TABERNACLE TOWNSHIP
DEPARTMENT OF PUBLIC WORKS BUILDING
ENERGY ASSESSMENT

for

NEW JERSEY
BUREAU OF PUBLIC UTILITIES

CHA PROJECT NO. 21063

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1.0 INTRODUCTION AND BACKGROUND

The Department of Public Works Building (DPW) was constructed in 1980. The single story, 2,290 square foot structure, located at 163 Carranza Road in Tabernacle, New Jersey, includes a two bay garage, lunchroom, storage room, and restroom.

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 summarizes the energy audit for Tabernacle, New Jersey Department of Public Works Building. The 2,290 square foot single story structure consists of a two bay garage, lunchroom, storage room, and restroom. The following areas were evaluated for energy conservation measures:

- Furnace replacement
- Insulation upgrade
- Lighting replacement
- Night setback
- Door seals

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Measures which are recommended for implementation have a payback of 10 years or less. This threshold is considered a viable return on investment. Potential annual savings of $4,400 for the recommended ECMs may be realized with a payback of 4.9 years.

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

ECM-1 Furnace Replacement

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
6,800	0	0	1,190	(1,220)	1,000	1.9	300	6.8	6.5

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

ECM-2 Increase Wall Insulation

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
10,100	0	0	500	0	1,500	1.2	NA	6.7	NA

*There is currently no incentive from the New Jersey Smart Start Program.

ECM-3 Night Setback

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
300	0	0	130	0	400	4.0	NA	0.8	NA

*There is currently no incentive from the New Jersey Smart Start Program.

ECM-4 Install Door Seals

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
1,200	0	680	90	0	200	0.76	NA	6.0	NA

*There is currently no incentive from the New Jersey Smart Start Program.

ECM-5 Lighting Replacements

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
3,700	0	4,630	0	0	800	2.3	400	4.6	4.1

* Incentive available through the New Jersey Smart Start Program.

3.0 EXISTING CONDITIONS

3.1 Building - General

The DPW building is a single story, 2,290 square foot structure consisting of a two bay garage, lunchroom, tool storage room, and restroom.

The DPW operates from 8:00 AM to 4:00 PM five days a week and is occupied by about three people.

Construction of the building's exterior walls consists of plaster over concrete masonry unit (CMU) block. The interior of the garage bays are unfinished with the CMU; the lunch room has finished walls. There are several windows along the building exterior. The DPW's roof has batt insulation and steel framing and a steel deck.

3.2 Utility Usage

Utilities include electricity and fuel oil. Electricity is purchased from Atlantic City Electric and fuel oil is purchased from Majestic Oil Company. The building does have a well outside and does not pay for water.

From January 2009 through December 2009, electric usage was approximately 19,000 kWh at a cost of about $3,300. Analyzing electricity bills during this period, the building was charged at an average demand unit cost of $12 per kW; and a blended unit cost of $0.17 per kWh. Electricity usage was highest in the summer months when the air conditioning equipment operates. In 2009 the building heat required about 1,840 gallons of oil. Based on the annual cost of about $3,700, the blended price per gallon was about $2.04. Fuel oil consumption is highest in the winter months to heat the building. Utility data can be found in Appendix A.

Electricity supply and delivery is presently purchased from Atlantic City Electric. The delivery component will always be the responsibility of the utility that connects the facility to the power grid; however, the supply can be purchased from a third party. The electricity 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 energy commodity suppliers can be found in Appendix A.

3.3 HVAC Systems

3.3.1 Space Heating System

The building's primary heating system consists of two, Comfort Air Patriot 80 oil fired forced hot air furnaces. Both air handlers are located in the garage bay and hung from the roof and walls. One unit serves the lunchroom and is relatively new; the other unit handles the garage and is older and less efficient.

3.3.2 Air Conditioning Systems

The only AC system is for the lunchroom and consists of one cooling coil attached to the furnace. The coil is connected to a two ton condensing unit located outside, which is in good condition.

3.3.3 Building Ventilation and Exhaust Systems

Primary ventilation is provided by the operable windows throughout the building. The restroom exhaust fan operates with the light switch.

3.4 Control Systems

HVAC in this building is controlled by two thermostats, each scheduled for night setback. For both the lunchroom and garage areas, the occupied setpoint for heating is 70°F and the unoccupied is 62°F. The lunchroom cooling occupied setpoint is 72°F and unoccupied is 80°F. The thermostats are not programmed for weekend schedules and the same Monday through Friday schedule operates on Saturday and Sunday.

3.5 Lighting/Electrical Systems

The majority of lighting in the building are F34T-12 fixtures that use 80 watts per lamp. These fixtures are either 4 and 8' bulbs and various U tubes. The exit lights are incandescent.

Lighting is controlled by individual switches at the entrances to each space. Lighting remains on during normal business hours, generally, eight to nine hours daily. Some fixtures use incandescent screw-type bulbs that can be easily upgraded. There are several outdoor incandescent lighting fixtures mounted directly to the building.

3.6 Plumbing Systems

Domestic hot water is generated by a 6 gallon electric hot water heater with an input of 1,500 watts. This unit, located in the tool room, is in good condition.

There is one restroom and all fixtures are standard high flow type.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Furnace Replacement

Space heating is provided by two, fuel oil fired, Comfort Air Patriot 80 furnaces. This ECM evaluated replacing the furnace which serves the garage with a high efficiency, condensing furnace along with new gas service to the building. The local gas utility, South Jersey Gas, was contacted and stated that new gas service and a gas meter would be provided at no charge. Modern condensing furnaces operate at much higher efficiencies and change fan speeds resulting from part load conditions, enabling the furnace to provide heat more accurately to match the changing building load, which saves energy.

Following review of the fuel oil utility bills, both furnaces combined consume about 1,840 gallons of fuel oil annually and it is estimated the furnace serving the garage area consumes about 65% of that or 1,190 gallons. With estimated average efficiencies of 95%, the proposed new condensing furnace will require approximately 1,880 therms to meet the heat load, resulting in a savings of about $1,500 per year. The proposed efficiency rating is based on the use of a new Rheem high efficiency 95% natural gas furnace with 60,000 Btuh input. This furnace would be used as a direct replacement for the existing furnace.

In addition to the new condensing furnace, other components of this measure include new direct vent flue system, and new gas piping.

Condensing furnaces have an expected life of 20 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 23,800 gallons fuel oil and (37,600) therms, totaling $19,400.

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

ECM-1 Furnace Replacement

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
6,800	0	0	1,190	(1,220)	1,000	1.9	300	6.8	6.5

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

This measure is recommended

4.2 ECM-2 Increase Wall Insulation

The interior walls of the garage area are not finished and have exposed CMUs. There is no insulation and this area is heated by one furnace. Significant savings can result from the installation of new rigid board insulation (R-14) attached to the interior walls of the garage.

The difference in heating BTUs between the initial and proposed calculations is taken as the savings. Following implementation of this measure, it is expected the building's annual heating consumption will be reduced by approximately 60,000 KBTU.

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

ECM-2 Increase Wall Insulation

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
5,600	0	0	500	0	900	2.2	NA	6.2	NA

*There is currently no incentive from the New Jersey Smart Start Program.

This measure is recommended.

4.3 ECM-3 Night Setback

HVAC system controls are based upon standard programmable thermostats for heating and cooling; some provisions have been made for temperature setback during unoccupied times. By replacing the older thermostats with seven day programmable models, thermostats can be programmed to increase the unoccupied space temperature set back timeframes to save additional heating and cooling energy. This ECM models the expected savings of adjusting the unoccupied temperature setpoints. The setbacks are 62°F heating and 80°F cooling periods. In the calculations for this measure, occupied temperature setpoints were maintained per those in use at the time of the energy audit.

To calculate the benefits of night setback, a block load building model was created to approximate the existing energy load for the building. The block load, provided in Appendix D, models the maximum overall cooling and heating load for the building, taking into account various parameters such as roof, wall, and window construction; total envelope surface area; ventilation and infiltration loads; building occupancy; internal heat generation; and other sources of heat gains and losses. By entering this calculated maximum load into a spreadsheet containing bin temperature data, the total accumulated year-round cooling and heating energy requirements were determined. The heating and cooling loads for the building were then reconciled to building utility data and HVAC equipment energy requirements to confirm the model's accuracy. The bin temperature spreadsheets are included in Appendix D.

The difference in heating BTUs between the existing and proposed models is taken as the savings. Following implementation of this measure, it is expected the building's annual fuel oil consumption will be reduced by approximately 420 gallons.

Programmable thermostats have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 970 gallons of fuel oil totaling $1,500.

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

ECM-3 Night Setback

Budgetary Cost	Annual Utility Savings						Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total	ROI			
$	kW	kWh	Gallons	Therms	$		$	Years	Years
300	0	0	65	0	100	4.0	NA	3.0	NA

*There is currently no incentive from the New Jersey Smart Start Program.

This measure is recommended.

4.4 ECM-4 Install Door Seals

The main two main overhead doors and entrance door do not seal properly, which causes infiltration of outdoor air into the conditioned areas. Installing new door seals will minimize infiltration and reduce heating and cooling energy consumption.

For this calculation, the block load developed for the existing building conditions in section 4.1 was utilized as a baseline for building energy consumption. Per this model, the existing infiltration around the front entrance doors is about 77 CFM. Assuming the proposed door seals reduce the amount of outdoor air infiltration to about 15 CFM, it is estimated that an annual savings of about 80 gallons of fuel oil can be expected.

Door seals have an expected life of 10 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 800 gallons fuel oil and $2,000.

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

ECM-4 Install Door Seals

Budgetary Cost	Annual Utility Savings						Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total	ROI			
$	kW	kWh	Gallons	Therms	$		$	Years	Years
1,200	0	0	80	0	200	0.7	NA	6.0	NA

*There is currently no incentive from the New Jersey Smart Start Program.

This measure is recommended.

4.5 ECM-5 Lighting Replacements

A comprehensive fixture survey was conducted of the entire building. Each switch and circuit was identified, and the number of fixtures, locations, and existing wattage established. The majority of the lighting in the facility utilizes T-12 lamps with magnetic ballasts, which are regarded as inefficient by

today's standards. In addition, the existing exit signs utilize older, incandescent technology, which can be upgraded to more efficient lighting technology.

Energy savings for this measure were calculated by applying the existing and proposed fixture wattages to the estimated time of operation. The difference resulted in an annual savings of 4,630 kWh per year. Supporting calculations, including all assumptions for lighting hours and the annual energy usage for each fixture is provided in Appendix F.

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

Lighting has an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 69,430 kWh, totaling $12,000.

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

ECM-5 Lighting Replacements

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
3,600	0	4,630	0	0	800	2.3	400	4.5	4.1

* Incentive available through the New Jersey Smart Start Program.

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. 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.

A new incentive structure is in place for projects exceeding 20% in energy savings, which doubles incentives #2 and #3 for a total of $0.36/kWh and $3.60/therm. For Incentive #1, the maximum incentive has been raised to 80% of project costs, or $2 million per gas account and $2 million per electric account. The 200 kW/month average minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations. This new incentive structure has been extended to December 31, 2010.

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.

5.2 Building Incentives

5.2.1 New Jersey Pay For Performance Program

Under incentive #1 of the New Jersey Pay for Performance Program, the 2,290 square foot building is eligible for about $100 towards the development of an Energy Reduction Plan. When calculating the total amount under Incentives #2 and #3, all energy conservation measures are applicable as the amount received is based on building wide energy improvements. Since the overall energy reduction for the building is not estimated to exceed the 15% minimum, the facility is ineligible for Incentives #2 and #3 as previously discussed. See Appendix G for calculations.

5.2.2 New Jersey Smart Start Program

The Tabernacle DPW Building is eligible for several incentives available under the New Jersey Smart Start Program. The total amount of all qualified incentives is about $700 and includes installing energy efficient lighting and a new high efficient furnace.

Incentives cannot be accepted under multiple programs.

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 oil fired furnaces to meet the HVAC requirements. All of the existing equipment is not compatible with a geothermal energy source. Therefore, to take advantage of a GHP system, the existing mechanical equipment would have to be removed or overhauled; and either a low temperature closed loop water source heat pump system or a water to water heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground.

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

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

The DPW 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 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 Philadelphia, Pennsylvania and a fixed tilt array type was utilized to calculate energy production. The PVWATT solar power generation model is provided in Appendix H.

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

Installation of (PV) arrays in the state New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission

producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1000 kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. The approximate cost of the ACP penalty for 2010 is $700; this is the amount that must be paid per SERC by the high emission producers. The expected dollar amount that will be paid to the PV producer for 2010 is around $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 12 kW and a minimum of 8 kW, from January 2009 through December 2009. The monthly average over the observed 12 month period was 10 kW. The existing load does not justify the use of the maximum incentive cap of 50 kW of installed PV solar array; therefore, an 8.0 kW system was used 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 for a system of this size is currently estimated at $7 per watt or $7,000 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 H and summarized below:

Photovoltaic (PV) Rooftop Solar Power Generation – 8 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
56,000	0	9,650	0	1,600	1,600	8,000	4,700	>25	7.6

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

While the payback period justifies recommendation of the measure, further investigation of possible installation locations, required system maintenance, and local installation costs are suggested prior to implementation.

6.2.2 Solar Thermal Hot Water Plant

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

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

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

Currently, an incentive is not available for installation of thermal solar systems. A Federal tax credit of 30% of installation cost for the thermal applications is available; however, the Tabernacle Township 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 I 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	1,250	0	200	200	NA	>25	NA

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

This measure is not recommended.

6.3 Wind

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

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

The New Jersey Clean Energy Program for small wind installations has designated numerous pre-approved wind turbines for installation in the State of New Jersey. Incentives for wind turbine installations are based on kilowatt hours saved in the first year. Systems sized under 16,000 kWh per year

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

The most important part of any small wind generation project is the mean annual wind speed at the height of which the turbine will be installed. In the Tabernacle, NJ area, the map indicates a mean annual wind speed of just under 10 miles per hour. For the municipal building, there are site restrictions. Parking lots, trees and surrounding structures would greatly affect a tower location.

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

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

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 municipal building does not have sufficient need for electrical generation and the ability to use most of the thermal byproduct during the winter, thermal usage during the summer months is low. Thermal energy produced by the CHP plant in the warmer months will be wasted. Purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

This measure is not recommended.

6.5 Biomass Power Generation

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

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

- Wood wastes not adulterated with chemicals, glues or adhesives

- Agricultural residues (corn stover, rice hulls or nut shells, manures, poultry litter, horse manure, etc) and/or methane gases from landfills
- Food wastes
- Municipal tree trimming and grass clipping wastes
- Paper and cardboard wastes
- Non adulterated construction wood wastes, pallets

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

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

* from NJOCE Website

This measure is not recommended because of noise issues, potential zoning issues, and because the DPW building does not have a steady waste stream to fuel the power generation system. Additionally, purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

6.6 Demand Response Curtailment

Utility Curtailment is an agreement with the electric utility company 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 during emergencies. Part of the program also will require that program participants reduce their required load or run emergency generators with notice to test the system.

A pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. The building had a maximum electricity demand of 12 kW and an average of 10 kW, in 2009.

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

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 is considered a high energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 201 kBTU/ft^2/year; however; after implementing the measures discussed in this report, the building can expect to lower their EUI to 166 kBTU/ft^2/year. Several factors contribute to the unfavorable EUI, including, wasted energy from poorly insulated walls, unnecessary heating during unoccupied hours, and inefficient lighting operation. The EPA Portfolio Manager did not generate an energy rating score for this building because this type of facility is not eligible.

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

The user name and password for the municipal building's EPA Portfolio Manager Account has been provided to Douglas Cramer of the Township of Tabernacle.

8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the Department of Public Works, in Tabernacle, New Jersey identified potential ECMs for furnace replacement, insulation upgrade, lighting replacement, night setback, and door seals. Potential annual savings of $4,400 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-1 Furnace Replacement

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
6,800	0	0	1,190	(1,220)	1,000	1.9	300	6.8	6.5

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

ECM-2 Increase Wall Insulation

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
10,100	0	0	500	0	1,500	1.2	NA	6.7	NA

*There is currently no incentive from the New Jersey Smart Start Program.

ECM-3 Night Setback

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
300	0	0	130	0	400	4.0	NA	0.8	NA

*There is currently no incentive from the New Jersey Smart Start Program.

ECM-4 Install Door Seals

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
1,200	0	680	90	0	200	0.76	NA	6.0	NA

*There is currently no incentive from the New Jersey Smart Start Program.

ECM-5 Lighting Replacements

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total				
$	kW	kWh	Gallons	Therms	$		$	Years	Years
3,700	0	4,630	0	0	800	2.3	400	4.6	4.1

* Incentive available through the New Jersey Smart Start Program.

APPENDIX A

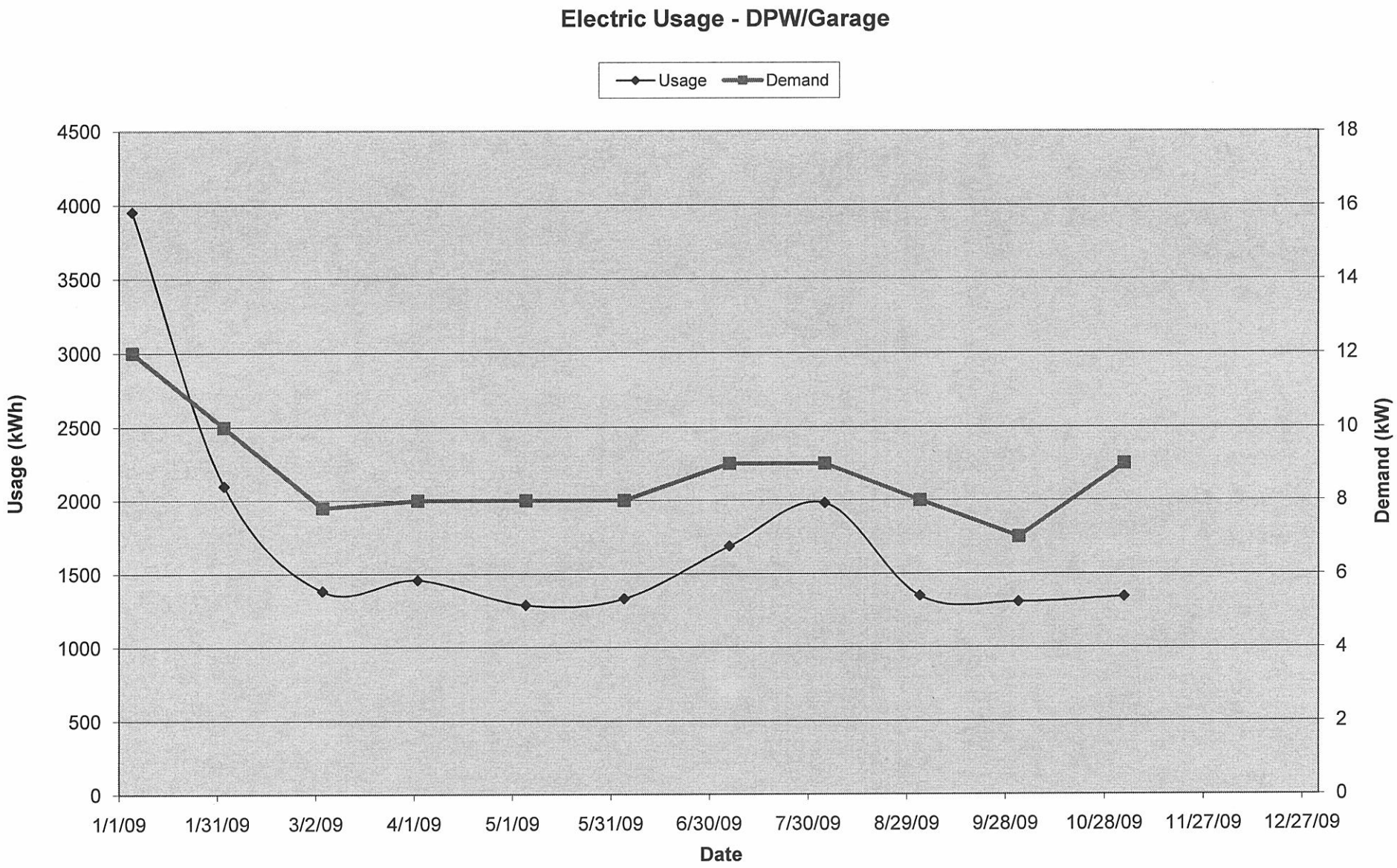
Utility Usage Analysis

New Jersey BPU Energy Audit Program
CHA #21063
Tabernacle Township
DPW/Garage

Account Number: 0039-6819-9996
Atlantic City Electric

Meter #: 60623446

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
1/5/09	2434	12	$ 400	$0.00	$400.00	0.1643	0.1643	-
2/2/09	3954	12	$ 590	$32.00	$558.00	0.1492	0.1411	2.67
3/4/09	2098	10	$ 333	$25.00	$308.00	0.1587	0.1468	2.50
4/2/09	1384	7.8	$ 225	$18.00	$207.00	0.1626	0.1496	2.31
5/5/09	1459	8	$ 240	$19.00	$221.00	0.1645	0.1515	2.38
6/4/09	1289	8	$ 212	$16.00	$196.00	0.1645	0.1521	2.00
7/6/09	1332	8	$ 266	$0.00	$266.00	0.1997	0.1997	-
8/4/09	1687	9	$ 334	$0.00	$334.00	0.1980	0.1980	-
9/2/09	1981	9	$ 399	$26.00	$373.00	0.2014	0.1883	2.89
10/2/09	1349	8	$ 266	$0.00	$266.00	0.1972	0.1972	-
11/3/09	1309	7	$ 229	$17.00	$212.00	0.1749	0.1620	2.43
12/3/09	1344	9	$ 230	$0.00	$230.00	0.1711	0.1711	-
Total	19,186	12.0	$3,324.00	$153.00	$3,171.00	0.1733	0.1653	1.60
Most Recent Yr	19,186	12.0	$3,324.00	$153.00	$3,171.00	0.1733	0.1653	1.60

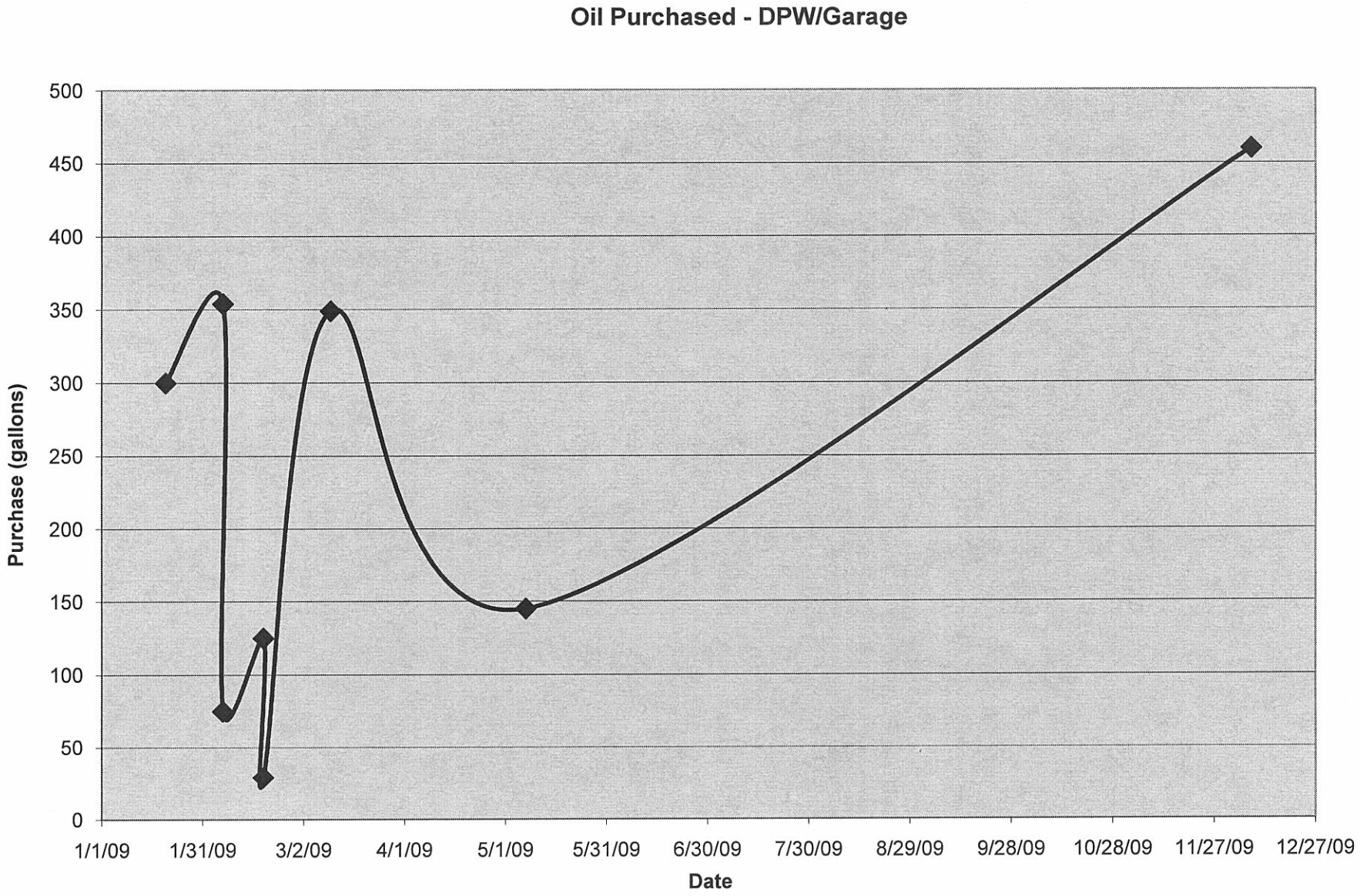

Electric Usage - DPW/Garage
Usage
Demand
Usage (kWh)
Demand (kW)
Date
4500
4000
3500
3000
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
1/1/09
1/31/09
3/2/09
4/1/09
5/1/09
5/31/09
6/30/09
7/30/09
8/29/09
9/28/09
10/28/09
11/27/09
12/27/09

New Jersey BPU Energy Audit Program
CHA #21063
Tabernacle Township
DPW/Garage

Account Number: 2349
Majestic Oil Company

Date	Gallons	Cost	($/Gallon)
1/20/09	300	$603	2.010
2/6/09	354	$712	2.011
2/6/09	75	$150	2.000
2/18/09	125	$230	1.840
2/18/09	29	$53	1.828
3/10/09	349	$594	1.702
5/7/09	145	$260	1.793
12/8/09	460	$1,141.00	2.480

Total	1,837	$3,743.00	2.038
Most Recent Yr	1,837	$3,743.00	2.038


Oil Purchased - DPW/Garage
Purchase (gallons)
500
450
400
350
300
250
200
150
100
50
0
1/1/09
1/31/09
3/2/09
4/1/09
5/1/09
5/31/09
6/30/09
7/30/09
8/29/09
9/28/09
10/28/09
11/27/09
12/27/09
Date

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

APPENDIX B

ECM-1 Furnace Replacement

Tabernacle Township
CHA #21063
Building: Department of Public Works Garage

ECM-1 Furnace Replacement

Existing Fuel	#2 Oil
Proposed Fuel	Nat.Gas

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	$2.04		
Proposed Fuel Cost	$1.20		
Baseline Fuel Use	1,194	Gals #2	Oil usage for Garage area only
Existing Furnace Efficiency	70%		Estimated or Measured
Baseline Load	115,930	Mbtu/yr	Baseline Fuel Use x Existing Efficiency x 138.7 Mbtu/Gals #2
Baseline Fuel Cost	$ 2,433		
Proposed Efficiency	95%		New Furnace Efficiency
Proposed Fuel Use	1,220	Therms	Baseline Furnace Load / Proposed Efficiency / 100 Mbtu/Therms
Proposed Fuel Cost	$ 1,464		
Annual Savings	1,194	Gals #2	
	(1,220)	Therms	
Annual Savings	**$ 969**	**/yr**	

Tabernacle Township
CHA #21063
Building: Department of Public Works Garage

ECM-1 Furnace Replacement

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.		
New Furnace for Garage only, all electrical	1	ls				$ -	$ -	$ -	$ 6,000	Contractor Quote includes O&P
and low voltage wiring						$ -	$ -	$ -	$ -	
RHEEM Model RGTC06EMAES						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 6,000	Subtotal
$ 800	10% Contingency
$ -	0% Contractor O&P
$ -	0% Engineering
$ 6,800	**Total**

APPENDIX C

ECM-2 Increase Wall Insulation

Tabernacle Township
CHA #21063
Building: Department of Public Works Garage

ECM-2 Install Wall Insulation

Total Existing Wall Area	1,900	sf	NEW
Existing U-value	0.40	Btu/hr/(sf*F)	
Proposed U-value	0.07	Btu/hr/(sf*F)	assume 3" rigid @ R=15
Heating Efficiency	75%		
Cooling Efficiency	1.30	kW/ton	

Existing Cooling		
Max. North Wall Cooling Load	1,216	Btu/hr
Max. East Wall Cooling Load	11,934	Btu/hr
Max. South Wall Cooling Load	6,696	Btu/hr
Max. West Wall Cooling Load	6,512	Btu/hr
Proposed Cooling		
Max. North Wall Cooling Load	203	Btu/hr
Max. East Wall Cooling Load	1,989	Btu/hr
Max. South Wall Cooling Load	1,116	Btu/hr
Max. West Wall Cooling Load	1,085	Btu/hr
Occupied Cooling Setpoint	72	F
Unoccupied Cooling Setpoint	80	F
Existing Cooling Total	731	kWh/yr
Proposed Cooling Total	122	kWh/yr
Savings	609	kWh/yr

Existing Heating		
Existing Heating Load Temp Diff.	56	F
Existing Max. Wall Heating Load	18,838	Btu/hr
Proposed Heating		
Proposed Max. Heating Load	3,140	Btu/hr
Occupied Heating Setpoint	70	F
Unoccupied Heating Setpoint	62	F
Existing Heating Total	71,000,792	Btu/yr
Proposed Heating Total	11,833,465	Btu/yr
Savings	59,167,327	Btu/yr
	789	therms
	422.62	gallons

				Occupied				Unoccupied							
Avg Outdoor Air Temp. Bins °F	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Cooling Load	Existing Heating Load	Proposed Cooling Load	Proposed Heating Load
				(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(kWh/yr)	(Btu/yr)	(kWh/yr)	(Btu/yr)
97.5	3	1	2	26,358	4,393	-	-	26,358	4,393	-	-	9	-	1	-
92.5	34	8	26	21,190	3,532	-	-	18,827	3,138	-	-	71	-	12	-
87.5	131	31	100	16,022	2,670	-	-	11,296	1,883	-	-	176	-	29	-
82.5	620	148	472	10,853	1,809	-	-	3,765	628	-	-	366	-	61	-
77.5	664	158	506	5,685	948	-	-	-	-	-	-	97	-	16	-
72.5	854	203	651	517	86	-	-	-	-	-	-	11	-	2	-
67.5	927	221	706	-	-	1,900	317	-	-	-	-	-	419,357	-	69,893
62.5	600	143	457	-	-	5,700	950	-	-	-	-	-	814,286	-	135,714
57.5	610	145	465	-	-	9,500	1,583	-	-	3,420	570	-	2,969,248	-	494,875
52.5	611	145	466	-	-	13,300	2,217	-	-	7,220	1,203	-	5,295,915	-	882,653
47.5	656	156	500	-	-	17,100	2,850	-	-	11,020	1,837	-	8,178,758	-	1,363,126
42.5	1,023	244	779	-	-	20,900	3,483	-	-	14,820	2,470	-	16,641,774	-	2,773,629
37.5	734	175	559	-	-	24,700	4,117	-	-	18,620	3,103	-	14,729,632	-	2,454,939
32.5	334	80	254	-	-	28,500	4,750	-	-	22,420	3,737	-	7,971,785	-	1,328,631
27.5	252	60	192	-	-	32,300	5,383	-	-	26,220	4,370	-	6,972,240	-	1,162,040
22.5	125	30	95	-	-	36,100	6,017	-	-	30,020	5,003	-	3,933,452	-	655,575
17.5	47	11	36	-	-	39,900	6,650	-	-	33,820	5,637	-	1,657,578	-	276,263
12.5	22	5	17	-	-	43,700	7,283	-	-	37,620	6,270	-	859,488	-	143,248
7.5	13	3	10	-	-	47,500	7,917	-	-	41,420	6,903	-	557,279	-	92,880
-7.5	0	0	0	-	-	58,900	9,817	-	-	52,820	8,803	-	-	-	-
TOTALS	**8,260**	**1,967**	**6,293**									**731**	**71,000,792**	**122**	**11,833,465**

Tabernacle
CHA #21063
Building: Department of Public Works Garage

ECM-2 Increase Wall Insulation

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT(Sqft)	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
New Insulation for Garage Walls	1900	sf	$ 1.47	$ 0.44		$ 2,745	$ 1,012	$ -	$ 3,756	
Removal and re installation of equipment						$ -	$ -	$ -	$ -	
and work area	24			$ 30		$ -	$ 871	$ -	$ 871	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 4,627	Subtotal
$ 463	10% Contingency
$ 509	10% Contractor O&P
$ -	0% Engineering
$ 5,599	**Total**

APPENDIX D

ECM-3 Night Setback

Tabernacle Township
CHA #21063
Building: Department of Public Works Garage

ECM-3 Night Setback

Building Footprint	2,288	SF	Ex Occupied Clng Temp.	*F		**65**	Gallons
Heating Efficiency	75%		Ex Unoccupied Clng Temp.	*F	**Heating Energy Savings**	**90**	**therms**
Cooling Efficiency	1.3	kW/ton	Prop Occupied Clng Temp.	*F	**Cooling Energy Savings**	**0**	**kWh**
Building Balance Temp.	60	*F	Prop Unoccupied Clng Temp.	*F			
Internal Gains	9,447	btu/h	Occupied Cooling UA	btu/hr/°F			
Unoc Internal Gain factor	0.03		Unoccupied Cooling UA	btu/hr/°F			
Ave Occ Internal Gain Factor	0.7		Cooling Occ Enthalpy Setpoint				
			Cooling Unocc Enthalpy Setpoint				

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

							PROPOSED LOADS									
							Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Total Bin Hours	Existing Occupied Bin Hours	Existing Unoccupied Bin Hours	Proposed Occupied Bin Hours	Proposed Unoccupied Bin Hours	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			K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	0	0	-90,705	-54,899	-6,613	-61,064	-54,899	-283	0	0	0	0
97.5	42.5	3	1	2	1	2	-75,836	-38,124	-6,613	-47,494	-38,124	-283	36	33	0	0
92.5	39.5	34	14	20	10	24	-60,966	-30,499	-6,613	-33,925	-30,499	-283	325	290	0	0
87.5	36.6	131	55	76	39	92	-46,096	-23,129	-6,613	-20,355	-23,129	-283	946	811	0	0
82.5	34	500	208	292	149	351	-31,226	-16,520	-6,613	-6,785	-16,520	-283	2,487	1,972	0	0
77.5	31.6	620	258	362	185	435	-16,357	-10,421	-6,613	0	0	-283	1,726	946	0	0
72.5	29.2	664	277	387	198	466	-1,487	-4,321	-6,613	0	0	-283	384	384	0	0
67.5	27	854	356	498	254	600	3,491	1,525	-6,613	0	0	-283	77	77	0	0
62.5	24.5	927	386	541	276	651	10,472	4,575	-6,613	0	0	-283	0	0	41	29
57.5	21.4	600	250	350	179	421	17,453	7,625	-6,613	6,283	2,745	-283	0	0	102	93
52.5	18.7	610	254	356	182	428	24,435	10,675	-6,613	13,264	5,795	-283	0	0	186	176
47.5	16.2	611	255	356	182	429	31,416	13,725	-6,613	20,246	8,845	-283	0	0	268	258
42.5	14.4	656	273	383	195	461	38,397	16,775	-6,613	27,227	11,895	-283	0	0	375	365
37.5	12.6	1,023	426	597	304	719	45,378	19,824	-6,613	34,208	14,945	-283	0	0	722	706
32.5	10.7	734	306	428	218	516	52,360	22,874	-6,613	41,190	17,995	-283	0	0	616	605
27.5	8.6	334	139	195	99	235	59,341	25,924	-6,613	48,171	21,044	-283	0	0	325	320
22.5	6.8	252	105	147	75	177	66,322	28,974	-6,613	55,152	24,094	-283	0	0	279	275
17.5	5.5	125	52	73	37	88	73,304	32,024	-6,613	62,133	27,144	-283	0	0	155	153
12.5	4.1	47	20	27	14	33	80,285	35,074	-6,613	69,115	30,194	-283	0	0	65	64
7.5	2.6	22	9	13	7	15	87,266	38,124	-6,613	76,096	33,244	-283	0	0	33	33
2.5	1	13	5	8	4	9	94,247	41,174	-6,613	83,077	36,294	-283	0	0	21	21
-2.5	0	0	0	0	0	0	101,229	44,224	-6,613	90,059	39,344	-283	0	0	0	0
-7.5	-1.5	0	0	0	0	0	108,210	47,274	-6,613	97,040	42,394	-283	0	0	0	0
TOTALS		**8,760**	**3,650**	**5,110**									**5,980**	**4,512**	**3,188**	**3,098**

Existing Building Ventilation & Infiltration (occ)	**565**
Overheat Ventilation Factor	**1.00**
Additional ventilation to offset overheat	**0**
Existing Building Ventilation & Infiltration (unocc)	**565**

Tabernacle Township
CHA #21063
Building: Department of Public Works Garage

Reconcile Thermal Model

Building Footprint	2,288	SF	Ex Occupied Clng Temp.	72	°F	Ex Occupied Htg Temp.	70 °F
Heating Efficiency	75%		Ex Unoccupied Clng Temp.	80	°F	Ex Unoccupied Htg Temp.	62 °F
Cooling Efficiency	1.30	kW/ton	Occupied Cooling UA	(2,974)	btu/hr/°F	Occupied Heating UA	1,396 btu/hr/°F
Internal Gains	9,447	btu/h	Unoccupied Cooling UA	(2,714)	btu/hr/°F	Unoccupied Heating UA	1,396 btu/hr/°F
Unoc Internal Gain factor	0.03		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb		
Ave Occ Internal Gain Factor	0.7		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	Ventilation BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load	Ventilation 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	-90,705		-98,639	-6,613	-61,064		-54,899	-283	0	0	0	0
97.5	42.5	3	1	2	-75,836		-68,499	-6,613	-47,494		-38,124	-283	0	33	33	0
92.5	39.5	34	8	26	-60,966		-54,799	-6,613	-33,925		-30,499	-283	0	289	289	0
87.5	36.6	131	31	100	-46,096		-41,556	-6,613	-20,355		-23,129	-283	0	792	792	0
82.5	34.0	500	148	352	-31,226		-29,683	-6,613	-6,785		-16,520	-283	0	1,980	1,980	0
77.5	31.6	620	158	462	-16,357		-18,723	-6,613	0		0	-283	0	728	728	0
72.5	29.2	664	203	461	-1,487		-7,763	-6,613	0		0	-283	0	364	364	0
67.5	27.0	854	221	633	3,491		2,740	-6,613	0		0	-283	0	29	29	0
62.5	24.5	927	143	784	10,472		8,220	-6,613	0		0	-283	0	0	0	20
57.5	21.4	600	145	455	17,453		13,700	-6,613	6,283		2,745	-283	0	0	0	101
52.5	18.7	610	145	465	24,435		19,180	-6,613	13,264		5,795	-283	0	0	0	188
47.5	16.2	611	156	455	31,416		24,660	-6,613	20,246		8,845	-283	0	0	0	278
42.5	14.4	656	244	412	38,397		30,140	-6,613	27,227		11,895	-283	0	0	0	415
37.5	12.6	1,023	175	848	45,378		35,619	-6,613	34,208		14,945	-283	0	0	0	726
32.5	10.7	734	80	654	52,360		41,099	-6,613	41,190		17,995	-283	0	0	0	606
27.5	8.6	334	60	274	59,341		46,579	-6,613	48,171		21,044	-283	0	0	0	331
22.5	6.8	252	30	222	66,322		52,059	-6,613	55,152		24,094	-283	0	0	0	278
17.5	5.5	125	11	114	73,304		57,539	-6,613	62,133		27,144	-283	0	0	0	154
12.5	4.1	47	5	42	80,285		63,019	-6,613	69,115		30,194	-283	0	0	0	65
7.5	2.6	22	3	19	87,266		68,499	-6,613	76,096		33,244	-283	0	0	0	34
2.5	1.0	13	0	13	94,247		73,979	-6,613	83,077		36,294	-283	0	0	0	21
-2.5	0.0	0	0	0	101,229		79,459	-6,613	90,059		39,344	-283	0	0	0	0
-7.5	-1.5	0	0	0	108,210		84,939	-6,613	97,040		42,394	-283	0	0	0	0
TOTALS		8,760	1,967	6,793										4,214	4,214	3,215

Existing Building Ventilation & Infiltration (occ)	**565**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**450**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**565**	**cfm**
Economizer Ventilation (from AHU's)	**0**	**cfm**

Energy Use Indices (calculated)

	Base Case
Heating	3,215
Target ->	2,548
	126.2%

	Base Case
Cooling	4,214
Target ->	300
	1404.8%

HEAT GAIN/LOSS WORKSHEET

Project Name:	Tabernacle Township	**Project No.:**	CHA #21063		
Location	163 Carranza Road	**Site Elevation:**	460 Feet	**Specific Volume**	13.50 CF/#
Building Name	Department of Public Works Garage	**Date:**			
Engineer:	Frank Cuttita				

Building/Facility Designation Department of Public Works Garage

Outdoor Winter Design DB Temperature	14 *F	**Indoor Winter Design DB Temperature**	70 *F
Outdoor Summer Design DB Temperature	91 *F	**Indoor Summer Design DB Temperature**	72 *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	12"CMU unfinished interior, painted outside/finished walls inside lunchroom	2.5	

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	6" Insulation, unfinished, metal roof	8.00	

Windows (Select One)		U Value
	Aluminum Frame, 1/8" SP Glazing	1.05
	Aluminum Frame, 1/4" DP Glazing	0.60
	Aluminum Frame, 3/16" DP Glazing	0.62
	Aluminum Frame, 1/2" DP Glazing	0.50
	Skylights	0.90
x	Single pane, Aluminum frame	1.10

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

BUILDING CHARACTERISTICS

Roof Area	2,288 SF		
Occupied Area	2,288 SF	**Return Plenum?**	n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	44 Ft	15.0 Ft	15.0 Ft	40 SF	468 SF	152 SF
East Exposure	52 Ft	15.0 Ft	15.0 Ft	0 SF	15 SF	765 SF
South Exposure	44 Ft	15.0 Ft	15.0 Ft	40 SF	0 SF	620 SF
West Exposure	52 Ft	15.0 Ft	15.0 Ft	40 SF	0 SF	740 SF

Forced Ventilation 0 cfm

HEAT GAIN/LOSS WORKSHEET

Project Name:	Tabernacle Township	Project No.:	CHA #21063		
Location	163 Carranza Road	Site Elevation:	460 Feet	Specific Volume	13.50 CF/#
Building Name	Department of Public Works Garage	Date:			
Engineer:	Frank Cuttita				

Building/Facility Designation: Department of Public Works Garage

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	40	38 btu/h/sf	0.8	0.75	Glass Type C	912 Btu/hr
East Exposure	0	216 btu/h/sf	0.8	0.31	Glass Type C	0 Btu/hr
South Exposure	40	109 btu/h/sf	0.8	0.58	Glass Type C	2,023 Btu/hr
West Exposure	40	216 btu/h/sf	0.8	0.29	Glass Type C	2,004 Btu/hr
						4,940 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	152	0.40	20 *F	1.0	1,216 Btu/hr
East Exposure	765	0.40	39 *F	1.0	11,934 Btu/hr
South Exposure	620	0.40	27 *F	1.0	6,696 Btu/hr
West Exposure	740	0.40	22 *F	1.0	6,512 Btu/hr
Roof	2,288	0.13	73 *F	1.0	20,878 Btu/hr
Fenestration	120	1.10	19 *F		2,508 Btu/hr
Doors	483	0.14	27 *F		1,821 Btu/hr
Ceiling	2,288	0.14	0 *F		0 Btu/hr
Partition		0.05	0 *F		0 Btu/hr
Floor	2,288	0.04	0 *F		0 Btu/hr
					51,565 Btu/h

INTERNAL HEAT GAINS

								Room Heat Gain
Lights	1.20 w/sf x	2,288 Occ Area =	2.7 kW x 3.4x		1.0 RAF =	9,371 Btu/h
Plug Load	w/sf x	2,288 Occ Area =	0.0 kW x 3.4x		1.0 RAF =	0 Btu/h
People	1 people x	255 btu/person x	30% time in space =			77 Btu/h
Computer Work Stations		0 Units x	W/Unit x	3414 =		0 Btu/h
Equipment	kW x 3.413 =					0 Btu/h
Misc.						0 Btu/h
						9,447 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor		Perimeter Ratio		Coef	Temp. Diff.		Room Heat Gain
Walls	2,277 SF	0.20	CFM/SF			1.08	19	*F	10,115 Btu/h
Doors	483 SF	0.50	CFM/LF	0.32	LF/SF	1.08	19	*F	1,710 Btu/h
Windows	120 SF	0.30	CFM/LF	0.90	LF/SF	1.08	19	*F	720 Btu/h
Ventilation	0 cfm					1.08	19	*F	0 Btu/h
									12,545 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	0.40	20	1.0	0 Btu/hr
East Exposure	0	0.40	39	1.0	0 Btu/hr
South Exposure	0	0.40	27	1.0	0 Btu/hr
West Exposure	0	0.40	22	1.0	0 Btu/hr
Roof	2,288	0.13	73	0.0	0 Btu/hr
					0 Btu/h

INTERNAL HEAT GAINS

					Room Heat Gain
Lights	1.20 w/sf x	2,288 Occ Area =	2.7 kW x3413x	0.00 RAF =	0 Btu/h
Misc.					0 Btu/h
					0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT		SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Solar	4,940	Internal Gains to Room	9,447
Conduction to Room	51,565	Internal Gains to Plenum	0
Conduction to Plenum	0		
Ventilaton and Infiltration	12,545		
Sub Total	69,050	Sub Total	9,447

HEAT GAIN/LOSS WORKSHEET

Project Name:	Tabernacle Township	**Project No.:**	CHA #21063		
Location	163 Carranza Road	**Site Elevation:**	460 Feet	**Specific Volume**	13.50 CF/#
Building Name	Department of Public Works Garage	**Date:**			
Engineer:	Frank Cuttita				

Building/Facility Designation Department of Public Works Garage

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	2,288 SF	0.20 CFM/SF	4,800	0.0042 #/#	9,319 Btu/h
Doors	483 SF	0.50 CFM/LF	4,800	0.0042 #/#	1,568 Btu/h
Windows	120 SF	0.30 CFM/LF	4,800	0.0042 #/#	660 Btu/h
Ventilation	0 cfm		4,800	0.0042 #/#	0 Btu/h
People	1 people	0.30 time in space		250 Btu/hr/person	75 Btu/h
					11,622 Btu/h

Cooling Load Summary

	Sensible	Latent	Total		
Temperature Dependent Gains	69,050	11,622	80,673		
Temperature Indep. Gains	9,447		9,447	SHR=	0.87
Total	78,498	11,622	90,120		

Building Cooling Load 7.5 Tons at 305 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is **6,043 CFM** / **2.64 CFM/sf**

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	152	0.40	56	3,405 Btu/h
East Exposure	765	0.40	56	17,136 Btu/h
South Exposure	620	0.40	56	13,888 Btu/h
West Exposure	740	0.40	56	16,576 Btu/h
Fenestration	120	1.10	56	7,392 Btu/h
Roof	2,288	0.13	56	16,016 Btu/h
Doors	483	0.14	56	3,778 Btu/h
Ceiling	2,288	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	2,288	0.04	0	0 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	2,277 SF	0.20 CFM/SF	1.08	56	455 cfm	27,605 Btu/h
Doors	483 SF	0.50 CFM/LF	1.08	56	77 cfm	4,668 Btu/h
Windows	120 SF	0.30 CFM/LF	1.08	56	32 cfm	1,964 Btu/h
Ventilation Load	0 cfm		1.08	56	0 cfm	0 Btu/h
Total Ventilation & Infiltration Load					565 cfm	34,237 Btu/h

Building Heating Load	**112,428**	**btu/h**
		49.1 btu/sf

Tabernacle Township
CHA #21063
Building: Department of Public Works Garage

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	15.0	15.0	2	450.0	120.0
	3.0	6.0	1	18.0	18.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	468.0	138.0
East	3.0	5.0	1	15.0	16.0
				0.0	0.0
				0.0	0.0
			Sub-total	15.0	16.0
South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
West				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
			Total	**483.0**	**154.0**

LF/SF
0.32

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North	44.0	15.0	1	660.0	118.0		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	
	44.0			660.0	118.0	15.0	Average height wall automatically linked to
East	52.0	15.0	1	780.0	134.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	52.0			780.0	134.0	15.0	Average height wall automatically linked to
South	44.0	15.0	1	660.0	118.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	44.0			660.0	118.0	15.0	Average height wall automatically linked to
West	52.0	15.0	1	780.0	134.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	52.0			780.0	134.0	15.0	Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North	4.0	5.0	2	40.0	36.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	40.0	36.0	
East				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	
South	4.0	5.0	2	40.0	36.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	40.0	36.0	
West	4.0	5.0	2	40.0	36.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	40.0	36.0	
			Total	**120.0**	**108.0**	LF/SF 0.90

Tabernacle Township
CHA #21063
Building: Department of Public Works Garage

ECM-3 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	$ 100	$ 150	$ -	$ 98	$ 182	$ -	$ 280	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 280	Subtotal
$ 27.95	10% Contingency
	Contractor 10% O&P
$ -	0% Engineering
$ 307	**Total**

APPENDIX E

ECM-4 Install Door Seals

Tabernacle Township
CHA #21063
Building: Department of Public Works Garage

ECM-4 Install Garage Door Seals

Existing: Doors or Door Seals result in excessive heat loss and infiltration
Proposed: Install new doors and/or weatherstripping to eliminate door infiltration

Building Footprint	2,288	SF	Ex Occupied Clng Temp.	72	*F	Ex Occupied Htg Temp.	70	*F
Heating System Efficiency	75%		Ex Unoccupied Clng Temp.	80	*F	Ex Unoccupied Htg Temp.	62	*F
Cooling System Efficiency	1.30	kW/ton	Prop Occupied Clng Temp.	72	*F	Prop Occupied Htg Temp.	70	*F
Internal Gains	9,447	btu/h	Prop Unoccupied Clng Temp.	80	*F	Prop Unoccupied Htg Temp.	62	*F
Unoc Internal Gain factor	0.03		Occupied Cooling UA	-2,974	btu/hr/°F	Occupied Heating UA	1,396	btu/hr/°F
Ave Occ Internal Gain Factor	0.7		Unoccupied Cooling UA	-2,714	btu/hr/°F	Unoccupied Heating UA	1,396	btu/hr/°F
			Cooling Occ Enthalpy Setpoint	27.5	Btu/lb			
			Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb			

					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 lbs	Proposed Heating Energy lbs
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	-90,705	-54,899	-6,613	-61,064	-54,899	-283	-90,705	-48,911	-6,613	-61,064	-48,911	-283	0	0	0	0
97.5	42.5	3	1	2	-75,836	-38,124	-6,613	-47,494	-38,124	-283	-75,836	-33,966	-6,613	-47,494	-33,966	-283	31	29	0	0
92.5	39.5	34	8	26	-60,966	-30,499	-6,613	-33,925	-30,499	-283	-60,966	-27,173	-6,613	-33,925	-27,173	-283	268	255	0	0
87.5	36.6	131	31	100	-46,096	-23,129	-6,613	-20,355	-23,129	-283	-46,096	-20,606	-6,613	-20,355	-20,606	-283	729	694	0	0
82.5	34.0	131	31	100	-31,226	-16,520	-6,613	-6,785	-16,520	-283	-31,226	-14,719	-6,613	-6,785	-14,719	-283	439	413	0	0
77.5	31.6	620	148	472	-16,357	-10,421	-6,613	0	0	-283	-16,357	-9,284	-6,613	0	0	-283	548	530	0	0
72.5	29.2	664	158	506	-1,487	-4,321	-6,613	0	0	-283	-1,487	-3,849	-6,613	0	0	-283	228	220	0	0
67.5	27.0	854	203	651	3,491	1,525	-6,613	0	0	-283	3,491	1,359	-6,613	0	0	-283	55	59	0	0
62.5	24.5	927	221	706	10,472	4,575	-6,613	0	0	-283	10,472	4,076	-6,613	0	0	-283	0	0	22	21
57.5	21.4	600	143	457	17,453	7,625	-6,613	6,283	2,745	-283	17,453	6,793	-6,613	6,283	2,446	-283	0	0	88	85
52.5	18.7	610	145	465	24,435	10,675	-6,613	13,264	5,795	-283	24,435	9,510	-6,613	13,264	5,163	-283	0	0	172	165
47.5	16.2	611	145	466	31,416	13,725	-6,613	20,246	8,845	-283	31,416	12,228	-6,613	20,246	7,880	-283	0	0	254	245
42.5	14.4	656	156	500	38,397	16,775	-6,613	27,227	11,895	-283	38,397	14,945	-6,613	27,227	10,597	-283	0	0	360	347
37.5	12.6	1,023	244	779	45,378	19,824	-6,613	34,208	14,945	-283	45,378	17,662	-6,613	34,208	13,315	-283	0	0	698	674
32.5	10.7	734	175	559	52,360	22,874	-6,613	41,190	17,995	-283	52,360	20,380	-6,613	41,190	16,032	-283	0	0	599	579
27.5	8.6	334	80	254	59,341	25,924	-6,613	48,171	21,044	-283	59,341	23,097	-6,613	48,171	18,749	-283	0	0	317	306
22.5	6.8	252	60	192	66,322	28,974	-6,613	55,152	24,094	-283	66,322	25,814	-6,613	55,152	21,467	-283	0	0	273	264
17.5	5.5	125	30	95	73,304	32,024	-6,613	62,133	27,144	-283	73,304	28,531	-6,613	62,133	24,184	-283	0	0	152	147
12.5	4.1	47	11	36	80,285	35,074	-6,613	69,115	30,194	-283	80,285	31,249	-6,613	69,115	26,901	-283	0	0	64	61
7.5	2.6	22	5	17	87,266	38,124	-6,613	76,096	33,244	-283	87,266	33,966	-6,613	76,096	29,618	-283	0	0	33	32
2.5	1.0	13	3	10	94,247	41,174	-6,613	83,077	36,294	-283	94,247	36,683	-6,613	83,077	32,336	-283	0	0	21	20
-2.5	0.0	0	0	0	101,229	44,224	-6,613	90,059	39,344	-283	101,229	39,401	-6,613	90,059	35,053	-283	0	0	0	0
-7.5	-1.5	0	0	0	108,210	47,274	-6,613	97,040	42,394	-283	108,210	42,118	-6,613	97,040	37,770	-283	0	0	0	0
TOTALS		8,391	1,998	6,393													2,298	2,201	3,053	2,947

Existing Building Ventilation & Infiltration	565	cfm
Existing Unocc. Building Ventilation & Infiltration	565	cfm
Door infiltration	77	cfm
Proposed reduction (80%)	62	cfm
Proposed Building Ventilation & Infiltration	503	cfm
Proposed Unocc. Building Ventilation & Infiltration	503	cfm

Savings		
	106	therms
	98	kWh
	76	gallons

Tabernacle Township
CHA #21063
Building: Department of Public Works Garage

ECM-4 Door seals

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.		
						$ -	$ -	$ -	$ -	
New Door Seals on overhead door	2	ea	$ 300	$ 200	$ -	$ 588	$ 484	$ -	$ 1,072	estimate
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 1,072	Subtotal
$ 107.20	10% Contingency
	Contractor 10% O&P
$ -	0% Engineering
$ 1,179	**Total**

APPENDIX F

ECM-5 Lighting Replacements

Tabernacle Township
CHA #21063
Building: Department of Public Works Garage

ECM-5 Replacement of Incandescent and T-12 lights

Building Schedule:

Existing conditions (master switch):	40	hrs/week
Supply Electric Rate	$ 0.165	/kWh
Demand Rate	$ 1.60	/kW

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

	EXISTING CONDITIONS										RETROFIT CONDITIONS								COST ANALYSIS				
Area Description	Number of Fixtures	Fixture Code	Watts per Fixture	Number of Non-Operational Fixtures	Watts per Non-Operational Fixtures	kW/Space	Exist Control	Daily Hours	Annual Hours	Annual kWh	Number of Fixtures	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Daily Hours	Annual Hours	Annual kWh	kW Saved	Annual kWh Saved	Annual $ Saved	Retrofit Cost	
Main area	17	F82SS	173	2	176.46	3.29392	switch	8	2,000	6,588	17	F82EHL	135	2.295	switch	8	2,000	4,590	1	1,998	$ 349	$ 2,133	
Offices/Lunch	7	F44SE	172	0	175.44	1.204	switch	8	2,000	2,408	7	F43ILL	89	0.623	switch	8	2,000	1,246	1	1,162	$ 203	$ 878	
Outside	5	I150	150	1	153	0.903	timeclock	8	2,920	2,637	5	CFT40	80	0.4	switch	8	2,920	1,168	1	1,469	$ 252	$ 627	
TOTALS -	29			3		5.4				11,633	29			3.3				7,004	2.1	4,629	$ 805	$ 3,639	

APPENDIX G

New Jersey Incentive Program

Tabernacle Township
CHA #21063
Building: Department of Public Works Garage

New Jersey Pay For Performance Incentive Program

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

Total Building Area (Square Feet)	2,290
Is this audit funded by the NJ BPU (Y/N)	Yes

Bureau of Public Utilites (BPU)

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

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$3,300	$0
Existing Usage (from utility)	19,190	0
Proposed Savings	4,629	-1,220
Existing Total MMBtus	65	
Proposed Savings MMBtus	-106	
% Energy Reduction	-162.2%	
Proposed Annual Savings	$3,000	

	≥ %15 - < 20%	
	$/kWh	$/therm
Incentive #2	$0.11	$1.10
Incentive #3	$0.07	$0.70

	≥ 20%	
	$/kWh	$/therm
Incentive #2	$0.22	$2.20
Incentive #3	$0.14	$1.40

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$115
Incentive #2	$0	$0	$0
Incentive #3	$0	$0	$0
Total All Incentives	$0	$0	$115

Total Project Cost	$17,500
% Incentives #1 of Utility Cost*	3.5%
% Incentives #2 & #3 of Project Cost**	0.0%
Total Eligible Incentives**	$115
Project Cost w/ Incentives	$17,386

Project Payback (years)	
w/o Incentives	w/ Incentives
5.8	5.8

* 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 #1 is $50,000 if not funded by NJ BPU, and $25,000 if it is.
Maximum allowable amount of Incentive #2 & #3 is 80% of total project cost, or $2 million per gas account and $2 million per electric account

APPENDIX H

Photovoltaic (PV) Rooftop Solar Power Generation

Tabernacle Township
DPW Building

Cost of Electricity $0.170 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-8kW 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
$56,000	**0.0**	**9,650**	**0**	**$1,641**	**0**	**$1,641**	**$8,000**	**$4,700**	**34.1**	**7.6**

Note: Budgetary cost is based on $7,000/kW.

*Incentive based on New Jersey renewable energy program for non-residential applications(PV)= $1.00/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

Station Identification	
City:	Philadelphia
State:	Pennsylvania
Latitude:	39.88° N
Longitude:	75.25° W
Elevation:	9 m
PV System Specifications	
DC Rating:	8.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	6.2 kW
Array Type:	Fixed Tilt
Array Tilt:	39.9°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	17.0 ¢/kWh

Results			
Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	3.30	648	110.16
2	4.16	737	125.29
3	4.74	889	151.13
4	5.06	891	151.47
5	5.20	911	154.87
6	5.43	893	151.81
7	5.51	924	157.08
8	5.67	959	163.03
9	5.07	850	144.50
10	4.59	830	141.10
11	3.37	610	103.70
12	2.67	507	86.19
Year	4.57	9648	1640.16

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

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.

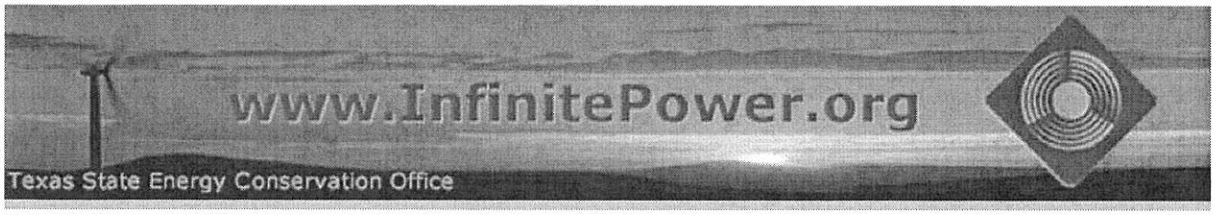
To accelerate the use of PV systems, many state and local governments offer financial incentives and programs. Go to http://www.nrel.gov/stateandlocal for more information.

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

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

APPENDIX I

Solar Thermal Domestic Hot Water Plant



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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)	.5	? Water Inlet Temperature (Degrees F)	50
? Capacity (gallons)	6	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	6.809	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	20
Energy Use			
478.9		? Heat Delivered in Hot Water (BTU/hr)	
0		? Heat loss through insulation (BTU/hr)	

Gas vs. Electric Water Heating		
Gas		**Electric**
0	? Overall Efficiency	0.98
0	? Conversion Efficiency	0.98
NaN BTU/hr	? Power Into Water Heater	488.7 BTU/hr
Cost		
$ 0 /Therm	? Utility Rates	$ 0.17 /kWh
$ NaN	? Yearly Water Heating Cost	$ 213.146
How Does Solar Compare?		
? Solar Water Heater Cost: $ 27100		? Percentage Solar: 70
NaN years for gas	? Payback Time for Solar System	181.632 years for electric

NJBPU Energy Audits
CHA #21063
DPW Building
Tabernacle Township

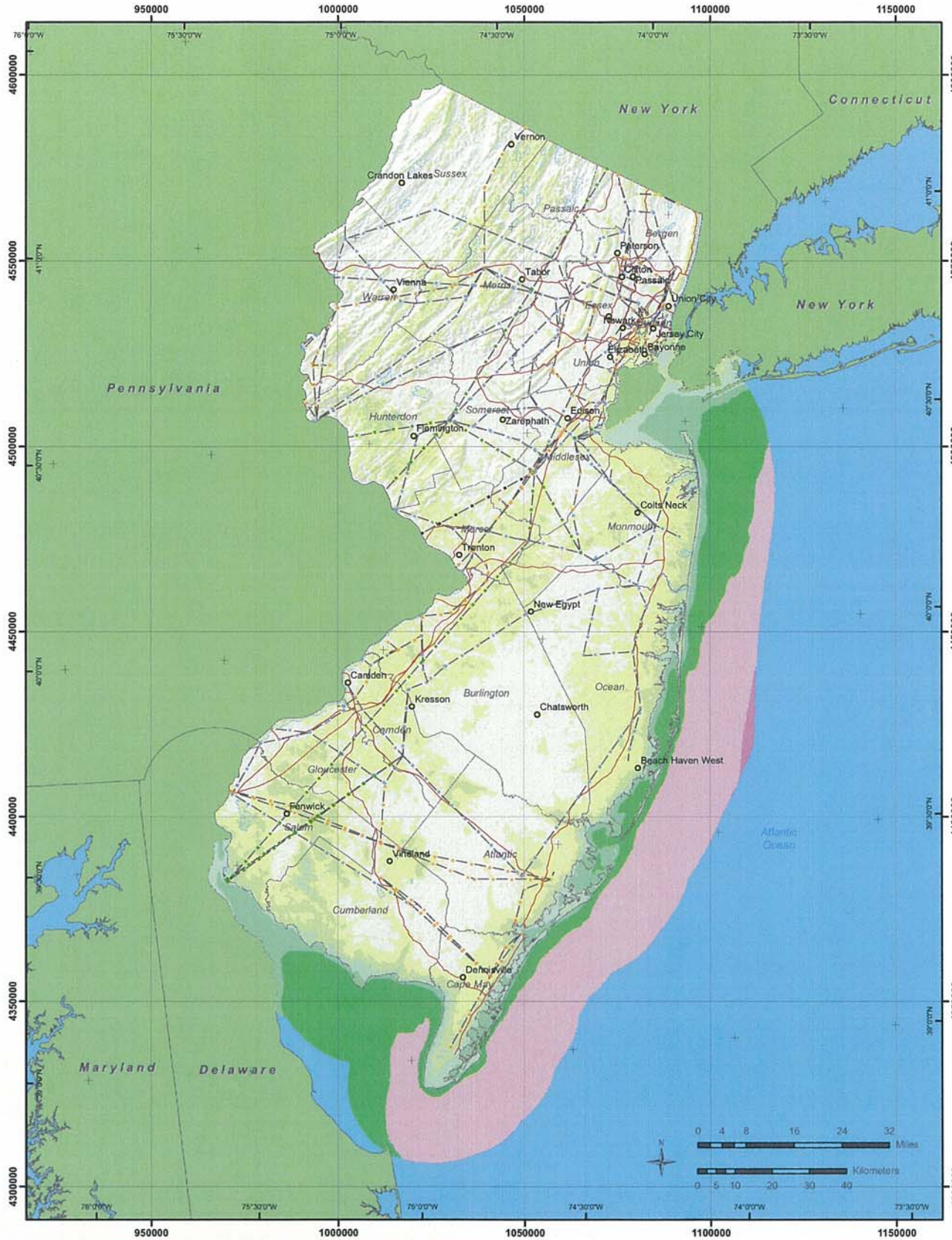
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

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 GallonStorage 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 J

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

AWS Truewind

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

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

Bing Maps

163 Carranza Rd, Tabernacle, NJ 08088-9304

My Notes

APPENDIX K

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
DPW

Building ID: 2209638
For 12-month Period Ending: December 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: April 12, 2010

Facility	**Facility Owner**	**Primary Contact for this Facility**
DPW	Tabernacle Township	Douglas Cramer
163 Carranza Road	163 Carranza Road	163 Caranza oad
Tabernacle, NJ 08088	Tabernacle, NJ 08088	Tabrnacle, NJ 08088

Year Built: 1970
Gross Floor Area (ft²): 1,600

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	72,825
Fuel Oil (No. 2) (kBtu)	249,274
Natural Gas - (kBtu)[4]	0
Total Energy (kBtu)	322,099
Energy Intensity[5]	
Site (kBtu/ft²/yr)	201
Source (kBtu/ft²/yr)	309
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	29
Electric Distribution Utility	
Pepco - Atlantic City Electric Co	
National Average Comparison	
National Average Site EUI	77
National Average Source EUI	150
% Difference from National Average Source EUI	106%
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.

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

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

Certifying Professional
N/A

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

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) 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	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	163 Carranza Road, Tabernacle, NJ 08088	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		☐

main shop (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	1,600 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	1(Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	40Hours(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	2(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: Pepco - Atlantic City Electric Co

Fuel Type: Electricity		
Meter: electric (kWh (thousand Watt-hours)) **Space(s):** main shop **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
11/05/2009	12/04/2009	2,098.00
10/05/2009	11/04/2009	1,384.00
09/05/2009	10/04/2009	1,459.00
08/05/2009	09/04/2009	1,289.00
07/05/2009	08/04/2009	1,332.00
06/05/2009	07/04/2009	1,687.00
05/05/2009	06/04/2009	1,981.00
04/05/2009	05/04/2009	1,349.00
03/05/2009	04/04/2009	1,309.00
02/05/2009	03/04/2009	1,344.00
01/05/2009	02/04/2009	2,434.00
electric Consumption (kWh (thousand Watt-hours))		**17,666.00**
electric Consumption (kBtu (thousand Btu))		**60,276.39**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**60,276.39**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Fuel Oil (No. 2)		
Meter: Fuel Oil (Gallons) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (Gallons)**
11/05/2009	12/04/2009	0.00
10/05/2009	11/04/2009	0.00
09/05/2009	10/04/2009	0.00
08/05/2009	09/04/2009	0.00
07/05/2009	08/04/2009	0.00
06/05/2009	07/04/2009	0.00
05/05/2009	06/04/2009	145.00
04/05/2009	05/04/2009	0.00
03/05/2009	04/04/2009	349.00
02/05/2009	03/04/2009	583.00
01/05/2009	02/04/2009	300.00

Fuel Oil Consumption (Gallons)	**1,377.00**
Fuel Oil Consumption (kBtu (thousand Btu))	**190,976.82**
Total Fuel Oil (No. 2) Consumption (kBtu (thousand Btu))	**190,976.82**
Is this the total Fuel Oil (No. 2) consumption at this building including all Fuel Oil (No. 2) 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
163 Carranza Road
Tabernacle, NJ 08088

Facility Owner
Tabernacle Township
163 Carranza Road
Tabernacle, NJ 08088

Primary Contact for this Facility
Douglas Cramer
163 Caranza oad
Tabrnacle, NJ 08088

General Information

DPW	
Gross Floor Area Excluding Parking: (ft²)	1,600
Year Built	1970
For 12-month Evaluation Period Ending Date:	December 31, 2009

Facility Space Use Summary

main shop	
Space Type	Other - Service (Vehicle Repair/Service, Postal Service)
Gross Floor Area(ft²)	1,600
Number of PCs°	1
Weekly operating hours°	40
Workers on Main Shift°	2

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2009)	**Baseline** (Ending Date 12/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	201	201	0	N/A	77
Source (kBtu/ft²)	309	309	0	N/A	150
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/ft²/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	29	29	0	N/A	11
$kgCO_2e$/ft²/year	18	18	0	N/A	7

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 L

Equipment Inventory

New Jersey BPU Energy Audit Program

Borough of Tabernacle, NJ

CHA#21063

DPW/Garage Building										
Item	Qty.	Manuf	Model No.	Serial No.	Capacity	Condition	Gas	MBH	Refrig.	Comments
Forced Hot Air Furnace										
1	1	Heat Controller	ODHA95D3	8406A15521		G		96		
2	1	Heat Controller	DOHA112/125F5	8404A10987		G		125		
Upright Compressor										
3	1	US Electric	G62718	184T	5hp	G				Compressor SaylorBeall- 705
Condensing unit										
4	1	Ducane	AC10B18	268209820		G			R-22	
Domestic Hot Water Heater										
5	1				6 gallon	E				1.5 KW

E = Excellent
G = Good
P = Poor