BOROUGH OF OCEAN GATE
DPW BUILDING
ENERGY ASSESSMENT

for

NEW JERSEY
BOARD OF PUBLIC UTILITIES

BOROUGH OF OCEAN GATE
DPW BUILDING
ENERGY ASSESSMENT

for

NEW JERSEY
BOARD OF PUBLIC UTILITIES

CHA PROJECT NO. 21611

September 2010

Prepared by:

CLOUGH HARBOUR & ASSOCIATES LLP

6 Campus Drive
Parsippany, NJ 07054

(973) 538-2120

TABLE OF CONTENTS

Page

1.0 INTRODUCTION & BACKGROUND.....1

2.0 EXECUTIVE SUMMARY.....2

3.0 EXISTING CONDITIONS.....3
- 3.1 Building General
- 3.2 Utility Usage
- 3.3 HVAC Systems
- 3.4 Lighting/Electrical Systems
- 3.5 Control Systems
- 3.6 Plumbing Systems

4.0 ENERGY CONSERVATION MEASURES.....6
- 4.1 ECM-1 Night Setback
- 4.2 ECM-2 Replace Unit Heaters with Infrared Heaters
- 4.3 ECM-3 Replace Garage Doors
- 4.4 ECM-4 Lighting Replacements
- 4.5 ECM-5 Lighting Controls
- 4.6 ECM-6 Lighting Replacements with Controls

5.0 INCENTIVES OVERVIEW.....11
- 5.1 Incentives Overview
- 5.2 Building Incentives

6.0 ALTERNATIVE ENERGY EVALUATION.....15
- 6.1 Geothermal
- 6.2 Solar
- 6.3 Wind
- 6.4 Combined Heat and Power Generation (CHP)
- 6.5 Biomass Power Generation
- 6.6 Demand Response Curtailment

7.0 EPA PORTFOLIO MANAGER.....20

8.0 CONCLUSIONS & RECOMMENDATIONS.....21

1.0 INTRODUCTION & BACKGROUND

The Ocean Gate Department of Public Works building is a 4,100 square foot facility located on the corner of Ocean Gate Avenue and East Arverne Avenue. The building was constructed in 1980 and has not had any major renovations. The building is comprised of two main vehicle bay areas, one with four vehicle bays and the other with a single vehicle bay. The smaller vehicle bay area is used primarily for storage and is not temperature controlled.

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 Department of Public Works in Ocean Gate, New Jersey, The 4,100 square foot building was constructed in 1980 and is comprised of two main vehicle bay areas, one with four vehicle bays and the other with a single vehicle bay. The smaller vehicle bay area is used primarily for storage and is not temperature controlled. The following areas were evaluated for energy conservation measures:

- Night setback
- Lighting replacement w/occupancy sensors
- Unit heater replacement
- Garage doors replacement

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Potential annual savings of $3,300 for the recommended ECMs may be realized with a payback of 4.0 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 Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
600	0	0	960	1,400	(34.7)	N/A	0.4	N/A

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

ECM-2 Replace Unit Heaters with Infrared Heaters

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
8,500	0	0	900	1,300	1.7	NA	6.6	NA

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

ECM-6 Lighting Replacements with Controls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
4,900	1.3	3,400	0	600	2.3	700	8.2	7.0

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

3.0 EXISTING CONDITIONS

3.1 Building General

The Ocean Gate DPW building was built in 1980 and has not been renovated since construction. The building walls are constructed with sheets of corrugated metal siding which are bolted to an internal steel frame. The siding has approximately 3 inches of insulation which is in good condition for the age of the building. The roof, which has a north-south ridgeline, is constructed of corrugated plastic panels that are also insulated. The roof has 16 transparent skylights that are made from corrugated plastic. The ceiling is approximately 20 feet tall on the sides, 25 feet tall in the center.

The building has one main and one secondary bay that house the DPW vehicles and equipment. The main area has four large 14'X14' garage doors made of uninsulated plastic. The large bay also has the DPW office, break area, tool storage room, and a loft on the southern side. There is also a small restroom which contains a low flow toilet and a high flow sink. The loft contains two natural gas fired unit heaters, an air compressor, and the domestic hot water heater. The secondary bay in the building is significantly smaller with only one 14'X14' garage door. This bay is separated from the main vehicle area by an insulated wall. This smaller bay is used primarily for storage and is not heated or cooled.

The building has four pedestrian doors; three leading into the main bay and one leading into the secondary bay. The doors are in good condition and seal properly. There are two windows on the eastern side that allow natural light in for the DPW office.

The building operates five days per week from 8:00 am to 5:00 pm Monday through Friday. Eight DPW workers utilize the building sporadically.

3.2 Utility Usage

The DPW building has meters to monitor electricity and natural gas consumption. Water is provided from the borough and is not metered. Electricity is provided by Jersey Central Power and Light, and natural gas by New Jersey Natural Gas.

Electric utility data for the building was available from January 2009 through December 2009. During that time period the building consumed about 22,550 kWh of electricity, and averaged about 14.2 kW of demand. Electricity usage in 2009 was approximately $4,200 costing about $0.179 per kWh. In addition, electric demand charges totaled about $200 on average, or $1.24 per kW. Combining these two costs produces a blended rate of $0.188/kWh.

Gas usage data January 2009 through December 2009 determined that the DPW building consumed about 3,940 therms of natural gas. The building paid an average of $1.44 per therm which equated to about $5,700 annually. Natural gas usage significantly increased in the building during the winter months which accounts for the usage of the two unit heaters. A consumption chart 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 the DPW Building 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 the DPW Building would save about $1,000 per year.

3.3 HVAC Systems

The DPW building is heated by two gas fired unit heaters located in the loft area. The larger of the two space heaters is manufactured by Lennox and produces 156 MBTUs of heat for the space. The second space heater is manufactured by Luxaire and provides 120 MBTUs of heat. Both units have a standard efficiency of 80% and blow convective hot air currents, each using a fan with a 1/8 HP motor. Both unit heaters are controlled by a single manual thermostat.

In addition to the natural gas heaters in the building, there are 5 Chromalox electric radiant heaters, each operating at 3 kW. According to building personnel, these heaters are never used because they do not provide sufficient heat for the building. There are two separate manual thermostats that operate these heaters, which were in the off position during the site visit. There is also a small electric unit heater located in the tool storage room which is controlled by a thermostat in the main vehicle bay.

An exhaust fan is located on the north part of the building with an approximately 3 HP motor. This fan is used only in the summer to ventilate the building. All other building ventilation is a result of infiltration through the walls, windows, and doors.

3.4 Lighting/Electrical Systems

The building is lit primarily with 4' T12 fixtures containing magnetic ballasts. These 2 lamp fixtures are placed end to end to create the effect of an 8' lamp fixture. The main vehicle bay has (28) T12 2 lamp fixtures with Philips 34 watt bulbs. The smaller secondary vehicle bay is lit with (12) T12 2 lamp fixtures, also with Philips bulbs and magnetic ballasts.

The building also utilizes other types lighting. There are 3 LED exit signs located over the main entry and exit doors. The main DPW office is lit with (2) 4-lamp T12 fixtures with magnetic ballasts. In the break area, there are (2) 150 Watt incandescent bulbs, and the restroom is lit by (1) 2 lamp T-12 troffer fixture. The tool storage room is lit by a single 2 lamp 8' T12 fixture.

The building lighting is controlled by switches, and has no occupancy sensors or day lighting controls. There is potential in some areas such as the tool storage room, restroom, and the DPW offices for occupancy sensors. These bays have sporadic usage schedules and during the site visit these lights were always on even when the bays were not in use. Additionally, all the lights used in the building are considered inefficient by today's standards and could be replaced with more efficient options.

3.5 Control Systems

Both of the gas fired unit heaters are controlled by one mechanical thermostat that does not allow for automatic temperature setback. Two additional thermostats control the IR heaters; however both of these thermostats were in the off position during the site visit. The building is maintained at about 68°F during the winter months.

3.6 Plumbing System

Domestic hot water is produced by an A.O. Smith 20 gallon electric hot water heater located in the loft area above the DPW office and draws 3kW of power. The water heater provides hot water at 120°F for the restroom and the wash basin in the main bay area. Electric hot water heaters are generally more expensive to operate than gas fired units; however, the DPW building has a low demand for hot water and it would not be economically feasible to replace the unit.

There is one restroom in the DPW building located next to the main office area, which has one low flow toilet and one high flow sink. In general, significant savings result from replacing a high flow sink with a low flow fixture. The building also has a wash basin located just outside the restroom area with a high flow sink fixture, which is used more often than the restroom; therefore, replacing this fixture could provide a water saving opportunity. However, water savings was not quantified because the borough does not meter water usage and does not pay for water.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Night Setback

The DPW building has one thermostat that controls the two unit heaters located in the loft area. The temperature of the building is maintained at about 68°F during the heating seasons. Installing a programmable thermostat in place of the existing manual thermostat would allow building operators to schedule setback when no one is using the building. It is recommended that the building have programmable thermostats installed, and the temperature set back to 60°F when not being used to conserve energy.

To calculate the benefits of reducing the setpoint temperature during unoccupied times, a block load model for the building was created. This model totals the overall heating load required for the building and can be viewed in appendix N. The block load takes into account parameters such as roof and wall insulation levels, ventilation and infiltration loads, building occupancy and usage, along with temperature setpoints. The block load was then compared to temperature bin data for the Ocean Gate area to create an accurate representation of heating needs. To calculate the savings, an identical block load was created except the unoccupied temperature setpoint was lowered to 60°F.

The difference between the two heating loads in therms represents the potential energy savings for implementing night setback. The building is expected to save approximately 960 therms of natural gas per year if the temperature during unoccupied times was set at 60°F.

Programmable thermostats have a life expectancy of about 15 years according to the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE). The total savings over the life of the project would be about 14,400 therms and $21,000.

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

ECM-1 Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
400	0	0	960	1,400	46.6	N/A	0.3	N/A

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

This measure is recommended.

4.2 ECM-2 Replace Unit Heaters with Infrared Heaters

The Ocean Gate DPW building is heated by two gas fired unit heaters located in the loft. One unit heater, made by Lennox, produces 156 MBTUs of heat, and the other, a Luxaire model, produces 120 MBTUs of heat. Both heaters operate at a standard efficiency of about 80%. This ECM proposes replacing the two unit heaters with gas fired infrared (IR) heaters. IR heaters work well in garage surroundings and have higher burning efficiencies than standard unit heaters.

To determine the savings associated with installing infrared heaters, the block load created in the previous ECM was used to determine the necessary heating requirements of the space. This block load is provided in Appendix N, and based on utility data provided by the borough; the building requires about 3,940 therms of natural gas for heating.

To calculate the savings associated with implementing infrared heaters, the efficiencies of the existing unit heaters were compared with the proposed efficiencies of the IR heaters. Additionally, the heating effectiveness between the two types of heaters was also compared to determine savings. Heating effectiveness is a ratio between the amount of heat being produced, compared to the amount of heat that actually reaches the floor space. IR heaters have an effectiveness ratio close to 100% because they use infrared wavelengths to distribute heat. Unit heaters must rely on a circulating fan to distribute heat which can cause certain areas of the space to be overheated or under heated. The effectiveness of the DPW building unit heaters is about 85%.

The higher efficiencies and better effectiveness of the infrared heaters will save the DPW building about 900 therms of natural gas used for heating. The implementation costs were based on two Modine 200 MBH high intensity infrared heaters which are approximately what the space requires; however, exact sizing requirements for the building should be assessed before this ECM is implemented.

Infrared heaters have a life expectancy of about 18 years according to ASHRAE. The savings over the life of the project would be about 16,200 therms and $23,400.

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

ECM-2 Replace Unit Heaters with Infrared Heaters

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
8,500	0	(30)	900	1,300	1.7	NA	6.6	NA

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

This measure is recommended.

4.3 ECM-3 Replace Garage Doors

As previously stated, the DPW building has five main garage doors each made of uninsulated corrugated plastic. The doors are each 14'x14' and the seals are not functioning effectively. Four doors serve the main vehicle bay and the fifth door serves the secondary bay. The secondary bay is used for storage and is not heated; therefore, it was excluded from the savings calculation. This ECM proposes replacing the four garage doors in the main vehicle bay with new, high efficiency insulated doors.

To determine the savings associated with this ECM, the existing infiltration and ventilation heat transfer rates through the doors were calculated. The total square areas of the doors, as well as the door perimeters were totaled. Heat transfer through the doors is determined by the amount of thermal resistance provided by the door material. To calculate conduction loads it was determined that the existing doors have an R-Value of approximately 1.3 $hr*ft^2*°F/$ Btu, and the new proposed doors have an R-Value of about 8.4 $hr*ft^2*°F/$ Btu.

To calculate the infiltration load on the doors, the perimeters were analyzed to determine infiltration rates. From this analysis, it was concluded that the doors allow in about 0.3 cfm/ linear foot of door perimeter. Well sealed doors will allow in approximately 0.2 cfm/linear foot. The difference between these two infiltration rates, multiplied by the total perimeter of the doors provides a good estimate of potential infiltration savings.

By combining the infiltration and ventilation savings, the building could save approximately 1,110 therms of natural gas per year.

Garage doors have an approximate life expectancy of 25 years according to the manufacturer. The savings over the life of the project would be about 27,750 therms and $40,000.

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

ECM-3 Replace Garage Doors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
19,300	0	0	1,110	1,600	1.1	NA	12.1	NA

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

This measure is not recommended.

4.4 ECM-4 Lighting Replacements

During the site visit a comprehensive lighting survey was performed. The main and secondary bays are lit with 2-lamp T12 lights with magnetic ballasts. The main vehicle bay has 28 fixtures and the secondary bay has 12 fixtures each drawing 80 watts. The DPW office is lit by two 4-lamp T12 fixtures each drawing 160 watts of power. The break area is lit with two 150 watt incandescent bulbs and the tool storage room is lit with (1) 2-lamp 8' T12 fixture that draws 173 watts of power. The restroom has a single 2-lamp T12 fixture and the hallway just outside the restroom has a 60 watt incandescent bulb. There are also three LED exit signs above the doors that draw 2.5 watts of power.

With the exception of the exit signs, all lights in the building are considered inefficient by today's standards. This ECM proposes replacing all incandescent bulbs with high efficiency compact fluorescents and the following T12 fixtures with electronic ballast T-8s:

Location	# fixtures	Current Fixture Type
Main Vehicle Bay	28	2-lamp T12
Secondary Vehicle Bay	12	2-lamp T12
DPW Office	2	4-lamp T12
Tool Storage Room	1	2-lamp 8 foot T12

Energy savings were calculated by comparing the existing wattages of the lights to the proposed wattages. This difference was then multiplied by the total estimated operating hours of the lights to determine

yearly energy savings. Replacing the lights in the building would result in a savings of about 2,970 kWh per year.
Compact fluorescents and T8 fixtures have an expected life of 15 years according to lighting manufacturers at the existing conditions. The total energy savings over the life of the project would be 44,550 kWh and $9,000.

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

ECM-4 Lighting Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
4,400	1.3	2,970	0	$600	0.9	600	7.3	6.3

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

This measure is not recommended in lieu of ECM 6.

4.5 ECM-5 Lighting Controls

Most lighting throughout the building is manually switched on and off. The irregular occupancy of the DPW building presents a good opportunity to utilize occupancy sensors. Sensors are relatively easy to install, and they will automatically turn off lights after 15 minutes of unoccupied time.

The restroom, office, and tool storage room all have intermittent occupancy and would benefit from the installation of occupancy sensors. To calculate the savings that could be realized from occupancy sensors, the existing hourly usage of the lights was compared with the proposed hourly usage of lights with occupancy sensors. Based on field observations of occupancy, it was estimated that the lights in the previously noted rooms could be turned off for half the amount of time with occupancy sensors. This would result in a savings of about 670 kWh per year.

Lighting controls have an expected lifespan of 15 years according to lighting manufacturers. The total energy savings over the life of the project would be 10,050 kWh and $1,500.

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

ECM-5 Lighting Controls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
440	0	670	0	100	3.1	100	4.4	3.4

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

This measure is not recommended in lieu of ECM 6.

4.6 ECM-6 Lighting Replacements with Controls

This measure combines ECMs 4 and 5 to more accurately represent the cost savings associated with implementing both ECMs. Because of interactivity effects, the savings for lighting controls and replacement lighting is not cumulative.

The savings for this ECM was determined by adding occupancy sensors to the proposed T-8 lights of ECM-4. This measure has the potential to save 3,400 kWh per year.

Lighting and controls have an expected lifespan of 15 years according to lighting manufacturers. The total energy savings over the life of the project would be 51,000 kWh and $9,000.

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

ECM-6 Lighting Replacements with Controls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
4,900	1.3	3,400	0	600	2.3	700	8.2	7.0

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

This measure is recommended.

5.0 PROJECT INCENTIVES

5.1 Incentives Overview

5.1.1 New Jersey Pay For Performance Program

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

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

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

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

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

5.1.2 New Jersey Smart Start Program

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

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

5.1.3 Energy Efficient and Conservation Block Grant

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

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

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

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

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

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

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

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

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

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

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

5.1.5 Direct Install Program

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

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

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

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

5.2 Building Incentives

5.2.1 New Jersey Pay For Performance Program

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 $200. 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 7,042 kWh which amounts to about $1,300 in incentives. The building is also projected to save about 2,265 therms of natural gas. With New Jersey's current incentive structure, this would qualify for about $4,100 in incentive money. Combining all incentives in the P4P program would amount to approximately $5,600, reducing the overall payback of the project from 8.4 years to 7.2 years. See appendix H for calculations.

5.2.2 New Jersey Smart Start Program

The Ocean Gate DPW building is eligible for incentives from the New Jersey Smart Start Program.

The lighting replacement measure is eligible for $600 in savings if all fixtures are replaced. There would also be $100 available for the installation of occupancy sensors.

5.2.3 Energy Efficient and Conservation Block Grant

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

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

The Ocean Gate DPW building does pay the Societal Benefits Charge so it is not eligible to receive this incentive.

5.2.5 Direct Install Program

The DPW Building will be eligible to receive funding from the Direct Install Program. This money will be in conjunction with the Energy Efficiency and Conservation Block Grant. The total implementation cost for all ECMs in the DPW Building is about $38,100. This program would pay 60%, or about $22,900 of these initial costs. This funding has the potential to significantly affect the payback periods of Energy Conservation Measures. For the DPW Building, the Direct Install Program brings the simple payback from about 6.8 years, to approximately 2.7 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 gas-fired, unit heaters 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

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

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

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.

The building had a maximum electricity demand of 14.2 kW and a minimum of 12.0 kW, over the previous 12 months. The monthly average over the observed 12 month period was 13.6 kW. The existing load does not justify the use of the maximum incentive cap of 50 kW of installed PV solar array; therefore, a 14 kW system size was selected for the calculations. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development Agency) estimates of total cost of system installation. It should be noted that the cost of installation is approximately $8 per watt or $8,000 per kW of installed system. This has increased in the past few years due to the rise in national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

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

Photovoltaic (PV) Rooftop Solar Power Generation – 14 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
112,000	0	16,600	0	3,100	3,100	10,500	8,100	>25	8.6

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

The DPW building roof has a north-south ridgeline which makes it not ideal for solar cells. 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. For primarily east and west facing roofs such as the DPW building there are mounts that can be used to orient the solar cells south but this adds to the implementation costs.

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

6.2.2 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 an electric water heater and a solar DHW system would save site electricity.

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

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

Solar Thermal Domestic Hot Water Plant

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$	$	$	Years	Years
27,100	0	600	0	100	100	NA	>25	NA

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

This measure is not recommended.

6.3 Wind

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

To avoid turbulence and capture greater wind energy, turbines are mounted on towers. Turbines should be mounted at least 30 feet above any structure or natural feature within 300 feet of the installation. Smaller

turbines can utilize shorter towers. For example, a 250-watt turbine may be mounted on a 30-50 foot tower, while a 10 kW turbine will usually need a tower of 80-120 feet. Tower designs include tubular or latticed, guyed or self-supporting. Wind turbine manufacturers also provide towers.

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

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 high 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 the DPW building.

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.

The DPW building is considered a high energy consumer by the Portfolio Manager with a Site Energy Usage Index (EUI) of 115 kBTU/ft^2/year. Several factors contribute to the unfavorable EUI, including, but not limited to, wasted energy from poor wall insulation, lack of heating controls, and inefficient lighting. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 54 kBTU/ft^2/year; the national average for this building type is 77 kBTU/ft^2/year. The EPA Portfolio Manager was unable to generate an energy rating score for this building because the utility data provided was over 120 days old. This number represents how energy efficient a building is on a scale from 1 to 100 with 100 being the best. In order for a building to receive and energy star label, this energy benchmark rating must be at least 75. As energy use decreases from the implementation of the proposed ECMs, this rating will increase.

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

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 Department of Public Works in Ocean Gate, New Jersey identified potential ECMs for night setback, lighting replacement w/occupancy sensors, and unit heater replacement. Potential annual savings of $3,300 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-1 Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
600	0	0	960	1,400	(34.7)	N/A	0.4	N/A

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

ECM-2 Replace Unit Heaters with Infrared Heaters

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
8,500	0	0	900	1,300	1.7	NA	6.6	NA

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

ECM-6 Lighting Replacements with Controls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
4,900	1.3	3,400	0	600	2.3	700	8.2	7.0

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

APPENDICES

A	Utility Usage Analysis
B	ECM-1 Night Setback
C	ECM-2 Replace Unit Heaters with Infrared Heaters
D	ECM-3 Replace Garage Doors
E	ECM-4 Lighting Replacements
F	ECM-5 Lighting Controls
G	ECM-6 Lighting Replacement with Controls
H	New Jersey Pay For Performance Incentive Program
I	Photovoltaic (PV) Rooftop Solar Power Generation
J	Solar Thermal Domestic Hot Water Plant
K	Wind
L	EPA Portfolio Manager
M	Equipment Inventory & Lighting
N	Block Load Models

APPENDIX A

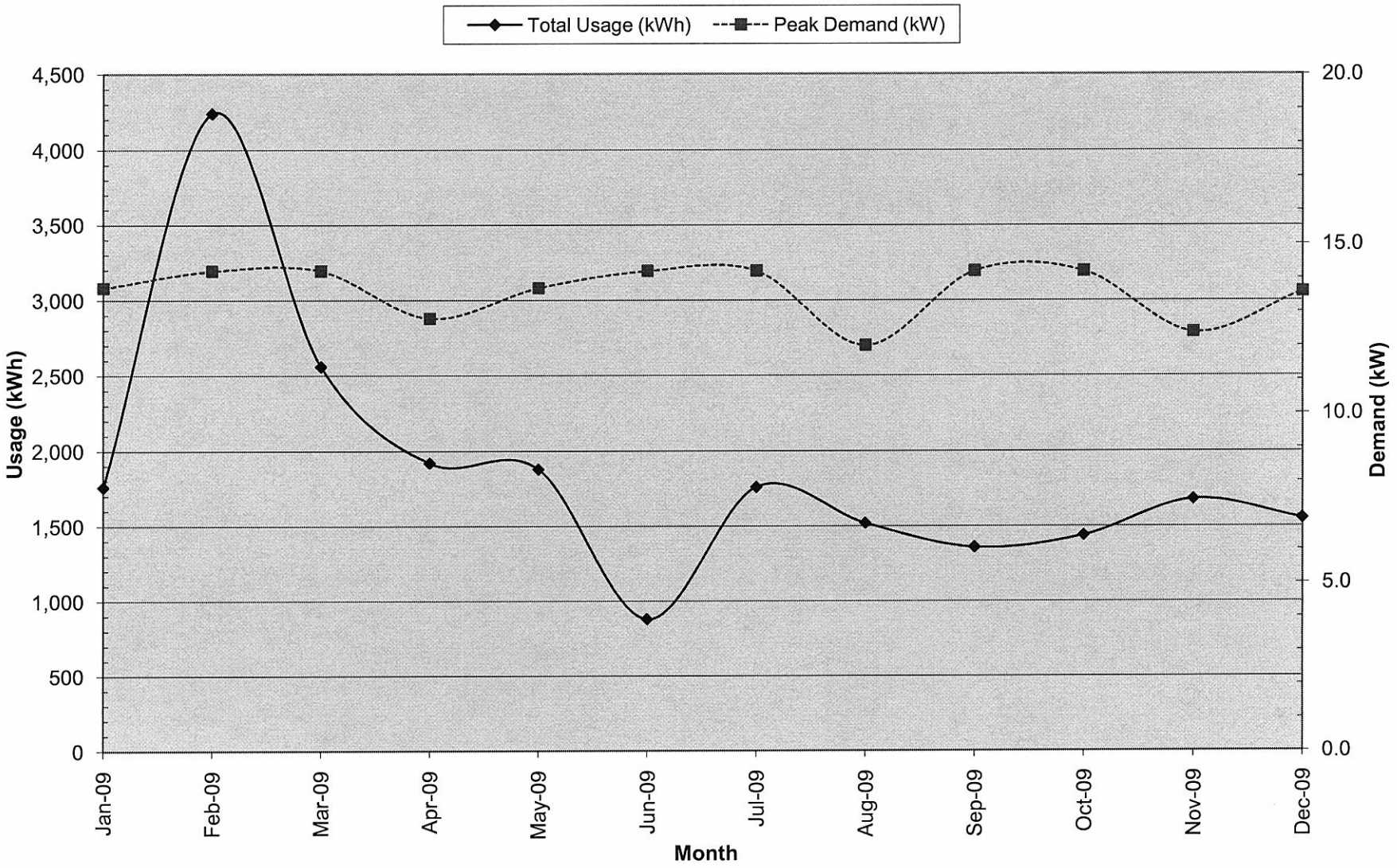
Utility Usage Analysis

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

900 Ocean Gate Ave, Ocean Gate, NJ 08740
Account Number: 100015850025

			Charges			Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
January-09	1,760	13.7	$342.82	$23.94	$318.88	$ 0.195	$ 0.181	$ 1.747
February-09	4,240	14.2	$706.99	$27.17	$679.82	$ 0.167	$ 0.160	$ 1.913
March-09	2,560	14.2	$442.62	$13.27	$429.35	$ 0.173	$ 0.168	$ 0.935
April-09	1,920	12.8	$353.58	$18.12	$335.46	$ 0.184	$ 0.175	$ 1.416
May-09	1,879	13.7	$325.25	$16.99	$308.27	$ 0.173	$ 0.164	$ 1.240
June-09	880	14.2	$214.25	$13.27	$200.98	$ 0.243	$ 0.228	$ 0.935
July-09	1,760	14.2	$358.43	$13.27	$345.16	$ 0.204	$ 0.196	$ 0.935
August-09	1,520	12.0	$321.34	$13.88	$307.46	$ 0.211	$ 0.202	$ 1.157
September-09	1,360	14.2	$290.51	$13.27	$277.24	$ 0.214	$ 0.204	$ 0.935
October-09	1,440	14.2	$279.42	$17.61	$261.81	$ 0.194	$ 0.182	$ 1.240
November-09	1,680	12.4	$315.18	$15.38	$299.80	$ 0.188	$ 0.178	$ 1.240
December-09	1,554	13.6	$279.69	$16.86	$262.83	$ 0.180	$ 0.169	$ 1.240
Total	22,553	14.2	$4,230.08	$203.03	$4,027.06	$ 0.188	$ 0.179	$ 1.243
Most Recent Yr	22,553	14.2	$4,230.08	$203.03	$4,027.06	$ 0.188	$ 0.179	$ 1.243

Electric Usage - Ocean Gate DPW Building



Utility Data - Ocean Gate DPW Building
Chart4

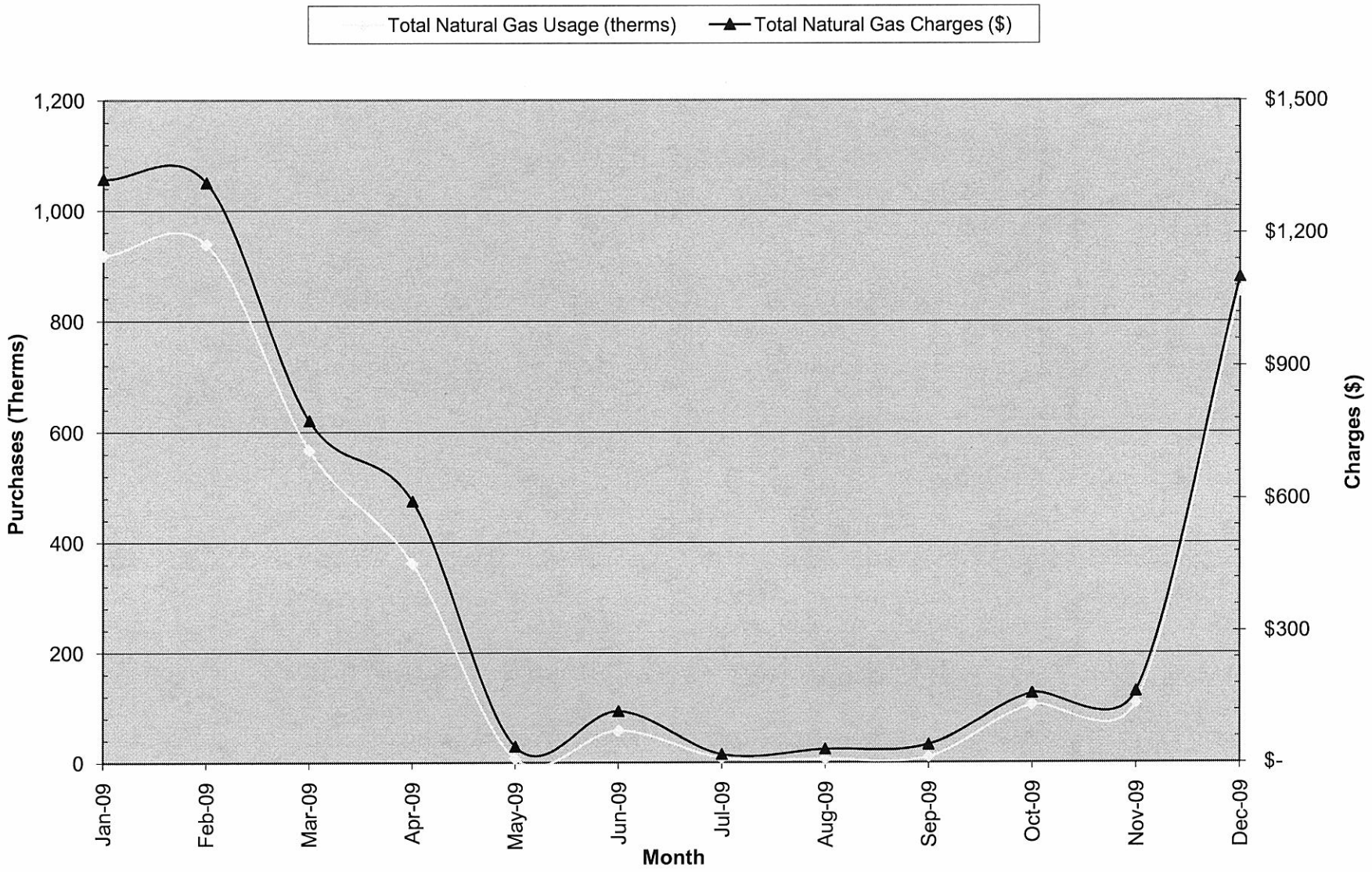
New Jersey BPU Energy Audit Program
CHA Project Number: 21611
Ocean Gate DPW Building
New Jersey Natural Gas

900 Ocean Gate Ave, Ocean Gate, NJ 08740
Account Number: 22-0008-2553-40

Month	Therms	Charges ($)	($/therm)
January-09	917	$ 1,321.79	$ 1.44
February-09	938	$ 1,313.57	$ 1.40
March-09	568	$ 775.70	$ 1.37
April-09	362	$ 594.41	$ 1.64
May-09	7	$ 36.51	$ 4.99
June-09	58	$ 116.77	$ 2.00
July-09	8	$ 18.12	$ 2.17
August-09	6	$ 29.90	$ 4.78
September-09	10	$ 40.51	$ 3.89
October-09	105	$ 157.69	$ 1.50
November-09	109	$ 162.00	$ 1.49
December-09	854	$ 1,099.74	$ 1.29

Total	3,944	$ 5,667	$ 1.44
Most Recent Yr	3,944	$ 5,667	$ 1.44

Natural Gas Usage - Ocean Gate DPW Building



Utility Data - Ocean Gate DPW Building
Chart3

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

Jan 14, 2009

GAS MARKETERS LIST

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

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

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

RPL Holdings, Inc
601 Carlson Pkwy
Minnetonka, MN 55305

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX B

ECM-1 Night Setback

Borough of Ocean Gate
CHA #21611
Building: DPW Building

ECM 1 Night Setback

Building Footprint	3,162	SF	Ex Occupied Clng Temp.	74	°F	Ex Occupied Htg Temp.	68	°F	**Heating Energy Savings**	**960**	**therms**
Heating Efficiency	80%		Ex Unoccupied Clng Temp.	74	°F	Ex Unoccupied Htg Temp.	68	°F	**Cooling Energy Savings**	**0**	**kWh**
Cooling Efficiency	0	kW/ton	Prop Occupied Clng Temp.	74	°F	Prop Occupied Htg Temp.	68	°F			
Building Balance Temp.	65	°F	Prop Unoccupied Clng Temp.	74	°F	Prop Unoccupied Htg Temp.	60	°F			
Internal Gains	17,619	btu/h	Occupied Cooling UA	-3,741	btu/hr/°F	Occupied Heating UA	1,595	btu/hr/°F			
Unoc Internal Gain factor	0.03		Unoccupied Cooling UA	-3,680	btu/hr/°F	Unoccupied Heating UA	1,595	btu/hr/°F			
Ave Occ Internal Gain Factor	0.5		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb						
			Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb						

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

					EXISTING LOADS						PROPOSED LOADS									
					Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	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	-106,610	-64,808	-8,809	-104,892	-64,808	-529	-106,610	-64,808	-8,809	-104,892	-64,808	-529	0	0	0	0
97.5	42.5	3	1	2	-87,906	-45,006	-8,809	-86,490	-45,006	-529	-87,906	-45,006	-8,809	-86,490	-45,006	-529	0	0	0	0
92.5	39.5	34	9	25	-69,203	-36,005	-8,809	-68,088	-36,005	-529	-69,203	-36,005	-8,809	-68,088	-36,005	-529	0	0	0	0
87.5	36.6	131	35	96	-50,499	-27,303	-8,809	-49,686	-27,303	-529	-50,499	-27,303	-8,809	-49,686	-27,303	-529	0	0	0	0
82.5	34	500	134	366	-31,796	-19,502	-8,809	-31,284	-19,502	-529	-31,796	-19,502	-8,809	-31,284	-19,502	-529	0	0	0	0
77.5	31.6	620	166	454	-13,092	-12,302	-8,809	-12,881	-12,302	-529	-13,092	-12,302	-8,809	-12,881	-12,302	-529	0	0	0	0
72.5	29.2	664	178	486	0	0	-8,809	0	0	-529	0	0	-8,809	0	0	-529	0	0	0	0
67.5	27	854	229	625	798	360	-8,809	798	360	-529	798	360	-8,809	0	0	-529	0	0	0	0
62.5	24.5	927	248	679	8,774	3,960	-8,809	8,774	3,960	-529	8,774	3,960	-8,809	0	0	-529	0	0	116	8
57.5	21.4	600	161	439	16,751	7,561	-8,809	16,751	7,561	-529	16,751	7,561	-8,809	3,988	1,800	-529	0	0	162	60
52.5	18.7	610	163	447	24,727	11,161	-8,809	24,727	11,161	-529	24,727	11,161	-8,809	11,965	5,401	-529	0	0	253	149
47.5	16.2	611	164	447	32,704	14,762	-8,809	32,704	14,762	-529	32,704	14,762	-8,809	19,941	9,001	-529	0	0	342	238
42.5	14.4	656	176	480	40,680	18,362	-8,809	40,680	18,362	-529	40,680	18,362	-8,809	27,918	12,602	-529	0	0	462	350
37.5	12.6	1,023	274	749	48,657	21,963	-8,809	48,657	21,963	-529	48,657	21,963	-8,809	35,894	16,202	-529	0	0	868	695
32.5	10.7	734	197	537	56,633	25,563	-8,809	56,633	25,563	-529	56,633	25,563	-8,809	43,871	19,802	-529	0	0	729	605
27.5	8.6	334	89	245	64,610	29,164	-8,809	64,610	29,164	-529	64,610	29,164	-8,809	51,847	23,403	-529	0	0	380	323
22.5	6.8	252	68	185	72,586	32,764	-8,809	72,586	32,764	-529	72,586	32,764	-8,809	59,824	27,003	-529	0	0	323	280
17.5	5.5	125	33	92	80,563	36,365	-8,809	80,563	36,365	-529	80,563	36,365	-8,809	67,800	30,604	-529	0	0	178	157
12.5	4.1	47	13	34	88,539	39,965	-8,809	88,539	39,965	-529	88,539	39,965	-8,809	75,777	34,204	-529	0	0	74	66
7.5	2.6	22	6	16	96,516	43,565	-8,809	96,516	43,565	-529	96,516	43,565	-8,809	83,753	37,805	-529	0	0	38	34
2.5	1	13	3	10	104,492	47,166	-8,809	104,492	47,166	-529	104,492	47,166	-8,809	91,730	41,405	-529	0	0	24	22
-2.5	0	0	0	0	112,469	50,766	-8,809	112,469	50,766	-529	112,469	50,766	-8,809	99,706	45,006	-529	0	0	0	0
-7.5	-1.5	0	0	0	120,445	54,367	-8,809	120,445	54,367	-529	120,445	54,367	-8,809	107,683	48,606	-529	0	0	0	0
TOTALS		8,760	2,346	6,414													0	0	3,948	2,988

Existing Building Ventilation & Infiltration (occ)	**667 cfm**
Overheat Ventilation Factor	**1.00**
Additional ventilation to offset overheat	**0 cfm**
Existing Building Ventilation & Infiltration (unocc)	**667 cfm**

Borough of Ocean Gate
CHA #21611
DPW Building

ECM 1 Night 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	1	ea	$ 50	$ 50	$ -	$ 49	$ 61	$ -	$ 110	
Miscellaneous Wiring and Programming	100	ft/wire	$ 1.00	$ 1.00		$ 98	$ 121	$ -	$ 219	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 329		Subtotal
$ 49	15%	Contingency
$ 57	15%	Contractor O&P
$ -	0%	Engineering
$ 434		**Total**

APPENDIX C

ECM-2 Repalce Unit Heaters with Infrared Heaters

Borough of Ocean Gate
CHA #21611
DPW Building

ECM 2: Replace Unit Heaters with Infrared Heaters

Building Footprint	3,162	SF	Ex Occupied Htg Temp.	68	°F
Natural gas Heat Content	100,000	Btu/Therm	Ex Unoccupied Htg Temp.	60	°F
Building Balance Temp.	60	°F	Occupied Heating UA	1,595	btu/hr/°F
Internal Gains	17,510	btu/h	Unoccupied Heating UA	1,595	btu/hr/°F
Unocc Internal Gain factor	0.03				
Ave Occ Internal Gain Factor	0.5				

Heating Energy Savings	902	Therms/year
Electric Energy Savings	-33	kWh/yr

Existing Burner Efficiency	80.0%	Existing unit heater burner efficiency
Existing Heat Distribution Effectiveness	85.0%	Heat Distribution Factor per ASHRAE Handbook - Fundamentals for Unit Heaters
Proposed Burner Efficiency	85.0%	Based on Reznor Infrared Tube Heaters
Proposed Heat Distribution Effectiveness	100%	Heat Distribution Factor per ASHRAE Handbook - Fundamentals for Infrared Heaters

				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 Heating Therms	Proposed Heating Therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	M	N
102.5	0	0	0	0	0	0	-8,809	0	0	-529	0	0	-8,809	0	0	-529	0	0
97.5	49.1	3	1	2	0	0	-8,809	0	0	-529	0	0	-8,809	0	0	-529	0	0
92.5	42.5	34	9	25	0	0	-8,809	0	0	-529	0	0	-8,809	0	0	-529	0	0
87.5	36.6	131	35	96	0	0	-8,809	0	0	-529	0	0	-8,809	0	0	-529	0	0
82.5	30.6	500	134	366	0	0	-8,809	0	0	-529	0	0	-8,809	0	0	-529	0	0
77.5	34	620	166	454	0	0	-8,809	0	0	-529	0	0	-8,809	0	0	-529	0	0
72.5	31.6	664	178	486	0	0	-8,809	0	0	-529	0	0	-8,809	0	0	-529	0	0
67.5	29.2	854	229	625	798	360	-8,809	798	360	-529	798	360	-8,809	798	360	-529	0	0
62.5	27	927	248	679	8,774	3,960	-8,809	8,774	3,960	-529	8,774	3,960	-8,809	8,774	3,960	-529	0	0
57.5	24.5	600	161	439	16,751	7,561	-8,809	16,751	7,561	-529	16,751	7,561	-8,809	16,751	7,561	-529	190	152
52.5	21.4	610	163	447	24,727	11,161	-8,809	24,727	11,161	-529	24,727	11,161	-8,809	24,727	11,161	-529	297	238
47.5	18.7	611	164	447	32,704	14,762	-8,809	32,704	14,762	-529	32,704	14,762	-8,809	32,704	14,762	-529	402	321
42.5	16.2	656	176	480	40,680	18,362	-8,809	40,680	18,362	-529	40,680	18,362	-8,809	40,680	18,362	-529	543	434
37.5	14.4	1,023	274	749	48,657	21,963	-8,809	48,657	21,963	-529	48,657	21,963	-8,809	48,657	21,963	-529	1,021	817
32.5	12.6	734	197	537	56,633	25,563	-8,809	56,633	25,563	-529	56,633	25,563	-8,809	56,633	25,563	-529	858	686
27.5	10.7	334	89	245	64,610	29,164	-8,809	64,610	29,164	-529	64,610	29,164	-8,809	64,610	29,164	-529	447	358
22.5	8.6	252	68	185	72,586	32,764	-8,809	72,586	32,764	-529	72,586	32,764	-8,809	72,586	32,764	-529	380	304
17.5	6.8	125	33	92	80,563	36,365	-8,809	80,563	36,365	-529	80,563	36,365	-8,809	80,563	36,365	-529	210	168
12.5	5.5	47	13	34	88,539	39,965	-8,809	88,539	39,965	-529	88,539	39,965	-8,809	88,539	39,965	-529	87	70
7.5	4.1	22	6	16	96,516	43,565	-8,809	96,516	43,565	-529	96,516	43,565	-8,809	96,516	43,565	-529	44	36
2.5	2.6	13	3	10	104,492	47,166	-8,809	104,492	47,166	-529	104,492	47,166	-8,809	104,492	47,166	-529	28	23
-2.5	-1.5	0	0	0	112,469	50,766	-8,809	112,469	50,766	-529	112,469	50,766	-8,809	112,469	50,766	-529	0	0
-7.5	0	0	0	0	120,445	54,367	-8,809	120,445	54,367	-529	120,445	54,367	-8,809	120,445	54,367	-529	0	0
TOTALS		8,760	2,346	6,414													4,508	3,807

Existing Building Ventilation & Infiltration (occ)	667	cfm
Overheat Ventilation Factor	1.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	667	cfm

Due to opening garage doors

Electrical Requirements for Heating Equipment

Existing Equipment

Unit	Htng Hrs	Motor HP	Motor kW	Annual kWh
UH-1	2,000	0.125	0.09325	195
UH-2	2,000	0.125	0.09325	195
Total				390

Proposed Equipment

Unit	Htng Hrs	Amps	Volts	Phase	Power Factor	Annual kWh
Infrared Htr	2,000	1.1	115	1	0.8	212
Infrared Htr	2,000	1.1	115	1	0.8	212
Total						423

*Electrical data based on Reznor VR Series Infrared Heaters

Avg. OA Temp °F	Heating Hrs	Assumed % Time of Operation	hrs of Operation
102.5	0	0%	0
97.5	0	0%	0
92.5	0	0%	0
87.5	0	0%	0
82.5	0	0%	0
77.5	0	0%	0
72.5	0	0%	0
67.5	0	0%	0
62.5	0	8%	0
57.5	600	15%	92
52.5	610	23%	141
47.5	611	31%	188
42.5	656	38%	252
37.5	1023	46%	472
32.5	734	64%	305
27.5	334	62%	209
22.5	252	69%	174
17.5	125	77%	96
12.5	47	85%	40
7.5	22	92%	20
2.5	13	100%	13
-2.5	0	100%	0
-7.5	0	100%	0
	5,027	42%	2090

Borough of Ocean Gate
CHA #21611
DPW Building

ECM 2: Replace Unit Heaters with Infrared Heaters

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.		
						$ -	$ -	$ -	$ -	
Unit Heater Removal	2	EA		$ 450		$ -	$ 1,089	$ -	$ 1,089	
200 Mbtu Input IR Heater	2	EA	$ 1,254	$ 400		$ 2,458	$ 968	$ -	$ 3,426	
Miscellaneous Gas Piping, Valves, etc.	2	EA	$ 400	$ 250		$ 784	$ 605	$ -	$ 1,389	
Miscellaneous electrical	1	LS	$ 250	$ 250		$ 245	$ 303	$ -	$ 548	

Unit Pricing based on Modine MHR200 Heater found on www.shophmac.com

$6,451	Subtotal
$968	15% Contingency
$1,113	15% Contractor O&P
$0	0% Engineering
$8,532	**Total**

APPENDIX D

ECM-3 Replace Garage Doors

Borough of Ocean Gate
CHA #21611
DPW Building

ECM 3: Replace Garage Doors

	Occupied Cooling Hours per Week	0	Hours		
	Occupied Heating Hours per Week	168	Hours		
Given	Heating Energy Cost	$1.44	$/therm		
	Cooling Cost	$0.188	$/kWh		
	Occupied Cooling Setpoint Temperature		Degrees F		
	Occupied Cooling Avg Space Air Enthalpy		btu/# air		
	Occupied Heatng Setpoint Temperature	68.0	Degrees F	Occupied	
	Unoccupied Heating Setpoint Temperature	68.0	Degrees F	Unoccupied	
	Door Area	784	sq.ft.		(From Door survey)
	Door Perimeter	224	ft		(From Door survey)
	Proposed U factor	0.12	Btu/(h*sqft*degf)		(From Door vendor)
	Proposed Air Infiltration	0.20	cfm/ft		
	Cooling Conversion	12,000	Btu/ton		
	Heating Btu Conversion	1,000,000	Btu/MMBtu		
Assumptions	Existing U factor	0.76	Btu/(h*sqft*degf)		Approximated from Door Survey
	Existing Air Infiltration	0.30	cfm/ft		(From ASHRAE Fundamentals)
	Heating System Efficiency	80%			
	Cooling System Efficiency	1.20	kW/ton		

Formula

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

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

Existing	Operation	OA Enthalpy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
	Cooling	38.3	92.5	51	0.0	0.0	0.0	0	0	0	0	0	0
	Cooling	36.6	87.5	146	0.0	0.0	0.0	0	0	0	0	0	0
	Cooling	33.5	82.5	298	0.0	0.0	0.0	0	0	0	0	0	0
	Cooling	31.6	77.5	476	0.0	0.0	0.0	0	0	0	0	0	0
	Cooling	30.3	72.5	662	0.0	0.0	0.0	0	0	0	0	0	0
	Cooling	27.9	67.5	740	0.0	740.3	0.0	0	220,141	0	0	26,865	0
	Cooling	24.6	62.5	765	0.0	765.3	0.0	0	2,503,366	0	0	305,503	0
	Cooling	21.6	57.5	733	0.0	733.3	0.0	0	4,579,240	0	0	558,836	0
	Cooling	18.7	52.5	668	0.0	668.3	0.0	0	6,160,392	0	0	751,795	0
	Cooling	16.2	47.5	659	0.0	659.3	0.0	0	8,037,842	0	0	980,913	0
	Cooling	14.3	42.5	685	0.0	685.3	0.0	0	10,392,760	0	0	1,268,300	0
	Cooling	12.4	37.5	739	0.0	739.3	0.0	0	13,410,484	0	0	1,636,574	0
	Cooling	10.4	32.5	717	0.0	717.3	0.0	0	15,144,247	0	0	1,848,157	0
	Cooling	8.7	27.5	543	0.0	543.2	0.0	0	13,084,436	0	0	1,596,784	0
	Cooling	7	22.5	318	0.0	318.1	0.0	0	8,608,722	0	0	1,050,582	0
	Cooling	5.4	17.5	245	0.0	245.1	0.0	0	7,361,353	0	0	898,357	0
	Cooling	3.9	12.5	156	0.0	156.1	0.0	0	5,151,311	0	0	628,650	0
	Cooling	2.5	7.5	92	0.0	92.0	0.0	0	3,311,642	0	0	404,143	0
	Cooling	1.2	2.5	36	0.0	36.0	0.0	0	1,402,956	0	0	171,212	0
	Heating	-0.2	-2.5	19	0.0	19.0	0.0	0	796,972	0	0	97,260	0
	Heating	-1.4	-7.5	8	0.0	8.0	0.0	0	359,202	0	0	43,836	0
	Subtotal =			**8,760**	**0**	**7,126**	**0**	**0**	**100,525,064**	**0 btu**	**0**	**12,267,769**	**0 btu**

	Conduction		Infiltration			
Cooling Load =	(0) + (	0) =				**0 btu**
	Cooling Load					
Cooling Energy =	(0)/(	12000) * (	1.20) =			**0 kWh**
	Cooling Energy		Cooling Cost			
Cooling Energy Cost =	(0.00) x (	$0.188) =				$ -
	Conduction		Infiltration			
Heating Load =	(100525064) + (	12267769) =				**112,792,833 btu**
	Heating Load		Heat Content			
Heating Energy =	(112792833)/(	80%)/(	100000) =			**1,410 therms**
	Heating Energy		Heating Cost			
Heating Energy Cost =	(1409.91) x (	$1.437) =				$ 2,026

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	51	0.0	0.0	0.0	0	0	0	0	0	0
Cooling	36.6	87.5	146	0.0	0.0	0.0	0	0	0	0	0	0
Cooling	33.5	82.5	298	0.0	0.0	0.0	0	0	0	0	0	0
Cooling	31.6	77.5	476	0.0	0.0	0.0	0	0	0	0	0	0
Cooling	30.3	72.5	662	0.0	0.0	0.0	0	0	0	0	0	0
Cooling	27.9	67.5	740	0.0	740.3	0.0	0	34,549	0	0	17,910	0
Cooling	24.6	62.5	765	0.0	765.3	0.0	0	392,879	0	0	203,669	0
Cooling	21.6	57.5	733	0.0	733.3	0.0	0	718,668	0	0	372,558	0
Cooling	18.7	52.5	668	0.0	668.3	0.0	0	966,815	0	0	501,197	0
Cooling	16.2	47.5	659	0.0	659.3	0.0	0	1,261,463	0	0	653,942	0
Cooling	14.3	42.5	685	0.0	685.3	0.0	0	1,631,045	0	0	845,534	0
Cooling	12.4	37.5	739	0.0	739.3	0.0	0	2,104,648	0	0	1,091,049	0
Cooling	10.4	32.5	717	0.0	717.3	0.0	0	2,376,745	0	0	1,232,105	0
Cooling	8.7	27.5	543	0.0	543.2	0.0	0	2,053,478	0	0	1,064,523	0
Cooling	7	22.5	318	0.0	318.1	0.0	0	1,351,057	0	0	700,388	0
Cooling	5.4	17.5	245	0.0	245.1	0.0	0	1,155,294	0	0	598,905	0
Cooling	3.9	12.5	156	0.0	156.1	0.0	0	808,449	0	0	419,100	0
Cooling	2.5	7.5	92	0.0	92.0	0.0	0	519,731	0	0	269,428	0
Cooling	1.2	2.5	36	0.0	36.0	0.0	0	220,181	0	0	114,142	0
Heating	-0.2	-2.5	19	0.0	19.0	0.0	0	125,077	0	0	64,840	0
Heating	-1.4	-7.5	8	0.0	8.0	0.0	0	56,373	0	0	29,224	0
Subtotal =			**8,760**	**0**	**7,126**	**0**	**0**	**15,776,451**	**0 btu**	**0**	**8,178,512**	**0 btu**

	Conduction		Infiltration		
Cooling Load =	(0) + (	0) =			**0 btu**
	Cooling Load				
Cooling Energy =	(0)/(	12000) * (	1.20) =		**0 kWh**
	Cooling Energy	Cooling Cost			
Cooling Energy Cost =	(0.00) x (	$0.188) =			$ -
	Conduction		Infiltration		
Heating Load =	(15776451) + (	8178512) =			**23,954,964 btu**
	Heating Load		Heat Content		
Heating Energy =	(23954964)/(	80%) / (	100000) =		**299 therms**
	Heating Energy	Heating Cost			
Heating Energy Cost =	(299.44) x (	$1.437) =			$ 430

Summary

EXISTING COOLING ENERGY	**0.00**	**kWh**	**$ -**
EXISTING HEATING ENERGY	**1409.91**	**therms**	**$ 2,025.77**
EXISTING ENERGY COST			**$ 2,025.77**

PROPOSED COOLING ENERGY	**0.00**	**kWh**	**$ -**
PROPOSED HEATING ENERGY	**299.44**	**therms**	**$ 430.23**
PROPOSED ENERGY COST			**$ 430.23**

COOLING ENERGY SAVINGS	**0.00**	**kWh**	**$ -**	**#DIV/0! of existing**
HEATING ENERGY SAVINGS	**1110.47**	**therms**	**$ 1,595.54**	**78.8% of existing**
ENERGY COST SAVINGS			**$ 1,595.54**	**78.8% of existing**

Comments

Borough of Ocean Gate
CHA #21611
DPW Building

ECM 3: Replace Garage Doors

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.		
						$ -	$ -	$ -	$ -	
Insulated Garage Doors	4	ea	$ 3,075	$ 445	$ -	$ 12,054	$ 2,154	$ -	$ 14,208	
Miscellaneous Wiring and Programming	4	ft/wire	$ 200.00	$ 200.00		$ 784	$ 968	$ -	$ 1,752	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

Cost is based on RSMeans for a non-automateic insulated garage door.

$ 15,960	Subtotal
$ 1,596	10% Contingency
$ 1,756	10% Contractor O&P
$ -	0% Engineering
$ 19,311	**Total**

APPENDIX E

ECM-4 Lighting Replacements

Borough of Ocean Gate
CHA #21611
ECM-4 Lighting Replacements

Cost of Electricity: $0.179 $/kWh
$1.24 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Annual Hours**	**Annual kWh**	**Annual kWh Saved**	**Annual kW Saved**	**Annual $ Saved**	**Retrofit Cost**	**NJ Lighting Incentive**	**Simple Payback With Out Incentive**	**Simple Payback**
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
2	Main Vehicle Bay	28	T 34 W F 2 (MAG) RL/RB	F42ES	80	2.2	SW	2340	5,242	28	0	F42LL	60	1.7	SW	2,340	3,931	1,310	0.6	$ 242.33	$ 2,785.30	$420	11.5	9.8
185	DPW Office	2	DC 40 W F 4	F44ES	160	0.3	SW	2340	749	2	DC 28 W F 4	F44SSILL	96	0.2	SW	2,340	449	300	0.1	$ 55.39	$ 283.50	$30	5.1	4.6
109	Break Area	2	SP I 150	I150/1	150	0.3	SW	2340	702	2	CF 26	CF42/1-L	42	0.1	SW	2,340	197	505	0.2	$ 93.47	$ 40.50	$0	0.4	0.4
191	Tool Storage Area	1	S 60 C F 2 (ELE) 8'	F82SS	173	0.2	SW	2340	405	1	S 60 C F 2 (ELE) 8'	F82EL	110	0.1	SW	2,340	257	147	0.1	$ 27.26	$ -	$0	0.0	0.0
2	Bathroom	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	SW	2340	187	1	0	F42LL	60	0.1	SW	2,340	140	47	0.0	$ 8.65	$ 99.48	$15	11.5	9.8
2	Secondary Vehicle Bay	12	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.0	SW	2340	2,246	12	0	F42LL	60	0.7	SW	2,340	1,685	562	0.2	$ 103.86	$ 1,193.70	$180	11.5	9.8
X1	Above Doors	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	39	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	39	-	0.0	$ -	$ -	$0		
71	Hallway near Bathroom	1	I 60	I60/1	60	0.1	SW	2340	140	1	CF 26	CF16/2D	16	0.0	SW	2,340	37	103	0.0	$ 19.04	$ 6.75	$0	0.4	0.4
	Total	**50**				**4.1**			**9,711**	**50**			**446**	**2.9**			**6,737**	**2,974**	**1.3**	**$550**	**$4,409**	**$645**		
																	Demand Savings			**1.3**	**$19**			
																	kWh Savings			**2,974**	**$531**			
																	Total savings				**$550**		**8.0**	**6.8**

APPENDIX F

ECM-5 Lighting Controls

Borough of Ocean Gate
CHA #21611
ECM-5 Install Lighting Controls

Cost of Electricity: $0.179 $/kWh
$1.24 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	*Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
2	Main Vehicle Bay	28	T 34 W F 2 (MAG) RL/RB	F42ES	80	2.2	SW	2340	5,242	28	T 34 W F 2 (MAG) RL/RB	F42ES	80	2.2	None	2340	5,241.6	0.0	0.0	$0.00	$0	$0.00		#DIV/0!
185	DPW Office	2	DC 40 W F 4	F44ES	160	0.3	SW	2340	749	2	DC 40 W F 4	F44ES	160	0.3	COCC	1170	374.4	374.4	0.0	$66.85	$202.50	$35.00	3.0	2.5
109	Break Area	2	SP I 150	I150/1	150	0.3	SW	2340	702	2	SP I 150	I150/1	150	0.3	None	2340	702.0	0.0	0.0	$0.00	$0.00	$0.00		0.0
191	Tool Storage Area	1	S 60 C F 2 (ELE) 8'	F82SS	173	0.2	SW	2340	405	1	S 60 C F 2 (ELE) 8'	F82SS	173	0.2	OCC	1170	202.4	202.4	0.0	$36.14	$118.75	$20.00	3.3	2.7
2	Bathroom	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	SW	2340	187	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	OCC	1170	93.6	93.6	0.0	$16.71	$118.75	$20.00	7.1	5.9
2	Secondary Vehicle Bay	12	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.0	SW	2340	2,246	12	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.0	None	2340	2,246.4	0.0	0.0	$0.00	$0.00	$0.00		0.0
X1	Above Doors	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	39	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8760	39.4	0.0	0.0	$0.00	$0.00	$0.00		0.0
71	Hallway near Bathroom	1	I 60	I60/1	60	0.1	SW	2340	140	1	I 60	I60/1	60	0.1	Nonn	2340	140.4	0.0	0.0	$0.00	$0.00	$0.00		0.0
	Total	50				4.1			9,711	50				4			9,040	670	0	120	$440	75		3.0
																	Demand Savings			0.0	$0			0.0
																	kWh Savings			670	$120			
																	Total Savings				$120		3.7	3.0

*Installation of Photoelectric Daylight Sensors to work with space skylights. One sensor per each of the eight lighting zones. Master controller (existing) to operate each zone (on/off) based on available sunlight. Existing fixtures to remain.
Data shows that Sea Brook, NJ has an average of 4.21 hours/day of available sunlight over the course of a year. Lighting operation hours reduced by available annual sunlight.

APPENDIX G

ECM-6 Lighting Replacement with Controls

Borough of Ocean Gate
CHA #21611
ECM-6 Combined Lighting Replacements with Controls

Cost of Electricity: $0.179 $/kWh
$1.24 $/kW Blended Rate was used

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
2	Main Vehicle Bay	28	T 34 W F 2 (MAG) RL/RB	F42ES	80	2.2	SW	2340	5,242	28	0	F42LL	60	1.7	None	2,340	3,931	1,310	0.6	$ 242.33	$ 2,785.30	$ 420	11.5	9.8
185	DPW Office	2	DC 40 W F 4	F44ES	160	0.3	SW	2340	749	2	DC 28 W F 4	F44SSILL	96	0.2	COCC	1,170	225	524	0.1	$ 95.50	$ 468.15	$ 65	4.9	4.2
109	Break Area	2	SP I 150	I150/1	150	0.3	SW	2340	702	2	CF 26	CF42/1-L	42	0.1	None	2,340	197	505	0.2	$ 93.47	$ 20.25	$ -	0.2	0.2
191	Tool Storage Area	1	S 60 C F 2 (ELE) 8'	F82SS	173	0.2	SW	2340	405	1	S 60 C F 2 (ELE) 8'	F82EL	110	0.1	OCC	1,170	129	276	0.1	$ 50.24	$ 251.58	$ 20	5.0	4.6
2	Bathroom	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	SW	2340	187	1	0	F42LL	60	0.1	OCC	1,170	70	117	0.0	$ 21.19	$ 218.23	$ 35	10.3	8.6
2	Secondary Vehicle Bay	12	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.0	SW	2340	2,246	12	0	F42LL	60	0.7	None	2,340	1,685	562	0.2	$ 103.86	$ 1,193.70	$ 180	11.5	9.8
X1	Above Doors	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	39	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8,760	39	-	0.0	$ -	$ -	$ -		
71	Hallway near Bathroom	1	I 60	I60/1	60	0.1	SW	2340	140	1	CF 26	CF16/2D	16	0.0	Nonn	2,340	37	103	0.0	$ 19.04	$ 6.75	$ -	0.4	0.4
	Total	**50**				**4.1**			**9,711**	**50**				**2.9**			**6,313**	**3,398**	**1.3**	**626**	**4,944**	**720**		
																	Demand Savings			**1.3**	**$19**			
																	kWh Savings			**3,398**	**$607**			
																	Total Savings				**$626**		**7.9**	**6.8**

Proposed fixtures to be equipped with dimming Photoelectric Daylight Sensors to work with space skylights based on available sunlight. Master controller (existing) to offer override ability.
Data shows that Sea Brook, NJ has an average of 4.21 hours/day of available sunlight over the course of a year. Lighting operation hours reduced by available annual sunlight.

APPENDIX H

New Jersey Pay For Performance Incentive Program

Borough of Ocean Gate
CHA #21611
DPW Building

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)	4,100
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)	$4,230	$5,667
Existing Usage (from utility)	22,553	3,944
Proposed Savings	7,042	2,265
Existing Total MMBtus	471	
Proposed Savings MMBtus	251	
% Energy Reduction	**53.1%**	
Proposed Annual Savings	$4,550	

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

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$205
Incentive #2	$775	$2,491	$3,266
Incentive #3	$493	$1,585	$2,078
Total All Incentives	**$1,268**	**$4,077**	**$5,550**

Total Project Cost	$38,216

		Allowable Incentive
% Incentives #1 of Utility Cost*	2.1%	$205
% Incentives #2 of Project Cost**	8.5%	$3,266
% Incentives #3 of Project Cost**	5.4%	$2,078
Total Eligible Incentives***	**$5,550**	
Project Cost w/ Incentives	$32,666	

Project Payback (years)	
w/o Incentives	w/ Incentives
8.4	7.2

* 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 I

Photovoltaic (PV) Rooftop Solar Power Generation

Ocean Gate Borough
DPW Building

Cost of Electricity $0.188 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-14 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
$112,000	**0.0**	**16,600**	**0**	**$3,100**	**0**	**$3,100**	**$10,500**	**$8,100**	**36.1**	**9.1**

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

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

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

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

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

PVWatts *** 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:	14.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	10.8 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	18.8 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.36	1159	217.89
2	4.05	1251	235.19
3	4.58	1518	285.38
4	4.84	1484	278.99
5	5.30	1635	307.38
6	5.33	1542	289.90
7	5.27	1557	292.72
8	5.25	1541	289.71
9	5.06	1495	281.06
10	4.46	1408	264.70
11	3.15	1005	188.94
12	2.87	969	182.17
Year	4.46	16562	3113.66

Output Hourly Performance Data

About the Hourly Performance Data

Output Results as Text

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

Disclaimer and copyright notice

RReDC 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.

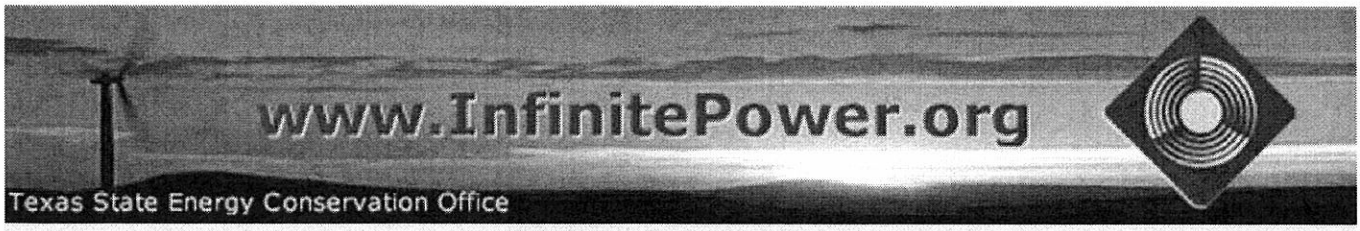
To accelerate the use of PV systems, many state and local governments offer financial incentives and programs. Go to http://www.nrel.gov/stateandlocal for more information.

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

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

APPENDIX J

Solar Thermal Domestic Hot Water Plant



Home

What Can I Do?

Electric Choice

Home Energy

FAQs

LEARN
Fact Sheets
Lesson Plans

PLAY
Calculators

NETWORK
Organizations
Businesses
Events Calendar

BROWSE
Resources
Solar
Wind
Biomass
Geothermal
Water

Projects

TX Energy - Past and Present

Financial Help

About Us

About SECO

RARE

Interactive Energy Calculators

RENEWABLE ENERGY THE INFINITE POWER OF TEXAS

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

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

Solar Water Heating Calculator

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

Water Heater Characteristics			
Physical		**Thermal**	
? Diameter (feet)	1.5	? Water Inlet Temperature (Degrees F)	55
? Capacity (gallons)	20	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	10.66	? Hot Water Temperature (Degrees F)	120
? Effective R-value	-41	? Hot Water Usage (Gallons per Day)	10
Energy Use			
222.4		? Heat Delivered in Hot Water (BTU/hr)	
-1.3		? Heat loss through insulation (BTU/hr)	

Gas vs. Electric Water Heating		
Gas		**Electric**
0	? Overall Efficiency	0.9858
0	? Conversion Efficiency	0.98
NaN BTU/hr	? Power Into Water Heater	225.6 BTU/hr
Cost		
$ 1.4 /Therm	? Utility Rates	$ 0.188 /kWh
$ NaN	? Yearly Water Heating Cost	$ 108.813(
How Does Solar Compare?		

	? Solar Water Heater Cost: $ 2000	? Percentage Solar: 60
NaN years for gas	? Payback Time for Solar System	30.6334 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

Return to Top of Page

Send comments, questions, and suggestions to **website manager**.

Window on State Government | **Privacy and Security Policy** | **Accessibility Policy**

State Energy Conservation Office (SECO)

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

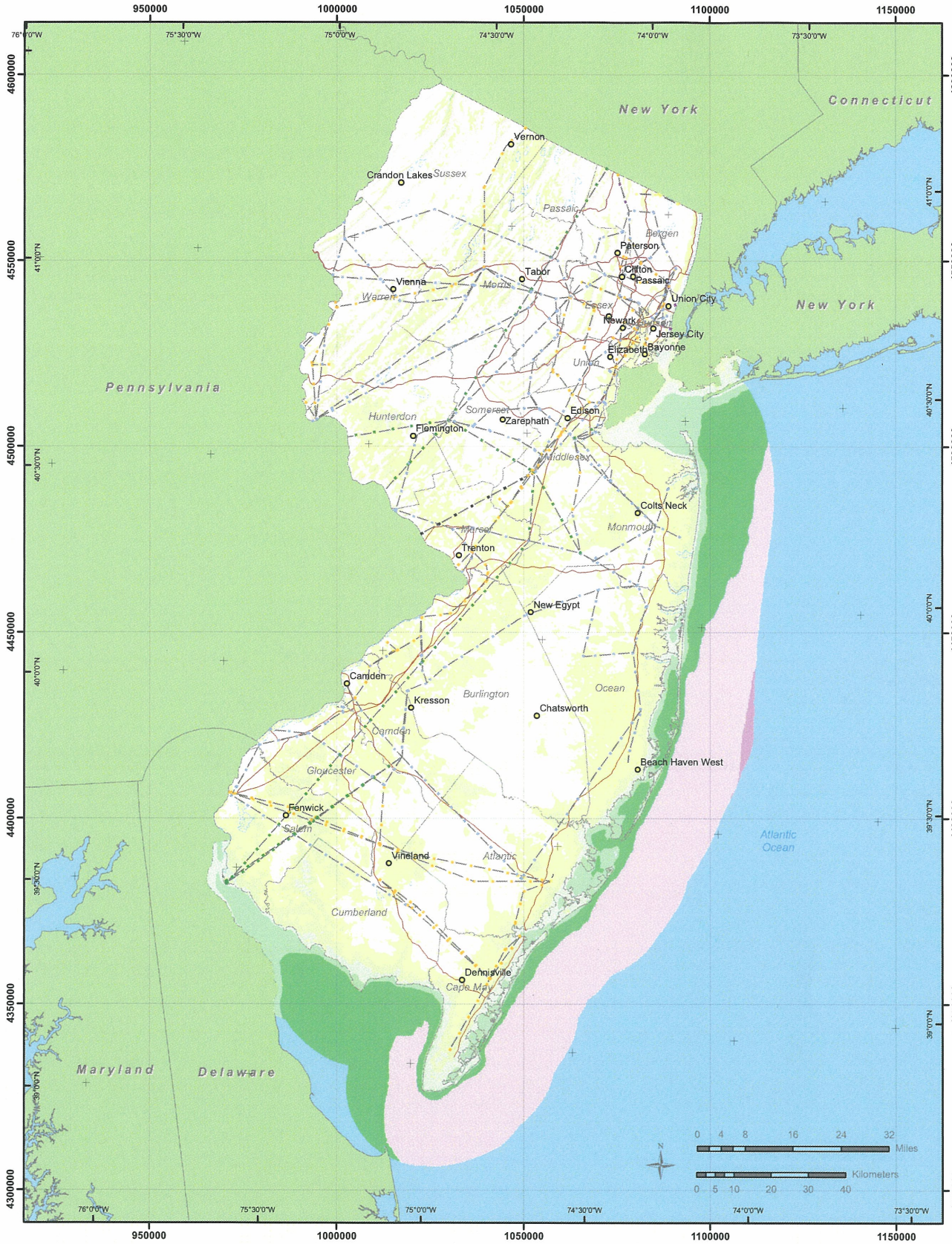
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

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**

APPENDIX K

Wind



Wind Resource of New Jersey

Mean Annual Wind Speed at 30 Meters

Features

- City
- Interstate Highway
- County Boundary
- Water Body

Generalized Transmission Line

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

Mean Speed at 30 m		
mph	m/s	
< 10.1	< 4.5	13.4 - 14.5 / 6.0 - 6.5
10.1 - 11.2	4.5 - 5.0	14.5 - 15.7 / 6.5 - 7.0
11.2 - 12.3	5.0 - 5.5	15.7 - 16.8 / 7.0 - 7.5
12.3 - 13.4	5.5 - 6.0	16.8 - 17.9 / 7.5 - 8.0
		17.9 - 19.0 / 8.0 - 8.5
		> 19.0 / > 8.5

AWS Truewind

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

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

AWS Truewind, LCC



Bird's eye view maps can't be printed, so another map view has been substituted.

APPENDIX L

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
DPW Building

Building ID: 2366538
For 12-month Period Ending: December 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 06, 2010

Facility
DPW Building
900 Ocean Gate Avenue
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: 1980
Gross Floor Area (ft²): 4,100

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	76,951
Natural Gas (kBtu)[4]	394,200
Total Energy (kBtu)	471,151

Energy Intensity[5]	
Site (kBtu/ft²/yr)	115
Source (kBtu/ft²/yr)	163

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	33

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison	
National Average Site EUI	77
National Average Source EUI	150
% Difference from National Average Source EUI	9%
Building Type	Service (Vehicle Repair/Service, Postal Service)

Stamp of Certifying Professional

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

Certifying Professional
N/A

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

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

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

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

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) 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 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	DPW Building	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Service (Vehicle Repair/Service, Postal Service)	Is this an accurate description of the space in question?		☐
Location	900 Ocean Gate Avenue, 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		☐

DPW Building (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	
Gross Floor Area	4,100 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Number of PCs	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: DPW Building Electric (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	1,554.00
11/01/2009	11/30/2009	1,680.00
10/01/2009	10/31/2009	1,440.00
09/01/2009	09/30/2009	1,360.00
08/01/2009	08/31/2009	1,520.00
07/01/2009	07/31/2009	1,760.00
06/01/2009	06/30/2009	880.00
05/01/2009	05/31/2009	1,879.00
04/01/2009	04/30/2009	1,920.00
03/01/2009	03/31/2009	2,560.00
02/01/2009	02/28/2009	4,240.00
01/01/2009	01/31/2009	1,760.00
DPW Building Electric Consumption (kWh (thousand Watt-hours))		**22,553.00**
DPW Building Electric Consumption (kBtu (thousand Btu))		**76,950.84**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**76,950.84**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: DPW Building Gas (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
12/01/2009	12/31/2009	854.00
11/01/2009	11/30/2009	109.00
10/01/2009	10/31/2009	105.00
09/01/2009	09/30/2009	10.00
08/01/2009	08/31/2009	6.00
07/01/2009	07/31/2009	8.00
06/01/2009	06/30/2009	58.00
05/01/2009	05/31/2009	7.00
04/01/2009	04/30/2009	362.00
03/01/2009	03/31/2009	568.00

02/01/2009	02/28/2009	938.00
01/01/2009	01/31/2009	917.00
DPW Building Gas Consumption (therms)		**3,942.00**
DPW Building Gas Consumption (kBtu (thousand Btu))		**394,200.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**394,200.00**
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 as the PE 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
DPW Building
900 Ocean Gate Avenue
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

DPW Building	
Gross Floor Area Excluding Parking: (ft^2)	4,100
Year Built	1980
For 12-month Evaluation Period Ending Date:	December 31, 2009

Facility Space Use Summary

DPW Building	
Space Type	Other - Service (Vehicle Repair/Service, Postal Service)
Gross Floor Area(ft^2)	4,100
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/ft^2)	115	115	0	N/A	77
Source (kBtu/ft^2)	163	163	0	N/A	150
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/$ft^2$/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	33	33	0	N/A	22
$kgCO_2e/ft^2$/year	8	8	0	N/A	5

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

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

APPENDIX M

Equipment Inventory & Lighting

New Jersey BPU Energy Audit Program
CHA #21611
Borough of Ocean Gate
DPW Garage

Description	Quantity	Manufacturer Name	Model No.	Serial Number	Equipment Type	Capacity/Size	Operating Hours	Location	Areas Served	Estimated Efficiency	Approximate Age	Useable Life Expectancy (years)
Gas Space Heater	1	Luxaire	UH1S0LE	NA	Unit Heater	150,000 Btu, 1/8 HP	Winter	Loft	Main Garage	80%	10	13
Gas Space Heater	1	Lennox	LF24-200A-6	NA	Unit Heater	195,000 Btu, 1/8 HP	Winter	Loft	Main Garage	80%	10	13
Air Compressor	1	Ingersol Rand	242-5G3	396567	Reciprocating compressor	5 HP motor	N/A	Loft		83%	15	18
Space Heater	1	Emerson Chromalox		NA	Electric	~ 3 kW	none	Tool Storage Room	Tool Storage	100%	15	13
IR Heaters (5)	1	Emerson Chromalox	RD035-305	NA	IR ElectricHeater	~ 4 kW	none	Main garage	Main Garage	85%	10	18
DHW Heater	1		RP20P4-1	RU117821730	Electric	3 kW	Whenever bathroom is used	Loft	bathroom, main garage sink	98%	5	15

Borough of Ocean Gate
CHA #21611
Building: DPW Building

Cost of Electricity: **$0.179 $/kWh**
$1.24 $/kW

		EXISTING CONDITIONS									
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Retrofit Control**	**Annual kWh**	
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	Retrofit control device	(kW/space) * (Annual Hours)	Notes
2	Main Vehicle Bay	28	T 34 W F 2 (MAG) RL/RB	F42ES	80	2.2	SW	2340	PDLS	5,242	
185	DPW Office	2	DC 40 W F 4	F44ES	160	0.3	SW	2340	COCC	749	
109	Break Area	2	SP I 150	I150/1	150	0.3	SW	2340	None	702	
191	Tool Storage Area	1	S 60 C F 2 (ELE) 8'	F82SS	173	0.2	SW	2340	OCC	405	
2	Bathroom	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	SW	2340	OCC	187	
2	Secondary Vehicle Bay	12	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.0	SW	2340	None	2,246	
X1	Above Doors	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	None	39	
71	Hallway near Bathroom	1	I 60	I60/1	60	0.1	SW	2340	Nonn	140	
	Total	**50**				**4.1**				**9,711**	

APPENDIX N

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	DPW Building	**Date:**	06/15/10		
Engineer:	Matt Pittinger				

Building/Facility Designation DPW Building

Outdoor Winter Design DB Temperature	2.5 *F	**Indoor Winter Design DB Temperature**	68 *F
Outdoor Summer Design DB Temperature	90 *F	**Indoor Summer Design DB Temperature**	74 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 ##	**Indoor Air (70*F) Humidity Ratio**	0.0079 #/#

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

		R Value	Wall Type
	Steel Siding, 4" Insulation, Steel Siding	15.2	1
	Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
	4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
	Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
	4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
	4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
	Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
	Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
	Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
	4" Block, 1" insulation, 8" Block	19.9	16
x	Air Resistance, Corrugated Plastic, 2.5" insulation, Air Resistance	9.6	

Wall Material
Outside Air Resistance
Corrugated Plastic
2.5" Insulation
Inside Air Resistance
Total

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	Weighted Average of Roof and Skylights (see O26 for calcs)	8.88	

Roof Material
Outside Air Resistance
Corrugated Plastic
2.5" Insulation
Inside Air Resistance
Total

Skylights
Corrugated Plastic
Outside Air Resistance
Inside Air Resistance
Total

Roof Area
Skylights
Normal Roof

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	3,224 SF		
Occupied Area	3,162 SF	**Return Plenum?**	n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	51 Ft	22.5 Ft	22.5 Ft	0 SF	0 SF	1,148 SF
East Exposure	62 Ft	20.0 Ft	20.0 Ft	18 SF	413 SF	809 SF
South Exposure	51 Ft	22.5 Ft	22.5 Ft	0 SF	21 SF	1,127 SF
West Exposure	62 Ft	20.0 Ft	20.0 Ft	0 SF	630 SF	610 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	DPW Building	Date:	06/15/10		
Engineer:	Matt Pittinger				

Building/Facility Designation: DPW Building

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	0	38 btu/h/sf	0.8	0.75	Glass Type C	0 Btu/hr
East Exposure	18	216 btu/h/sf	0.8	0.31	Glass Type C	964 Btu/hr
South Exposure	0	109 btu/h/sf	0.8	0.58	Glass Type C	0 Btu/hr
West Exposure	0	216 btu/h/sf	0.8	0.29	Glass Type C	0 Btu/hr
						964 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	1,148	0.10	20 °F	1.0	2,403 Btu/hr
East Exposure	809	0.10	39 °F	1.0	3,303 Btu/hr
South Exposure	1,127	0.10	27 °F	1.0	3,184 Btu/hr
West Exposure	610	0.10	22 °F	1.0	1,405 Btu/hr
Roof	3,224	0.11	73 °F	1.0	26,497 Btu/hr
Fenestration	18	1.05	16 °F		302 Btu/hr
Doors	1,064	0.76	27 °F		21,792 Btu/hr
Ceiling	3,162	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	3,162	0.04	0 °F		0 Btu/hr
					58,887 Btu/h

INTERNAL HEAT GAINS

							Room Heat Gain
Lights	0.80 w/sf x	3,162 Occ Area =	2.5 kW x 3.4x		1.0 RAF =		8,634 Btu/h
Plug Load	0.70 w/sf x	3,162 Occ Area =	2.2 kW x 3.4x		1.0 RAF =		7,554 Btu/h
People	8 people x	255 btu/person x	30% time in space =				612 Btu/h
Computer Work Stations		2 Units x	120 W/Unit x		3414 =		819 Btu/h
Equipment	0.0 kW x 3.413 =						0 Btu/h
Misc.							0 Btu/h
							17,619 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.		Room Heat Gain
Walls	3,693 SF	0.15 CFM/SF		1.04	16 °F		9,992 Btu/h
Doors	1,064 SF	0.30 CFM/LF	0.34 LF/SF	1.04	16 °F		1,948 Btu/h
Windows	18 SF	0.20 CFM/LF	1.33 LF/SF	1.04	16 °F		87 Btu/h
Ventilation	0 cfm			1.04	16 °F		0 Btu/h
							12,026 Btu/h

COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE 4,950

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	0	0.10	20	1.0	0 Btu/hr
East Exposure	0	0.10	39	1.0	0 Btu/hr
South Exposure	0	0.10	27	1.0	0 Btu/hr
West Exposure	0	0.10	22	1.0	0 Btu/hr
Roof	3,224	0.11	73	0.0	0 Btu/hr
					0 Btu/h

INTERNAL HEAT GAINS

Lights	0.80 w/sf x	3,162 Occ Area =	2.5 kW x3413x	0.00 RAF =	0 Btu/h
Misc.					0 Btu/h
					0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT	
Solar	964
Conduction to Room	58,887
Conduction to Plenum	0
Ventilaton and Infiltration	12,026
Sub Total	71,877

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Internal Gains to Room	17,619
Internal Gains to Plenum	0
Sub Total	17,619

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	DPW Building	**Date:**	06/15/10		
Engineer:	Matt Pittinger				

Building/Facility Designation DPW Building

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	3,224 SF	0.15 CFM/SF	4,629	0.0042 ##	9,497 Btu/h
Doors	1,064 SF	0.30 CFM/LF	4,629	0.0042 ##	2,121 Btu/h
Windows	18 SF	0.20 CFM/LF	4,629	0.0042 ##	94 Btu/h
Ventilation	0 cfm		4,629	0.0042 ##	0 Btu/h
People	8 people	0.30 time in space		250 Btu/hr/person	600 Btu/h
					12,312 Btu/h

Cooling Load Summary

	Sensible	Latent	Total		
Temperature Dependent Gains	71,877	12,312	84,189		
Temperature Indep. Gains	17,619		17,619	SHR=	0.88
Total	89,496	12,312	101,808		

Building Cooling Load 8.5 Tons at 373 SF/Ton

Building Air Flow to Condition Space based on a 12*F Temp Rise is **7,145 CFM** / **2.26 CFM/sf**

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	1,148	0.10	66	7,869 Btu/h
East Exposure	809	0.10	66	5,548 Btu/h
South Exposure	1,127	0.10	66	7,725 Btu/h
West Exposure	610	0.10	66	4,183 Btu/h
Fenestration	18	1.05	66	1,238 Btu/h
Roof	3,224	0.11	66	23,775 Btu/h
Doors	1,064	0.76	66	52,865 Btu/h
Ceiling	3,162	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	3,224	0.04	10	1,290 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	3,693 SF	0.15 CFM/SF	1.04	66	554 cfm	37,873 Btu/h
Doors	1,064 SF	0.30 CFM/LF	1.04	66	108 cfm	7,384 Btu/h
Windows	18 SF	0.20 CFM/LF	1.04	66	5 cfm	328 Btu/h
Ventilation Load	0 cfm		1.04	66	0 cfm	0 Btu/h
Total Ventilation & Infiltration Load					667 cfm	45,585 Btu/h

Building Heating Load	150,078	**btu/h**
		47.5 btu/sf

Borough of Ocean Gate
CHA #21611
Building: DPW Building

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
East	14.0	14.0	2	392.0	112.0
	3.0	7.0	1	21.0	20.0
				0.0	0.0
			Sub-total	413.0	132.0
South	3.0	7.0	1	21.0	20.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	21.0	20.0
West	3.0	7.0	2	42.0	40.0
	14.0	14.0	3	588.0	168.0
			Sub-total	630.0	208.0
			Total	**1064.0**	**360.0**

LF/SF
0.34

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North	51.0	22.5	1	1147.5	147.0		All wall quantities must remain equal to 1
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	51.0	22.5		1147.5	147.0	22.5	Average height wall automatically linked to
East	62.0	20.0	1	1240.0	164.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	62.0	20.0		1240.0	164.0	20.0	Average height wall automatically linked to
South	51.0	22.5	1	1147.5	147.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	51.0	22.5		1147.5	147.0	22.5	Average height wall automatically linked to
West	62.0	20.0	1	1240.0	164.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	62.0	20.0		1240.0	164.0	20.0	Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
East	3.0	3.0	2	18.0	24.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	18.0	24.0	
South				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
West				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
			Total	**18.0**	**24.0**	LF/SF 1.33

Skylight	Width	Length	Quantity
	2.0	8.0	16
		Total Area	256

Total Roof Area

25.5	62.0	2
	Total Area	3162

Borough of Ocean Gate
CHA #21611
Building: DPW Building

Reconcile Thermal Model

Building Footprint	3,162	SF	Ex Occupied Clng Temp.	74	*F	Ex Occupied Htg Temp.	68 *F
Heating Efficiency	80%		Ex Unoccupied Clng Temp.	74	*F	Ex Unoccupied Htg Temp.	68 *F
Cooling Efficiency	0.00	kW/ton	Occupied Cooling UA	(3,741)	btu/hr/*F	Occupied Heating UA	1,595 btu/hr/*F
Internal Gains	17,619	btu/h	Unoccupied Cooling UA	(3,680)	btu/hr/*F	Unoccupied Heating UA	1,595 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	-106,610	-64,808	-8,809	-104,892	-64,808	-529	0	0	0	0
97.5	42.5	3	1	2	-87,906	-45,006	-8,809	-86,490	-45,006	-529	0	0	0	0
92.5	39.5	34	9	25	-69,203	-36,005	-8,809	-68,088	-36,005	-529	0	0	0	0
87.5	36.6	131	35	96	-50,499	-27,303	-8,809	-49,686	-27,303	-529	0	0	0	0
82.5	34.0	500	134	366	-31,796	-19,502	-8,809	-31,284	-19,502	-529	0	0	0	0
77.5	31.6	620	166	454	-13,092	-12,302	-8,809	-12,881	-12,302	-529	0	0	0	0
72.5	29.2	664	178	486	0	0	-8,809	0	0	-529	0	0	0	0
67.5	27.0	854	229	625	798	360	-8,809	798	360	-529	0	0	0	0
62.5	24.5	927	248	679	8,774	3,960	-8,809	8,774	3,960	-529	0	0	0	116
57.5	21.4	600	161	439	16,751	7,561	-8,809	16,751	7,561	-529	0	0	0	162
52.5	18.7	610	163	447	24,727	11,161	-8,809	24,727	11,161	-529	0	0	0	253
47.5	16.2	611	164	447	32,704	14,762	-8,809	32,704	14,762	-529	0	0	0	342
42.5	14.4	656	176	480	40,680	18,362	-8,809	40,680	18,362	-529	0	0	0	462
37.5	12.6	1,023	274	749	48,657	21,963	-8,809	48,657	21,963	-529	0	0	0	868
32.5	10.7	734	197	537	56,633	25,563	-8,809	56,633	25,563	-529	0	0	0	729
27.5	8.6	334	89	245	64,610	29,164	-8,809	64,610	29,164	-529	0	0	0	380
22.5	6.8	252	68	185	72,586	32,764	-8,809	72,586	32,764	-529	0	0	0	323
17.5	5.5	125	33	92	80,563	36,365	-8,809	80,563	36,365	-529	0	0	0	178
12.5	4.1	47	13	34	88,539	39,965	-8,809	88,539	39,965	-529	0	0	0	74
7.5	2.6	22	6	16	96,516	43,565	-8,809	96,516	43,565	-529	0	0	0	38
2.5	1.0	13	3	10	104,492	47,166	-8,809	104,492	47,166	-529	0	0	0	24
-2.5	0.0	0	0	0	112,469	50,766	-8,809	112,469	50,766	-529	0	0	0	0
-7.5	-1.5	0	0	0	120,445	54,367	-8,809	120,445	54,367	-529	0	0	0	0
TOTALS		8,760	2,346	6,414								0	0	3,948

Existing Building Ventilation & Infiltration (occ)	**667 cfm**
Overheat Ventilation Factor	**1.00**
Additional ventilation to offset overheat	**0 cfm**
Existing Building Ventilation & Infiltration (unocc)	**667 cfm**
Economizer Ventilation (from AHU's)	**0 cfm**

Energy Use Indices (calculated)

	Base Case
Heating	3,948
Target ->	3,944
	100.1%

	Base Case
Cooling	0
Target ->	300
	0.0%