BOROUGH OF OCEAN GATE
ADRIAN HALL
ENERGY ASSESSMENT

for

NEW JERSEY
BOARD OF PUBLIC UTILITIES

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1.0 INTRODUCTION & BACKGROUND

Adrian Hall in the Borough of Ocean Gate is a 2,810 square foot facility located at 30 East Cape May Street. The building, used as a town meeting hall for community functions, was constructed in 1927 and has not had any major renovations. The facility consists of a large meeting room, small commercial kitchen, restrooms, and storage closets.

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

2.0 EXECUTIVE SUMMARY

This report details the results of the Ocean Gate Adrian Hall in Ocean Gate, New Jersey, a 2,810 square foot facility used as a meeting hall for community functions, and consists of a large meeting room and small commercial kitchen. The building was constructed in 1937 and has not had any major renovations. The following areas were evaluated for energy conservation measures:

- Roof/wall insulation upgrades
- Temperature setback
- Boiler replacement
- Window replacement
- Lighting upgrades
- Domestic hot water heater replacement

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Potential annual savings of $2,100 for the recommended ECMs may be realized with a payback of 1.9 years.

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

ECM-1 Insulate Roof

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
3,900	0	0	720	1,100	4.5	NA	3.5	NA

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

ECM-4 Temperature Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
100	0	0	670	1,000	199.8	NA	0.1	NA

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

3.0 EXISTING CONDITIONS

3.1 Building General

Adrian Hall was constructed in 1927 and has not undergone any major renovations. The building, constructed of concrete block, has two chimneys and both have been sealed off on the inside. The mechanical equipment is located in the building, but has a separate entrance on the western side. This utility closet is also where the attic access is located. The attic area spans the length and width of the building, and provides a large equipment storage area. The roof is supported by wooden trusses and consists of asphalt shingles, felt paper, and plywood sheathing. The roof is insulated with about one to two inches of ground corn cob insulation.

The building windows, with the exception of the restrooms, are very old, and according to a maintenance worker, have not been replaced in over 40 years. There are nine primary building windows, each 56" x 80". They are aluminum framed with single panes of glass and do not seal well. There are also four 3'x4' windows in the restroom area, two single paned, and two double paned. On average, the restroom windows are newer and in better condition than the general building windows

The building is comprised of two primary areas, the main meeting hall and kitchen. The meeting hall is a large space with an elevated stage. The kitchen is full service with a commercial refrigerator, freezer, eight burner stove, ovens, and multiple wash basins. The kitchen is only used about once a month on average. According to borough personnel, the building is used about two evenings a week for about two to three hours, and unoccupied the remainder of the time.

3.2 Utility Usage

Adrian Hall utilities include electricity and natural gas. Water is not metered, and is provided by the Ocean Gate Water Treatment Facility. Electricity for the building is provided by Jersey Central Power and Light (JCP&L) and gas by New Jersey Natural Gas.

Electricity data, available from January 2009 through December 2009, showed that electrical usage totaled about 15,330 kWh at a cost of $3,200. Specific electric demand and supply data was not categorized on the utility bills. The blended rate for electricity in 2009 was calculated to be about $.211 per kWh. Electric usage decreased in the summer, which is not typical for buildings with central air conditioning. This indicates that air conditioning is not extensively utilized in the summer and usage of the building increases in winter months. A chart of electricity usage is provided in Appendix A.

Gas usage data was available for the same time period. The building consumed a total of 3,800 therms of natural gas at a cost of $5,500 or $1.46 per therm. Natural gas is used primarily for heating, causing usage to spike in the winter. However, some natural gas usage can be attributed to kitchen appliances and domestic hot water. A chart of natural gas usage is provided in Appendix A.

Electricity and natural gas commodity supply and delivery is presently purchased from JCP&L. 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.

The statewide average for commercial natural gas customers in the state of New Jersey was about $1.01/therm in 2009. If Adrian Hall paid a rate closer to the statewide average, the facility would save about $1,700 per year. The commercial statewide average for electricity in 2009 for the state of New Jersey was about $0.144/kWh. If the building paid a rate closer to the statewide average Adrian Hall would save about $1,000 per year.

3.3 HVAC Systems

Adrian Hall is heated by a 15 year old Weil McLain boiler, which circulates water through finned-tubing at 180°F. The boiler is located in a service closet only accessible from the outside on the west side of the building. Water is pumped through the loop by a small circulating pump, and goes through the main hall and into the kitchen to a small hot water unit heater. The boiler has an output of 256,750 Btu/hr and an efficiency of approximately 80%.

The building is centrally cooled with a 7.5 ton air conditioning unit. The condensing unit is located on the west side of the building near the entrance to the service room door. Air conditioning ducting is run through the attic to the main hall. The ducting is covered with insulation; however, it is falling off in several places.

There is no forced ventilation in the main hall; however, the kitchen has a ventilation hood located over the eight burner stove. The vent hood is controlled by a switch and is run only when the kitchen is in use. There are four ceiling fans in the main hall which run on an as-needed basis.

3.4 Lighting/Electrical Systems

3.4.1 Interior Lights

The main meeting hall is lit with (26) 2 lamp T8 fixtures. The lights are controlled by three switches near the exit doors. Above each door is an LED exit sign. Both the T8s and the LED exit signs are considered high efficiency by today's standards. The kitchen is lit with (6) T12 2 lamp fixtures that are each eight feet long. There are two closets just off the main room lit with 2 lamp T12 lights with magnetic ballasts. The men's and women's restrooms each have (3) T12 2 lamp fixtures with magnetic ballasts. T12 lights are considered inefficient by today's standards.

The main hall also has two emergency Par 38 spotlights near the kitchen.

3.4.2 Exterior Lights

There are very few outdoor lights on Adrian Hall. Two 60 watt incandescent bulbs illuminate the entrance area of the building at night and there is a 100 watt halogen light utilized as a spotlight at the front of the building.

3.5 Control Systems

The building's heating and air conditioning is controlled by a programmable thermostat located in the northwest section of the main hall. According to borough employees, the building is set to about 70°F in the winter during occupied times and is set back to 65°F when unoccupied. There was no setpoint for summer temperatures as the air conditioning is only turned on when the building is both occupied and requiring cooling, which is approximately five hours per week.

3.6 Plumbing Systems

Adrian Hall's domestic hot water (DHW) is produced by an 80 gallon 76,000 Btu/hr hot water heater located in the kitchen. This heater serves the kitchen and both restrooms' hot water needs. The kitchen has two high flow sinks used about once a month. Considering the low usage of the facility, the domestic hot water heater is oversized.

The women's restroom is equipped with two low flow toilets and one low flow sink; the men's restroom has a sink, urinal, and toilet, all of which are low flow.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Insulate Roof

The roof of Adrian Hall is pitched, and has an attic space underneath. The attic serves as general storage and also contains the ducting for the air conditioner. The roof is supported by rough cut trusses, which are typical for the age of the building. The ceiling boards in the attic are also rough cut, and have an average of one to two inches of corn cob insulation in between. The insulation is extremely old, and has shifted significantly so that some areas have four or five inches, while other spots are bare. Corn cob insulation does not have high insulating properties; therefore, this ECM proposes adding about 9 inches of blown-in fiberglass insulation. This would raise the thermal resistance, or R-value, from about R-5.3 to R-38, which is recommended by the Department of Energy for buildings in this part of the country.

To calculate the savings associated with adding insulation, the existing thermal losses through the roof were calculated with the corn cob insulation. This number was then compared with the thermal losses through the roof with the added fiberglass insulation. The difference between the existing conditions and proposed conditions was taken and compared with yearly temperature bin data. Ocean Gate, NJ bin data was not available; therefore, Newark, NJ data was used. The calculated savings associated with adding nine inches of roof insulation would be approximately 730 therms of natural gas per year. There would also be minimal cooling savings; however, since the air conditioner is run very infrequently, this saving was not calculated.

Roof insulation has a life expectancy of about 20 years according to the manufacturer, and the total energy savings over the life of the project would be about 14,400 therms and $22,000.

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

ECM-1 Insulate Roof

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
3,900	0	0	720	1,100	4.5	NA	3.5	NA

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

This measure is recommended.

4.2 ECM-2 Increase Wall Insulation

The Adrian Hall walls are concrete block and original to the 1927 construction. The walls are uninsulated, and have a thermal resistance of approximately R-4.3. This R-Value is very low by today's standards and causes excessive heat loss through the walls. This ECM proposes adding a wooden frame to the inside of the building using 2"x4"s and blowing 3.5" of insulation into the wall cavity. This would effectively increase the R-Value of the wall to approximately 17.3 which is in the range of recommended wall R-values for buildings in this area of the country. Adding this insulation would require the addition of drywall, and the relocation of electrical conduit which would add to the implementation cost.

To calculate the savings that could be achieved with the increase in R-Value, the existing heat loss through the walls was compared with the proposed heat loss with the added insulation. Heat losses were determined again using temperature bin data from Newark, NJ. The savings that could be realized from adding wall insulation would be approximately 600 therms per year. There would also be a small amount of electricity saving realized in cooling. However, similarly to the previous ECM, the savings were not calculated because the space is cooled such a small amount of time.

Wall insulation has an expected life of about 20 years according to the manufacturer. The energy savings over the life of the project would be about 12,000 therms and $18,000.

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

ECM-2 Increase Wall Insulation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
10,900	0	0	600	900	0.7	NA	12.1	NA

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

This measure is not recommended.

4.3 ECM-3 Boiler Replacement with Hot Water Temperature Reset

The building is heated by a single natural gas fired boiler with a 256,750 Btu output. According to borough staff, the boiler is over 15 years' old. The boiler operates with an efficiency of 80%, and the building temperature is set at 70°F in the winter. Hot water at 180°F is circulated throughout the building to finned tube heaters and a unit heater in the kitchen.

This ECM proposes replacing the existing boiler with a gas fired condensing unit can which achieve efficiencies up to 95%. Condensing boiler efficiencies are high because they are able to extract more heat from the combusted gasses normally lost through the vent. This is achieved by installing a large heat exchanger in the exhaust air stream.

The existing boiler heats water to 180°F regardless of the building's heating needs. Load requirements fluctuate with the outdoor air (OA) temperature and the boiler may not always need to produce water with temperatures as high as 180°F. Adding temperature reset would allow the boiler to generate water at lower temperatures when outside temperature increases. This would prevent overheating the space and save energy costs. A control system would modulate the supply heating hot water temperature based on OA temperature.

To calculate the savings associated with replacing the boiler and adding temperature reset, a block load model of Adrian Hall was created. This model can be viewed in Appendix D and takes into account building parameters such as roof and wall infiltration, internal heat gains, occupancy, and many other characteristics that affect heat gain and loss. After establishing a block load model with the existing boiler conditions, a second model was generated with the proposed boiler conditions, including hot water temperature reset. A new condensing boiler with hot water reset could save Adrian Hall approximately 520 therms of natural gas per year.

Condensing boilers are costly which adversely affects the payback of this ECM. However, since the current boiler is over 15 years' old, it is recommended that when a new boiler is required, a condensing unit should be considered.

Condensing boilers have a life expectancy of about 24 years, according to ASHRAE. The total energy savings over the life of the project is 12,480 therms and $19,200.

The implementation cost and savings associated with this ECM are represented in appendix D and summarized below:

ECM-3 Boiler Replacement with Hot Water Temperature Reset

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
11,500	0	0	520	800	0.6	500	14.4	13.8

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

This measure is not recommended.

4.4 ECM-4 Temperature Setback

Adrian Hall's boiler is controlled by a programmable thermostat which is set to 70°F during the heating season, and the temperature is set back to 65°F during unoccupied times. However, since the building is unoccupied for the majority of the year, the temperature could be set back even further for additional energy savings. Since a programmable thermostat is already in place, implementation would require only reprogramming the system, and allowing the building time to align with its new temperature setpoint. This ECM proposes setting back the temperature of the building from 65°F to 60°F during unoccupied times.

To calculate the savings for temperature setback, the block load model of the building created for the previous ECM was used to establish the existing energy load on the building. This load was then reconciled to utility data provided by the borough based on the existing conditions of a 65°F unoccupied setpoint. The block load was then modified to represent the energy usage of the building with an unoccupied setpoint temperature of 60°F. The difference between energy usage represents the potential savings from setting back the temperature. If implemented, this ECM could save about 670 therms of natural gas per year.

Since the programmable thermostat is already in place, the life expectancy calculation is not applicable.

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

ECM-4 Temperature Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
100	0	0	670	1,000	199.8	NA	0.1	NA

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

This measure is recommended.

4.5 ECM-5 Window Replacement/Upgrade

Adrian Hall has nine 56" x 80" windows in the main hall area and the kitchen. These windows are single paned with uninsulated aluminum frames, and according to borough staff have been in place for over 40 years. The seals around the windows are in poor condition allowing excessive infiltration into the building, and the single paned glass has a low thermal resistance. The restrooms each have one older single pane window, and one newer double paned window. The single paned windows appear to be newer than the windows in the main hall but still have a low R-value, and let in excess infiltration. This ECM proposes replacing all the windows in the main hall and kitchen, and the two inefficient windows in the restrooms with new double paned windows.

To calculate the savings that could be achieved with replacing the old windows, the existing thermal resistance and infiltration rates were compared with new windows. Windows lose heat through conduction and infiltration. Conduction is based on the thermal resistance of the windows; infiltration occurs along a window's perimeter and is primarily attributed to worn seals.

Single paned windows like in Adrian Hall typically have an R-value of 0.95 ft^2*hr*°F/Btu and can allow in up to 0.5 cfm per linear foot around the perimeter. A conservative estimate of 0.4 cfm/ linear foot was used for calculation purposes. New, double paned, high emissivity windows have R-values around 2 ft^2*hr*°F/Btu and allow in approximately 0.2 cfm/ linear foot. The difference in the R values, multiplied by the total area of the windows yields a conductive thermal savings. The difference between the two infiltration rates, multiplied by the total perimeter of the windows represents the potential infiltration savings with new windows. By comparing these numbers to temperature bin data from Newark, NJ a savings of 510 therms could be realized. There would also be a minimal kWh savings for the small amount of time the air conditioner is running.

Windows have an expected life of 25 years according to the manufacturers. The total energy savings over the life of the project would be 12,750 therms and $17,500.

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

ECM-5 Window Replacement/Upgrade

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
9,900	0	0	510	700	0.9	NA	14.1	NA

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

This measure is not recommended.

4.6 ECM-6 Lighting Replacements

The main hall of the building is lit with T8 bulbs which are considered efficient by today's standards. The kitchen area is lit with 8' T12 2-lamp fixtures, and the restrooms are illuminated with 4' T12 2-lamp fixtures. There are also two incandescent outdoor lights that light the entrance to the building. The incandescent lights and T12 lights are considered inefficient by today's standards. This ECM proposes changing out the T12 lights to high efficient T8 bulbs with electronic ballasts, and replacing the incandescent bulbs with compact fluorescents (CFL).

To calculate the savings that could be achieved with the lighting replacement, the total existing wattages were summed, then multiplied by the operating hours of each light. The proposed lighting wattages were then summed and multiplied by the same operating hours as the existing lights. The difference between these numbers is the kWh savings for the lighting replacement. Through these calculations it was determined that Adrian Hall could save about 500 kWh per year.

The unfavorable payback for this measure is due to the limited usage of the lights and it is, therefore, not recommended. However, in performing the calculations, it was determined that the two incandescent bulbs used for outside lighting of the entrance to the building should be replaced with CFLs, which would yield a simple payback of about 0.1 years.

Lights have an expected life of 15 years according to lighting manufacturers. The total energy savings over the life of the project would be 7,500 kWh and $1,500.

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

ECM-6 Lighting Replacement

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
1,500	0.7	500	0	100	0.0	200	15.0	13.0

* Incentive shown is per the 2010 New Jersey Smart Start Program's Lighting Application.

This measure is not recommended.

4.7 ECM-7 Replace Gas Domestic Hot Water Heater

Domestic hot water is produced by a 76,000 Btu/hr gas hot water heater located in the kitchen, and provides hot water for the restrooms and kitchen at 120°F with an 80 gallon tank. Kitchens require large hot water heaters, such as the unit in Adrian Hall, for food preparation and dish washing; however, when water is not required, significant stand-by losses occur. To keep the water warm, the heating elements of the tank will turn on, only to be lost through conduction with the air in the kitchen. Since Adrian Hall is only used about five hours per week, standby heat losses from the tank are elevated. To eliminate these losses, this ECM proposes replacing the 80 gallon hot water heater with a gas fired instantaneous unit. Instantaneous hot water heaters do not have a reservoir, and only heat hot water when needed.

To calculate the savings associated with replacing the 80 gallon hot water heater with an instantaneous unit, the daily hot water consumption was calculated, along with the amount of time the heater is in stand-by mode. According to the Department of Energy, domestic hot water heaters lose about 2.5% of their stored energy every hour. By implementing this ECM, Adrian Hall is expected to save about 90 therms of natural gas per year.

Instantaneous heaters have an estimated lifespan of about 19 years according to ASHRAE and manufacturer data. The total savings over the life of this project would be about 1,170 therms and $1,300.

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

ECM-7 Replace Gas Domestic Hot Water Heater

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
2,300	0	0	90	100	(0.3)	300	23.0	20.0

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

This measure is not 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 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

The building is eligible for all three incentives available from the New Jersey P4P program. Incentive #1 is for the development of an energy reduction plan and will pay $.05/ square foot of the building footprint, which equates to about $100. Implementation of the energy conservation measures discussed in this report is expected to reduce the building's energy usage by over 15% which qualifies it for both incentives #2 and #3. Combining incentives #2 and #3 will provide maximum savings of $0.18/ kWh and $1.80/ therm not to exceed 50% of the total project cost. The building is projected to save about 500 kWh of electricity which amounts to about $100 in incentives. The building is also projected to save about 3,120 therms of natural gas. With New Jersey's current incentive structure, this would qualify for about $5,600 in incentive money. Combining all incentives in the P4P program would amount to approximately $5,500, reducing the overall payback of the project from 9.7 years to 8.4 years if every ECM were implemented. See appendix I for calculations.

5.2.2 New Jersey Smart Start Program

Adrian Hall is eligible for multiple incentives from the New Jersey Smart Start Program.

The boiler replacement ECM is eligible for about $500 in incentive money for being at least 85% efficient. The lighting replacement measure is eligible for $180 in savings if all fixtures are replaced. There would also be $300 available for the installation of a new instantaneous gas fired hot water heater. Totaling all these incentives would produce a savings of about $980.

5.2.3 Energy Efficient and Conservation Block Grant

Adrian 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"

Adrian 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

Adrian Hall 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 Adrian Hall is about $45,100. This program would pay 60%, or about $27,100 of these initial costs. This funding has the potential to significantly affect the payback periods of Energy Conservation Measures. For Adrian Hall, the Direct Install Program brings the simple payback from about 9.6 years, to approximately 4.1 years.

In order to apply for this program the borough must contact the Direct Install contractor for Ocean County, Hutchinson Mechanical Services. 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 boiler and central air to meet its HVAC needs, which are not compatible with a geothermal energy source. Therefore, to take advantage of a GHP system, the existing mechanical equipment would have to be removed or overhauled; and either a low temperature closed loop water source heat pump system or a water to water heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground.

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

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

Adrian Hall 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 room to install a solar cell array but there are large trees adjacent to the building that potentially cast shadows over the solar cells. 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. Projects up to 50 kW are eligible to apply. Federal tax credits are also available for renewable energy projects up to 30% of installation cost. Municipalities do not pay federal taxes and would not be able to utilize the federal tax credit incentive.

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

Electrical demand is not monitored in Adrian Hall which is normally one of the characteristics for properly sizing a PV array. However, based on the kWh usage, a 5 kW system was estimated for implementation on the building. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development Agency) estimates of total cost of system installation. It should be noted that the cost of installation is approximately $8 per watt or $8,000 per kW of installed system. This has increased in the past few years due to the rise in national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

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

Photovoltaic (PV) Rooftop Solar Power Generation – 5 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
40,000	0	5,900	0	1,200	1,200	3,800	2,900	>25	8.8

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

Adrian Hall does have some southern facing roof area, but there are also trees adjacent to the building that block direct sunlight. Solar cells work best when they are south facing, with no surrounding obstructions (mostly trees and other buildings) that could cast shadows over the panels. There is very little open land area around Adrian Hall for arrays to be built. Mounting kits do exist that allow east and west facing roofs to have solar arrays face south but this can often add to the implementation costs.

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

6.2.2 Solar Thermal Hot Water Plant

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

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

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

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

This measure is not recommended for Adrian Hall.

6.3 Wind

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

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

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

The most important part of any small wind generation project is the mean annual wind speed at the height of which the turbine will be installed. In the Ocean Gate Borough area, the map shown in the appendices indicates a mean annual wind speed of about 12.8 mph. For the building, 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.

The borough already has one wind turbine on its premises with another turbine wind turbine that is planned to go up. The coastal area of New Jersey is optimal for turbines because of the elevated average 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 does not have an excessively large electricity demand, and it does not have a heating load to use the thermal byproduct in the summer. An absorption chiller could be installed to utilize the heat to produce chilled water; however, there is no chilled water distribution system in the building and no need for cooling. The most viable selection for a CHP plant at this location would be a reciprocating engine natural gas-fired unit. Purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

This measure is not recommended.

6.5 Biomass Power Generation

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

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

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

- Non adulterated construction wood wastes, pallets

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

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

* from NJOCE Website

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

6.6 Demand Response Curtailment

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

JCP&L does not currently have a Demand Response Curtailment, or Load shedding program for its customers so this is not an option for Adrian Hall.

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.

Adrian Hall is considered a high energy consumer by the Portfolio Manager with a Site Energy Usage Index (EUI) of 154 kBTU/ft^2/year. Several factors contribute to the unfavorable EUI, including, but not limited to, wasted energy from poor wall insulation, higher than necessary temperature setpoints, and inefficient lighting. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 69 kBTU/ft^2/year; the national average for this building type is52 kBTU/ft^2/year. The EPA Portfolio Manager was unable to generate an energy rating score for this building because the utility data provided was over 120 days old. This number represents how energy efficient a building is on a scale from 1 to 100 with 100 being the best. In order for a building to receive and energy star label, this energy benchmark rating must be at least 75. As energy use decreases from the implementation of the proposed ECMs, this rating will increase.

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

The user name and password for the EPA Portfolio Manager Account has been provided to Paulette Konopka, the Ocean Gate Chief Financial Officer.

8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the Ocean Gate Adrian Hall, in Ocean Gate, New Jersey identified potential ECMs for insulation upgrade and temperature setback. Potential annual savings of $2,100 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-1 Insulate Roof

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
3,900	0	0	720	1,100	4.5	NA	3.5	NA

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

ECM-4 Temperature Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
100	0	0	670	1,000	199.8	NA	0.1	NA

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

APPENDIX A

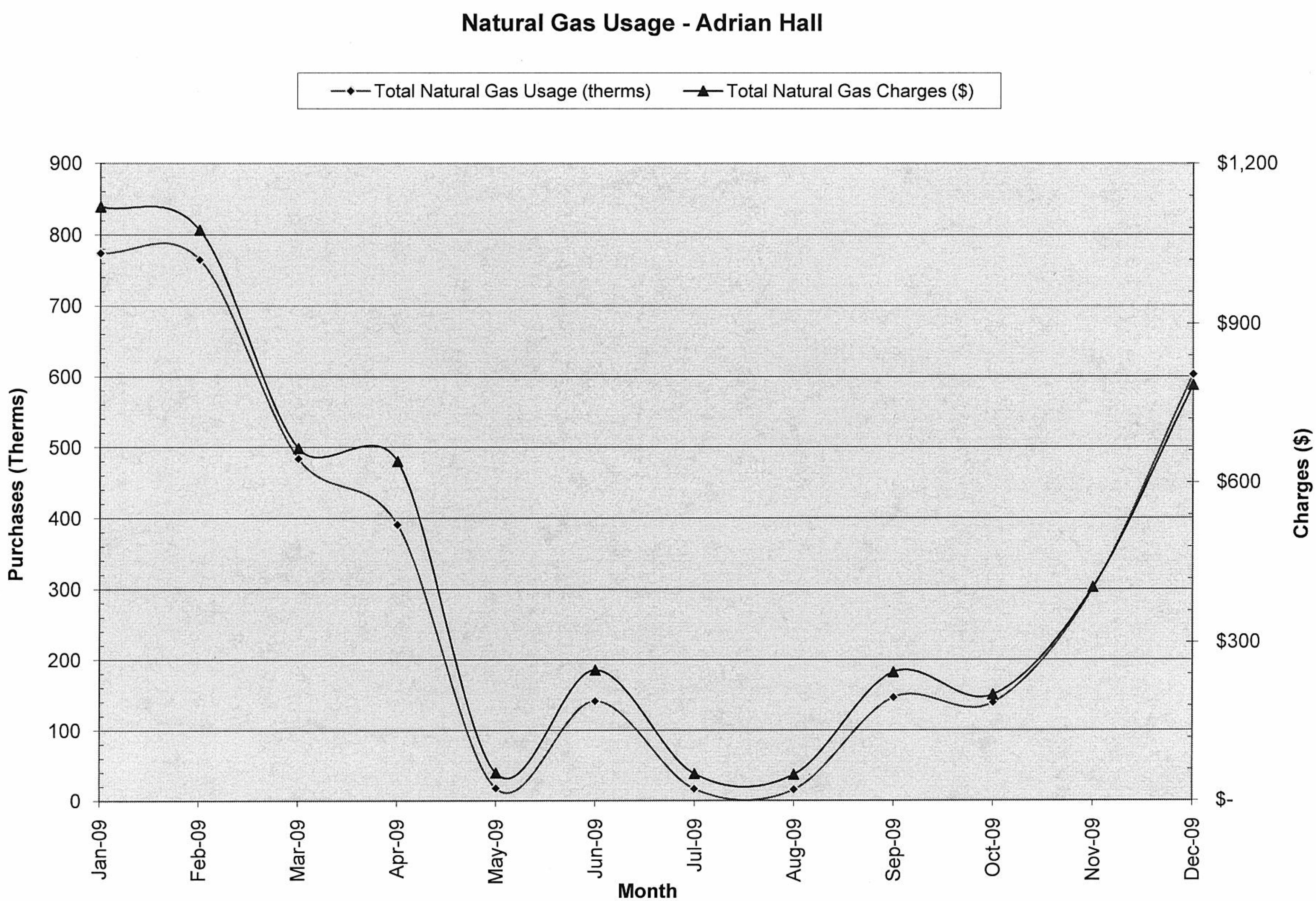
Utility Usage Analysis

New Jersey BPU Energy Audit Program
CHA Project Number: 21611
Ocean Gate Adrian Hall
New Jersey Natural Gas

30 East Cape Mae Street Ocean Gate, NJ 08740
Account Number: 16-4672-6250-10

Month	Therms	Charges ($)	($/therm)
January-09	774	$ 1,119.63	$ 1.45
February-09	765	$ 1,075.75	$ 1.41
March-09	484	$ 664.89	$ 1.37
April-09	391	$ 640.06	$ 1.64
May-09	18	$ 53.08	$ 2.97
June-09	141	$ 247.27	$ 1.75
July-09	17	$ 51.37	$ 3.07
August-09	16	$ 49.82	$ 3.18
September-09	146	$ 243.22	$ 1.66
October-09	139	$ 200.56	$ 1.44
November-09	301	$ 403.83	$ 1.34
December-09	603	$ 783.68	$ 1.30

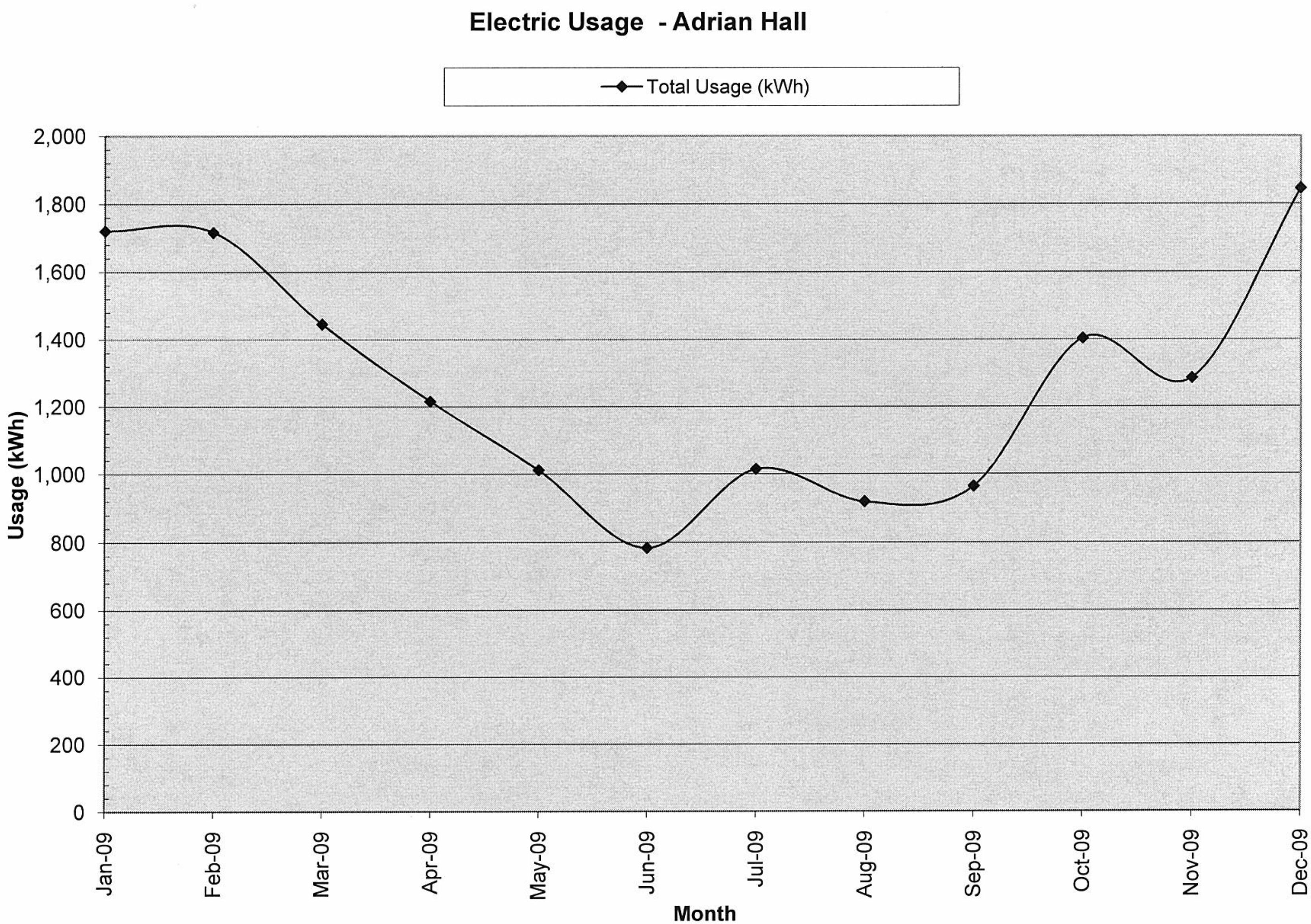
Total	3,795	$ 5,533	$ 1.46
Most Recent Yr	3,795	$ 5,533	$ 1.46


Natural Gas Usage - Adrian Hall
Total Natural Gas Usage (therms)
Total Natural Gas Charges ($)
Purchases (Therms)
900
800
700
600
500
400
300
200
100
0
Charges ($)
$1,200
$900
$600
$300
$-
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Month

New Jersey BPU Energy Audit Program
CHA Project Number: 21611
Ocean Gate Adrian Hall
JCP&L - Electric Service

30 East Cape Mae Street Ocean Gate, NJ 08740
Account Number: 100051044095

			Charges			Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
January-09	1,721		$311.83		$311.83	0.1812	0.1812	
February-09	1,717		$361.75		$361.75	0.2107	0.2107	
March-09	1,446		$318.84		$318.84	0.2205	0.2205	
April-09	1,216		$277.78		$277.78	0.2284	0.2284	
May-09	1,011		$238.10		$238.10	0.2355	0.2355	
June-09	784		$203.55		$203.55	0.2596	0.2596	
July-09	1,014		$251.61		$251.61	0.2481	0.2481	
August-09	919		$231.29		$231.29	0.2517	0.2517	
September-09	964		$237.58		$237.58	0.2465	0.2465	
October-09	1,404		$244.81		$244.81	0.1744	0.1744	
November-09	1,286		$221.97		$221.97	0.1726	0.1726	
December-09	1,846		$327.09		$327.09	0.1772	0.1772	
Total	15,328	0.0	$3,226.20	$0.00	$3,226.20	0.2105	0.2105	
Most Recent Yr	15,328	0.0	$3,226.20	$0.00	$3,226.20	0.2105	0.2105	



Electric Usage - Adrian Hall
Total Usage (kWh)
Usage (kWh)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Month

ELECTRIC MARKETERS LIST

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

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

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

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

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

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

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

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

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

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

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

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

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

Integrys Energy Services, Inc
99 Wood Avenue, Suite 802
Iselin, NJ 08830
www.integrysenergy.com

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

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

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

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

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

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

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

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

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

GAS MARKETERS LIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

RPL Holdings, Inc
601 Carlson Pkwy
Minnetonka, MN 55305

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

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

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

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

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

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

APPENDIX B

ECM-1 Insulate Roof

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

ECM 1 Install Roof Insulation

Existing Roof Area	2,810	sf
Existing U-value	0.19	Btu/hr/(sf*F)
Proposed R-value	38	
Proposed U-value	0.03	Btu/hr/(sf*F)
Heating System Efficiency	80%	
Cooling System Efficiency	0.00	kW/ton

<u>Existing Cooling</u>

Existing Cooling Load Temp Diff.	73	F
Existing Max. Roof Cooling Load	39,010	Btu/hr

<u>Proposed Cooling</u>

Proposed Cooling Load	5,362	Btu/hr
Occupied Cooling Setpoint	74	F
Unoccupied Cooling Setpoint	80	F

<u>Existing Heating</u>

Existing Heating Load Temp Diff.	70	F
Existing Max. Roof Heating Load	37,140	Btu/hr
Occupied Heating Setpoint	72	F
Unoccupied Heating Setpoint	65	F

Existing Heating Total	67,843,357	Btu/yr
Proposed Heating Total	9,324,582	Btu/yr
Savings	58,518,775	Btu/yr
Input	**731**	**therms**

Existing Cooling Total	-	kWh/yr
Proposed Cooling Total	-	kWh/yr
Savings	-	kWh/yr

Avg Outdoor Air Temp. Bins °F	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Occupied: Existing Heat Gain	Occupied: Proposed Heat Gain	Occupied: Existing Heat Loss	Occupied: Proposed Heat Loss	Unoccupied: Existing Heat Gain	Unoccupied: Proposed Heat Gain	Unoccupied: Existing Heat Loss	Unoccupied: Proposed Heat Loss	Existing Cooling Load	Existing Heating Load	Proposed Cooling Load	Proposed Heating Load
				(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(kWh/yr)	(Btu/yr)	(kWh/yr)	(Btu/yr)
102.5	0	0	0	15,230	2,093	-	-	12,024	1,653	-	-	-	-	-	-
97.5	3	0	3	12,558	1,726	-	-	9,352	1,285	-	-	-	-	-	-
92.5	34	1	33	9,886	1,359	-	-	6,680	918	-	-	-	-	-	-
87.5	131	4	127	7,214	992	-	-	4,008	551	-	-	-	-	-	-
82.5	500	15	485	4,542	624	-	-	1,336	184	-	-	-	-	-	-
77.5	620	18	602	1,870	257	-	-	-	-	-	-	-	-	-	-
72.5	664	20	644	-	-	-	-	-	-	-	-	-	-	-	-
67.5	854	25	829	-	-	2,405	331	-	-	-	-	-	61,121	-	8,401
62.5	927	28	899	-	-	5,077	698	-	-	1,336	184	-	1,341,653	-	184,401
57.5	600	18	582	-	-	7,749	1,065	-	-	4,008	551	-	2,471,553	-	339,697
52.5	610	18	592	-	-	10,421	1,432	-	-	6,680	918	-	4,142,635	-	569,375
47.5	611	18	593	-	-	13,093	1,799	-	-	9,352	1,285	-	5,781,987	-	794,693
42.5	656	20	636	-	-	15,765	2,167	-	-	12,024	1,653	-	7,960,628	-	1,094,131
37.5	1,023	30	993	-	-	18,436	2,534	-	-	14,696	2,020	-	15,147,615	-	2,081,931
32.5	734	22	712	-	-	21,108	2,901	-	-	17,368	2,387	-	12,829,588	-	1,763,335
27.5	334	10	324	-	-	23,780	3,268	-	-	20,040	2,754	-	6,730,418	-	925,048
22.5	252	8	245	-	-	26,452	3,636	-	-	22,712	3,122	-	5,751,371	-	790,485
17.5	125	4	121	-	-	29,124	4,003	-	-	25,384	3,489	-	3,186,856	-	438,011
12.5	47	1	46	-	-	31,796	4,370	-	-	28,055	3,856	-	1,323,840	-	181,952
7.5	22	1	21	-	-	34,468	4,737	-	-	30,727	4,223	-	678,452	-	93,248
2.5	13	0	13	-	-	37,140	5,105	-	-	33,399	4,591	-	435,639	-	59,875
-2.5	0	0	0	-	-	39,812	5,472	-	-	36,071	4,958	-	-	-	-
-7.5	0	0	0	-	-	42,484	5,839	-	-	38,743	5,325	-	-	-	-
TOTALS	**8,760**	**261**	**8,499**									**-**	**67,843,357**	**-**	**9,324,582**

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

ECM 1 Install Roof Insulation

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.		
Fiberglass Blown in Insulation (9", R-33)	2,810	SF	$ 0.51	$ 0.31	$ 0.15	$ 1,404	$ 1,054	$ 459	$ 2,918	Costs from Means
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 2,918	Subtotal
$ 437.69	15% Contingency
$ 503.34	Contractor 15% O&P
$ -	Engineering
$ 3,859	**Total**

APPENDIX C

ECM-2 Increase Wall Insulation

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

ECM 2 Increase Wall Insulation

Total Existing Wall Area	2,178	sf
Existing U-value	0.23	Btu/hr/(sf*F)
Proposed R-Value	17.32	
Proposed U-value	0.06	Btu/hr/(sf*F)
Heating Efficiency	80%	
Cooling Efficiency	0.00	kW/ton

Existing Cooling		
Max. North Wall Cooling Load	3,073	Btu/hr
Max. East Wall Cooling Load	3,938	Btu/hr
Max. South Wall Cooling Load	4,343	Btu/hr
Max. West Wall Cooling Load	1,089	Btu/hr
Proposed Cooling		
Max. North Wall Cooling Load	766	Btu/hr
Max. East Wall Cooling Load	982	Btu/hr
Max. South Wall Cooling Load	1,083	Btu/hr
Max. West Wall Cooling Load	272	Btu/hr
Occupied Cooling Setpoint	74	F
Unoccupied Cooling Setpoint	80	F
Existing Cooling Total	-	kWh/yr
Proposed Cooling Total	-	kWh/yr
Savings	-	kWh/yr

Existing Heating		
Existing Heating Load Temp Diff.	70	F
Existing Max. Wall Heating Load	35,054	Btu/hr
Occupied Heating Setpoint	72	F
Unoccupied Heating Setpoint	65	F
Proposed Heating		
Proposed Max. Heating Load	8,741	Btu/hr
Existing Heating Total	64,031,982	Btu/yr
Proposed Heating Total	15,966,399	Btu/yr
Savings	48,065,583	Btu/yr
Input	**601**	**therms**

				Occupied				Unoccupied							
Avg Outdoor Air Temp. Bins °F	**Existing Equipment Bin Hours**	**Occupied Equipment Bin Hours**	**Unoccupied Equipment Bin Hours**	**Existing Heat Gain**	**Proposed Heat Gain**	**Existing Heat Loss**	**Proposed Heat Loss**	**Existing Heat Gain**	**Proposed Heat Gain**	**Existing Heat Loss**	**Proposed Heat Loss**	**Existing Cooling Load**	**Existing Heating Load**	**Proposed Cooling Load**	**Proposed Heating Load**
				(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(kWh/yr)	(Btu/yr)	(kWh/yr)	(Btu/yr)
97.5	3	0	3	12,443	3,103	-	-	12,443	3,103	-	-	-	-	-	-
92.5	34	1	33	9,796	2,443	-	-	8,888	2,216	-	-	-	-	-	-
87.5	131	4	127	7,148	1,782	-	-	5,333	1,330	-	-	-	-	-	-
82.5	500	15	485	4,501	1,122	-	-	1,778	443	-	-	-	-	-	-
77.5	620	18	602	1,853	462	-	-	-	-	-	-	-	-	-	-
72.5	664	20	644	-	-	-	-	-	-	-	-	-	-	-	-
67.5	854	25	829	-	-	2,270	566	-	-	-	-	-	57,687	-	14,384
62.5	927	28	899	-	-	4,791	1,195	-	-	1,261	314	-	1,266,280	-	315,747
57.5	600	18	582	-	-	7,313	1,824	-	-	3,783	943	-	2,332,704	-	581,661
52.5	610	18	592	-	-	9,835	2,452	-	-	6,305	1,572	-	3,909,906	-	974,936
47.5	611	18	593	-	-	12,357	3,081	-	-	8,826	2,201	-	5,457,161	-	1,360,745
42.5	656	20	636	-	-	14,879	3,710	-	-	11,348	2,830	-	7,513,408	-	1,873,471
37.5	1,023	30	993	-	-	17,401	4,339	-	-	13,870	3,459	-	14,296,637	-	3,564,872
32.5	734	22	712	-	-	19,923	4,968	-	-	16,392	4,087	-	12,108,834	-	3,019,342
27.5	334	10	324	-	-	22,444	5,597	-	-	18,914	4,716	-	6,352,310	-	1,583,951
22.5	252	8	245	-	-	24,966	6,225	-	-	21,436	5,345	-	5,428,265	-	1,353,540
17.5	125	4	121	-	-	27,488	6,854	-	-	23,957	5,974	-	3,007,822	-	750,002
12.5	47	1	46	-	-	30,010	7,483	-	-	26,479	6,603	-	1,249,468	-	311,555
7.5	22	1	21	-	-	32,532	8,112	-	-	29,001	7,231	-	640,338	-	159,668
2.5	13	0	13	-	-	35,054	8,741	-	-	31,523	7,860	-	411,165	-	102,524
-2.5	0	0	0	-	-	37,575	9,369	-	-	34,045	8,489	-	-	-	-
-7.5	0	0	0	-	-	40,097	9,998	-	-	36,567	9,118	-	-	-	-
TOTALS	**8,760**	**261**	**8,499**									**-**	**64,031,982**	**-**	**15,966,399**

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

ECM 2 Increase Wall Insulation

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.		
3.5 Inches Blown in Insulation (R-13)	2178	SF	$ 0.54	$ 0.29	$ -	$ 1,153	$ 764	$ -	$ 1,917	From Means
Wood Framing	1442	LF	$ 1.00	$ 0.50	$ -	$ 1,413	$ 872	$ -	$ 2,286	Estimated
1/2" Gypsum Board, without finish	2178	SF	$ 0.24	$ 0.33	$ -	$ 512	$ 870	$ -	$ 1,382	From Means
Drywall Finishing	2178	SF	$ 0.12	$ 0.30	$ -	$ 256	$ 791	$ -	$ 1,047	From Means
Painting	2178	SF	$ 0.19	$ 0.29	$ -	$ 406	$ 764	$ -	$ 1,170	From Means
Miscellaneous electrical and plumbing costs	2178	SF	$ 0.10	$ 0.25	$ -	$ 213	$ 659	$ -	$ 872	Estimated
Miscellaneous Trim Work	2178	SF	$ 0.50	$ 0.50	$ -	$ 1,067	$ 1,318	$ -	$ 2,385	Estimated

$ 11,058	Subtotal
$ 1,105.81	10% Contingency
$ 1,216.40	10% Contractor O&P
$ -	Engineering
$ 13,380	**Total**

APPENDIX D

ECM-3 Boiler Replacement with Hot Water Temperature Reset

Borough of Ocean Gate
CHA #21611
Adrian Hall

ECM-3 Boiler Replacement with Hot Water Temperature Reset

Existing Fuel	Nat.Gas
Proposed Fuel	Nat.Gas

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	$ 1.46		
Proposed Fuel Cost	$ 1.46		
Baseline Fuel Use	3,795	Therms	Based on historical utility data
Existing Boiler Plant Efficiency	80%		Estimated or Measured
Baseline Boiler Load	3,036	Mbtu/yr	
Baseline Fuel Cost	$ 5,533		
Proposed Boiler Plant Efficiency	92%		New Boiler Efficiency, based on manufacturers data and operating hours
Proposed Fuel Use	3,314	Therms	
Proposed Fuel Cost	$ 4,832		
Annual Savings	481	Therms	
Annual Savings	**$ 701**	**/yr**	

Borough of Ocean Gate
CHA #21611
Adrian Hall

ECM-3 Boiler Replacement with Hot Water Temperature Reset

Description
Existing heating hot water (HHW) supply setpoint is 180°F.
Proposed:
Vary heating hot water supply temperature as building heating load decreases in relation to outside air temperature.

$ 1.46

A	$ 1.46	C	D	E	F	G	H	I	J
					Proposed Usage			Utility Usage	
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	102.5	0	0	0	0	0	0.0%	0	0
95-99	97.5	3	0	0	0	0	0.0%	0	0
90-94	92.5	34	0	0	0	0	0.0%	0	0
85-89	87.5	131	0	0	0	0	0.0%	0	0
80-84	82.5	500	0	0	0	0	0.0%	0	0
75-79	77.5	620	0	0	0	0	0.0%	0	0
70-74	72.5	664	0	0	0	0	0.0%	0	0
65-69	67.5	854	0	0	0	0	0.0%	0	0
60-64	62.5	927	0	0	0	0	96.0%	0	0
55-59	57.5	600	600	484	90	82	95.0%	5	1
50-54	52.5	610	610	492	97	84	94.0%	5	1
45-49	47.5	611	611	493	105	84	93.4%	5	1
40-44	42.5	656	656	529	112	90	92.0%	6	1
35-39	37.5	1,023	1,023	825	119	140	90.6%	9	2
30-34	32.5	734	734	592	126	101	89.8%	7	1
25-29	27.5	334	334	269	134	46	89.0%	3	1
20-24	22.5	252	252	203	141	35	88.5%	2	0
15-19	17.5	125	125	101	148	17	88.0%	1	0
10-14	12.5	47	47	38	155	6	87.6%	0	0
5-9	7.5	22	22	18	163	3	87.2%	0	0
0-4	2.5	13	13	10	170	2	86.8%	0	0
(5) - (1)	-2.5	0	0	0	170	0	86.8%	0	0
(10) - (6)	-7.5	0	0	0	170	0	86.8%	0	0
Totals		**8,760**	**5,027**	**4,053**		**690**		**44**	**8**

Annual Energy Savings	**37**	**Therms/yr**
Annual Cost Savings	**$ 42**	**/yr**

Existing Boiler Efficiency	80%	
Avg. Proposed Boiler Efficiency	92%	

Building HHW Piping System		
Heating On Temperature	60	°F
Total Length of Pipe	375	LF
Existing HHW Setpoint High	180	°F
Existing HHW Setpoint Low	160	°F
Avg HHW Temp	170	°F
Avg Pipe Size	1	Inches
Avg Insul Thickness	1	Inches
Existing Heat Loss	14.3	Btu/Hr/LF
Percent in Uncond. Space	15%	
Existing System Heat Loss	806	Btu/Hr
Proposed Min HHW Return*	80	°F
Avg Prop HHW Supply Temp	115	°F
Proposed Heat Loss	2.4	Btu/Hr/LF
Proposed System Heat Loss	137	Btu/Hr

*Refer to proposed boiler capabilities

Size (in)	Length (ft)
1 1/2	62.5
1	62.5
3/4	250
1	**Average**

Total Pipe Length is estimated based on building size, height, and perimeter

Comments:

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.

Borough of Ocean Gate
CHA #21611
Adrian Hall

ECM-3 Boiler Replacement with Hot Water 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.		
						$ -	$ -	$ -	$ -	
Weil Mclain 299 MBH Condensing Gas Boiler	1	Boiler	$ 5,995	$ 500		$ 5,875	$ 605	$ -	$ 6,480	
BMS II Boiler Control System	1	Controller	$ 1,500	$ 300		$ 1,470	$ 363	$ -	$ 1,833	With HW Reset
Old Boiler Removal	1	Boiler		$ 250		$ -	$ 303	$ -	$ 303	
Miscellaneous Electrical	1	LS	$ 200	$ 250		$ 196	$ 303	$ -	$ 499	
Flu and Air Intake Piping Modifications	1	LS	$ 300	$ 300		$ 294	$ 363	$ -	$ 657	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 9,771	Subtotal
$ 977	10% Contingency
$ 1,075	Contractor 10% O&P
$ -	Engineering
$ 11,823	**Total**

APPENDIX E

ECM-4 Temperature Setback

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

ECM 4 Temperature Setback

Building Footprint	2,710	SF
Heating Efficiency	80%	
Cooling Efficiency	1.2	kW/ton
Building Balance Temp.	65	°F
Internal Gains	7,718	btu/h
Unoc Internal Gain factor	0.03	
Ave Occ Internal Gain Factor	0.5	

Ex Occupied Clng Temp.	74	°F
Ex Unoccupied Clng Temp.	74	°F
Prop Occupied Clng Temp.	74	°F
Prop Unoccupied Clng Temp.	74	°F
Occupied Cooling UA	-4,461	btu/hr/°F
Unoccupied Cooling UA	-3,638	btu/hr/°F
Cooling Occ Enthalpy Setpoint	27.5	Btu/lb
Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb

Ex Occupied Htg Temp.	72	°F
Ex Unoccupied Htg Temp.	65	°F
Prop Occupied Htg Temp.	70	°F
Prop Unoccupied Htg Temp.	60	°F
Occupied Heating UA	1,427	btu/hr/°F
Unoccupied Heating UA	1,427	btu/hr/°F

Heating Energy Savings	672	**therms**
Cooling Energy Savings	0	**kWh**

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

					EXISTING LOADS						PROPOSED LOADS									
					Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	-127,139	-50,548	-3,859	-103,692	-50,548	-232	-127,139	-50,548	-3,859	-103,692	-50,548	-232	0	0	0	0
97.5	42.5	3	0	3	-104,834	-35,103	-3,859	-85,500	-35,103	-232	-104,834	-35,103	-3,859	-85,500	-35,103	-232	36	36	0	0
92.5	39.5	34	1	33	-82,529	-28,082	-3,859	-67,309	-28,082	-232	-82,529	-28,082	-3,859	-67,309	-28,082	-232	327	327	0	0
87.5	36.6	131	4	127	-60,224	-21,296	-3,859	-49,117	-21,296	-232	-60,224	-21,296	-3,859	-49,117	-21,296	-232	931	931	0	0
82.5	34	500	15	485	-37,919	-15,211	-3,859	-30,926	-15,211	-232	-37,919	-15,211	-3,859	-30,926	-15,211	-232	2,334	2,334	0	0
77.5	31.6	620	18	602	-15,614	-9,595	-3,859	-12,734	-9,595	-232	-15,614	-9,595	-3,859	-12,734	-9,595	-232	1,411	1,411	0	0
72.5	29.2	664	20	644	0	0	-3,859	0	0	-232	0	0	-3,859	0	0	-232	23	23	0	0
67.5	27	854	25	829	6,422	2,527	-3,859	0	0	-232	3,568	1,404	-3,859	0	0	-232	0	0	-1	-2
62.5	24.5	927	28	899	13,558	5,336	-3,859	3,568	1,404	-232	10,704	4,212	-3,859	0	0	-232	0	0	58	1
57.5	21.4	600	18	582	20,694	8,144	-3,859	10,704	4,212	-232	17,840	7,021	-3,859	3,568	1,404	-232	0	0	112	39
52.5	18.7	610	18	592	27,830	10,952	-3,859	17,840	7,021	-232	24,976	9,829	-3,859	10,704	4,212	-232	0	0	190	116
47.5	16.2	611	18	593	34,966	13,760	-3,859	24,976	9,829	-232	32,112	12,637	-3,859	17,840	7,021	-232	0	0	266	192
42.5	14.4	656	20	636	42,102	16,569	-3,859	32,112	12,637	-232	39,248	15,445	-3,859	24,976	9,829	-232	0	0	368	287
37.5	12.6	1,023	30	993	49,239	19,377	-3,859	39,248	15,445	-232	46,384	18,253	-3,859	32,112	12,637	-232	0	0	700	575
32.5	10.7	734	22	712	56,375	22,185	-3,859	46,384	18,253	-232	53,520	21,062	-3,859	39,248	15,445	-232	0	0	594	504
27.5	8.6	334	10	324	63,511	24,993	-3,859	53,520	21,062	-232	60,656	23,870	-3,859	46,384	18,253	-232	0	0	312	271
22.5	6.8	252	8	245	70,647	27,801	-3,859	60,656	23,870	-232	67,792	26,678	-3,859	53,520	21,062	-232	0	0	266	236
17.5	5.5	125	4	121	77,783	30,610	-3,859	67,792	26,678	-232	74,928	29,486	-3,859	60,656	23,870	-232	0	0	148	132
12.5	4.1	47	1	46	84,919	33,418	-3,859	74,928	29,486	-232	82,064	32,295	-3,859	67,792	26,678	-232	0	0	61	56
7.5	2.6	22	1	21	92,055	36,226	-3,859	82,064	32,295	-232	89,200	35,103	-3,859	74,928	29,486	-232	0	0	31	29
2.5	1	13	0	13	99,191	39,034	-3,859	89,200	35,103	-232	96,336	37,911	-3,859	82,064	32,295	-232	0	0	20	19
-2.5	0	0	0	0	106,327	41,843	-3,859	96,336	37,911	-232	103,472	40,719	-3,859	89,200	35,103	-232	0	0	0	0
-7.5	-1.5	0	0	0	113,463	44,651	-3,859	103,472	40,719	-232	110,608	43,527	-3,859	96,336	37,911	-232	0	0	0	0
TOTALS		8,760	261	8,499													5,062	5,062	3,127	2,455

Existing Building Ventilation & Infiltration (occ)	520	cfm
Overheat Ventilation Factor	1.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	520	cfm

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

ECM 4 Temperature Setback

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Programmable thermostat	0	ea	$ 50	$ 100	$ -	$ -	$ -	$ -	$ -	
Reprogram Thermostat	1	ea	$ -	$ 50	$ -	$ -	$ 61	$ -	$ 61	per temperature program
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 61	Subtotal
$ 6.05	10% Contingency
$ 6.66	Contractor 10% O&P
$ -	0% Engineering
$ 73	**Total**

APPENDIX F

ECM-5 Window Replacement/ Upgrade

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

ECM 5 Window Replacement/Upgrade

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

Given

Occupied Cooling Hours per Week	5	Hours		
Occupied Heating Hours per Week	168	Hours		
Heating Energy Cost	$1.46	$/therm		
Cooling Cost	$0.210	$/kWh		
Occupied Cooling Setpoint Temperature	72.0	Degrees F		(Assumption)
Occupied Cooling Avg Space Air Enthalpy	25.5	btu/# air		(Assumption)
Occupied Heatng Setpoint Temperature	72.0	Degrees F	Occupied	(Assumption)
Unoccupied Heating Setpoint Temperature	65.0	Degrees F	Unoccupied	(Assumption)
Window Area	326	sq.ft.		(From window survey)
Window Perimeter	260	ft		(From window survey)
Proposed U factor	0.50	Btu/(h*sqft*degf)		(From window vendor)
Proposed Air Infiltration	0.20	cfm/ft		(From window vendor)
Cooling Conversion	12,000	Btu/ton		
Heating Btu Conversion	1,000,000	Btu/MMBtu		

Assumptions

Existing U factor	1.05	Btu/(h*sqft*degf)	(From ASHRAE Fundamentals)
Existing Air Infiltration	0.40	cfm/ft	(From ASHRAE Fundamentals)
Heating System Efficiency	80%		
Cooling System Efficiency	-	kW/ton	

Formula

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

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

Existing

Operation	OA Enthalphy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
Cooling	38.3	92.5	37	1.1	0.0	0.0	7,774	0	0	6,596	0	0
Cooling	36.6	87.5	131	3.9	0.0	0.0	20,811	0	0	20,253	0	0
Cooling	33.5	82.5	500	14.9	0.0	0.0	53,807	0	0	55,712	0	0
Cooling	31.6	77.5	620	18.5	0.0	0.0	34,949	0	0	52,676	0	0
Cooling	30.3	72.5	664	19.8	0.0	0.0	3,403	0	0	44,391	0	0
Heating	27.9	67.5	854	0.0	854.0	0.0	0	1,323,406	0	0	431,628	0
Heating	24.6	62.5	927	0.0	927.0	0.0	0	3,032,676	0	0	989,105	0
Heating	21.6	57.5	600	0.0	600.0	0.0	0	2,996,000	0	0	977,143	0
Heating	18.7	52.5	610	0.0	610.0	0.0	0	4,096,256	0	0	1,335,991	0
Heating	16.2	47.5	611	0.0	611.0	0.0	0	5,155,015	0	0	1,681,304	0
Heating	14.3	42.5	656	0.0	656.0	0.0	0	6,664,207	0	0	2,173,526	0
Heating	12.4	37.5	1,023	0.0	1023.0	0.0	0	12,153,947	0	0	3,964,001	0
Heating	10.4	32.5	734	0.0	734.0	0.0	0	9,984,258	0	0	3,256,358	0
Heating	8.7	27.5	334	0.0	334.0	0.0	0	5,118,340	0	0	1,669,343	0
Heating	7	22.5	252	0.0	252.0	0.0	0	4,295,645	0	0	1,401,021	0
Heating	5.4	17.5	125	0.0	125.0	0.0	0	2,346,006	0	0	765,148	0
Heating	3.9	12.5	47	0.0	47.0	0.0	0	963,025	0	0	314,090	0
Heating	2.5	7.5	22	0.0	22.0	0.0	0	488,658	0	0	159,375	0
Heating	1.2	2.5	13	0.0	13.0	0.0	0	311,136	0	0	101,477	0
Heating	-0.2	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Heating	-1.4	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Subtotal =			8,760	58	6,808	0	120,744	58,928,575	0 btu	179,628	19,219,512	0 btu

	Conduction	Infiltration		
Cooling Load =	(120744) + (	179628) =		300,372 btu
	Cooling Load			
Cooling Energy =	(300372)/(	12000) * (	0.00) =	0 kWh
	Cooling Energy	Cooling Cost		
Cooling Energy Cost =	(0.00) x (	$0.210) =		$ -
	Conduction	Infiltration		
Heating Load =	(58928575) + (	19219512) =		78,148,087 btu
	Heating Load	Heat Content		
Heating Energy =	(78148087)/(	80%)/(	100000) =	977 therms
	Heating Energy	Heating Cost		
Heating Energy Cost =	(976.85) x (	$1.458) =		$ 1,424

Operation	OA Enthalphy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
Cooling	38.3	92.5	37	1.1	0.0	0.0	3,702	0	0	3,298	0	0
Cooling	36.6	87.5	131	3.9	0.0	0.0	9,910	0	0	10,126	0	0
Cooling	33.5	82.5	500	14.9	0.0	0.0	25,623	0	0	27,856	0	0
Cooling	31.6	77.5	620	18.5	0.0	0.0	16,642	0	0	26,338	0	0
Cooling	30.3	72.5	664	19.8	0.0	0.0	1,620	0	0	22,196	0	0
Heating	27.9	67.5	854	0.0	854.0	0.0	0	630,193	0	0	215,814	0
Heating	24.6	62.5	927	0.0	927.0	0.0	0	1,444,131	0	0	494,552	0
Heating	21.6	57.5	600	0.0	600.0	0.0	0	1,426,667	0	0	488,572	0
Heating	18.7	52.5	610	0.0	610.0	0.0	0	1,950,598	0	0	667,995	0
Heating	16.2	47.5	611	0.0	611.0	0.0	0	2,454,769	0	0	840,652	0
Heating	14.3	42.5	656	0.0	656.0	0.0	0	3,173,432	0	0	1,086,763	0
Heating	12.4	37.5	1,023	0.0	1023.0	0.0	0	5,787,594	0	0	1,982,001	0
Heating	10.4	32.5	734	0.0	734.0	0.0	0	4,754,408	0	0	1,628,179	0
Heating	8.7	27.5	334	0.0	334.0	0.0	0	2,437,305	0	0	834,671	0
Heating	7	22.5	252	0.0	252.0	0.0	0	2,045,545	0	0	700,511	0
Heating	5.4	17.5	125	0.0	125.0	0.0	0	1,117,146	0	0	382,574	0
Heating	3.9	12.5	47	0.0	47.0	0.0	0	458,583	0	0	157,045	0
Heating	2.5	7.5	22	0.0	22.0	0.0	0	232,694	0	0	79,688	0
Heating	1.2	2.5	13	0.0	13.0	0.0	0	148,160	0	0	50,738	0
Heating	-0.2	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Heating	-1.4	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Subtotal =			8,760	58	6,808	0	57,497	28,061,226	0 btu	89,814	9,609,756	0 btu

	Conduction / Infiltration	
Cooling Load =	(57497) + (89814) =	147,311 btu
	Cooling Load	
Cooling Energy =	(147311)/(12000) * (0.00) =	0 kWh
	Cooling Energy / Cooling Cost	
Cooling Energy Cost =	(0.00) x ($0.210) =	$ -
	Conduction / Infiltration	
Heating Load =	(28061226) + (9609756) =	37,670,982 btu
	Heating Load / Heat Content	
Heating Energy =	(37670982)/(80%) / (100000) =	471 therms
	Heating Energy / Heating Cost	
Heating Energy Cost =	(470.89) x ($1.458) =	$ 686

Summary

EXISTING COOLING ENERGY	0.00	kWh	$	-
EXISTING HEATING ENERGY	976.85	therms	$	1,424.12
EXISTING ENERGY COST			$	1,424.12

PROPOSED COOLING ENERGY	0.00	kWh	$	-
PROPOSED HEATING ENERGY	470.89	therms	$	686.49
PROPOSED ENERGY COST			$	686.49

COOLING ENERGY SAVINGS	0.00	kWh	$	-	#DIV/0!	of existing
HEATING ENERGY SAVINGS	505.96	therms	$	737.63	51.8%	of existing
ENERGY COST SAVINGS			$	737.63	51.8%	of existing

Comments

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

ECM 5 Window Replacement/Upgrade

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
56" x 80 Vinyl Casement Windows	9	ea	$ 715	$ 44.50	$ -	$ 6,306	$ 485	$ -	$ 6,791	From Means 2010
36" x 48" Vinyl Casement	2	ea	$ 460	$ 37	$ -	$ 902	$ 90	$ -	$ 991	From Means 2010
Window Removal of 56" x 80"	9	ea		$ 29.50		$ -	$ 321	$ -	$ 321	From Means 2010
Window Removal of 36" x 48"	2	ea		$ 21		$ -	$ 50	$ -	$ 50	From Means 2010
Trimwork and Finishing	11	ea	$ 50	$ 100		$ 539	$ 1,331	$ -	$ 1,870	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 10,023	Subtotal
$ 1,002	10% Contingency
$ 1,103	Contractor 10% O&P
$ -	0% Engineering
$ 12,128	**Total**

APPENDIX G

ECM-6 Lighting Replacements

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

ECM 6 Lighting Replacement

Building Schedule:
Existing conditions (master switch): 5 hrs/week
Blended Electric Rate $ 0.210 /kWh

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

	EXISTING CONDITIONS										RETROFIT CONDITIONS								COST ANALYSIS				
Area Description	Number of Fixtures	Fixture Code	Watts per Fixture	Number of Non-Operational Fixtures	Watts per Non-Operational Fixtures	kW/Space	Exist Control	Daily Hours	Annual Hours	Annual kWh	Number of Fixtures	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Daily Hours	Annual Hours	Annual kWh	kW Saved	Annual kWh Saved	Annual $ Saved	Retrofit Cost	Simple Payback
Kitchen Area	6	F82SS	173	0	176.46	1.038	switch		260	270	6	F82ILL	109	0.654	switch		260	170	0.38	100	$ 21	$ 753	35.8
Mens Restroom	3	F42SS	94	0	95.88	0.282	switch		260	73	3	F42ILL	59	0.177	switch		260	46	0.11	27	$ 6	$ 376	65.5
Womens Restroom	3	F42SS	94	0	95.88	0.282	switch		260	73	3	F42ILL	59	0.177	switch		260	46	0.11	27	$ 6	$ 376	65.5
Outdoor Lights (Entrance)	2	I60/1	60	0	61.2	0.12	switch		3,650	438	2	CFQ13/3	13	0.026	switch		3,650	95	0.094	343	$ 72	$ 10	0.1
																			-				
TOTALS -	14			0		1.7				855	14			1.0				357	0.7	498	$ 105	$ 1,516	14.5

APPENDIX H

ECM-7 Replace Gas Domestic Hot Water Heater

Borough of Ocean Gate
CHA #21611
Adrian Hall

ECM 7: Replace Gas DHW Heater

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

Item	Value	Units	Formula/Comments
Occupied days per week	3	days/wk	
Water supply Temperature	55	°F	Termperature of water coming into building
Hot Water Temperature	120	°F	
Hot Water Usage per day	8	gal/day	Calculated from usage below
Annual Hot Water Energy Demand	633	MBTU/yr	Energy required to heat annual quantity of hot water to setpoint
Existing Tank Size	80	Gallons	Per manufacturer nameplate
Hot Water Temperature	120	°F	Per building personnel
Average Room Temperature	70	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.8	MBH	
Annual Standby Hot Water Load	7,300	MBTU/yr	
Total Annual Hot Water Demand (w/ standby losses)	7,933	Mbtu/yr	Building demand plus standby losses
Existing Water Heater Efficiency	80%		Per Manufacturer
Total Annual Energy Required	9,917	Mbtu/yr	
Total Annual Gas Required	**99**	**Therms**	**Gas Savings**
New Tank Size	0	Gallons	tankless
Hot Water Temperature	120	°F	
Average Room Temperature	70	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.0	MBH	
Annual Standby Hot Water Load	0	MBTU/yr	
Prop Annual Hot Water Demand (w/ standby losses)	633	MBTU/yr	
Proposed Avg. Hot water heater efficiency	82%		Based on Bosch 2700 ES Hot Water Heater
Proposed Total Annual Energy Required	773	MBTU/yr	
Proposed Fuel Use	8	Therms/yr	Standby Losses and inefficient DHW heater eliminated
NG Utility Unit Cost	$1.46	$/Therm	
Existing Operating Cost of DHW	$145	$/yr	
Proposed Operating Cost of DHW	$11	$/yr	
Annual Utility Cost Savings	**$133**	**$/yr**	

Daily Hot Water Demand

			#USES PER DAY		FULL TIME OCCUPANTS**				
FIXTURE	*BASE WATER USE GPM	DURATION OF USE (MIN)	MALE	FEMALE	MALE	FEMALE	TOTAL GAL/DAY	% HOT WATER	TOTAL HW GAL/DAY
LAVATORY (Low-Flow Lavs use 0.5 GPM)	2.5	0.25	3	3	2	2	8	50%	4
KITCHEN SINK	2.5	0.5	1	1	2	2	5	75%	4
MOP SINK	2.5	2	1	1	0	0	0	75%	0
Dishwasher (gal per	10	1	1	0	0	0	0	100%	0
						TOTAL	13		8

Borough of Ocean Gate
CHA #21611
Adrian Hall

ECM 7: Replace Gas DHW 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	
Tankless DHW Heater	1	EA	$ 1,175	$ 280		$ 1,152	$ 339	$ -	$ 1,490	Bosch 2700 ES
Miscellaneous Electrical	1	LS	$ 150	$ 200		$ 147	$ 242	$ -	$ 389	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

Price based on Bosch 2700 ES series DHW Heater for commercial applications.

$ 1,940		Subtotal
$ 194	10%	Contingency
$ 213	10%	Contractor
$ -	0%	Engineering
$ 2,347		**Total**

APPENDIX I

New Jersey Pay For Performance Incentive Program

Borough of Ocean Gate
CHA #21611
Adrian Hall

New Jersey Pay For Performance Incentive Program

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

Total Building Area (Square Feet)	2,710
Is this audit funded by the NJ BPU (Y/N)	Yes

Bureau of Public Utilites (BPU)

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

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$3,226	$5,533
Existing Usage (from utility)	15,328	3,795
Proposed Savings	498	2,369
Existing Total MMBtus	432	
Proposed Savings MMBtus	239	
% Energy Reduction	**55.3%**	
Proposed Annual Savings	$3,559	

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

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$136
Incentive #2	$55	$2,606	$2,661
Incentive #3	$35	$1,659	$1,693
Total All Incentives	**$90**	**$4,265**	**$4,490**

Total Project Cost	$45,126

		Allowable Incentive
% Incentives #1 of Utility Cost*	1.5%	$136
% Incentives #2 of Project Cost**	5.9%	$2,661
% Incentives #3 of Project Cost**	3.8%	$1,693
Total Eligible Incentives***	**$4,490**	
Project Cost w/ Incentives	$40,636	

Project Payback (years)	
w/o Incentives	w/ Incentives
12.7	11.4

* 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

Ocean Gate Borough
Adrian Hall

Cost of Electricity $0.211 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-5 kW System

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	New Jersey Renewable * Energy Incentive	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$40,000	**0.0**	**5,900**	**0**	**$1,200**	**0**	**$1,200**	**$3,800**	**$2,900**	**33.3**	**8.8**

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

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

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

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

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

AC Energy & Cost Savings

Cautions for Interpreting the Results

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

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	5.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	3.8 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	21.0 ¢/kWh

Results

Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	3.36	414	87.15
2	4.05	447	94.09
3	4.58	542	114.09
4	4.84	530	111.56
5	5.30	584	122.93
6	5.33	551	115.99
7	5.27	556	117.04
8	5.25	550	115.78
9	5.06	534	112.41
10	4.46	503	105.88
11	3.15	359	75.57
12	2.87	346	72.83
Year	4.46	5915	1245.11

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

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

Cautions for Interpreting the Results

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

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

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

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

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

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

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

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

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

Return to RREDC Home Page (http://rredc.nrel.gov/)

APPENDIX K

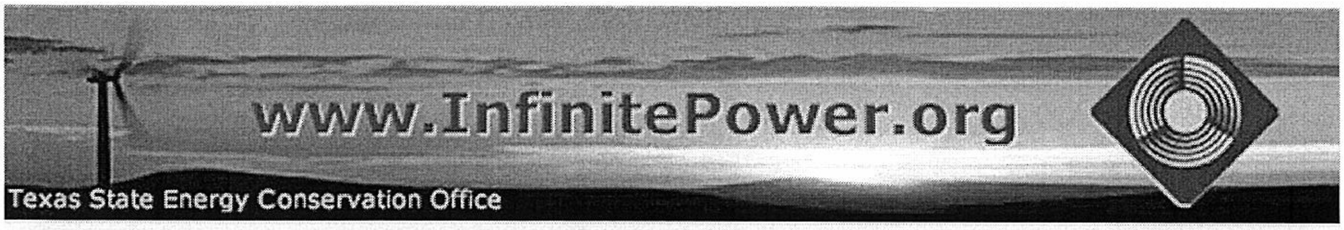
Solar Thermal Domestic Hot Water Plant

NJBPU Energy Audits
CHA #21611
Building: Borough of Ocean Gate Adrian 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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RARE

RENEWABLE ENERGY
THE INFINITE POWER
OF TEXAS

Interactive Energy Calculators

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

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

Solar Water Heating Calculator

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

Water Heater Characteristics			
Physical		Thermal	
? Diameter (feet)	3	? Water Inlet Temperature (Degrees F)	55
? Capacity (gallons)	80	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	28.4	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	10
Energy Use			
222.4		? 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
278 BTU/hr	? Power Into Water Heater	226.9 BTU/hr
Cost		
$ 1.46 /Therm	? Utility Rates	$ 0.08 /kWh
$ 35.5550{	? Yearly Water Heating Cost	$ 46.5704{
How Does Solar Compare?		

? Solar Water Heater Cost: $ 2000		? Percentage Solar: 70
80.3581! years for gas	? Payback Time for Solar System	61.3509 years for electric

More information on solar water heating:

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

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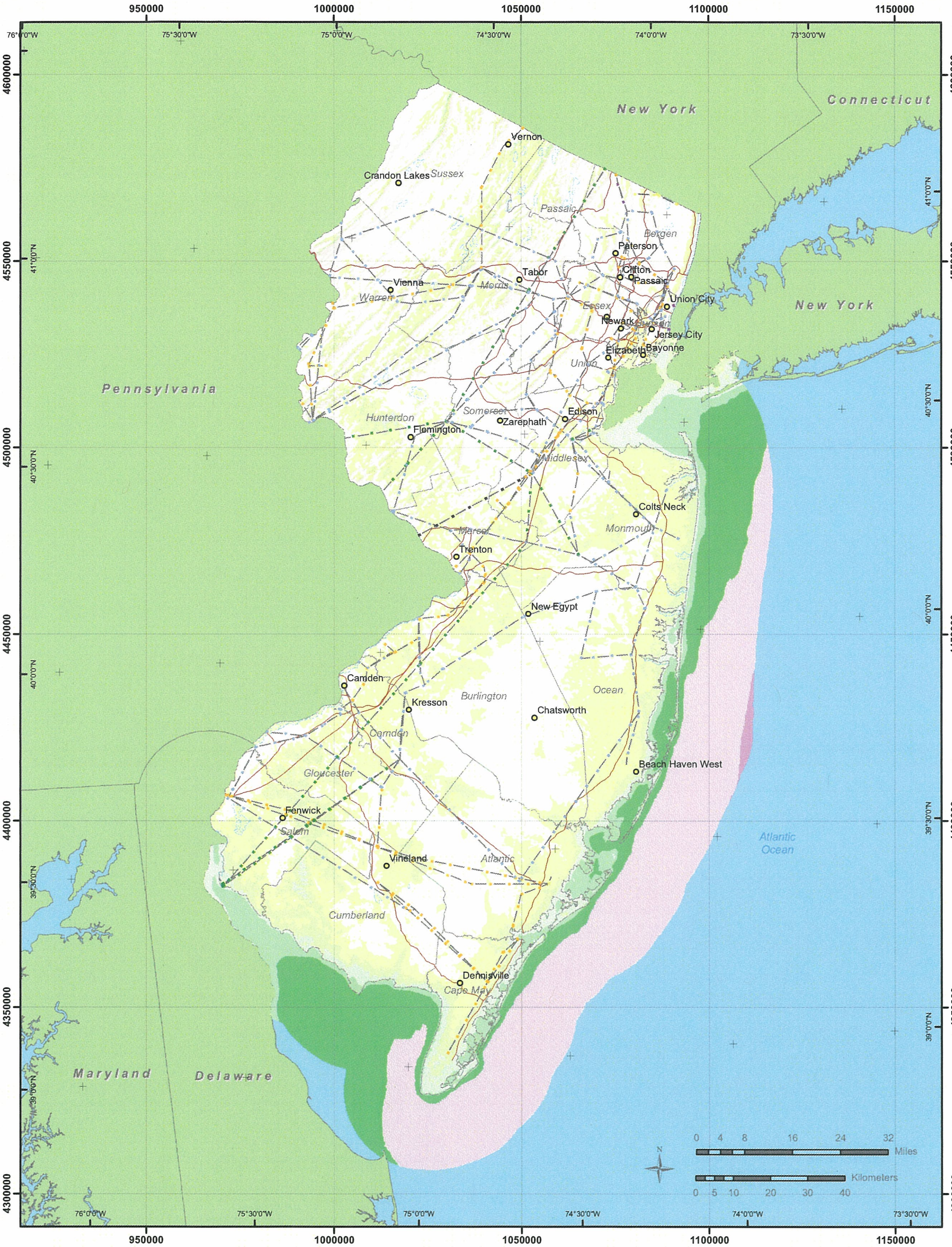
APPENDIX L

Wind



Wind Resource of New Jersey

Mean Annual Wind Speed at 30 Meters

Features

- City
- Interstate Highway
- County Boundary
- Water Body

Generalized Transmission Line

Category

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

Mean Speed at 30 m

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

AWS Truewind

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

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


E Cape May Ave
E Cape May Ave
E Arverne Ave
E Arverne Ave
bing
© GlobeXplorer © 2010 Navteq © 2010 Microsoft

APPENDIX M

EPA Portfolio Manager

OMB No. 2060-0347

ENERGY STAR

STATEMENT OF ENERGY PERFORMANCE
Adrian Hall

Building ID: 2366503
For 12-month Period Ending: December 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 12, 2010

Facility
Adrian Hall
30 East Cape Mae
Ocean Gate, NJ 08740

Facility Owner
Borough of OceanGate
801 Ocean Gate Ave
Ocean Gate, NJ 08740

Primary Contact for this Facility
Paulette Konopka
801 Ocean Gate Ave
Ocean Gate, NJ 08740

Year Built: 1927
Gross Floor Area (ft²): 2,810

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	52,299
Natural Gas (kBtu)[4]	379,500
Total Energy (kBtu)	431,799
Energy Intensity[5]	
Site (kBtu/ft²/yr)	154
Source (kBtu/ft²/yr)	204
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	28
Electric Distribution Utility	
FirstEnergy - Jersey Central Power & Lt Co	
National Average Comparison	
National Average Site EUI	52
National Average Source EUI	102
% Difference from National Average Source EUI	100%
Building Type	Social/Meeting

Stamp of Certifying Professional

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

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

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

Certifying Professional
N/A

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	
Building Name	Adrian Hall	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Social/Meeting	Is this an accurate description of the space in question?		☐
Location	30 East Cape Mae, Ocean Gate, NJ 08740	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		☐

Adrian Hall (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	
Gross Floor Area	2,810 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Number of PCs	N/A(Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	N/A(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	N/A(Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

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

Fuel Type: Electricity		
Meter: Adrian Hall 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	1,846.00
11/01/2009	11/30/2009	1,286.00
10/01/2009	10/31/2009	1,404.00
09/01/2009	09/30/2009	964.00
08/01/2009	08/31/2009	919.00
07/01/2009	07/31/2009	1,014.00
06/01/2009	06/30/2009	784.00
05/01/2009	05/31/2009	1,011.00
04/01/2009	04/30/2009	1,216.00
03/01/2009	03/31/2009	1,446.00
02/01/2009	02/28/2009	1,717.00
01/01/2009	01/31/2009	1,721.00
Adrian Hall Electricity Consumption (kWh (thousand Watt-hours))		**15,328.00**
Adrian Hall Electricity Consumption (kBtu (thousand Btu))		**52,299.14**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**52,299.14**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: Adrian Hall Gas (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
12/01/2009	12/31/2009	603.00
11/01/2009	11/30/2009	301.00
10/01/2009	10/31/2009	139.00
09/01/2009	09/30/2009	146.00
08/01/2009	08/31/2009	16.00
07/01/2009	07/31/2009	17.00
06/01/2009	06/30/2009	141.00
05/01/2009	05/31/2009	18.00
04/01/2009	04/30/2009	391.00
03/01/2009	03/31/2009	484.00

02/01/2009	02/28/2009	765.00
01/01/2009	01/31/2009	774.00
Adrian Hall Gas Consumption (therms)		**3,795.00**
Adrian Hall Gas Consumption (kBtu (thousand Btu))		**379,500.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**379,500.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

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

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

Certifying Professional

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

Name: ____________________________________ Date: ___________

Signature: ______________________________

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Adrian Hall
30 East Cape Mae
Ocean Gate, NJ 08740

Facility Owner
Borough of OceanGate
801 Ocean Gate Ave
Ocean Gate, NJ 08740

Primary Contact for this Facility
Paulette Konopka
801 Ocean Gate Ave
Ocean Gate, NJ 08740

General Information

Adrian Hall	
Gross Floor Area Excluding Parking: (ft²)	2,810
Year Built	1927
For 12-month Evaluation Period Ending Date:	December 31, 2009

Facility Space Use Summary

Adrian Hall	
Space Type	Other - Social/Meeting
Gross Floor Area(ft2)	2,810
Number of PCs°	N/A
Weekly operating hours°	N/A
Workers on Main Shift°	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2009)	**Baseline** (Ending Date 12/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft2)	154	154	0	N/A	52
Source (kBtu/ft2)	204	204	0	N/A	102
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/ft2/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	28	28	0	N/A	9
$kgCO_2e$/ft2/year	10	10	0	N/A	3

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

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

APPENDIX N

Equipment Inventory & Lighting

New Jersey BPU Energy Audit Program
CHA #21611
Borough of Ocean Gate
Adrian Hall

Description	Qty	Manufacturer Name	Model No.	Serial Number	Equipment Type	Capacity/Size	Operating Hours	Location	Areas Served	Estimated Efficiency	Approximate Age	Useable Life Expectancy (years)
DHW Heater	1	AO Smith	P6D-80-780	76071K01312	Gas	76000 Btu, 80 gallon	8760 hours/year	Kitchen	Kitchen, bathroom	80%	10	19
Dishwasher	1	Hobart	NA	NA	Electric	NA	Rarely if Ever Used	kitchen	Kitchen	100%	12	20
Stove	1	Comstock Castle	NA	NA	Gas	25000 Btu/ burner. 8 burners	twice a month	kitchen	Kitchen	100%	12	20
A/C	1	Air Temp	12075ER111	H5458125		7.5 ton	Only when there are functions	Outside Mech Room	Building	1.2 kW/ton	10	15
Boiler	1	Weil-McLain	CP1669935	NA	Gas	256750 Output	Winter	Outside Mech Room	Building	80%	18	24

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

Existing Lighting

Building Schedule:
Existing conditions (master switch): 5 hrs/week
Blended Electric Rate $ 0.210 /kWh

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

	EXISTING CONDITIONS									
Area Description	**Number of Fixtures**	**Fixture Code**	**Watts per Fixture**	**Number of Non-Operational Fixtures**	**Watts per Non-Operational Fixtures**	**kW/Space**	**Exist Control**	**Daily Hours**	**Annual Hours**	**Annual kWh**
Kitchen Area	6	F82SS	173	0	176.46	1.038	switch		260	270
Mens Restroom	3	F42SS	94	0	95.88	0.282	switch		260	73
Womens Restroom	3	F42SS	94	0	95.88	0.282	switch		260	73
Outdoor Lights (Entrance)	2	I60/1	60	0	61.2	0.12	switch		260	31
Main Hall	26	F42ILL	59	0	60.18	1.534	switch		260	
TOTALS -	**40**			**0**		**3.3**				**448**

APPENDIX O

Block Load Models

HEAT GAIN/LOSS WORKSHEET

Project Name:	Borough of Ocean Gate	**Project No.:**	CHA #21611		
Location	Ocean Gate, NJ	**Site Elevation:**	460 Feet	**Specific Volume**	14.00 CF/#
Building Name	Adrian Hall	**Date:**	06/18/10		
Engineer:	Matt Pittinger				

Building/Facility Designation Adrian Hall

Outdoor Winter Design DB Temperature	2.5 *F	**Indoor Winter Design DB Temperature**	72 *F
Outdoor Summer Design DB Temperature	90 *F	**Indoor Summer Design DB Temperature**	74 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 #/#	**Indoor Air (70*F) Humidity Ratio**	0.0079 #/#

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

		R Value	Wall Type
	Steel Siding, 4" Insulation, Steel Siding	15.2	1
	Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
	4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
	Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
	4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
	4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
	Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
	Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
	Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
	4" Block, 1" insulation, 8" Block	19.9	16
x	Outside Air Resistance, Concrete Block, Airspace, Paint, Inside Air Resistance	4.3	

Roofs (Select One)

		R Value	Roof Type
	Tectum Deck, 3.3" Insul., BU Roof	13.0	1
	Steel Deck, 5" Insul., BU Roof	18.2	1
	Attic Roof with 6" Insul.	25.0	4
	4" HW Concrete Deck, BU Roof	2.7	2
	Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
	Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
	Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
	Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
	Wood Deck, 6" insulation, Felt & Membrane	18.0	
x	Outside Surface Resistance, Air Space, Cob Insulation, Insude Surface resistance	5.26	

Windows (Select One)

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

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

BUILDING CHARACTERISTICS

Roof Area 2,810 SF
Occupied Area 2,710 SF

Return Plenum? n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	83 Ft	11.0 Ft	10.0 Ft	124 SF	42 SF	747 SF
East Exposure	46 Ft	10.3 Ft	10.0 Ft	24 SF	0 SF	450 SF
South Exposure	83 Ft	10.5 Ft	10.0 Ft	93 SF	42 SF	738 SF
West Exposure	30 Ft	11.0 Ft	10.0 Ft	86 SF	0 SF	244 SF

Forced Ventilation 0 cfm

HEAT GAIN/LOSS WORKSHEET

Project Name:	Borough of Ocean Gate	Project No.:	CHA #21611		
Location	Ocean Gate, NJ	Site Elevation:	460 Feet	Specific Volume	14.00 CF/#
Building Name	Adrian Hall	Date:	06/18/10		
Engineer:	Matt Pittinger				

Building/Facility Designation Adrian Hall

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor		Solar Heat Gain	
North Exposure	124	38 btu/h/sf	0.8	0.75	Glass Type C	2,837 Btu/hr	
East Exposure	24	216 btu/h/sf	0.8	0.31	Glass Type C	1,286 Btu/hr	
South Exposure	93	109 btu/h/sf	0.8	0.58	Glass Type C	4,720 Btu/hr	
West Exposure	86	216 btu/h/sf	0.8	0.29	Glass Type C	4,321 Btu/hr	
							13,163 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain	
North Exposure	664	0.23	20 °F	1.0	3,073 Btu/hr	
East Exposure	436	0.23	39 °F	1.0	3,938 Btu/hr	
South Exposure	695	0.23	27 °F	1.0	4,343 Btu/hr	
West Exposure	214	0.23	22 °F	1.0	1,089 Btu/hr	
Roof	2,810	0.19	73 °F	1.0	39,010 Btu/hr	
Fenestration	328	1.05	16 °F		5,510 Btu/hr	
Doors	84	0.14	27 °F		317 Btu/hr	
Ceiling	2,710	0.14	0 °F		0 Btu/hr	
Partition		0.05	0 °F		0 Btu/hr	
Floor	2,710	0.04	0 °F		0 Btu/hr	
						57,281 Btu/h

INTERNAL HEAT GAINS

						Room Heat Gain	
Lights	0.50 w/sf x	2,710 Occ Area =	1.4 kW x 3.4x		1.0 RAF =	4,625 Btu/h	
Plug Load	0.30 w/sf x	2,710 Occ Area =	0.8 kW x 3.4x		1.0 RAF =	2,775 Btu/h	
People	25 people x	255 btu/person x	5% time in space =			319 Btu/h	
Computer Work Stations		0 Units x	120 W/Unit x	3414 =		0 Btu/h	
Equipment		kW x 3.413 =				0 Btu/h	
Misc.						0 Btu/h	
							7,718 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain	
Walls	2,008 SF	0.18 CFM/SF		1.04	16 °F	6,519 Btu/h	
Doors	84 SF	0.30 CFM/LF	0.95 LF/SF	1.04	16 °F	433 Btu/h	
Windows	328 SF	0.40 CFM/LF	0.79 LF/SF	1.04	16 °F	1,876 Btu/h	
Ventilation	0 cfm			1.04	16 °F	0 Btu/h	
							8,828 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	83	0.23	20	1.0	384 Btu/hr	
East Exposure	14	0.23	39	1.0	126 Btu/hr	
South Exposure	43	0.23	27	1.0	269 Btu/hr	
West Exposure	30	0.23	22	1.0	153 Btu/hr	
Roof	2,810	0.19	73	0.0	0 Btu/hr	
						933 Btu/h

INTERNAL HEAT GAINS

Lights	0.50 w/sf x	2,710 Occ Area =	1.4 kW x3413x	0.00 RAF =	0 Btu/h	
Misc.					0 Btu/h	
						0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT	
Solar	13,163
Conduction to Room	57,281
Conduction to Plenum	933
Ventilaton and Infiltration	8,828
Sub Total	80,205

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Internal Gains to Room	7,718
Internal Gains to Plenum	0
Sub Total	7,718

HEAT GAIN/LOSS WORKSHEET

Project Name:	Borough of Ocean Gate	**Project No.:**	CHA #21611
Location	Ocean Gate, NJ	**Site Elevation:**	460 Feet
Building Name	Adrian Hall	**Date:**	06/18/10
Engineer:	Matt Pittinger	**Specific Volume**	14.00 CF/#

Building/Facility Designation Adrian Hall

LATENT COOLING LOADS

Infiltration

			Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	2,980 SF		0.18 CFM/SF	4,629	0.0042 #/#	10,534 Btu/h
Doors	84 SF		0.30 CFM/LF	4,629	0.0042 #/#	471 Btu/h
Windows	328 SF		0.40 CFM/LF	4,629	0.0042 #/#	2,042 Btu/h
Ventilation	0 cfm			4,629	0.0042 #/#	0 Btu/h
People	25 people		0.05 time in space		250 Btu/hr/person	313 Btu/h
						13,360 Btu/h

Cooling Load Summary

	Sensible	Latent	Total		
Temperature Dependent Gains	80,205	13,360	93,565		
Temperature Indep. Gains	7,718		7,718	SHR=	0.87
Total	87,923	13,360	101,283		

Building Cooling Load 8.4 Tons at 321 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is **6,945 CFM** **2.56 CFM/sf**

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	747	0.23	70	12,016 Btu/h
East Exposure	450	0.23	70	7,242 Btu/h
South Exposure	738	0.23	70	11,872 Btu/h
West Exposure	244	0.23	70	3,923 Btu/h
Fenestration	328	1.05	70	23,934 Btu/h
Roof	2,810	0.19	70	37,140 Btu/h
Doors	84	0.14	70	815 Btu/h
Ceiling	2,710	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	2,810	0.04	20	2,248 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	2,178 SF	0.18 CFM/SF	1.04	70	392 cfm	28,441 Btu/h
Doors	84 SF	0.30 CFM/LF	1.04	70	24 cfm	1,741 Btu/h
Windows	328 SF	0.40 CFM/LF	1.04	70	104 cfm	7,544 Btu/h
Ventilation Load	0 cfm		1.04	70	0 cfm	0 Btu/h
Total Ventilation & Infiltration Load					520 cfm	37,726 Btu/h

Building Heating Load 136,917 btu/h

50.5 btu/sf

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

Reconcile Thermal Model

Building Footprint	2,710	SF	Ex Occupied Clng Temp.	74 °F	Ex Occupied Htg Temp.	72	°F
Heating Efficiency	80%		Ex Unoccupied Clng Temp.	74 °F	Ex Unoccupied Htg Temp.	65	°F
Cooling Efficiency	0.00	kW/ton	Occupied Cooling UA	(4,461) btu/hr/°F	Occupied Heating UA	1,427	btu/hr/°F
Internal Gains	7,718	btu/h	Unoccupied Cooling UA	(3,638) btu/hr/°F	Unoccupied Heating UA	1,427	btu/hr/°F
Unoc Internal Gain factor	0.03		Cooling Occ Enthalpy Setpoint	27.5 Btu/lb			
Ave Occ Internal Gain Factor	0.5		Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb			
Economizer available (Y/N)	No						

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

					EXISTING LOADS									
					Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-127,139	-50,548	-3,859	-103,692	-50,548	-232	0	0	0	0
97.5	42.5	3	0	3	-104,834	-35,103	-3,859	-85,500	-35,103	-232	0	0	0	0
92.5	39.5	34	1	33	-82,529	-28,082	-3,859	-67,309	-28,082	-232	0	0	0	0
87.5	36.6	131	4	127	-60,224	-21,296	-3,859	-49,117	-21,296	-232	0	0	0	0
82.5	34.0	500	15	485	-37,919	-15,211	-3,859	-30,926	-15,211	-232	0	0	0	0
77.5	31.6	620	18	602	-15,614	-9,595	-3,859	-12,734	-9,595	-232	0	0	0	0
72.5	29.2	664	20	644	0	0	-3,859	0	0	-232	0	0	0	0
67.5	27.0	854	25	829	6,422	2,527	-3,859	0	0	-232	0	0	0	-1
62.5	24.5	927	28	899	13,558	5,336	-3,859	3,568	1,404	-232	0	0	0	58
57.5	21.4	600	18	582	20,694	8,144	-3,859	10,704	4,212	-232	0	0	0	112
52.5	18.7	610	18	592	27,830	10,952	-3,859	17,840	7,021	-232	0	0	0	190
47.5	16.2	611	18	593	34,966	13,760	-3,859	24,976	9,829	-232	0	0	0	266
42.5	14.4	656	20	636	42,102	16,569	-3,859	32,112	12,637	-232	0	0	0	368
37.5	12.6	1,023	30	993	49,239	19,377	-3,859	39,248	15,445	-232	0	0	0	700
32.5	10.7	734	22	712	56,375	22,185	-3,859	46,384	18,253	-232	0	0	0	594
27.5	8.6	334	10	324	63,511	24,993	-3,859	53,520	21,062	-232	0	0	0	312
22.5	6.8	252	8	245	70,647	27,801	-3,859	60,656	23,870	-232	0	0	0	266
17.5	5.5	125	4	121	77,783	30,610	-3,859	67,792	26,678	-232	0	0	0	148
12.5	4.1	47	1	46	84,919	33,418	-3,859	74,928	29,486	-232	0	0	0	61
7.5	2.6	22	1	21	92,055	36,226	-3,859	82,064	32,295	-232	0	0	0	31
2.5	1.0	13	0	13	99,191	39,034	-3,859	89,200	35,103	-232	0	0	0	20
-2.5	0.0	0	0	0	106,327	41,843	-3,859	96,336	37,911	-232	0	0	0	0
-7.5	-1.5	0	0	0	113,463	44,651	-3,859	103,472	40,719	-232	0	0	0	0
TOTALS		8,760	261	8,499								0	0	3,127

Existing Building Ventilation & Infiltration (occ)	520	cfm
Overheat Ventilation Factor	1.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	520	cfm
Economizer Ventilation (from AHU's)	0	cfm

Energy Use Indices (calculated)

	Base Case
Heating	3,127
Target ->	3,221
	97.1%

	Base Case
Cooling	0
Target ->	300
	0.0%

Borough of Ocean Gate
CHA #21611
Building: Adrian Hall

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
			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	3.0	7.0	2	42.0	40.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	42.0	40.0
West				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
			Total	**84.0**	**80.0**

LF/SF
0.95

Walls

All wall quantities must remain equal to 1

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	83.0	11.0	1	913.0	188.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
	83.0			913.0	188.0

Ave. height 11.0 — Average height wall automatically linked to

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
East	30.0	11.0	1	330.0	82.0
	16.0	9.0	1	144.0	50.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
	46.0			474.0	132.0

Ave. height 10.3 — Average height wall automatically linked to

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
South	63.0	11.0	1	693.0	148.0
	20.0	9.0	1	180.0	58.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
	83.0			873.0	206.0

Ave. height 10.5 — Average height wall automatically linked to

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
West	30.0	11.0	1	330.0	82.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
	30.0			330.0	82.0

Ave. height 11.0 — Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	4.7	6.7	4	124.4	90.7
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	124.4	90.7
East	3.0	4.0	2	24.0	28.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	24.0	28.0
South	4.7	6.7	3	93.3	68.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	93.3	68.0
West	4.7	6.7	2	62.2	45.3
	3.0	4.0	2	24.0	28.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	86.2	73.3
			Total	**328.0**	**260.0**

LF/SF 0.79