turn on emergency generators during high electrical demand conditions or during emergencies. Part of the program also will require that program participants reduce their required load or run emergency generators with notice to test the system.

A PSE&G pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. The Saddle River Borough Hall building had a monthly average electricity demand of 29.0 kW and a maximum demand of 40.2 kW in 2009.

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

7.0 EPA PORTFOLIO MANAGER

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

Borough Hall is considered an above average energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 106 kBTU/ft²/year. The EUI can be improved upon by addressing wasted energy from over inefficient HVAC equipment, domestic hot water heater, lighting systems, etc. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 63 kBTU/ft²/year; the national average for this building type is 87 kBTU/ft²/year. The EPA Portfolio Manager generated an energy rating score of 31 for this building. Reducing the Site EUI will help increase this score; a building with a score of 75 or higher may qualify for the EPA's Energy Star performance rating.

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

The user name and password for the building's EPA Portfolio Manager Account has been provided to Charles Cuccia of the Borough of Saddle River.

8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the Saddle River Borough Hall in Saddle River, New Jersey identified potential ECMs for night setback and lighting replacement w/occupancy sensors. Potential annual savings of \$4,000 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-4 Night Setback

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
\$	kW	kWh	Therms	kGals	\$	\$	\$		\$	Years	Years
1,400	0	3,510	1,440	0	2,300	0	2,300	24.3	NA	0.6	NA

*Incentive shown is per the New Jersey Smart Start Program, 2010 Electric Unitary HVAC Application.

ECM-7 Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
\$	kW	kWh	Therms	kGals	\$	\$	\$		\$	Years	Years
6,300	4.3	8,930	0	0	1,700	0	1,700	3.0	1,000	3.7	3.1

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

APPENDIX A

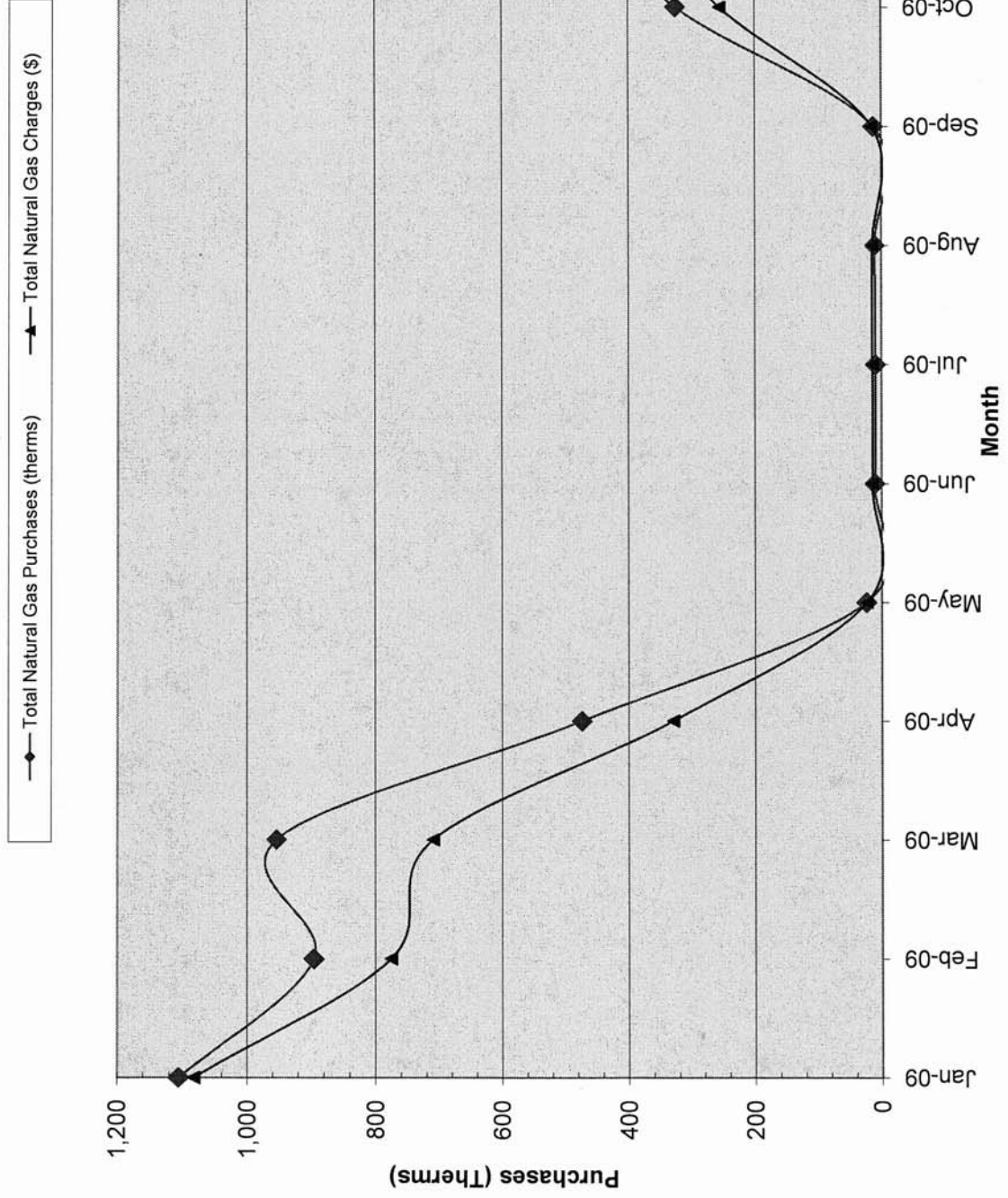
Utility Usage Analysis

New Jersey BPU Energy Audit Program
CHA Project No.: 21351
Borough of Saddle River - Boro Hall
PSE&G - Natural Gas Service

Address: 100 E Allendale Rd.
Account No.: 66 205 859 06
Meter No.: 3163428

Month	Therms	Charges (\$)	(\$/Therm)
January-09	1,106.0	\$ 1,445.07	\$ 1.307
February-09	895.5	\$ 1,034.08	\$ 1.155
March-09	953.4	\$ 946.17	\$ 0.992
April-09	473.7	\$ 440.48	\$ 0.930
May-09	24.0	\$ 31.10	\$ 1.296
June-09	10.4	\$ 19.39	\$ 1.864
July-09	9.4	\$ 18.90	\$ 2.011
August-09	10.4	\$ 19.27	\$ 1.853
September-09	12.6	\$ 20.50	\$ 1.627
October-09	325.9	\$ 341.11	\$ 1.047
November-09	515.5	\$ 568.02	\$ 1.102
December-09	1,093.2	\$ 1,241.48	\$ 1.136
Total	5,430	\$ 6,125.57	\$ 1.128

Natural Gas Usage - Borough of Saddle River - Boro Hall

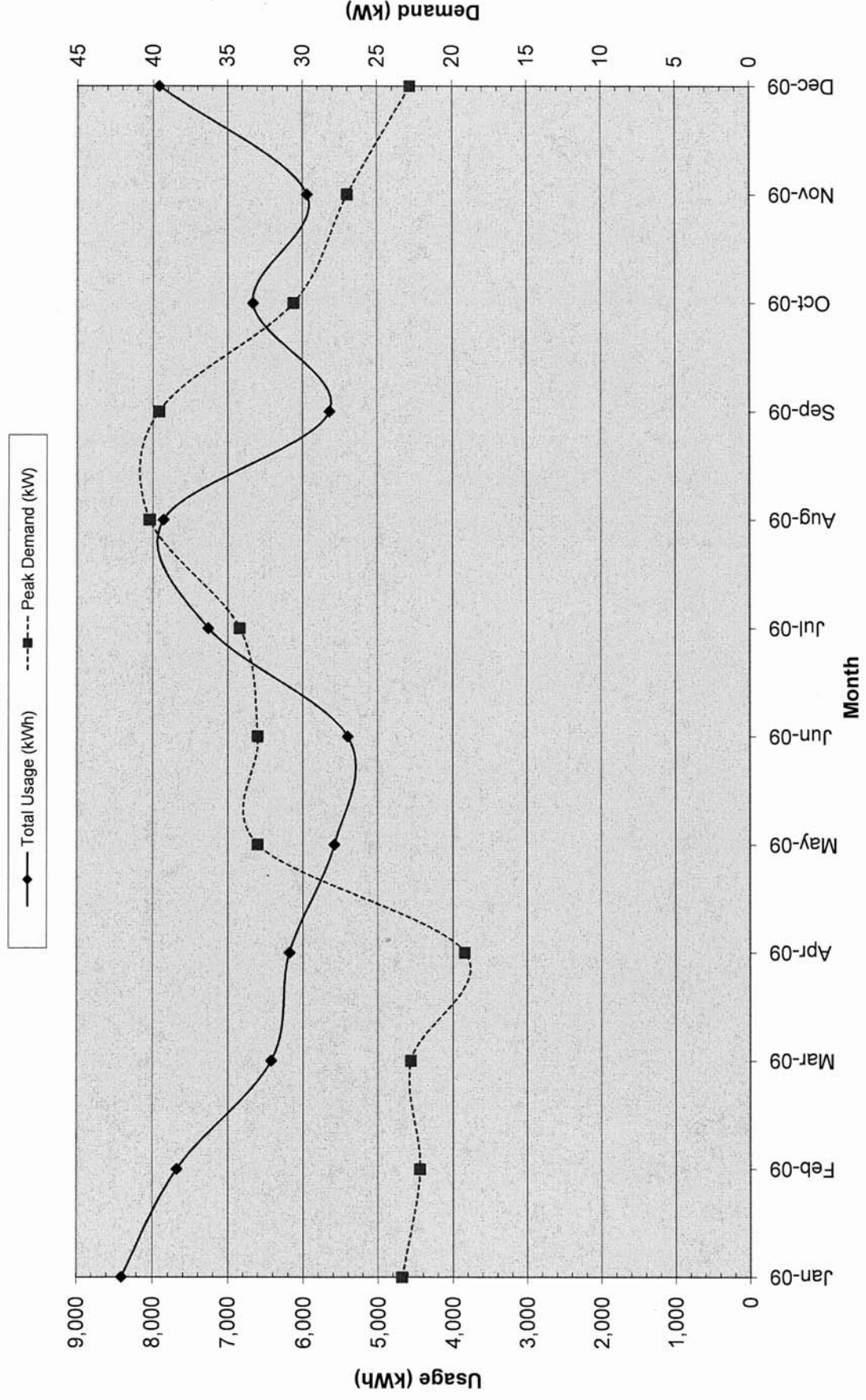


New Jersey BPU Energy Audit Program
 CHA Project No.: 21351
 Borough of Saddle River - Boro Hall
 Orange & Rockland - Electric Service

Address: 100 E Allendale Rd.
 Account No.: 49988-43006
 Meter No.: -

Month	Charges		Unit Costs	
	Consumption (kWh)	Demand (kW)	Blended Rate (\$/kWh)	Demand (\$/kW)
January-09	8,400	23.4	\$ 0.169	\$ 10.86
February-09	7,680	22.2	\$ 0.141	\$ 11.45
March-09	6,420	22.8	\$ 0.177	\$ 11.15
April-09	6,180	19.2	\$ 0.167	\$ 13.24
May-09	5,580	33.0	\$ 0.190	\$ 8.02
June-09	5,400	33.0	\$ 0.218	\$ 8.26
July-09	7,260	34.2	\$ 0.197	\$ 8.33
August-09	7,860	40.2	\$ 0.206	\$ 8.55
September-09	5,640	39.6	\$ 0.210	\$ 8.53
October-09	6,660	30.6	\$ 0.173	\$ 7.92
November-09	5,940	27.0	\$ 0.177	\$ 8.05
December-09	7,920	22.8	\$ 0.181	\$ 9.52
Total	80,940	40.2	\$ 0.183	\$ 9.19

Electric Usage - Borough of Saddle River - Boro Hall



GAS MARKETERS LIST

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

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

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

RPL Holdings, Inc
601 Carlson Pkwy
Minnetonka, MN 55305

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

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

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

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

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

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

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

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

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

Intelligent Energy
7001 SW 24th Avenue
Gainesville, FL 32607
Sales: 1 877 I've Got Gas
(1 877 483-4684)
Customer Service:
1 800 927-9794
www.intelligentenergy.org

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

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

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

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

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

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

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

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

ELECTRIC MARKETERS LIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Integrus Energy Services, Inc.
99 Wood Avenue, Suite 802
Iselin, NJ 08830
www.integrusenergy.com

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

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

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

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

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

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

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

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

APPENDIX B

ECM-1 Boiler Replacement with HW Temperature Reset

Saddle River, NJ
CHA #21351
Building: Borough Hall

ECM-1 Boiler Replacement with HW Temperature Reset

Existing Fuel	Nat.Gas	▼
Proposed Fuel	Nat.Gas	▼

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	\$ 1.13		
Proposed Fuel Cost	\$ 1.13		
Baseline Fuel Use	5,270	Therms	Based on historical utility data
Existing Boiler Plant Efficiency	80%		80% when new
Baseline Boiler Load	421,600	Mbtu/yr	Baseline Fuel Use x Existing Efficiency x 100 Mbtu/Therms
Baseline Fuel Cost	\$ 5,945		
Proposed Boiler Plant Efficiency	93%		New Boiler Efficiency
Proposed Fuel Use	4,539	Therms	Baseline Boiler Load / Proposed Efficiency / 100 Mbtu/Therms
Proposed Fuel Cost	\$ 5,120		
Annual Savings	731	Therms	
Annual Savings	\$ 825 /yr		

Saddle River, NJ
CHA #21351
Building: Borough Hall

ECM-1 Boiler Replacement with HW Temperature Reset

Description

Existing heating hot water (HHW) supply setpoint is 212°F max and can only be reset to 160°F due to boiler capabilities.

Proposed:

Vary heating hot water supply temperature as building heating load decreases in relation to outside air temperature.

A	B	C	D	E	F	G	H	I	J
Amb. Bin Temp °F	Avg. DB Bin Temp °F	Bin Hours	Heating Bin HOURS	Existing Heat Loss In Piping MBH	Avg. HHW Temp @ OA Temp °F	Proposed Heat Loss In Piping MBH	Proposed Boiler Efficiency	Existing Utility Use Therms/Yr	Proposed Utility Use Therms/Yr
100-104	102.0	0	0	0	0	0	0.0%	0	0
95-99	97.0	3	0	0	0	0	0.0%	0	0
90-94	92.0	34	0	0	0	0	0.0%	0	0
85-89	87.0	131	0	0	0	0	0.0%	0	0
80-84	82.0	500	0	0	0	0	0.0%	0	0
75-79	77.0	620	0	0	0	0	0.0%	0	0
70-74	72.0	664	0	0	0	0	0.0%	0	0
65-69	67.0	854	854	9,541	113	4,840	97.0%	98	50
60-64	62.0	927	927	10,357	119	5,254	96.0%	108	55
55-59	57.0	600	600	6,704	125	3,401	95.0%	71	36
50-54	52.0	610	610	6,815	131	3,457	94.0%	73	37
45-49	47.0	611	611	6,826	137	3,463	93.4%	73	37
40-44	42.0	656	656	7,329	143	3,718	92.0%	80	40
35-39	37.0	1,023	1,023	11,429	149	5,798	90.6%	126	64
30-34	32.0	734	734	8,201	156	4,160	89.8%	91	46
25-29	27.0	334	334	3,732	162	1,893	89.0%	42	21
20-24	22.0	252	252	2,815	168	1,428	88.5%	32	16
15-19	17.0	125	125	1,397	174	709	88.0%	16	8
10-14	12.0	47	47	525	180	266	87.6%	6	3
5-9	7.0	22	22	246	186	125	87.2%	3	1
0-4	2.0	13	13	145	193	74	86.8%	2	1
-5- -1	-3.0	0	0	0	193	0	86.8%	0	0
-10- -6	-8.0	0	0	0	193	0	86.8%	0	0
Totals		8,760	6,808	76,062		38,588		820	416

Annual Energy Savings	\$	404	Therms/yr
Annual Cost Savings		483	/yr

Comments:

- A-C Newark, NJ weather bins
- D Based on building balance points and bin data.
- E Existing heat loss in piping system based on current average HHW temperature.
- F Estimated Average HHW temperature with HW reset based on OA temperature.
- G Proposed heat loss in piping system based on estimated average HW temperature. Return HHW temp min 70 deg F
- H Proposed boiler efficiency based return water temperature and boiler efficiency curve.
- I-J Utility usage to overcome heat loss in HHW piping system based on boiler efficiency.

Existing Boiler Efficiency	80%
Avg. Proposed Boiler Efficiency	93%

Building HHW Piping System	
Heating On Temperature	70 °F
Total Length of Pipe	545 LF
Existing HHW Setpoint High	225 °F
Existing HHW Setpoint Low	160 °F
Avg HHW Temp	192.5 °F
Avg Pipe Size	1 1/2 Inches
Avg Insul Thickness	1 Inches
Existing Heat Loss	20.5 Btu/Hr/LF
Percent in Uncond. Space	100%
Existing System Heat Loss	11.173 Btu/Hr
Proposed Min HHW Return*	80 °F
Avg Prop HHW Supply Temp	138 °F
Proposed Heat Loss	10.4 Btu/Hr/LF
Proposed System Heat Loss	5.668 Btu/Hr

*Refer to proposed boiler capabilities

Size (in)	Length (ft)
1/2	0
3/4	100
1	110
1 1/4	75
1 1/2	10
2	250
2 1/2	0
3	0
1 1/2 Average	0

Saddle River, NJ

CHA #21351

Building: Borough Hall

ECM-1 Boiler Replacement with HW Temperature Reset

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Boiler Removal	1	EA		\$ 500		\$ -	\$ -	\$ -	\$ -	
1,000 MBH Gas-Fired Condensing HW Boiler*	1	EA	\$ 18,000	\$ 4,000		\$ 17,640	\$ 4,840	\$ -	\$ 22,480	
Condensate Neutralization Kit	1	EA	\$ 300	\$ 250		\$ 294	\$ 303	\$ -	\$ 597	
Flue Replacement	20	LF	\$ 10.0	\$ 8.50		\$ 196	\$ 206	\$ -	\$ 402	
Miscellaneous Electrical	1	LS	\$ 250	\$ 200		\$ 245	\$ 242	\$ -	\$ 487	
Miscellaneous HW Piping	1	LS	\$ 250	\$ 200		\$ 245	\$ 242	\$ -	\$ 487	
Miscellaneous Gas Piping	1	LS	\$ 250	\$ 200		\$ 245	\$ 242	\$ -	\$ 487	
						\$ -	\$ -	\$ -	\$ -	

*Pricing based on Aerco KC-1000 boiler. Boiler comes equipped with HW temperature reset controls.

\$	25,544	Subtotal
\$	2,554	10% Contingency
\$	1,405	5% Contractor O&P
\$	-	Engineering
\$	29,504	Total

New Jersey Smart Start Incentive Program	QTY	UNIT	\$/UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
NG Boilers ≥ 300 - 1500 MBH	1,000	MBH	\$1.75	\$1,750	\$ -	\$ -
					\$ 22,480	\$ 20,730
				\$1,750	\$22,480	\$20,730

Total ECM Cost w/ Incentives	\$27,754
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APPENDIX C

ECM-2 Replace Domestic Hot Water Heater

Saddle River, NJ
CHA #21351
Building: Borough Hall

ECM-2: Replace Domestic Hot Water Heater

Summary

* Replace 180 MBH, 97 Gal Gas-Fired DHW Heater w/ Instantaneous, Condensing, Gas-Fired DHW Heater

Item	Value	Units	Formula/Comments
Avg. Monthly Utility Demand by Water Heater	13	Therms/month	Calculated from utility bill
Total Annual Utility Demand by Water Heater	15,600	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	75%		Per manufacturer nameplate
Total Annual Hot Water Demand (w/ standby losses)	11,700	MBTU/yr	
Existing Tank Size	75	Gallons	Per manufacturer nameplate
Hot Water Piping System Capacity	10	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	°F	Per building personnel
Room Temperature	68	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.9	MBH	
Annual Standby Hot Water Load	8,067	MBTU/yr	
New Tank Size	0	Gallons	Based on Takagi Flash T-Hi instantaneous, condensing DHW Heater
Hot Water Piping System Capacity	10	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	°F	
Room Temperature	68	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.1	MBH	
Annual Standby Hot Water Load	949	MBTU/yr	
Total Annual Hot Water Demand	4,583	MBTU/yr	
Proposed Avg. Hot water heater efficiency	92%		Based on Takagi Flash T-Hi instantaneous, condensing DHW Heater
Proposed Fuel Use	50	Therms	Standby Losses and inefficient DHW heater eliminated
Utility Cost	\$1.13	\$/Therm	
Existing Operating Cost of DHW	\$176	\$/yr	
Proposed Operating Cost of DHW	\$56	\$/yr	

Savings Summary:

Utility	Energy Savings	Cost Savings
Therms/yr	106	\$120

Saddle River, NJ
CHA #21351
Building: Borough Hall

ECM-2: Replace Domestic Hot Water Heater

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
DHW Heater Removal	1	LS		\$ 50		\$ -	\$ 61	\$ -	\$ 61	
Instantaneous Gas-Fired DHW Heater	1	EA	\$ 1,200	\$ 280		\$ 1,176	\$ 339	\$ -	\$ 1,515	
Miscellaneous Electrical	1	LS	\$ 50	\$ 100		\$ 49	\$ 121	\$ -	\$ 170	
Venting	10	LF	\$ 5.50	\$ 6.70		\$ 54	\$ 81	\$ -	\$ 135	PVC piping
Miscellaneous Piping and Valves	1	LS	\$ 250	\$ 200		\$ 245	\$ 242	\$ -	\$ 487	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	

\$ 2,367	Subtotal
\$ 355	15% Contingency
\$ 272	Contractor
\$ -	10% O&P
\$ -	0% Engineering
\$ 2,995	Total

New Jersey Smart Start Incentive Program	QTY	UNIT	\$/UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
Tankless Water Heater	1	EA	\$300	\$300	\$ 1,515	\$ 1,215
				\$300	\$1,515	\$1,215

Total ECM Cost w/ Incentives	\$2,695
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APPENDIX D

ECM-3 Window Replacement – Courtroom

Saddle River, NJ
CHA #21351
Building: Borough Hall

ECM-3 Window Replacement - Court Room
Court Rm Section

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

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

Given
Equipment Cooling Hours per Week
Equipment Heating Hours per Week
Heating Energy Cost
Cooling Cost
Occupied Cooling Setpoint Temperature
Occupied Cooling Avg Space Air Enthalpy
Occupied Heating Setpoint Temperature
Unoccupied Heating Setpoint Temperature
Window Area
Window Perimeter
Proposed U factor
Proposed Air Infiltration
Cooling Conversion
Heating Btu Conversion

168 Hours
168 Hours
\$113 \$/Btu
\$0.183 \$/kWh
74.0 Degrees F
27.5 Btu/lb air
70.0 Degrees F
70.0 Degrees F
180 sq ft
135 ft
0.50 Btu/(h*sqft*degf)
0.20 cfm/ft
12,000 Btu/ton
1,000,000 Btu/MMBtu

Assumptions

Existing U factor
Existing Air Infiltration
Heating System Efficiency
Cooling System Efficiency
(From ASHRAE Fundamentals)
(From ASHRAE Fundamentals)

1.10 Btu/(h*sqft*degf)
0.35 cfm/ft
80%
1.151 kW/ton

Formula

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

Existing	Operation	OA Enthalpy	OA Temp	Total Hours	Cooling Hours	Heating Hours	Cooling Conduction	Heating Conduction	Cooling Infiltration	Heating Infiltration
	Cooling	38.3	82.5	82.5	0.0	0.0	0.0	0.0	0.0	0.0
	Heating	36.0	87.5	131.0	0.0	131.0	0.0	131.0	0.0	0.0
	Cooling	33.5	82.5	500.0	500.0	0.0	841,500	0	257,400	0
	Heating	31.8	77.5	620.0	0.0	620.0	0	429,600	637,875	0
	Cooling	30.3	72.5	684.0	0.0	0.0	0	0	540,493	0
	Heating	27.9	67.5	854.0	0.0	854.0	0	422,730	0	108,949
	Heating	24.6	62.5	927.0	0.0	927.0	0	1,376,595	0	354,786
	Heating	21.6	57.5	600.0	0.0	600.0	0	1,485,000	0	382,725
	Heating	18.7	52.5	610.0	0.0	610.0	0	2,113,850	0	544,745
	Heating	16.2	47.5	611.0	0.0	611.0	0	2,722,005	0	701,535
	Heating	14.3	42.5	656.0	0.0	656.0	0	3,571,920	0	920,581
	Heating	12.4	37.5	1,023.0	0.0	1,023.0	0	6,583,005	0	1,696,620
	Heating	10.4	32.5	734.0	0.0	734.0	0	5,449,950	0	1,404,601
	Heating	8.7	27.5	334.0	0.0	334.0	0	2,810,610	0	724,371
	Heating	7	22.5	252.0	0.0	252.0	0	2,370,060	0	610,829
	Heating	5.4	17.5	125.0	0.0	125.0	0	1,289,375	0	334,884
	Heating	3.6	12.5	47.0	0.0	47.0	0	535,085	0	137,909
	Heating	2.8	7.5	22.0	0.0	22.0	0	272,250	0	70,169
	Heating	1.2	2.5	11.0	0.0	11.0	0	173,745	0	44,770
	Heating	-0.2	-2.5	0.0	0.0	0.0	0	0	0	0
	Heating	-1.4	-7.5	0.0	0.0	0.0	0	0	0	0
	Subtotal =			8,790	1,288	6,808	1,756,854	31,185,990	1,516,803	8,037,480

Cooling Load =	Conduction	Infiltration
	1756854	+ (1516803) =
Cooling Energy =	Cooling Load	3,273,657
	3273657	W 12000 * (1.15) =
Cooling Energy Cost =	Cooling Energy	314
	313.73	X (\$0.183) =
Heating Load =	Conduction	Infiltration
	31185990	+ (8037480) =
Heating Energy =	Heating Load	39,223,470
	39223470	W Heat Content
Heating Energy Cost =	Heating Energy	490
	490.29	X (\$1.128) =

Operation	OA Enthalpy	OA Temp	Total Hours	Cooling Hours	Heating Hours	Cooling Conduction	Heating Conduction	Cooling Infiltration	Heating Infiltration
Cooling	36.3	92.5	37	37.0	0.0	0.0	0.0	144,851	0
Cooling	36.6	87.5	131	131.0	0.0	159,165	0	144,840	0
Cooling	33.5	82.5	500	500.0	0.0	382,500	0	364,500	0
Cooling	31.6	77.5	620	620.0	0.0	196,300	0	308,853	0
Cooling	30.3	72.5	664	0.0	0.0	0.0	0	0	0
Heating	27.9	67.5	854	0.0	854.0	0	192,150	0	62,257
Heating	24.6	62.5	927	0.0	927.0	0	625,725	0	202,735
Heating	21.6	57.5	600	0.0	600.0	0	675,000	0	218,700
Heating	18.7	52.5	610	0.0	610.0	0	960,750	0	311,283
Heating	16.2	47.5	611	0.0	611.0	0	1,237,275	0	400,877
Heating	14.3	42.5	656	0.0	656.0	0	1,623,600	0	526,046
Heating	12.4	37.5	1,023	0.0	1,023.0	0	2,992,275	0	965,497
Heating	10.4	32.5	734	0.0	734.0	0	2,477,250	0	802,629
Heating	8.7	27.5	334	0.0	334.0	0	1,277,550	0	413,926
Heating	7	22.5	252	0.0	252.0	0	1,077,300	0	340,045
Heating	5.4	17.5	125	0.0	125.0	0	590,625	0	191,363
Heating	3.9	12.5	47	0.0	47.0	0	243,225	0	78,805
Heating	2.5	7.5	22	0.0	22.0	0	123,750	0	40,086
Heating	1.2	2.5	1	0.0	1.0	0	78,975	0	25,588
Heating	-0.2	-2.5	0	0.0	0.0	0	0	0	0
Heating	-1.4	-7.5	0	0.0	0.0	0	0	0	0
Subtotal =			8,760	1,288	6,808	798,570	14,175,450	865,745	4,592,846

Cooling Load =	Conduction	Infiltration
	798570	+ (866745) =
Cooling Energy =	Cooling Load	1,665,315
	1665315	12000) * (1.15) =
Cooling Energy Cost =	Cooling Energy	160 kWh
	159.59	1 x (\$0.163) =
Heating Load =	Conduction	Infiltration
	14175450	+ (4592846) =
Heating Energy =	Heating Load	18,768,296
	18768296	80%) / (100000) =
Heating Energy Cost =	Heating Energy	235 therms
	234.60	1 x (\$1.128) =

Summary

EXISTING COOLING ENERGY	313.73	kWh	\$ 57.41
EXISTING HEATING ENERGY	480.29	therms	\$ 553.05
EXISTING ENERGY COST			\$ 610.46
PROPOSED COOLING ENERGY	159.59	kWh	\$ 26.21
PROPOSED HEATING ENERGY	234.60	therms	\$ 264.63
PROPOSED ENERGY COST			\$ 293.84
COOLING ENERGY SAVINGS	154.13	kWh	\$ 28.21
HEATING ENERGY SAVINGS	255.69	therms	\$ 288.42
ENERGY COST SAVINGS			\$ 316.62

48.1% of existing
52.2% of existing
51.9% of existing

Comments

Saddle River, NJ
CHA #21351
Building: Borough Hall

ECM-3 Window Replacement - Court Room

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

[illegible]

\$	3,868	Subtotal
\$	290	7.5% Contingency
\$	312	7.5% Contractor O&P
\$	-	Engineering
\$	4,470	Total

APPENDIX E

ECM-4 Night Setback

Saddle River, NJ
CHA #21351
Building: Borough Hall

ECM-4 Night Setback
Second Floor Offices - Historic Section

Building Footprint	1,820 SF
Heating Efficiency	80%
Cooling Efficiency	1.15 kWh/ton
Building Balance Temp.	60 °F
Internal Gains	16,088 btuh
Unoc Internal Gain factor	0.03
Ave Occ Internal Gain Factor	0.8

Ex Occupied Chg Temp.	73 °F
Ex Unoccupied Chg Temp.	73 °F
Prop Occupied Chg Temp.	73 °F
Prop Unoccupied Chg Temp.	80 °F
Unoccupied Cooling UA	-1,403 btuh/°F
Cooling Occ Enthalpy Setpoint	-552 btuh/°F
Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb

Ex Occupied Htg Temp.	70 °F
Ex Unoccupied Htg Temp.	70 °F
Prop Occupied Htg Temp.	70 °F
Prop Unoccupied Htg Temp.	60 °F
Unoccupied Heating UA	462 btuh/°F
Unoccupied Heating UA	462 btuh/°F

Heating Energy Savings
Cooling Energy Savings

421 therms
817 kWh

EXISTING LOADS				PROPOSED LOADS									
A	Avg Outdoor Air Enthalpy	Existing Equipment Bins Hours	Occupied Hours	Unoccupied Hours	Occupied				Unoccupied				N
					Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Unoccupied Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Unoccupied Ventilation Load BTUH	
102.5	49.1	0	0	0	-41,379	-48,338	-12,869	-25,148	-48,338	-12,869	-48,338	-483	0
97.5	42.5	3	1	2	-34,366	-33,568	-483	-20,885	-33,568	-12,869	-483	-483	0
92.5	39.5	34	8	26	-27,353	-26,854	-483	-16,823	-26,854	-12,869	-483	-483	0
87.5	36.6	131	31	100	-20,339	-20,364	-483	-12,361	-20,364	-12,869	-483	-483	0
82.5	34	500	119	381	-13,326	-14,546	-483	-8,098	-14,546	-12,869	-483	-483	0
77.5	31.6	620	148	472	-6,312	-9,175	-483	-3,836	-9,175	-12,869	-483	-483	0
72.5	29.2	664	158	506	0	0	-483	0	0	-12,869	-483	-483	0
67.5	27	854	203	651	1,155	1,343	-483	1,155	1,343	-12,869	-483	-483	0
62.5	24.5	927	221	706	3,466	4,028	-483	3,466	4,028	-12,869	-483	-483	0
57.5	21.4	600	143	457	5,777	6,714	-483	5,777	6,714	-12,869	-483	-483	0
52.5	18.7	610	145	465	8,088	9,399	-483	8,088	9,399	-12,869	-483	-483	0
47.5	16.2	611	145	466	10,399	12,084	-483	10,399	12,084	-12,869	-483	-483	0
42.5	14.4	656	156	500	12,710	14,770	-483	12,710	14,770	-12,869	-483	-483	0
37.5	12.6	1,023	244	779	15,021	17,455	-483	15,021	17,455	-12,869	-483	-483	0
32.5	10.7	734	175	559	17,332	20,141	-483	17,332	20,141	-12,869	-483	-483	0
27.5	8.6	334	80	254	19,643	22,826	-483	19,643	22,826	-12,869	-483	-483	0
22.5	6.8	252	60	192	21,954	25,511	-483	21,954	25,511	-12,869	-483	-483	0
17.5	5.5	125	30	95	24,265	28,197	-483	24,265	28,197	-12,869	-483	-483	0
12.5	4.1	47	11	36	26,576	30,882	-483	26,576	30,882	-12,869	-483	-483	0
7.5	2.6	22	5	17	28,887	33,568	-483	28,887	33,568	-12,869	-483	-483	0
2.5	1	13	3	10	31,198	36,253	-483	31,198	36,253	-12,869	-483	-483	0
-2.5	0	0	0	0	33,509	38,939	-483	33,509	38,939	-12,869	-483	-483	0
-7.5	-1.5	0	0	0	35,820	41,624	-483	35,820	41,624	-12,869	-483	-483	0
TOTALS		8,760	2,086	6,674									1,570
													2,700
													3,517
													1,149

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

497 cfm
1.00
0 cfm
497 cfm

Saddle River, NJ
CHA #21351
Building: Borough Hall

ECM-4 Night Setback
Court Room and Conference Room

Building Footprint	2,340 SF
Heating Efficiency	80%
Cooling Efficiency	1.15 kWh/ton
Building Balance Temp.	60 °F
Internal Gains	23.157 btu/h
Unoc Internal Gain factor	0.02
Ave Occ Internal Gain Factor	0.8

Ex Occupied Cing Temp.	74 °F
Ex Unoccupied Cing Temp.	74 °F
Prop Occupied Cing Temp.	74 °F
Prop Unoccupied Cing Temp.	60 °F
Occupied Cooling UA	-1.482 btu/h/°F
Unoccupied Cooling UA	940 btu/h/°F
Cooling Occ Enthalpy Setpoint	27.5 Btu/lb
Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb

Ex Occupied Htg Temp.	70 °F
Ex Unoccupied Htg Temp.	70 °F
Prop Occupied Htg Temp.	70 °F
Prop Unoccupied Htg Temp.	60 °F
Occupied Heating UA	444 btu/h/°F
Unoccupied Heating UA	444 btu/h/°F

Heating Energy Savings
Cooling Energy Savings

754 therms
1,408 kWh

EXISTING LOADS										PROPOSED LOADS									
Avg Outdoor Air Temp. Bins °F	A	Existing Equipment Bins Hours	B	Occupied Hours	C	Unoccupied Equipment Bins Hours	D	Occupied				Unoccupied				Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
								Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	G	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	J				
102.5	49.1	0	0	0	0	0	0	-42,240	-85,558	-18,525	-463	-42,240	-85,558	-18,525	-463	0	0	0	0
97.5	42.5	3	3	0	0	3	3	-34,830	-59,415	-18,525	-463	-34,830	-59,415	-18,525	-463	24	22	0	0
92.5	39.5	34	34	1	33	33	33	-27,419	-47,532	-18,525	-463	-27,419	-47,532	-18,525	-463	215	197	0	0
87.5	36.6	131	131	3	128	128	128	-20,009	-36,045	-18,525	-463	-20,009	-36,045	-18,525	-463	625	556	0	0
82.5	34	500	500	12	488	488	488	-12,598	-25,747	-18,525	-463	-12,598	-25,747	-18,525	-463	1,664	1,401	0	0
77.5	31.6	620	620	15	605	605	605	-5,187	-16,240	-18,525	-463	-5,187	-16,240	-18,525	-463	1,216	83	0	0
72.5	29.2	664	664	16	648	648	648	0	0	-18,525	-463	0	0	-18,525	-463	57	57	0	0
67.5	27	854	854	20	834	834	834	1,111	2,377	-18,525	-463	1,111	2,377	-18,525	-463	29	66	0	0
62.5	24.5	927	927	22	905	905	905	3,333	7,130	-18,525	-463	3,333	7,130	-18,525	-463	17	57	0	0
57.5	21.4	600	600	14	586	586	586	5,555	11,883	-18,525	-463	5,555	11,883	-18,525	-463	0	0	0	0
52.5	18.7	610	610	15	595	595	595	7,777	16,636	-18,525	-463	7,777	16,636	-18,525	-463	0	0	0	0
47.5	16.2	611	611	15	596	596	596	10,000	21,389	-18,525	-463	10,000	21,389	-18,525	-463	0	0	0	0
42.5	14.4	656	656	16	640	640	640	12,222	26,143	-18,525	-463	12,222	26,143	-18,525	-463	0	0	0	0
37.5	12.6	1,023	1,023	24	999	999	999	14,444	30,896	-18,525	-463	14,444	30,896	-18,525	-463	0	0	0	0
32.5	10.7	734	734	17	717	717	717	16,666	35,649	-18,525	-463	16,666	35,649	-18,525	-463	0	0	0	0
27.5	8.6	334	334	8	326	326	326	18,888	40,402	-18,525	-463	18,888	40,402	-18,525	-463	0	0	0	0
22.5	6.8	252	252	6	246	246	246	21,110	45,156	-18,525	-463	21,110	45,156	-18,525	-463	0	0	0	0
17.5	5.5	125	125	3	122	122	122	23,332	49,909	-18,525	-463	23,332	49,909	-18,525	-463	0	0	0	0
12.5	4.1	47	47	1	46	46	46	25,554	54,662	-18,525	-463	25,554	54,662	-18,525	-463	0	0	0	0
7.5	2.6	22	22	1	21	21	21	27,777	59,415	-18,525	-463	27,777	59,415	-18,525	-463	0	0	0	0
2.5	1	0	0	0	0	0	0	29,999	64,168	-18,525	-463	29,999	64,168	-18,525	-463	0	0	0	0
-2.5	0	0	0	0	0	0	0	32,221	68,922	-18,525	-463	32,221	68,922	-18,525	-463	0	0	0	0
-7.5	-1.5	0	0	0	0	0	0	34,443	73,675	-18,525	-463	34,443	73,675	-18,525	-463	0	0	0	0
TOTALS		8,760	8,760	209	8,551	8,551	8,551									3,849	2,441	2,408	1,654

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

880 cfm
1.00
0 cfm
880 cfm

Saddle River, NJ
CHA #21351
Building: Borough Hall
ECM-4 Night Setback
First Floor Offices

Building Footprint 4,160 SF
Heating Efficiency 80%
Cooling Efficiency 1.15 kWton
Building Balance Temp. 60 °F
Internal Gains 43,944 btuh
Unoc Internal Gain factor 0.03
Ave Occ Internal Gain Factor 0.8

Ex Occupied Cing Temp. 72 °F
Ex Unoccupied Cing Temp. 72 °F
Prop Occupied Cing Temp. 72 °F
Prop Unoccupied Cing Temp. 80 °F
Unoccupied Cooling UA -974 btuh/°F
Cooling Occ Enthalpy Setpoint -355 btuh/°F
Cooling Unocc Enthalpy Setpoint 27.5 Btu/lb

Ex Occupied Htg Temp. 68 °F
Ex Unoccupied Htg Temp. 68 °F
Prop Occupied Htg Temp. 68 °F
Prop Unoccupied Htg Temp. 60 °F
Unoccupied Heating UA 314 btuh/°F
Unoccupied Heating UA 314 btuh/°F

Heating Energy Savings 256 therms
Cooling Energy Savings 1,282 kWh

EXISTING LOADS				PROPOSED LOADS									
Avg Outdoor Air Temp. Bins °F	Existing Equipment Bins Hours	Occupied Equipment Bins Hours	Unoccupied Equipment Bins Hours	Occupied			Unoccupied			Unoccupied			
				Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH
A	B	C	D	E	F	G	H	I	J	K	L	M	N
102.5	49.1	0	0	-29,712	-94,970	-35,155	-10,822	-94,970	-1,318	-29,712	-94,970	-35,155	-7,983
97.5	42.5	3	2	-24,841	-65,952	-35,155	-9,046	-65,952	-1,318	-24,841	-65,952	-35,155	-6,209
92.5	39.5	34	8	-19,970	-52,761	-35,155	-7,274	-52,761	-1,318	-19,970	-52,761	-35,155	-4,435
87.5	36.6	131	26	-15,100	-40,011	-35,155	-5,500	-40,011	-1,318	-15,100	-40,011	-35,155	-2,661
82.5	34	500	100	-10,229	-28,579	-35,155	-3,726	-28,579	-1,318	-10,229	-28,579	-35,155	-887
77.5	31.6	620	119	-5,358	-18,027	-35,155	-1,952	-18,027	-1,318	-5,358	-18,027	-35,155	0
72.5	29.2	664	158	-487	-7,475	-35,155	-177	-7,475	-1,318	-487	-7,475	-35,155	0
67.5	27	854	203	157	528	-35,155	157	528	-1,318	157	528	-35,155	0
62.5	24.5	927	221	1,729	5,804	-35,155	1,729	5,804	-1,318	1,729	5,804	-35,155	0
57.5	21.4	600	143	3,301	11,080	-35,155	3,301	11,080	-1,318	3,301	11,080	-35,155	0
52.5	18.7	610	145	4,873	16,356	-35,155	4,873	16,356	-1,318	4,873	16,356	-35,155	0
47.5	16.2	611	145	6,445	21,632	-35,155	6,445	21,632	-1,318	6,445	21,632	-35,155	0
42.5	14.4	656	156	8,017	26,908	-35,155	8,017	26,908	-1,318	8,017	26,908	-35,155	0
37.5	12.6	1,023	244	9,590	32,184	-35,155	9,590	32,184	-1,318	9,590	32,184	-35,155	0
32.5	10.7	734	175	11,162	37,461	-35,155	11,162	37,461	-1,318	11,162	37,461	-35,155	0
27.5	8.6	334	80	12,734	42,737	-35,155	12,734	42,737	-1,318	12,734	42,737	-35,155	0
22.5	6.8	252	60	14,306	48,013	-35,155	14,306	48,013	-1,318	14,306	48,013	-35,155	0
17.5	5.5	125	95	15,878	53,289	-35,155	15,878	53,289	-1,318	15,878	53,289	-35,155	0
12.5	4.1	47	36	17,450	58,565	-35,155	17,450	58,565	-1,318	17,450	58,565	-35,155	0
7.5	2.6	22	5	19,022	63,841	-35,155	19,022	63,841	-1,318	19,022	63,841	-35,155	0
2.5	1	13	3	20,594	69,117	-35,155	20,594	69,117	-1,318	20,594	69,117	-35,155	0
-2.5	0	0	0	22,166	74,394	-35,155	22,166	74,394	-1,318	22,166	74,394	-35,155	0
-7.5	-1.5	0	0	23,738	79,670	-35,155	23,738	79,670	-1,318	23,738	79,670	-35,155	0
TOTALS		8,760	2,086										7,807
			6,674										6,525
													1,299
													1,033

Existing Building Ventilation & Infiltration (occ) 977 cfm
Overheat Ventilation Factor 1.00
Additional ventilation to offset overheat 0 cfm
Existing Building Ventilation & Infiltration (unocc) 977 cfm

Saddle River, NJ
CHA #21351
Building: Borough Hall

Reconcile Thermal Model
Second Floor Offices - Historic Section

Building Footprint	1,820 SF	Ex Occupied Cing Temp.	73 °F	Ex Occupied Htg Temp.	70 °F
Heating Efficiency	80%	Ex Unoccupied Cing Temp.	73 °F	Ex Unoccupied Htg Temp.	70 °F
Cooling Efficiency	1.16 kWton	Occupied Cooling UA	(1,403) btu/hr°F	Occupied Heating UA	462 btu/hr°F
Internal Gains	16,086 btu/h	Unoccupied Cooling UA	(832) btu/hr°F	Unoccupied Heating UA	462 btu/hr°F
Unoc Internal Gain factor	0.03	Cooling Occ Enthalpy Setpoint	27.5 Btu/lb		
Ave Occ Internal Gain Factor	0.8	Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb		
Economizer available (Y/N)	No				

EXISTING LOADS											
Avg Outdoor Air Temp. Bins °F A	Total Bin Hours B	Occupied Equipment Bin Hours C	Unoccupied Equipment Bin Hours D	Occupied			Unoccupied			Available Economizer Cooling kWh K	Necessary Cooling Energy kWh L
				Envelope Load BTUH E	Ventilation Load BTUH F	Internal Gain BTUH G	Unoccupied Envelope Load BTUH H	Ventilation Load BTUH I	Internal Gain BTUH J		
102.5	49.1	0	0	-41,379	-48,338	-12,869	-25,148	-48,338	-483	0	0
97.5	42.5	3	2	-34,366	-33,568	-12,869	-20,885	-33,568	-483	0	0
92.5	39.5	34	8	-27,353	-26,854	-12,869	-16,623	-26,854	-483	0	18
87.5	36.6	131	31	-20,339	-20,364	-12,869	-12,361	-20,364	-483	0	161
82.5	34.0	500	119	-13,328	-14,546	-12,869	-8,098	-14,546	-483	0	478
77.5	31.6	620	148	-6,312	-9,175	-12,869	-3,836	-8,175	-483	0	1,309
72.5	29.2	664	158	0	0	-12,869	0	0	-483	0	1,012
67.5	27.0	854	203	1,155	1,343	-12,869	1,155	1,343	-483	0	218
62.5	24.5	927	221	3,466	4,028	-12,869	3,466	4,028	-483	0	202
57.5	21.4	600	143	5,777	6,714	-12,869	5,777	6,714	-483	0	114
52.5	18.7	610	145	8,088	9,399	-12,869	8,088	9,399	-483	0	5
47.5	16.2	611	145	10,399	12,084	-12,869	10,399	12,084	-483	0	0
42.5	14.4	656	156	12,710	14,770	-12,869	12,710	14,770	-483	0	0
37.5	12.6	1,023	244	15,021	17,455	-12,869	15,021	17,455	-483	0	0
32.5	10.7	734	175	17,332	20,141	-12,869	17,332	20,141	-483	0	0
27.5	8.6	334	80	19,643	22,826	-12,869	19,643	22,826	-483	0	0
22.5	6.8	252	60	21,954	25,511	-12,869	21,954	25,511	-483	0	0
17.5	5.5	125	30	24,265	28,197	-12,869	24,265	28,197	-483	0	0
12.5	4.1	47	11	26,576	30,882	-12,869	26,576	30,882	-483	0	0
7.5	2.6	22	5	28,887	33,568	-12,869	28,887	33,568	-483	0	0
2.5	1.0	13	3	31,198	36,253	-12,869	31,198	36,253	-483	0	0
-2.5	0.0	0	0	33,509	38,939	-12,869	33,509	38,939	-483	0	0
-7.5	-1.5	0	0	35,820	41,624	-12,869	35,820	41,624	-483	0	0
TOTALS		8,760	2,086								3,517
			6,674								1,570

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

497 cfm
1.00
0 cfm
497 cfm

Energy Use Indices (calculated)

Heating	Base Case	Cooling	Base Case
Historic	1,570	Historic	3,517
Court Rm	2,408	Court Rm	3,849
1st Fir	1,299	1st Fir	7,807
Total	5,278	Total	15,173
Target ->	5,270	Target ->	15,096

100.1%

Electrical Requirements for Cooling Equipment

Unit	Area Served	Cing Hrs	Amps	Volts	Phase	Power Factor	% Runtime	Annual kWh
Cond-1	2nd Fir Conf Rm	1,288	35	208	1	0.8	10%	750
Cond-2	1st Fir West	1,952	38.8	208	3	0.8	20%	4361
Cond-3	1st Fir East Side	1,952	38.8	208	3	0.8	20%	4361
Cond-4	Offices, Foyer	1,288	50.3	208	3	0.8	20%	3730
Cond-5	Court Room	1,288	51.1	208	3	0.8	10%	1895
Total								15096

HEAT GAIN/LOSS WORKSHEET

Project Name: Saddle River, NJ
 Location:
 Building Name: Borough Hall
 Engineer: CAA

Project No.: CHA #21351
 Site Elevation: 460 Feet
 Date:

Specific Volume 13.50 CF/#

Building/Facility Designation Second Floor Offices - Historic Section

Outdoor Winter Design DB Temperature 14°F
 Outdoor Summer Design DB Temperature 91°F
 Outdoor Summer Design WB Temperature 73°F
 Outdoor Summer Humidity Ratio 0.0121 ##

Indoor Winter Design DB Temperature 70°F
 Indoor Summer Design DB Temperature 73°F
 Indoor Summer Design WB Temperature 60°F
 Indoor Air (70°F) Humidity Ratio 0.0078 ##

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

	R Value	Wall Type
Steel Siding, 4" Insulation, Steel Siding	15.2	1
Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
4" Block, 1" insulation, 8" Block	19.9	16
x U value calculator	10.8	

Roofs (Select One)

	R Value	Roof Type
Tectum Deck, 3.3" Insul., BU Roof	13.0	1
Steel Deck, 5" Insul., BU Roof	18.2	1
Attic Roof with 6" Insul.	25.0	4
4" HW Concrete Deck, BU Roof	2.7	2
Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
Wood Deck, 6" insulation, Felt & Membrane	18.0	
x U value calculator	19.2	

Windows (Select One)

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

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

BUILDING CHARACTERISTICS

Roof Area 1,820 SF
 Occupied Area 1,820 SF

Return Plenum? y

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	68 Ft	14.4 Ft	10.0 Ft	85 SF	42 SF	849 SF
East Exposure	28 Ft	22.0 Ft	10.0 Ft	68 SF	0 SF	548 SF
South Exposure	36 Ft	12.0 Ft	10.0 Ft	30 SF	0 SF	402 SF
West Exposure	28 Ft	22.0 Ft	10.0 Ft	56 SF	0 SF	560 SF
Occupied Forced Ventilation	200 cfm	#DIV/0!	AC/hr			
Unoccupied Forced Ventilation	200 cfm	#DIV/0!	AC/hr			

HEAT GAIN/LOSS WORKSHEET

Project Name: Saddle River, NJ
 Location:
 Building Name: Borough Hall
 Engineer: CAA

Project No.: CHA #21351
 Site Elevation: 460 Feet
 Date:

Specific Volume 13.50 CF/#

Building/Facility Designation Second Floor Offices - Historic Section

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor	Glass Type	Solar Heat Gain
North Exposure	85	38 btu/h/sf	0.8	0.75	Glass Type C	1,938 Btu/hr
East Exposure	68	216 btu/h/sf	0.8	0.31	Glass Type C	3,643 Btu/hr
South Exposure	30	109 btu/h/sf	0.8	0.58	Glass Type C	1,517 Btu/hr
West Exposure	56	216 btu/h/sf	0.8	0.29	Glass Type C	2,806 Btu/hr
						9,904 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	553	0.09	20 °F	1.0	1,023 Btu/hr
East Exposure	212	0.09	39 °F	1.0	765 Btu/hr
South Exposure	330	0.09	27 °F	1.0	824 Btu/hr
West Exposure	224	0.09	22 °F	1.0	456 Btu/hr
Roof	1,820	0.05	73 °F	1.0	6,913 Btu/hr
Fenestration	239	0.60	18 °F		2,581 Btu/hr
Doors	42	0.14	27 °F		158 Btu/hr
Ceiling	1,820	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	1,820	0.04	0 °F		0 Btu/hr
					12,721 Btu/h

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

Lights	1.50 w/sf x	1,820 Occ Area =	2.7 kW x 3.4x	1.0 RAF =	9,317 Btu/h
Plug Load	0.25 w/sf x	1,820 Occ Area =	0.5 kW x 3.4x	1.0 RAF =	1,553 Btu/h
People	3 people x	255 btu/person x	75% time in space =		574 Btu/h
Computer Work Stations		3 Units x	120 W/Unit x 3414 =		1,229 Btu/h
Equipment	1.0 kW x 3.413 =				3,413 Btu/h
Misc.					0 Btu/h
					16,086 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain
Walls	1,319 SF	0.10 CFM/SF		1.08	18 °F	2,775 Btu/h
Doors	42 SF	0.20 CFM/LF	0.95 LF/SF	1.08	18 °F	168 Btu/h
Windows	239 SF	0.20 CFM/LF	1.12 LF/SF	1.08	18 °F	1,123 Btu/h
Ventilation	200 cfm			1.08	18 °F	4,208 Btu/h
						8,275 Btu/h
Infiltration	193 cfm	#DIV/0! AC/hr				

COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE

4,950

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	296	0.09	20	1.0	548 Btu/hr
East Exposure	336	0.09	39	1.0	1,212 Btu/hr
South Exposure	72	0.09	27	1.0	180 Btu/hr
West Exposure	336	0.09	22	1.0	684 Btu/hr
Roof	1,820	0.05	73	0.0	0 Btu/hr
					2,623 Btu/h

INTERNAL HEAT GAINS

Lights	1.50 w/sf x	1,820 Occ Area =	2.7 kW x3413x	0.00 RAF =	0 Btu/h
Misc.					0 Btu/h
					0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT

Solar	9,904
Conduction to Room	12,721
Conduction to Plenum	2,623
Ventilation and Infiltration	8,275
Sub Total	33,523

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

Internal Gains to Room	16,086
Internal Gains to Plenum	0
Sub Total	16,086

HEAT GAIN/LOSS WORKSHEET

Project Name: Saddle River, NJ
 Location:
 Building Name: Borough Hall
 Engineer: CAA

Project No.: CHA #21351
 Site Elevation: 460 Feet
 Date:

Specific Volume 13.50 CF/#

Building/Facility Designation Second Floor Offices - Historic Section

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.
Walls	2,860 SF	0.10 CFM/SF	4,800	0.0043 ##
Doors	42 SF	0.20 CFM/LF	4,800	0.0043 ##
Windows	239 SF	0.20 CFM/LF	4,800	0.0043 ##
Ventilation	200 cfm		4,800	0.0043 ##
People	3 people	0.75 time in space		250 Btu/hr/person

Room Heat Gain
5,962 Btu/h
167 Btu/h
1,113 Btu/h
4,169 Btu/h
563 Btu/h

11,973 Btu/h

Cooling Load Summary

	Sensible	Latent	Total
Temperature Dependent Gains	33,523	11,973	45,497
Temperature Indep. Gains	16,086		16,086
Total	49,609	11,973	61,582

SHR= 0.81

Building Cooling Load 5.1 Tons at 355 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

3,618 CFM
1.99 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.
North Exposure	849	0.09	56
East Exposure	548	0.09	56
South Exposure	402	0.09	56
West Exposure	560	0.09	56
Fenestration	239	0.60	56
Roof	1,820	0.05	56
Doors	42	0.14	56
Ceiling	1,820	0.14	0
Partition	0	0.05	0
Floor	1,820	0.04	0

Room Heat Gain

4,398 Btu/h
2,839 Btu/h
2,083 Btu/h
2,901 Btu/h
8,030 Btu/h
5,303 Btu/h
328 Btu/h
0 Btu/h
0 Btu/h
0 Btu/h

Ventilation and Infiltration

	Infiltration Factor	Coef	Temp. Difference
Walls	2,359 SF	0.10 CFM/SF	1.08
Doors	42 SF	0.20 CFM/LF	1.08
Windows	239 SF	0.20 CFM/LF	1.08
Ventilation Load	200 cfm		1.08

Air Flow

236 cfm
8 cfm
53 cfm
200 cfm

Room Heat Gain

14,297 Btu/h
485 Btu/h
3,236 Btu/h
13,091 Btu/h
31,110 Btu/h

Total Ventilation & Infiltration Load

497 cfm

Building Heating Load	56,992	btu/h
		31.3 btu/sf

Saddle River, NJ
 CHA #21351
 Building: Borough Hall
 Second Floor Offices - Historic Section

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	3.0	7.0	2	42.0	40.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
	Sub-total			42.0	40.0

East		0.0	0.0
		0.0	0.0
		0.0	0.0
	Sub-total	0.0	0.0

South		0.0	0.0
		0.0	0.0
		0.0	0.0
		0.0	0.0
	Sub-total	0.0	0.0

West		0.0	0.0
		0.0	0.0
	Sub-total	0.0	0.0

Total 42.0 40.0

LF/SF
0.95

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North	28.0	12.0	1	336.0	80.0	All wall quantities must remain equal to 1
	40.0	16.0	1	640.0	112.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	68.0			976.0	192.0	
						Ave. height 14.4
						Average height wall automatically linked to
East	28.0	22.0	1	616.0	100.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	28.0			616.0	100.0	
						Ave. height 22.0
						Average height wall automatically linked to
South	28.0	12.0	1	336.0	80.0	
	8.0	12.0	1	96.0	40.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	36.0			432.0	120.0	
						Ave. height 12.0
						Average height wall automatically linked to
West	28.0	22.0	1	616.0	100.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	28.0			616.0	100.0	
						Ave. height 22.0
						Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	3.5	5.0	4	70.0	68.0
	1.25	4.0	2	10.0	21.0
	5.0	1.0	1	5.0	12.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	85.0	101.0
East	3.5	5.0	2	35.0	34.0
	3.5	3.0	2	21.0	26.0
	3.0	4.0	1	12.0	14.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	68.0	74.0
South	2.5	5.0	1	12.5	15.0
	3.5	5.0	1	17.5	17.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	30.0	32.0
West	3.5	5.0	2	35.0	34.0
	3.5	3.0	2	21.0	26.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	56.0	60.0
			Total	239.0	267.0

LF/SF
1.12

Saddle River, NJ
CHA #21351
Building: Borough Hall

Reconcile Thermal Model
Court Room and Conference Room

Building Footprint	2,340 SF	Ex Occupied Cing Temp.	74 °F	Ex Occupied Htg Temp.	70 °F
Heating Efficiency	80%	Ex Unoccupied Cing Temp.	74 °F	Ex Unoccupied Htg Temp.	70 °F
Cooling Efficiency	1.15 kWton	Occupied Cooling UA	(1,482) btu/hr°F	Occupied Heating UA	444 btu/hr°F
Internal Gains	23,157 btu/h	Unoccupied Cooling UA	(940) btu/hr°F	Unoccupied Heating UA	444 btu/hr°F
Unoc Internal Gain Factor	0.02	Cooling Occ Enthalpy Setpoint	27.5 Btu/lb		
Ave Occ Internal Gain Factor	0.8	Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb		
Economizer available (Y/N)	No				

EXISTING LOADS									
Occupied					Unoccupied				
Avg Outdoor Air Temp. Bins °F	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Enthalpy Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Unoccupied Ventilation Load BTUH	Internal Gain BTUH
102.5	0	0	0	-42,240	-85,558	-18,525	-26,778	-85,558	-463
97.5	3	0	3	-34,830	-59,415	-18,525	-22,080	-59,415	-463
92.5	34	1	33	-27,419	-47,532	-18,525	-17,382	-47,532	-463
87.5	131	3	128	-20,009	-36,045	-18,525	-12,684	-36,045	-463
82.5	500	12	488	-12,598	-25,747	-18,525	-7,986	-25,747	-463
77.5	620	15	605	-5,187	-16,240	-18,525	-3,289	-16,240	-463
72.5	864	16	848	0	0	-18,525	0	0	-463
67.5	854	20	834	1,111	2,377	-18,525	1,111	2,377	-463
62.5	927	22	905	3,333	7,130	-18,525	3,333	7,130	-463
57.5	600	14	586	5,555	11,883	-18,525	5,555	11,883	-463
52.5	610	15	595	7,777	16,636	-18,525	7,777	16,636	-463
47.5	611	15	596	10,000	21,389	-18,525	10,000	21,389	-463
42.5	656	16	640	12,222	26,143	-18,525	12,222	26,143	-463
37.5	1,023	24	999	14,444	30,896	-18,525	14,444	30,896	-463
32.5	734	17	717	16,666	35,649	-18,525	16,666	35,649	-463
27.5	334	8	326	18,888	40,402	-18,525	18,888	40,402	-463
22.5	252	6	246	21,110	45,156	-18,525	21,110	45,156	-463
17.5	125	3	122	23,332	49,909	-18,525	23,332	49,909	-463
12.5	47	1	46	25,554	54,662	-18,525	25,554	54,662	-463
7.5	22	1	21	27,777	59,415	-18,525	27,777	59,415	-463
2.5	13	0	13	29,999	64,168	-18,525	29,999	64,168	-463
-2.5	0	0	0	32,221	68,922	-18,525	32,221	68,922	-463
-7.5	0	0	0	34,443	73,675	-18,525	34,443	73,675	-463
TOTALS	8,760	209	8,551						
					Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms	
					0	3,849	3,849	2,408	

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

880 cfm
1.00
0 cfm
880 cfm

Energy Use Indices (calculated)

Heating	Base Case
Historic	1,570
Court Rm	2,408
1st Flr	1,299
Total	5,278
Target ->	100.1%

Cooling	Base Case
Historic	3,517
Court Rm	3,849
1st Flr	7,807
Total	15,173
Target ->	100.5%

HEAT GAIN/LOSS WORKSHEET

Project Name: Saddle River, NJ
 Location:
 Building Name: Borough Hall
 Engineer: CAA

Project No.: CHA #21351
 Site Elevation: 460 Feet
 Date:

Specific Volume 13.50 CF/#

Building/Facility Designation Court Room and Conference Room

Outdoor Winter Design DB Temperature 14 °F
 Outdoor Summer Design DB Temperature 91 °F
 Outdoor Summer Design WB Temperature 73 °F
 Outdoor Summer Humidity Ratio 0.0121 ##

Indoor Winter Design DB Temperature 70 °F
 Indoor Summer Design DB Temperature 74 °F
 Indoor Summer Design WB Temperature 60 °F
 Indoor Air (70°F) Humidity Ratio 0.0078 ##

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

	R Value	Wall Type
Steel Siding, 4" Insulation, Steel Siding	15.2	1
Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
4" Block, 1" insulation, 8" Block	19.9	16
x U value calculator	18.7	

Roofs (Select One)

	R Value	Roof Type
Tectum Deck, 3.3" Insul., BU Roof	13.0	1
Steel Deck, 5" Insul., BU Roof	18.2	1
Attic Roof with 6" Insul.	25.0	4
4" HW Concrete Deck, BU Roof	2.7	2
Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
Wood Deck, 6" insulation, Felt & Membrane	18.0	
x U value calculator	19.2	

Windows (Select One)

	U Value
Aluminum Frame, 1/8" SP Glazing	1.05
Aluminum Frame, 1/4" DP Glazing	0.60
Aluminum Frame, 3/16" DP Glazing	0.62
Aluminum Frame, 1/2" DP Glazing	0.50
Skylights	0.90
x Wood Frame, SP Glazing	1.10

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

BUILDING CHARACTERISTICS

Roof Area 2,340 SF
 Occupied Area 2,340 SF

Return Plenum? y

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	0 Ft	0.0 Ft	10.0 Ft	0 SF	0 SF	0 SF
East Exposure	73 Ft	13.8 Ft	10.0 Ft	52 SF	16 SF	937 SF
South Exposure	32 Ft	15.0 Ft	10.0 Ft	50 SF	0 SF	430 SF
West Exposure	73 Ft	13.8 Ft	10.0 Ft	78 SF	0 SF	927 SF
Occupied Forced Ventilation	600 cfm	36.0 AC/hr				
Unoccupied Forced Ventilation	600 cfm	36.0 AC/hr				

HEAT GAIN/LOSS WORKSHEET

Project Name: Saddle River, NJ
 Location:
 Building Name: Borough Hall
 Engineer: CAA

Project No.: CHA #21351
 Site Elevation: 460 Feet
 Date:

Specific Volume 13.50 CF/#

Building/Facility Designation Court Room and Conference Room

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor	Glass Type	Solar Heat Gain
North Exposure	0	38 btu/h/sf	0.8	0.75	Glass Type C	0 Btu/hr
East Exposure	52	216 btu/h/sf	0.8	0.31	Glass Type C	2,786 Btu/hr
South Exposure	50	109 btu/h/sf	0.8	0.58	Glass Type C	2,529 Btu/hr
West Exposure	78	216 btu/h/sf	0.8	0.29	Glass Type C	3,909 Btu/hr
						9,223 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	0	0.05	20 °F	1.0	0 Btu/hr
East Exposure	662	0.05	39 °F	1.0	1,377 Btu/hr
South Exposure	270	0.05	27 °F	1.0	389 Btu/hr
West Exposure	652	0.05	22 °F	1.0	765 Btu/hr
Roof	2,340	0.05	73 °F	1.0	8,888 Btu/hr
Fenestration	180	1.10	17 °F		3,366 Btu/hr
Doors	16	0.14	27 °F		61 Btu/hr
Ceiling	2,340	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	2,340	0.04	0 °F		0 Btu/hr
					14,847 Btu/h

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

Lights	2.00 w/sf x	2,340 Occ Area =	4.7 kW x 3.4x	1.0 RAF =	15,973 Btu/h
Plug Load	0.05 w/sf x	2,340 Occ Area =	0.1 kW x 3.4x	1.0 RAF =	399 Btu/h
People	100 people x	255 btu/person x	25% time in space =		6,375 Btu/h
Computer Work Stations		1 Units x	120 W/Unit x	3414 =	410 Btu/h
Equipment		kW x 3.413 =			0 Btu/h
Misc.					0 Btu/h
					23,157 Btu/h

VENTILATION AND INFILTRATION

	Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain
Walls	1.584 SF	0.10 CFM/SF	1.08	17 °F	3,147 Btu/h
Doors	16 SF	0.20 CFM/LF	1.08	17 °F	72 Btu/h
Windows	180 SF	0.35 CFM/LF	1.08	17 °F	939 Btu/h
Ventilation	600 cfm		1.08	17 °F	11,922 Btu/h
Infiltration	209 cfm	12.6 AC/hr			16,080 Btu/h

COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE

4,950

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	0	0.05	20	1.0	0 Btu/hr
East Exposure	275	0.05	39	1.0	572 Btu/hr
South Exposure	160	0.05	27	1.0	231 Btu/hr
West Exposure	275	0.05	22	1.0	323 Btu/hr
Roof	2,340	0.05	73	0.0	0 Btu/hr
					1,126 Btu/h

INTERNAL HEAT GAINS

Lights	2.00 w/sf x	2,340 Occ Area =	4.7 kW x3413x	0.00 RAF =	0 Btu/h
Misc.					0 Btu/h
					0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT

Solar	9,223
Conduction to Room	14,847
Conduction to Plenum	1,126
Ventilation and Infiltration	16,080
Sub Total	41,276

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

Internal Gains to Room	23,157
Internal Gains to Plenum	0
Sub Total	23,157

HEAT GAIN/LOSS WORKSHEET

Project Name: Saddle River, NJ
 Location:
 Building Name: Borough Hall
 Engineer: CAA

Project No.: CHA #21351
 Site Elevation: 460 Feet
 Date:

Specific Volume 13.50 CF/#

Building/Facility Designation Court Room and Conference Room

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.
Walls	3,050 SF	0.10 CFM/SF	4,800	0.0043 ##
Doors	16 SF	0.20 CFM/LF	4,800	0.0043 ##
Windows	180 SF	0.35 CFM/LF	4,800	0.0043 ##
Ventilation	600 cfm		4,800	0.0043 ##
People	100 people	0.25 time in space		250 Btu/hr/person

Room Heat Gain	
6,358	Btu/h
75	Btu/h
985	Btu/h
12,507	Btu/h
6,250	Btu/h

26,175 Btu/h

Cooling Load Summary

	Sensible	Latent	Total
Temperature Dependent Gains	41,276	26,175	67,451
Temperature Indep. Gains	23,157		23,157
Total	64,432	26,175	90,608

SHR= 0.71

Building Cooling Load 7.6 Tons at 310 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

4,875 CFM

2.08 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.
North Exposure	0	0.05	56
East Exposure	937	0.05	56
South Exposure	430	0.05	56
West Exposure	927	0.05	56
Fenestration	180	1.10	56
Roof	2,340	0.05	56
Doors	16	0.14	56
Ceiling	2,340	0.14	0
Partition	0	0.05	0
Floor	2,340	0.04	0

Room Heat Gain

0	Btu/h
2,799	Btu/h
1,285	Btu/h
2,770	Btu/h
11,088	Btu/h
6,818	Btu/h
127	Btu/h
0	Btu/h
0	Btu/h
0	Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow
Walls	2,294 SF	0.10 CFM/SF	1.08	56	229 cfm
Doors	16 SF	0.20 CFM/LF	1.08	56	4 cfm
Windows	180 SF	0.35 CFM/LF	1.08	56	47 cfm
Ventilation Load	600 cfm		1.08	56	600 cfm
Total Ventilation & Infiltration Load					880 cfm

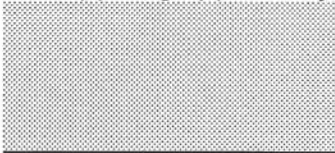
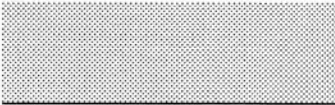
Room Heat Gain

13,902	Btu/h
218	Btu/h
2,864	Btu/h
39,273	Btu/h
56,257	Btu/h

Building Heating Load 81,145 btu/h

34.7 btu/sf

Saddle River, NJ
 CHA #21351
 Building: Borough Hall
 Court Room and Conference Room
Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
	Sub-total			0.0	0.0
East	2.5	6.5	1	16.3	18.0
				0.0	0.0
				0.0	0.0
	Sub-total			16.3	18.0
South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
	Sub-total			0.0	0.0
West				0.0	0.0
				0.0	0.0
				0.0	0.0
	Sub-total			0.0	0.0
	Total			16.3	18.0

LF/SF
1.11

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North				0.0	0.0	All wall quantities must remain equal to 1
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	0.0			0.0	0.0	Ave. height 0.0
						Average height wall automatically linked to

East	55.0	15.0	1	825.0	140.0	
	18.0	10.0	1	180.0	56.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	73.0			1005.0	196.0	Ave. height 13.8
						Average height wall automatically linked to

South	32.0	15.0	1	480.0	94.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	32.0			480.0	94.0	Ave. height 15.0
						Average height wall automatically linked to

West	55.0	15.0	1	825.0	140.0	
	18.0	10.0	1	180.0	56.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	73.0			1005.0	196.0	Ave. height 13.8
						Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0

East	4.0	6.5	2	52.0	42.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	52.0	42.0

South	10.0	5.0	1	50.0	30.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	50.0	30.0

West	4.0	6.5	3	78.0	63.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	78.0	63.0

			Total	180.0	135.0
					LF/SF 0.75

Saddle River, NJ
CHA #21351
Building: Borough Hall

Reconcile Thermal Model
First Floor Offices

Building Footprint	4,160 SF	Ex Occupied Cing Temp.	72 °F	Ex Occupied Htg Temp.	68 °F
Heating Efficiency	80%	Ex Unoccupied Cing Temp.	72 °F	Ex Unoccupied Htg Temp.	68 °F
Cooling Efficiency	1.16 kWton	Occupied Cooling UA	(974) btu/hr°F	Occupied Heating UA	314 btu/hr°F
Internal Gains	43,844 btu/h	Unoccupied Cooling UA	(355) btu/hr°F	Unoccupied Heating UA	314 btu/hr°F
Unoc Internal Gain factor	0.03	Cooling Occ Enthalpy Setpoint	27.5 Btu/lb		
Ave Occ Internal Gain Factor	0.8	Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb		
Economizer available (Y/N)	No				

EXISTING LOADS													
Occupied					Unoccupied								
Avg Outdoor Air Temp. Bins °F	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therm
A	B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	-29,712	-94,970	-35,155	-10,822	-94,970	-1,318	0	0	0	0
97.5	42.5	3	2	-24,841	-65,952	-35,155	-9,048	-65,952	-1,318	0	25	25	0
92.5	39.5	34	8	-19,970	-52,761	-35,155	-7,274	-52,761	-1,318	0	238	238	0
87.5	36.6	131	31	-15,100	-40,011	-35,155	-5,500	-40,011	-1,318	0	718	718	0
82.5	34.0	500	119	-10,229	-28,579	-35,155	-3,726	-28,579	-1,318	0	2,071	2,071	0
77.5	31.6	620	148	-5,358	-18,027	-35,155	-1,952	-18,027	-1,318	0	1,792	1,792	0
72.5	29.2	664	158	-487	-7,475	-35,155	-177	-7,475	-1,318	0	1,088	1,088	0
67.5	27.0	854	203	157	528	-35,155	157	528	-1,318	0	711	711	0
62.5	24.5	927	221	1,729	5,804	-35,155	1,729	5,804	-1,318	0	584	584	0
57.5	21.4	600	143	3,301	11,080	-35,155	3,301	11,080	-1,318	0	284	284	0
52.5	18.7	610	145	4,873	16,356	-35,155	4,873	16,356	-1,318	0	194	194	0
47.5	16.2	611	145	6,445	21,632	-35,155	6,445	21,632	-1,318	0	99	99	0
42.5	14.4	656	156	8,017	26,908	-35,155	8,017	26,908	-1,318	0	3	3	0
37.5	12.6	1,023	244	9,590	32,184	-35,155	9,590	32,184	-1,318	0	0	0	414
32.5	10.7	734	175	11,162	37,461	-35,155	11,162	37,461	-1,318	0	0	0	360
27.5	8.6	334	80	12,734	42,737	-35,155	12,734	42,737	-1,318	0	0	0	192
22.5	6.8	252	60	14,306	48,013	-35,155	14,306	48,013	-1,318	0	0	0	167
17.5	5.5	125	30	15,878	53,289	-35,155	15,878	53,289	-1,318	0	0	0	93
12.5	4.1	47	11	17,450	58,565	-35,155	17,450	58,565	-1,318	0	0	0	39
7.5	2.6	22	5	19,022	63,841	-35,155	19,022	63,841	-1,318	0	0	0	20
2.5	1.0	13	3	20,594	69,117	-35,155	20,594	69,117	-1,318	0	0	0	13
-2.5	0.0	0	0	22,166	74,394	-35,155	22,166	74,394	-1,318	0	0	0	0
-7.5	-1.5	0	0	23,738	79,670	-35,155	23,738	79,670	-1,318	0	0	0	0
TOTALS		8,760	2,086	6,674							7,807	7,807	1,299

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

977 cfm
1.00
977 cfm

Energy Use Indices (calculated)

Heating	Base Case
Historic	1,570
Court Rm	2,408
1st Flr	1,299
Total	5,278
Target ->	100.1%

Cooling	Base Case
Historic	3,517
Court Rm	3,849
1st Flr	7,807
Total	15,173
Target ->	100.5%

HEAT GAIN/LOSS WORKSHEET

Project Name: Saddle River, NJ
 Location:
 Building Name: Borough Hall
 Engineer: CAA

Project No.: CHA #21351
 Site Elevation: 460 Feet
 Date:

Specific Volume 13.50 CF/#

Building/Facility Designation First Floor Offices

Outdoor Winter Design DB Temperature 14 °F
 Outdoor Summer Design DB Temperature 91 °F
 Outdoor Summer Design WB Temperature 73 °F
 Outdoor Summer Humidity Ratio 0.0121 ##

Indoor Winter Design DB Temperature 68 °F
 Indoor Summer Design DB Temperature 72 °F
 Indoor Summer Design WB Temperature 60 °F
 Indoor Air (70°F) Humidity Ratio 0.0078 ##

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

	R Value	Wall Type
Steel Siding, 4" Insulation, Steel Siding	15.2	1
Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
4" Block, 1" insulation, 8" Block	19.9	16
x U value calculator	18.7	

Roofs (Select One)

	R Value	Roof Type
Tectum Deck, 3.3" Insul., BU Roof	13.0	1
Steel Deck, 5" Insul., BU Roof	18.2	1
Attic Roof with 6" Insul.	25.0	4
4" HW Concrete Deck, BU Roof	2.7	2
Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
Wood Deck, 6" insulation, Felt & Membrane	18.0	
x U value calculator	19.2	

Windows (Select One)

	U Value
Aluminum Frame, 1/8" SP Glazing	1.05
Aluminum Frame, 1/4" DP Glazing	0.60
Aluminum Frame, 3/16" DP Glazing	0.62
Aluminum Frame, 1/2" DP Glazing	0.50
Skylights	0.90
x Vinyl Frame, DP Glazing	0.55

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

BUILDING CHARACTERISTICS

Roof Area 0 SF
 Occupied Area 4,160 SF

Return Plenum? y

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	0 Ft	0.0 Ft	8.0 Ft	0 SF	0 SF	0 SF
East Exposure	99 Ft	10.4 Ft	8.0 Ft	85 SF	21 SF	926 SF
South Exposure	68 Ft	12.0 Ft	8.0 Ft	63 SF	63 SF	690 SF
West Exposure	99 Ft	10.4 Ft	8.0 Ft	80 SF	0 SF	952 SF
Occupied Forced Ventilation	660 cfm	#DIV/0! AC/hr				
Unoccupied Forced Ventilation	660 cfm	#DIV/0! AC/hr				

HEAT GAIN/LOSS WORKSHEET

Project Name: Saddle River, NJ
 Location:
 Building Name: Borough Hall
 Engineer: CAA

Project No.: CHA #21351
 Site Elevation: 460 Feet
 Date:

Specific Volume 13.50 CF/#

Building/Facility Designation First Floor Offices

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor	Glass Type	Solar Heat Gain
North Exposure	0	38 btu/h/sf	0.8	0.75	Glass Type C	0 Btu/hr
East Exposure	85	216 btu/h/sf	0.8	0.31	Glass Type C	4,553 Btu/hr
South Exposure	63	109 btu/h/sf	0.8	0.58	Glass Type C	3,205 Btu/hr
West Exposure	80	216 btu/h/sf	0.8	0.29	Glass Type C	4,009 Btu/hr
						11,767 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	0	0.05	20 °F	1.0	0 Btu/hr
East Exposure	686	0.05	39 °F	1.0	1,428 Btu/hr
South Exposure	418	0.05	27 °F	1.0	602 Btu/hr
West Exposure	712	0.05	22 °F	1.0	836 Btu/hr
Roof	0	0.05	73 °F	1.0	0 Btu/hr
Fenestration	228	0.55	19 °F		2,387 Btu/hr
Doors	84	0.14	27 °F		317 Btu/hr
Ceiling	4,160	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	4,160	0.04	0 °F		0 Btu/hr
					5,568 Btu/h

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

Lights	1.50 w/sf x	4,160 Occ Area =	6.2 kW x 3.4x	1.0 RAF =	21,297 Btu/h
Plug Load	0.25 w/sf x	4,160 Occ Area =	1.0 kW x 3.4x	1.0 RAF =	3,550 Btu/h
People	20 people x	255 btu/person x	80% time in space =		4,080 Btu/h
Computer Work Stations		20 Units x	120 W/Unit x	3414 =	8,191 Btu/h
Equipment	2.0 kW x 3.413 =				6,826 Btu/h
Misc.					0 Btu/h
					43,944 Btu/h

VENTILATION AND INFILTRATION

	Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain
Walls	1,816 SF 0.10 CFM/SF		1.08	19 °F	4,032 Btu/h
Doors	84 SF 0.20 CFM/LF	0.95 LF/SF	1.08	19 °F	355 Btu/h
Windows	228 SF 0.20 CFM/LF	0.97 LF/SF	1.08	19 °F	984 Btu/h
Ventilation	660 cfm		1.08	19 °F	14,657 Btu/h
Infiltration	242 cfm #DIV/0! AC/hr				20,029 Btu/h

COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE

4,950

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	0	0.05	20	1.0	0 Btu/hr
East Exposure	240	0.05	39	1.0	499 Btu/hr
South Exposure	272	0.05	27	1.0	392 Btu/hr
West Exposure	240	0.05	22	1.0	282 Btu/hr
Roof	0	0.05	73	0.0	0 Btu/hr
					1,173 Btu/h

INTERNAL HEAT GAINS

Lights	1.50 w/sf x	4,160 Occ Area =	6.2 kW x3413x	0.00 RAF =	0 Btu/h
Misc.					0 Btu/h
					0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT

Solar	11,767
Conduction to Room	5,568
Conduction to Plenum	1,173
Ventilation and Infiltration	20,029
Sub Total	38,538

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

Internal Gains to Room	43,944
Internal Gains to Plenum	0
Sub Total	43,944

HEAT GAIN/LOSS WORKSHEET

Project Name: Saddle River, NJ
 Location:
 Building Name: Borough Hall
 Engineer: CAA

Project No.: CHA #21351
 Site Elevation: 460 Feet
 Date:

Specific Volume 13.50 CF/#

Building/Facility Designation First Floor Offices

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.
Walls	752 SF	0.10 CFM/SF	4,800	0.0043 ##
Doors	84 SF	0.20 CFM/LF	4,800	0.0043 ##
Windows	228 SF	0.20 CFM/LF	4,800	0.0043 ##
Ventilation	660 cfm		4,800	0.0043 ##
People	20 people	0.80 time in space		250 Btu/hr/person

Room Heat Gain
1,568 Btu/h
334 Btu/h
923 Btu/h
13,758 Btu/h
4,000 Btu/h

20,583 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	SHR=	
Temperature Dependent Gains	38,538	20,583	59,121		
Temperature Indep. Gains	43,944		43,944	0.80	
Total	82,482	20,583	103,064		

Building Cooling Load 8.6 Tons at 484 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

6,261 CFM

1.50 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.
North Exposure	0	0.05	54
East Exposure	926	0.05	54
South Exposure	690	0.05	54
West Exposure	952	0.05	54
Fenestration	228	0.55	54
Roof	0	0.05	54
Doors	84	0.14	54
Ceiling	4,160	0.14	0
Partition	0	0.05	0
Floor	4,160	0.04	13

Room Heat Gain

0 Btu/h
2,668 Btu/h
1,987 Btu/h
2,743 Btu/h
6,783 Btu/h
0 Btu/h
634 Btu/h
0 Btu/h
0 Btu/h
2,163 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow
Walls	2,568 SF	0.10 CFM/SF	1.08	54	257 cfm
Doors	84 SF	0.20 CFM/LF	1.08	54	16 cfm
Windows	228 SF	0.20 CFM/LF	1.08	54	44 cfm
Ventilation Load	660 cfm		1.08	54	660 cfm
Total Ventilation & Infiltration Load					977 cfm

Room Heat Gain

15,006 Btu/h
935 Btu/h
2,589 Btu/h
41,658 Btu/h
60,188 Btu/h

Building Heating Load 77,166 btu/h

18.5 btu/sf

Saddle River, NJ
CHA #21351
Building: Borough Hall
First Floor Offices

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
East	3.0	7.0	1	21.0	20.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	21.0	20.0
South	3.0	7.0	3	63.0	60.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	63.0	60.0
West				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
			Total	84.0	80.0

LF/SF 0.95

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North				0.0	0.0	All wall quantities must remain equal to 1
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	0.0			0.0	0.0	Ave. height 0.0
						Average height wall automatically linked to
East	73.0	12.0	1	876.0	170.0	
	26.0	6.0	1	156.0	64.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	99.0			1032.0	234.0	Ave. height 10.4
						Average height wall automatically linked to
South	32.0	12.0	1	384.0	88.0	
	36.0	12.0	1	432.0	96.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	68.0			816.0	184.0	Ave. height 12.0
						Average height wall automatically linked to
West	73.0	12.0	1	876.0	170.0	
	26.0	6.0	1	156.0	64.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	99.0			1032.0	234.0	Ave. height 10.4
						Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
East	4.0	5.0	2	40.0	36.0	
	5.0	9.0	1	45.0	28.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	85.0	64.0	
South	2.5	5.0	1	12.5	15.0	
	3.0	5.0	1	15.0	16.0	
	1.5	7.0	2	21.0	34.0	
	1.75	8.5	1	14.9	20.5	
				0.0	0.0	
				0.0	0.0	
			Sub-total	63.4	85.5	
West	4.0	5.0	4	80.0	72.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	80.0	72.0	
			Total	228.4	221.5	LF/SF 0.97

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

[illegible]

\$	1,127	Subtotal
\$	113	10% Contingency
\$	124	10% Contractor O&P
\$	-	0% Engineering
\$	1,364	Total

APPENDIX F

ECM-5 Lighting Replacements

Cost of Electricity: \$0.13 kWh
 \$5.19 kWh

EXISTING CONDITIONS										RETROFIT CONDITIONS				COST & SAVINGS ANALYSIS								
Field Code	Area Description Unique description of the location - Room number/Room name - Floor number (if applicable)	No. of Fixtures before the retrofit	Standard Fixture Code "Lighting Fixture Code" Example: 21 40 F (U) = 2' x 2' Troff 40 w recessed, 2 lamps U shape	Watts per Fixture Value from Table of Standard Fixture Wattages	W/S/Space (Watts/Ft ²)	Exist. Control	Annual Hours Estimated daily (Hours for the usage group)	Annual kWh (kWh/fixture * Annual Hours)	Number of Fixtures after the retrofit	Standard Fixture Code	Fixture Code Code from Table of Standard Fixture Wattages	Watts per Fixture Value from Table of Standard Fixture Wattages	W/S/Space (Watts/Ft ²)	Retrofit Control	Annual Hours Estimated daily (Hours for the usage group)	Annual kWh (kWh/fixture * Annual Hours)	Annual kWh Saved (Original Annual kWh - Annual kWh)	Annual \$ Saved (Annual kWh * Cost of electricity)	Retrofit Cost Cost for new lighting system	NJ Incentive Prescriptive Requirements for Energy Efficient Measures	Simple Payback With Out Incentive Length of time for retrofits for energy efficient lighting fixtures to be recovered	
244	South Vestibule	1	9 W (2) Lamp CF (MAG)	23	0.1	SW	2000	191	4	CF192	CF192	23	0.1	SW	2,000	191	- 50	\$ -	\$ -	\$ -	25.2	21.6
245	First Floor Men's Restroom	1	1 W (1) F 1 (MAG)	43	0.0	SW	2000	89	1	F41EE	F41EE	43	0.0	SW	2,000	89	- 54	\$ 6.93	\$ 175.00	\$ 175.00	25.2	21.6
246	First Floor Women's Restroom	1	1 W (1) F 1 (MAG)	43	0.0	SW	2000	89	1	F41EE	F41EE	43	0.0	SW	2,000	89	- 54	\$ 6.93	\$ 175.00	\$ 175.00	25.2	21.6
247	First Floor Men's Restroom	1	1 W (1) F 1 (MAG)	43	0.0	SW	2000	89	1	F41EE	F41EE	43	0.0	SW	2,000	89	- 54	\$ 6.93	\$ 175.00	\$ 175.00	25.2	21.6
248	First Floor Women's Restroom	1	1 W (1) F 1 (MAG)	43	0.0	SW	2000	89	1	F41EE	F41EE	43	0.0	SW	2,000	89	- 54	\$ 6.93	\$ 175.00	\$ 175.00	25.2	21.6
249	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
250	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
251	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
252	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
253	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
254	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
255	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
256	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
257	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
258	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
259	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
260	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
261	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
262	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
263	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
264	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
265	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
266	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
267	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
268	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
269	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
270	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
271	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
272	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
273	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
274	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
275	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
276	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
277	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
278	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
279	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
280	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
281	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
282	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
283	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
284	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
285	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
286	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
287	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
288	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
289	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
290	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
291	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
292	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
293	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
294	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
295	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
296	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
297	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
298	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
299	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F21LL	F21LL	33	0.1	SW	2,000	137	- 100	\$ -	\$ -	\$ -	18.5	16.0
300	First Floor Hall	2	2 T 1 W F 1 (E) (MAG)	33	0.1	SW	2000	137	2	F												

APPENDIX G

ECM-6 Install Occupancy Sensors

Cost of Electricity: \$0.143 \$/kWh
\$9.18 \$/kW

Area Description		EXISTING CONDITIONS				RETROFIT CONDITIONS				COST & SAVINGS ANALYSIS												
		No. of Features	Standard Feature Code	NYSEERA Feature Code	Watts per Fixture	kW/Space (Watts/sq ft)	Existing	Annual Hours	Annual kWh (kWxHours)	Number of Features	Standard Feature Code	Feature Code from Table of Standard Wattages	Watts per Fixture	kW/Space (Watts/sq ft)	Retrofit Control	Annual Hours	Annual kWh (kWxHours)	Annual kWh Saved (Original kWh - Retrofitted kWh)	Annual \$ Saved (Original kWh cost - Retrofitted kWh cost)	Retrofit Cost (Cost for new lighting system)	NJ Lighting Incentive	Simple Payback
Field Code	Unique description of the location, room, and fixture. If the fixture is a retrofit, include the fixture number (if applicable).																					
244	244	1	1	1	CF192	23	SW	2050	81.4	4	1	W20 CF1 (MAG)	23	0.1	None	2050	81.4	0	\$0.00	\$0.00		
245	245	1	1	1	F22LL	43	SW	2050	81.4	1	1	Z 1 W F F (E LE)	43	0.1	None	2050	81.4	0	\$0.00	\$0.00		
246	246	1	1	1	F22LL	33	SW	2050	137.2	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	137.2	0	\$0.00	\$0.00		
247	247	1	1	1	F22LL	33	SW	2050	137.2	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	137.2	0	\$0.00	\$0.00		
248	248	1	1	1	F22LL	33	SW	2050	137.2	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	137.2	0	\$0.00	\$0.00		
249	249	1	1	1	CF192	23	SW	2050	81.4	2	2	W20 CF1 (MAG)	23	0.1	None	2050	81.4	0	\$0.00	\$0.00		
250	250	1	1	1	CF192	23	SW	2050	81.4	2	2	W20 CF1 (MAG)	23	0.1	None	2050	81.4	0	\$0.00	\$0.00		
251	251	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
252	252	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
253	253	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
254	254	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
255	255	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
256	256	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
257	257	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
258	258	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
259	259	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
260	260	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
261	261	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
262	262	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
263	263	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
264	264	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
265	265	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
266	266	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
267	267	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
268	268	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
269	269	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
270	270	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
271	271	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
272	272	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
273	273	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
274	274	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
275	275	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
276	276	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
277	277	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
278	278	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
279	279	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
280	280	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
281	281	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
282	282	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
283	283	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
284	284	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
285	285	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
286	286	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
287	287	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
288	288	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
289	289	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
290	290	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
291	291	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
292	292	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
293	293	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
294	294	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
295	295	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
296	296	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
297	297	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
298	298	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
299	299	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
300	300	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
301	301	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
302	302	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
303	303	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
304	304	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
305	305	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
306	306	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
307	307	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
308	308	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
309	309	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
310	310	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
311	311	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
312	312	1	1	1	F22LL	33	SW	2050	81.4	2	2	Z 1 W F F (E LE)	33	0.1	None	2050	81.4	0	\$0.00	\$0.00		
313	313	1	1	1																		

APPENDIX H

ECM-7 Lighting Replacements with Occupancy Sensors

APPENDIX I

New Jersey Pay For Performance Incentive Program

Saddle River, NJ
CHA #21351
Building: Borough Hall

New Jersey Pay For Performance Incentive Program

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

Total Building Area (Square Feet)	7,700
Is this audit funded by the NJ BPU (Y/N)	Yes

Bureau of Public Utilities (BPU)

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

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	\$14,800	\$6,100
Existing Usage (from utility)	80,940	5,430
Proposed Savings	12,590	2,940
Existing Total MMBtus	819	
Proposed Savings MMBtus	337	
% Energy Reduction	41.1%	
Proposed Annual Savings	\$5,700	

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

	Incentives \$		
	Elec	Gas	Total
Incentive #1	\$0	\$0	\$385
Incentive #2	\$1,385	\$3,234	\$4,619
Incentive #3	\$881	\$2,058	\$2,939
Total All Incentives	\$2,266	\$5,292	\$7,943

Total Project Cost	\$44,700
--------------------	----------

	Allowable Incentive	
% Incentives #1 of Utility Cost*	1.8%	\$385
% Incentives #2 of Project Cost**	10.3%	\$4,619
% Incentives #3 of Project Cost**	6.6%	\$2,939
Total Eligible Incentives***	\$7,943	
Project Cost w/ Incentives	\$36,757	

Project Payback (years)	
w/o Incentives	w/ Incentives
7.8	6.4

* Maximum allowable incentive is 50% of annual utility cost if not funded by NJ BPU, and %25 if it is.

** Maximum allowable amount of Incentive #2 is 30% of total project cost.

Maximum allowable amount of Incentive #3 is 20% of total project cost.

*** Maximum allowable amount of Incentive #1 is \$50,000 if not funded by NJ BPU, and \$25,000 if it is.

Maximum allowable amount of Incentive #2 & #3 is \$1 million per gas account and \$1 million per electric account

APPENDIX J

Photovoltaic (PV) Rooftop Solar Power Generation

**Borough of Saddle River
Borough Hall**

Cost of Electricity \$0.183 \$/kWh
System Capacity 30.0 kW

Photovoltaic (PV) Rooftop Solar Power Generation

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	New Jersey Renewable * Energy Incentive	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
	kW	kWh	therms	\$						
\$	0.0	35,490	0	\$	\$	\$	\$	\$	Years	Years
\$240,000	0.0	35,490	0	\$6,500	0	\$6,500	\$22,500	\$17,300	36.9	9.1

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

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

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

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

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



AC Energy & Cost Savings



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

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	30.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	23.1 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	18.3 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	3.36	2483	454.39
2	4.05	2682	490.81
3	4.58	3253	595.30
4	4.84	3179	581.76
5	5.30	3503	641.05
6	5.33	3304	604.63
7	5.27	3336	610.49
8	5.25	3302	604.27
9	5.06	3203	586.15
10	4.46	3016	551.93
11	3.15	2153	394.00
12	2.87	2076	379.91
Year	4.46	35490	6494.67

Output Hourly Performance Data

Output Results as Text

*

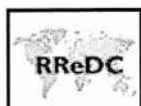
About the Hourly Performance Data

Saving Text from a Browser

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

Please send questions and comments regarding PVWATTS to Webmaster

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



Cautions for Interpreting the Results

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

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

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

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

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

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

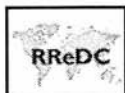
If net-metering isn't available and the PV system sends surplus electricity to the utility grid, the utility generally buys the electricity from the owner at a lower price than the owner pays the utility for electricity. In this case, the cost savings shown in the table should be reduced.

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

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

Please send questions and comments to Webmaster

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APPENDIX K

Solar Thermal Domestic Hot Water Plant

NJBPU Energy Audits
CHA #21351
Borough of Saddle River - Borough Hall

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

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

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


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Interactive Energy Calculators

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 THE INFINITE POWER
 OF TEXAS

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

[Carbon Pollution Calculator](#)
[Electric Power Pollution Calculator](#)
[PV System Economics](#)
[Solar Water Heating](#)
[What's a Watt?](#)

Solar Water Heating Calculator

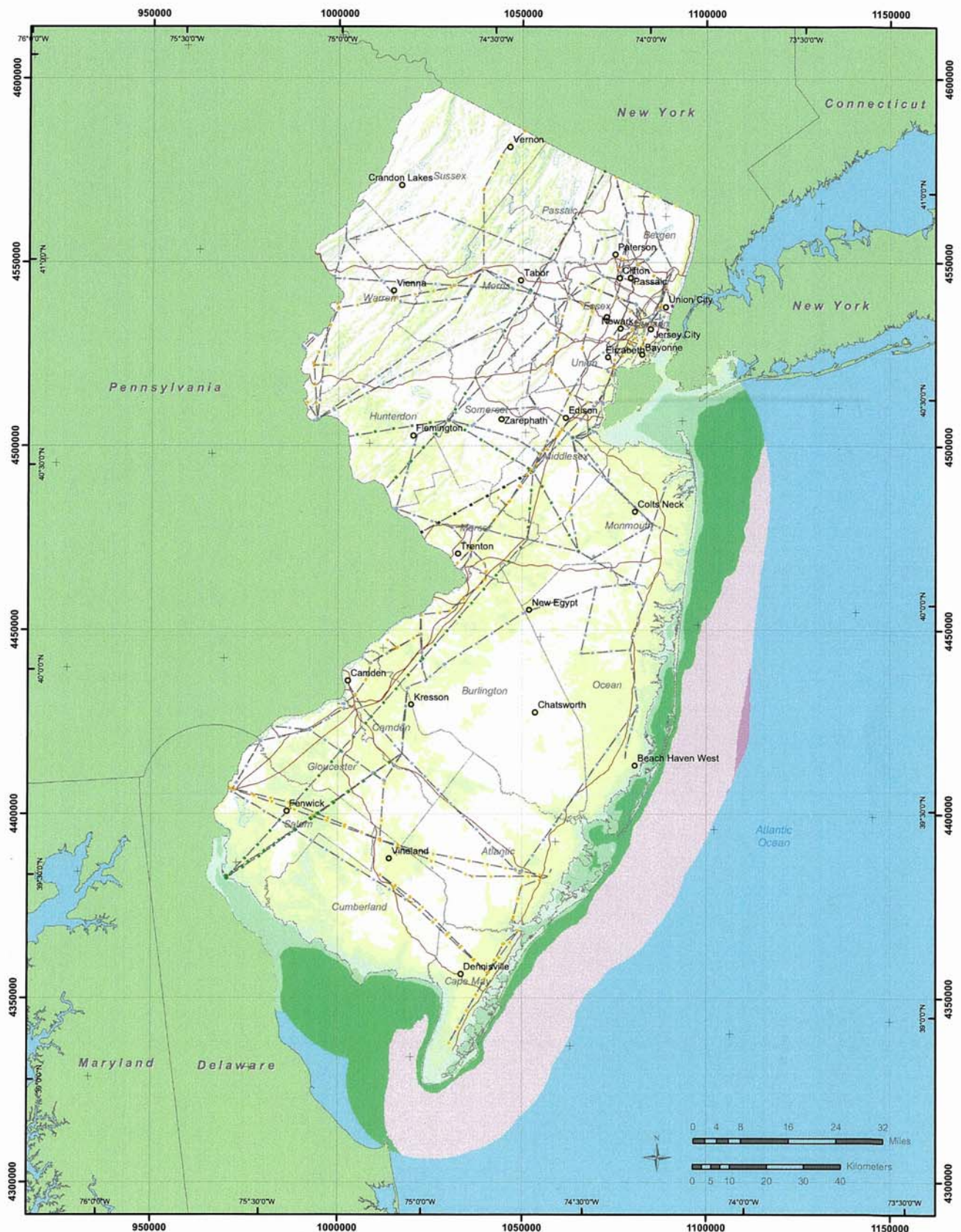
Water heating is a major energy consumer. Although the energy consumed daily is often less than for air conditioning or heating, it is required year round, making it a good application of solar energy. Use this calculator to explore the energy usage of your water heater, and to estimate whether a solar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

Water Heater Characteristics			
Physical		Thermal	
2.0 Diameter (feet)	2.0	50 Water Inlet Temperature (Degrees F)	50
75 Capacity (gallons)	75	68 Ambient Temperature (Degrees F)	68
26.34 Surface Area (calculated - sq ft)	26.34	120 Hot Water Temperature (Degrees F)	120
NaN Effective R-value	NaN	25 Hot Water Usage (Gallons per Day)	25
Energy Use			
598.6		Heat Delivered in Hot Water (BTU/hr)	
0		Heat loss through insulation (BTU/hr)	

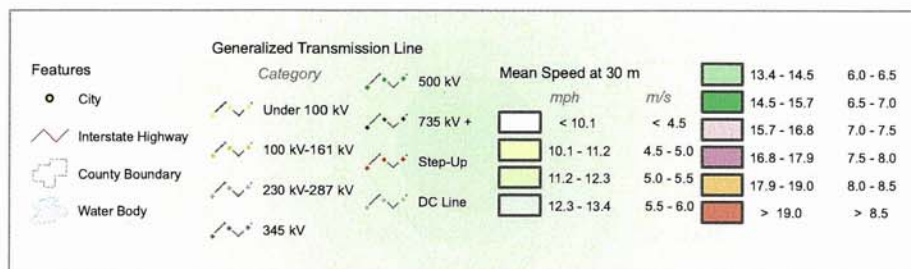
Gas vs. Electric Water Heating		
Gas		Electric
0.8	Overall Efficiency	0.98
0.8	Conversion Efficiency	0.98
748.3 BTU/hr	Power Into Water Heater	610.8 BTU/hr
Cost		
\$ 1.128 /Therm	Utility Rates	\$ 0.183 /kWh
\$ 73.9416	Yearly Water Heating Cost	\$ 286.7711
How Does Solar Compare?		
Solar Water Heater Cost: \$ 27100		Percentage Solar: 70
523.5791 years for gas	Payback Time for Solar System	135.0001 years for electric

APPENDIX L

Wind



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



AWS Truewind

Projection: Transverse Mercator,
UTM Zone 17 WGS84

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

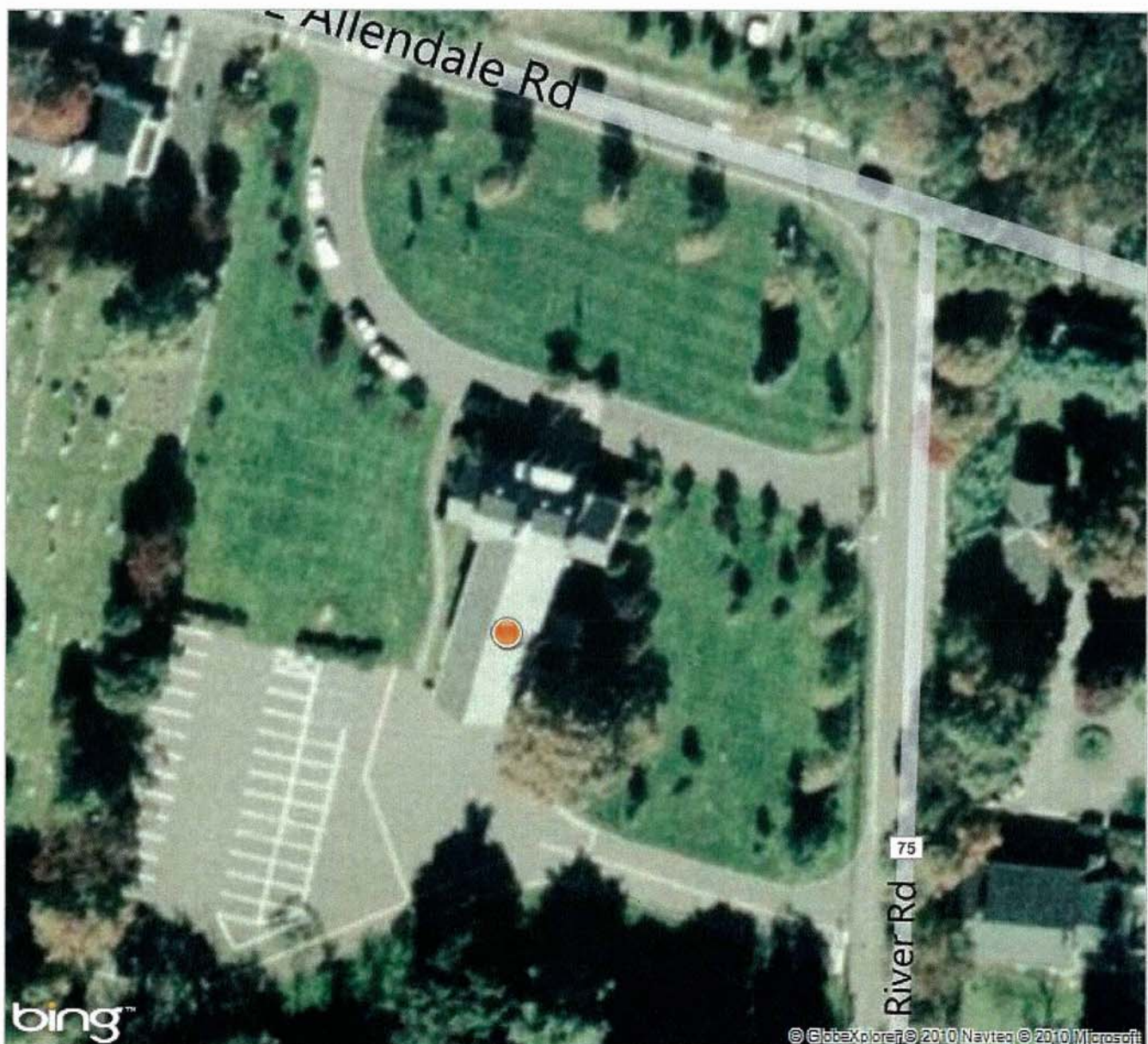
The transmission line information was obtained by AWS Truewind from the Global Energy Decisions Velocity Suite. AWS does not warrant the accuracy of the transmission line information.

Bing Maps

100 E Allendale Rd, Saddle River, NJ 07458-3040

My Notes

 **FREE!** Use **Bing 411** to find movies, businesses & more! **800-BING-411**



APPENDIX M

EPA Portfolio Manager



STATEMENT OF ENERGY PERFORMANCE

Borough Hall

Building ID: 2439505

For 12-month Period Ending: December 31, 2009¹

Date SEP becomes ineligible: N/A

Date SEP Generated: September 28, 2010

Facility

Borough Hall
100 East Allendale Road
Saddle River, NJ 07458

Facility Owner

Borough of Saddle River
100 East Allendale Road
Saddle River, NJ 07458

Primary Contact for this Facility

Charles Cuccia
100 East Allendale Road
Saddle River, NJ 07458

Year Built: 1937

Gross Floor Area (ft²): 7,700Energy Performance Rating² (1-100) 31**Site Energy Use Summary³**

Electricity - Grid Purchase(kBtu)	276,167
Natural Gas (kBtu) ⁴	543,040
Total Energy (kBtu)	819,207

Energy Intensity⁵

Site (kBtu/ft ² /yr)	106
Source (kBtu/ft ² /yr)	194

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	71
---	----

Electric Distribution Utility

Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI	87
National Average Source EUI	159
% Difference from National Average Source EUI	22%
Building Type	Office

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

Meets Industry Standards⁶ for Indoor Environmental Conditions:

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

Certifying Professional

N/A

Notes:

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.

NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Building Name	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	100 East Allendale Road, Saddle River, NJ 07458	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		☐
Court Room / Offices (Courthouse)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Gross Floor Area	3,800 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 Courthouse 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	3	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.		☐
Number of PCs	3	Is this the number of personal computers in the Courthouse?		☐
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?		☐
Borough Offices (Office)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒

Gross Floor Area	3,900 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	20	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 5.3 workers per 1000 square feet (92.8 square meters)	☐
Number of PCs	20	Is this the number of personal computers in the Office?	☐
Percent Cooled	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?	☐
Percent Heated	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?	☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Public Service Elec & Gas Co

Fuel Type: Electricity

Meter: PSE&G Electricity (kWh (thousand Watt-hours))

Space(s): Entire Facility

Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/01/2009	12/31/2009	7,920.00
11/01/2009	11/30/2009	5,940.00
10/01/2009	10/31/2009	6,660.00
09/01/2009	09/30/2009	5,640.00
08/01/2009	08/31/2009	7,860.00
07/01/2009	07/31/2009	7,260.00
06/01/2009	06/30/2009	5,400.00
05/01/2009	05/31/2009	5,580.00
04/01/2009	04/30/2009	6,180.00
03/01/2009	03/31/2009	6,420.00
02/01/2009	02/28/2009	7,680.00
01/01/2009	01/31/2009	8,400.00
PSE&G Electricity Consumption (kWh (thousand Watt-hours))		80,940.00
PSE&G Electricity Consumption (kBtu (thousand Btu))		276,167.28
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		276,167.28
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: PSE&G Natural Gas (therms)

Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
12/01/2009	12/31/2009	1,093.20
11/01/2009	11/30/2009	515.90
10/01/2009	10/31/2009	325.90
09/01/2009	09/30/2009	12.60
08/01/2009	08/31/2009	10.40
07/01/2009	07/31/2009	9.40
06/01/2009	06/30/2009	10.40
05/01/2009	05/31/2009	24.00
04/01/2009	04/30/2009	473.70
03/01/2009	03/31/2009	953.40

02/01/2009	02/28/2009	895.50
01/01/2009	01/31/2009	1,106.00
PSE&G Natural Gas Consumption (therms)		5,430.40
PSE&G Natural Gas Consumption (kBtu (thousand Btu))		543,040.00
Total Natural Gas Consumption (kBtu (thousand Btu))		543,040.00
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

Additional Fuels

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

☐

On-Site Solar and Wind Energy

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

☐

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Borough Hall
100 East Allendale Road
Saddle River, NJ 07458

Facility Owner
Borough of Saddle River
100 East Allendale Road
Saddle River, NJ 07458

Primary Contact for this Facility
Charles Cuccia
100 East Allendale Road
Saddle River, NJ 07458

General Information

Borough Hall	
Gross Floor Area Excluding Parking: (ft ²)	7,700
Year Built	1937
For 12-month Evaluation Period Ending Date:	December 31, 2009

Facility Space Use Summary

Court Room / Offices		Borough Offices	
Space Type	Courthouse	Space Type	Office
Gross Floor Area(ft ²)	3,800	Gross Floor Area(ft ²)	3,900
Weekly operating hours	40	Weekly operating hours	40
Workers on Main Shift	3	Workers on Main Shift	20
Number of PCs	3	Number of PCs	20
Percent Cooled	50% or more	Percent Cooled	50% or more
Percent Heated	50% or more	Percent Heated	50% or more

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 12/31/2009)	Baseline (Ending Date 12/31/2009)	Rating of 75	Target	National Average
Energy Performance Rating	31	31	75	N/A	50
Energy Intensity					
Site (kBtu/ft ²)	106	106	65	N/A	87
Source (kBtu/ft ²)	194	194	117	N/A	159
Energy Cost					
\$/year	N/A	N/A	N/A	N/A	N/A
\$/ft ² /year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
MtCO ₂ e/year	71	71	43	N/A	58
kgCO ₂ e/ft ² /year	9	9	5	N/A	7

More than 50% of your building is defined as Office. Please note that your rating accounts for all of the spaces listed. The National Average column presents energy performance data your building would have if your building had an average rating of 50.

Notes:

o - This attribute is optional.

d - A default value has been supplied by Portfolio Manager.

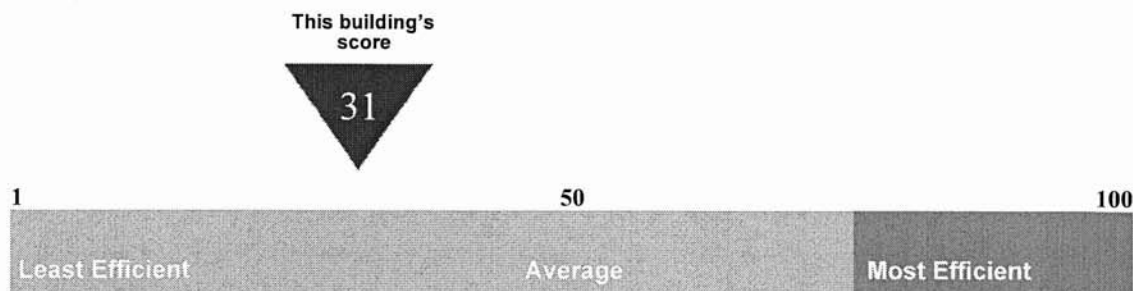
Statement of Energy Performance

2009

Borough Hall
100 East Allendale Road
Saddle River, NJ 07458

Portfolio Manager Building ID: 2439505

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 194 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending December 2009

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification



Date Generated: 09/28/2010

APPENDIX N

Equipment Inventory

New Jersey BPU Energy Audit Program
CHA #21351
Borough of Saddle River - Borough Hall

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size	Location	Areas Served	Date Installed	Remaining Useful Life (years)	Other Info.
Boiler	1	Caravan Slant/Fin	GGT-900	NJ016246-07H	Heating & Cooling / Natural Gas & Electric	900 MBH input, 720 MBH output	Boiler Room	Entire Building	1995	20	Good Condition
HW Pump	1	Bell & Gossett	-	-	Heating / Electric	3/4 HP	Boiler Room	Entire Building	-	-	Good Condition
HW Pump	1	Bell & Gossett	-	-	Heating / Electric	1/2 HP	Boiler Room	Entire Building	-	-	Good Condition
HW Pump	1	Taco	-	-	Heating / Electric	1/8 HP	Boiler Room	Entire Building	-	-	Good Condition
AHU #1	1	Carrier	40QH036	-	HVAC / HW & Electric	30,000 Btuh	Ceiling	2nd Flr Conference Room	1992	2	Fair Condition
AHU #2	1	Carrier	40BA007	-	HVAC / HW & Electric	75,600 Btuh	Ceiling	1st Flr West Side	1992	2	Fair Condition
AHU #3	1	Carrier	40BA007	-	HVAC / HW & Electric	75,600 Btuh	Ceiling	1st Flr East Side	1992	2	Fair Condition
AHU #4	1	Carrier	515B120CVHFS	2581G 09684	HVAC / HW & Electric	-	3rd Flr Attic	Offices, Foyer, Storage	1992	2	Fair Condition
AHU #5	1	Carrier	515B120CVHFS	2581G 09688	HVAC / HW & Electric	-	3rd Flr Attic	Court Room	1992	2	Fair Condition
Condenser #1	1	Luxaire	HAMC-F036SA	EEAM196855	Cooling / Electric	3.0 tons; 35.0 Amps	Outside	2nd Flr Conference Room	1992	2	Fair Condition
Condenser #2	1	Luxaire	HCHB-T090AA	NBAM109902	Cooling / Electric	7.5 tons; 38.8 Amps	Outside	1st Flr West Side	1992	2	Fair Condition
Condenser #3	1	Luxaire	HCHB-T090AA	NBAM109904	Cooling / Electric	7.5 tons; 38.8 Amps	Outside	1st Flr East Side	1992	2	Fair Condition
Condenser #4	1	Carrier	38ARZ012	1402G40027	Cooling / Electric	11.1 tons; 50.3 Amps; 10.4 EER	Outside	Offices, Foyer, Storage	2002	12	Good Condition
Condenser #5	1	Carrier	38AK-012	2900G00149	Cooling / Electric	9.3 tons 51.1 Amps	Outside	Court Room	2000	10	Good Condition
Split System	1	Mitsubishi	MUH-09DW-U1 MSH-09DS-U1	-	Cooling / Electric	9,500 Btuh; 870 W; 16.0 Amps	Outside	Court Office	1992	-3	Fair Condition
Generator	1	Winco	B55 H0S-4R/BNG	P04611	Electric Generation / Natural Gas	55 kW; 88.75 kVA; 120/208, 3 phase	Generator Shed	Entire Building	-	-	Good Condition
Domestic HW Heater	1	Ruud	GL 75-75-1	973 7139	DHW / Natural Gas	75 Gal / 75,500 Btuh	Boiler Room	Entire Building	-	-	Poor Condition

New Jersey BPU Energy Audit Program
CHA #21351
Borough of Saddle River - Borough Hall
Existing Lighting

Cost of Electricity:

\$0.143 \$/kWh
\$9.19 \$/kW

Area Description		No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Retrofit Control	Annual kWh	Notes
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fxt No.)	Pre-inst. control device	Estimated annual hours for the usage group	Retrolif control device	(kW/Space) * (Annual Hours)	
246	South Vestibule	4	9 W (2) Lamp CF (MAG)	CF19/2	23	0.1	SW	2080	None	191	
3	First Floor Men's Restroom	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	2080	OCC	89	Multi Stall
39	First Floor Men's Restroom	2	2' 17 W F 2 (ELE)	F22ILL	33	0.1	SW	2080	OCC	137	Multi Stall
3	First Floor Women's Restroom	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	2080	OCC	89	Multi Stall
39	First Floor Women's Restroom	2	2' 17 W F 2 (ELE)	F22ILL	33	0.1	SW	2080	OCC	137	Multi Stall
246	First Floor Hall	2	9 W (2) Lamp CF (MAG)	CF19/2	23	0.0	SW	2080	None	96	
39	First Floor Hall	9	2' 17 W F 2 (ELE)	F22ILL	33	0.3	SW	2080	None	618	
222	First Floor Hall	2	W 20 CF1 (MAG)	F21SS	28	0.1	SW	2080	None	116	
210	Revenue & Finance Office	4	2T 32 R F 3 (ELE) THIN TUBE	FU3ILL	89	0.4	SW	2080	OCC	740	
210	Administration Borough Clerk Office	8	2T 32 R F 3 (ELE) THIN TUBE	FU3ILL	89	0.7	SW	2080	OCC	1,481	
210	Private Office	4	2T 32 R F 3 (ELE) THIN TUBE	FU3ILL	89	0.4	SW	2080	OCC	740	
210	Tax Assessor	2	2T 32 R F 3 (ELE) THIN TUBE	FU3ILL	89	0.2	SW	2080	OCC	370	
210	First Floor Conference Room	2	2T 32 R F 3 (ELE) THIN TUBE	FU3ILL	89	0.2	SW	520	OCC	93	
210	Construction Dept. Zoning BOH Office	13	2T 32 R F 3 (ELE) THIN TUBE	FU3ILL	89	1.2	SW	2080	C-OCC	2,407	
210	Private Office	2	2T 32 R F 3 (ELE) THIN TUBE	FU3ILL	89	0.2	SW	2080	OCC	370	
35	Fire Marshal / Inspector Office	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	2080	OCC	374	
210	File Storage	3	2T 32 R F 3 (ELE) THIN TUBE	FU3ILL	89	0.3	SW	260	None	89	
39	Break Room / Copy Center	6	2' 17 W F 2 (ELE)	F22ILL	33	0.2	SW	2080	OCC	412	
39	Server Room	1	2' 17 W F 2 (ELE)	F22ILL	33	0.0	SW	520	None	17	
222	Stairwell	1	W 20 CF1 (MAG)	F21SS	28	0.0	SW	2080	None	58	
6	Second Floor Kitchen	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	520	None	75	
11	Foyer	2	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2080	None	300	
95	Foyer	1	TK 90 C 14	I100/4	400	0.4	SW	2080	None	832	
222	Second Floor Men's Restroom	1	W 20 CF1 (MAG)	F21SS	28	0.0	SW	780	None	22	Single Restroom
39	Second Floor Men's Restroom	1	2' 17 W F 2 (ELE)	F22ILL	33	0.0	SW	780	None	26	Single Restroom
222	Second Floor Women's Restroom	1	W 20 CF1 (MAG)	F21SS	28	0.0	SW	780	None	22	Single Restroom
39	Second Floor Women's Restroom	1	2' 17 W F 2 (ELE)	F22ILL	33	0.0	SW	780	None	26	Single Restroom
18	Court Office	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	2080	OCC	932	
11	Court Office	2	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2080	OCC	300	
246	Court Office	2	9 W (2) Lamp CF (MAG)	CF19/2	23	0.0	SW	2080	OCC	96	
247	Court Room	6	TK 90 C 13	I100/3	300	1.8	SW	208	None	374	
101	Court Room	4	I 40	I40/1	40	0.2	SW	208	None	33	
6	Court Room	8	T 34 R F 4 (MAG)	F44EE	144	1.2	SW	208	None	240	
246	Large Conference Room	4	9 W (2) Lamp CF (MAG)	CF19/2	23	0.1	SW	208	None	19	
39	Large Conference Room	8	2' 17 W F 2 (ELE)	F22ILL	33	0.3	SW	208	None	55	
11	Mayor's Office	4	S 34 P F 2 (MAG)	F42EE	72	0.3	SW	2080	OCC	599	
222	Front Vestibule	1	W 20 CF1 (MAG)	F21SS	28	0.0	SW	2080	None	58	
78	Front Vestibule	1	EPI 100	I100/1	100	0.1	SW	2080	None	208	
3	Third Floor Stairwell	2	W 34 W F 1 (MAG)	F41EE	43	0.1	SW	260	None	22	
6	Third Floor	7	T 34 R F 4 (MAG)	F44EE	144	1.0	SW	260	None	262	
134	Rear Entrance (exterior)	2	DC 50 I 4	I60/4	240	0.5	Timer	4380	None	2,102	
78	Over Exit Doors (exterior)	2	EPI 100	I100/1	100	0.2	Timer	4380	None	876	
78	Front Entrance (exterior)	2	EPI 100	I100/1	100	0.2	Timer	4380	None	876	
65	Building Corners (exterior)	4	I 100	I100/1	100	0.4	Timer	4380	None	1,752	
226	Flag (exterior)	1	70 W MH	MH70/1	95	0.1	Timer	4380	None	416	
Total		143				12.3				19,129	