TABERNACLE TOWNSHIP
MUNICIPAL BUILDING
ENERGY ASSESSMENT

for

NEW JERSEY
BUREAU OF PUBLIC UTILITIES

CHA PROJECT NO. 21063

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1.0 INTRODUCTION AND BACKGROUND

The municipal building was constructed in 1875. The two story, 3,400 square foot structure, located at 163 Carranza Road in Tabernacle, New Jersey, includes the town courtroom and administrative offices.

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 the Tabernacle, New Jersey municipal building. The two story, 3,400 square foot facility includes the town courtroom and administrative offices. The following areas were evaluated for energy conservation measures:

- Lighting replacement
- Night setback
- Window replacement
- Furnace replacement

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 $1,100 for the recommended ECMs may be realized with a payback of 4.8 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-2 Modify 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
700	0	330	150	0	300	5.1	NA	2.5	NA

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

ECM-4 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
4,600	1.7	4,540	0	0	800	1.6	500	5.8	5.1

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

3.0 EXISTING CONDITIONS

3.1 Building - General

The municipal building is a two story, 3,400 square foot structure which houses the town offices and the town courtroom.

The municipal offices operate from 8:00 AM to 4:00 PM five days a week and are occupied by about eight people. The courtroom is in session from 3:00 PM to 8:00 PM two nights per month.

The building's exterior walls consist of siding with wood framed studs, insulation and finished with plaster on the interior. The windows on the ground floor have been replaced; however, the second floor windows are single pane, uninsulated, and in poor condition. The roof has shingles on the exterior with several inches of batt insulation.

3.2 Utility Usage

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

From January 2009 through December 2009, electric usage was approximately 32,080 kWh at a cost of about $6,000. Analyzing electricity bills during this period, the building was charged at a demand unit cost of $19.00 per kW; and a blended unit cost of $0.17 per kWh. Electricity usage was highest in the summer months due to air conditioning equipment. In 2009 the building heat required about 740 gallons of oil. Based on the annual cost of about $1,400, the blended price per gallon was $1.86. Fuel oil consumption is highest in the winter months to heat the building. Utility data can be found in Appendix A.

Electricity commodity 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 or gas line; 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 plant consists of two, Comfort Air Patriot 80 oil fired forced hot air furnaces located in the basement. These units were installed over 10 years' ago and are in average condition. One unit serves the main floor, the other serves the second level.

3.3.2 Air Conditioning Systems

The primary AC system consists of one cooling coil attached to each furnace. Each coil is connected to a five ton condensing unit located outside. Building personnel indicated that one condensing unit was installed about five years' ago; the other unit is older and beyond its useful life.

3.3.3 Building Ventilation and Exhaust Systems

Primary ventilation is provided by the operable windows throughout the building. The two restroom exhaust fans operate with the light switch in each room.

3.4 Control Systems

HVAC controls in this building are from two thermostats, one located on each level. The setpoints are 73°F occupied cooling, 80°F unoccupied cooling; 68°F occupied heating and 62°F unoccupied heating. Each floor is on a schedule with night setback only. The thermostats do not enable weekend schedules; the Monday through Friday schedule operates on Saturday and Sunday.

3.5 Lighting/Electrical Systems

The majority of lighting in the building is F34T-12 fixtures that use 34 watts per lamp. These fixtures are either 4' tubes or 2' u-tubes. The exit lights are incandescent.

Lighting in the municipal office areas are controlled by individual switches at the main entrance door. The lighting is left on during normal business hours. Generally, this lighting remains on eight to nine hours daily. There are some fixtures that use incandescent screw-type bulbs that can be easily upgraded.

The few outdoor lighting fixtures are incandescent and are mounted directly to the building. Several other fixtures are owned and maintained by the electrical utility company. These light fixtures are on the power poles around the parking lot, and light the building and lot at night.

3.6 Plumbing Systems

Domestic hot water is generated by a 19 gallon electric hot water heater with an input of 1,500 watts. This unit, located in the basement, is in good condition.

There are two restrooms located in the municipal office area of the building on the ground floor. 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 evaluates replacing both furnaces with two high efficiency, condensing furnaces along with new gas service to the building. The local gas utility, South Jersey Gas, was contacted and they stated that new gas service and meter to this building would be provided from the street at no charge. Modern condensing furnaces operate at much higher efficiencies and change fan speeds due to part load conditions, enabling the furnace to provide heat more accurately to match the changing building load, which saves energy.

Review of the fuel oil utility bills determined this building consumed about 740 gallons of fuel oil annually. With estimated average efficiencies of 95%, the proposed new gas fired condensing furnaces will require approximately 970 therms to meet the heat load, resulting in a savings of about $200 per year. The proposed boiler efficiency rating is based on the use of two Rheem high efficiency 95% natural gas furnaces with 90,000 Btuh input. These furnaces were used as a direct replacement for the existing furnaces.

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

Condensing furnaces have an expected life of 18 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 13,300 gallons fuel oil and (17,530) therms, totaling $10,000.

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
14,300	0	0	740	(970)	200	(0.8)	600	>25	>25

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

This measure is not recommended.

4.2 ECM-2 Modify Night Setback

The 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 new 7 day programmable models, the times of occupied and unoccupied modes can be changed to save heating and cooling energy. This ECM models the expected savings of adjusting the hours of the unoccupied temperature setpoints to include both weekend days. The current setpoints are 62°F for unoccupied heating, and 80°F during unoccupied cooling. 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 increased setback hours, a block load building model was created to approximate the existing energy load for the building. The block load, provided in Appendix C, 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 C.

The difference in heating therms and cooling kWh between the initial and proposed models is taken as the savings. Following implementation of this measure, it is expected the building's annual fuel oil and electricity consumption will be reduced by approximately 150 gallons and 330 kWh, respectively.

Programmable thermostats have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 2,280 gallons and 4,870 kWh, totaling $4,300.

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

ECM-2 Modify 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
700	0	330	150	0	300	5.1	NA	2.5	NA

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

This measure is recommended.

4.3 ECM-3 Replace Windows

The second floor windows are double pane glass with an aluminum frame; they are old and leaking. The windows incur increased infiltration, cold drafts, and heat loss. This ECM evaluates replacement with new energy efficient windows.

It was estimated that the existing windows have a combined U-value of 0.8 and an infiltration rate of about 0.3 CFM/LF. To calculate the savings for this measure, the baseline energy loss was found by applying these values to the total square footage and perimeter length of the existing windows for the second floor only, in conjunction with weather bin data. The proposed energy loss was then determined using the expected U-value of 0.45 and infiltration rate of 0.2 CFM/LF for the new energy efficient windows. The difference in heating and cooling losses through the windows results in an annual savings of about 80 gallons of oil and 40 kWh.

Windows have an expected life of 25 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 2,030 gallons and 950 kWh, totaling $2,500.

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

ECM-3 Replace Windows

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
42,800	0	40	80	0	100	(0.9)	NA	>25	NA

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

This measure is not recommended.

4.4 ECM-4 Lighting Replacements

A comprehensive lighting 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 4,600 kWh per year. Supporting calculations, including all assumptions for lighting hours and the annual energy usage for each fixture is provided in Appendix E.

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. Exit signs will be replaced with LED type signs.

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 68,070 kWh, totaling $12,000.

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

ECM-4 Lighting Replacements

Budgetary Cost	Annual Utility Savings						Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Fuel Oil	Gas	Total	ROI			
$	kW	kWh	Gallons	Therms	$		$	Years	Years
4,600	1.7	4,540	0	0	800	1.6	500	5.8	5.1

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

This measure is recommended.

5.0 PROJECT INCENTIVES

5.1 Incentives Overview

5.1.1 New Jersey Pay For Performance Program

The building will be eligible for incentives from the New Jersey Office of Clean Energy. The most significant incentives will be from the New Jersey Pay for Performance (P4P) Program. The P4P program is designed for qualified energy conservation projects in facilities whose demand in any of the preceding 12 months exceeds 200 kW. 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 3,400 square foot building is eligible for about $200 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 F for calculations.

5.2.2 New Jersey Smart Start Program

The Tabernacle municipal building is eligible for several incentives available under New Jersey Smart Start Programs. The total amount of all qualified incentives is about $1,100 and includes upgrades to the lighting system and new furnaces.

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.

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

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

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

The municipal building was evaluated for the potential to install rooftop photovoltaic (PV) solar panels for power generation. Present technology incorporates the use of solar cell arrays that produce direct current (DC) electricity. This DC current is converted to alternating current (AC) with the use of an electrical device known as an inverter.

The 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 G.

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 cost of the ACP penalty for 2009 is $700; this is the amount that must be paid per SERC by the high emission producers. 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 19.0 kW and a minimum of 11.8 kW, from January 2009 through December 2009. The monthly average over the observed 12 month period was 15.6 kW. The existing load justifies the use of 12 kW of installed PV solar array. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development 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 G and summarized below:

Photovoltaic (PV) Rooftop Solar Power Generation – 12 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
84,000	0	14,470	0	2,500	2,500	12,000	7,000	>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 a natural gas fired water heater and, therefore, this measure would not save site electricity.

Currently, an incentive is not available for installation of thermal solar systems. A Federal tax credit of 30% of installation cost for the thermal applications is available; however, the Township of Tabernacle 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 H 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	2,510	0	400	400	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 I.

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 municipal 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 19.0 kW and an average of 15.6 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 municipal building is considered a low energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 72 kBTU/ft^2/year. However, several building characteristic such as poorly insulated windows, unnecessary heating and cooling during unoccupied hours, and inefficient lighting, could be addressed to further reduce the Site EUI. Should all ECMs be implemented, it is expected that the Site EUI can be reduced to about 59 kBTU/ft^2/year. The EPA Portfolio Manager did not generate an energy rating score for this building because the minimum size of the building needs to be 5,000 sq ft.

A full EPA Energy Star Portfolio Manager Report is located in Appendix J. 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 Tabernacle municipal building, in Tabernacle, New Jersey identified potential ECMs for lighting retrofits and night setback. Potential annual savings of $1,100 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-2 Modify 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
700	0	330	150	0	300	5.1	NA	2.5	NA

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

ECM-4 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
4,600	1.7	4,540	0	0	800	1.6	500	5.8	5.1

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

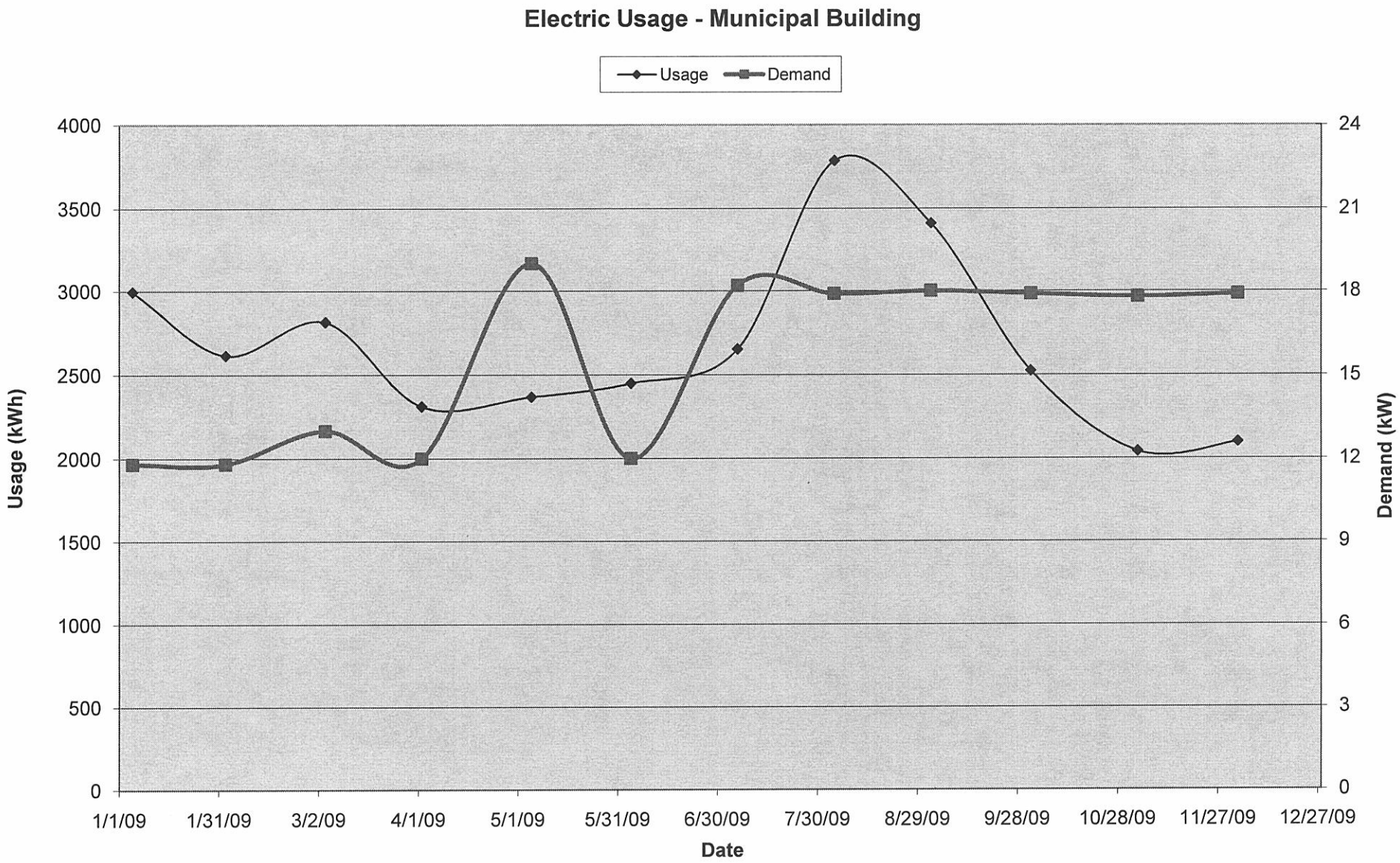
APPENDIX A

Utility Usage Analysis

New Jersey BPU Energy Audit Program
CHA #21063
Tabernacle Township
Municipal Building

Account Number: 0039-6829-9994
Atlantic City Electric

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
01/05/09	2996	11.8	$ 462	$31.00	$431.00	0.1542	0.1439	2.63
02/02/09	2617	11.8	423	$37.00	$386.00	0.1616	0.1475	3.14
03/04/09	2816	13	$ 450	$37.00	$413.00	0.1598	0.1467	2.85
04/02/09	2313	12	$ 375	$32.00	$343.00	0.1621	0.1483	2.67
05/05/09	2370	19	$ 380	$113.00	$267.00	0.1603	0.1127	5.95
06/04/09	2451	12	$ 414	$35.00	$379.00	0.1689	0.1546	2.92
07/06/09	2654	18.2	$ 524	$0.00	$524.00	0.1974	0.1974	-
08/04/09	3785	17.9	$ 744	$0.00	$744.00	0.1966	0.1966	-
09/02/09	3410	18	$ 671	$0.00	$671.00	0.1968	0.1968	-
10/02/09	2525	17.9	$ 494	$0.00	$494.00	0.1956	0.1956	-
11/03/09	2043	17.8	$ 348	$0.00	$348.00	0.1703	0.1703	-
12/03/09	2100	17.9	$ 357	$0.00	$357.00	0.1700	0.1700	-
Total	32,080	19.0	$5,642.00	$285.00	$5,357.00	0.1759	0.1670	1.52
Most Recent Yr	32,080	19.0	$5,642.00	$285.00	$5,357.00	0.1759	0.1670	1.52

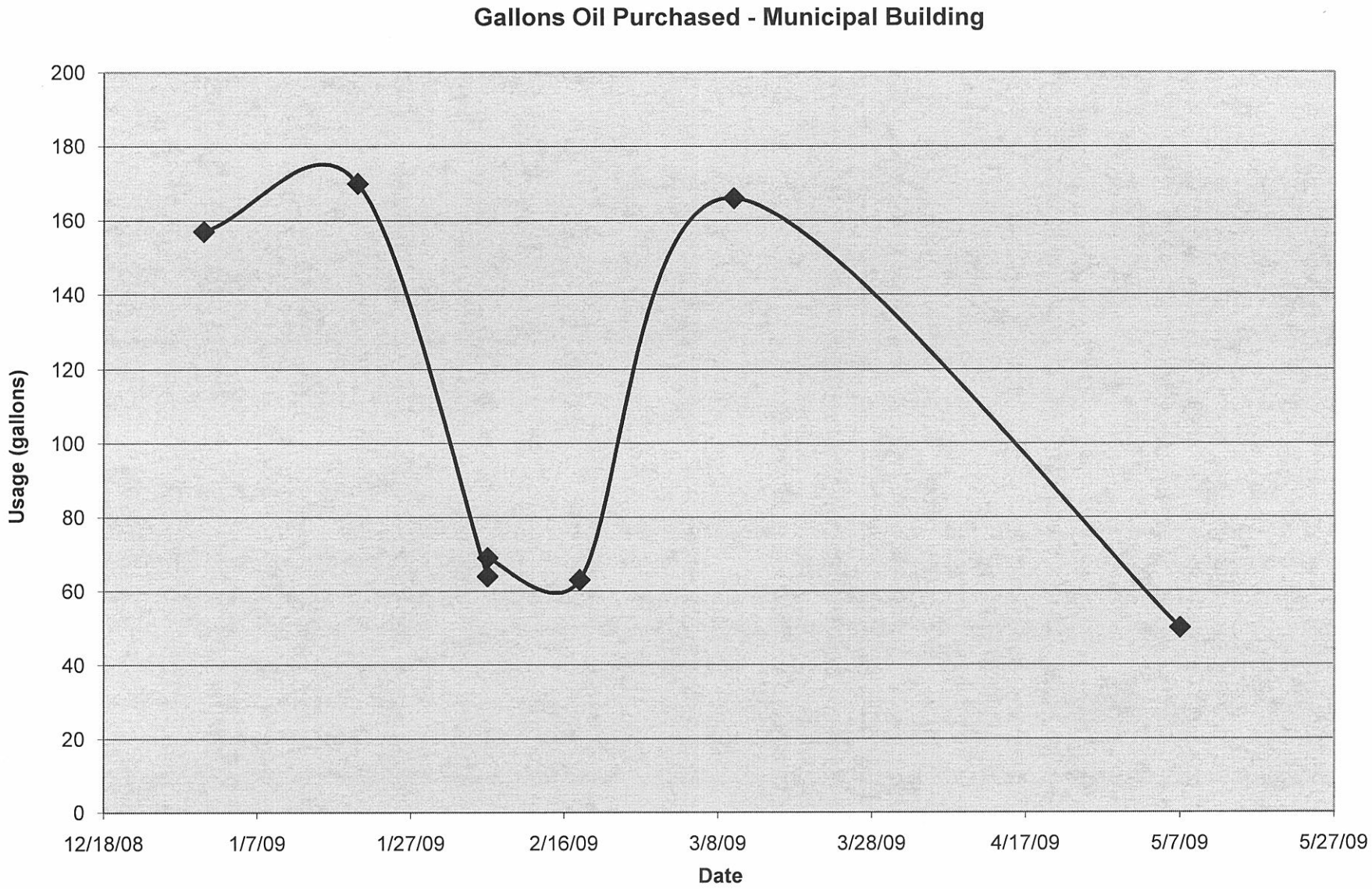

Electric Usage - Municipal Building
Usage
Demand
Usage (kWh)
Demand (kW)
4000
3500
3000
2500
2000
1500
1000
500
0
24
21
18
15
12
9
6
3
0
1/1/09
1/31/09
3/2/09
4/1/09
5/1/09
5/31/09
6/30/09
7/30/09
8/29/09
9/28/09
10/28/09
11/27/09
12/27/09
Date

New Jersey BPU Energy Audit Program
CHA #21063
Tabernacle Township
Municipal Building

Account Number: 2351
Majestic Oil Company

Date	Gallons	Cost	($/Gallon)
12/31/08	157	280	$1.78
01/20/09	170	342	$2.01
02/06/09	64	$128	$2.00
02/06/09	69	$139	$2.01
02/18/09	63	$117	$1.86
03/10/09	166	$283	$1.70
05/07/09	50	$88	$1.76

Total	739	$1,377.00	1.863
Most Recent Yr	739	$1,377.00	1.863


Gallons Oil Purchased - Municipal Building
Usage (gallons)
200
180
160
140
120
100
80
60
40
20
0
12/18/08
1/7/09
1/27/09
2/16/09
3/8/09
3/28/09
4/17/09
5/7/09
5/27/09
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: Municipal Building

ECM-1 Furnace Replacement & New Gas Service

Existing Fuel	#2 Oil
Proposed Fuel	Nat.Gas

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	$ 2.01		
Proposed Fuel Cost	$ 1.20		
Baseline Fuel Use	953	Gals #2	Based on historical utility data
Existing Furnace Efficiency	70%		Estimated
Baseline Load	92,527	Mbtu/yr	Baseline Fuel Use x Existing Efficiency x 138.7 Mbtu/Gals #2
Baseline Fuel Cost	$ 1,911		
Proposed Efficiency	95%		New Furnace Efficiency
Proposed Fuel Use	1,256	Therms	Baseline Boiler Load / Proposed Efficiency / 100 Mbtu/Therms
Proposed Fuel Cost	$ 1,507		
Annual Savings	953	Gals #2	
	(1,256)	Therms	
Annual Savings	**$ 404**	**/yr**	

Tabernacle Township
CHA #-21063
Building: Municipal Building

ECM-1 Furnace Replacement & New Gas Service

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.		
Two New Furnaces	1	ls				$ -	$ -	$ -	$ 13,000	contractor quote inc O&P
All new as piping from meter						$ -	$ -	$ -	$ -	
to units, electrical line and low						$ -	$ -	$ -	$ -	
voltage, new direct venting.						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 13,000	Subtotal
$ 1,300	10% Contingency
$ -	0% Contractor O&P
$ -	0% Engineering
$ 14,300	**Total**

APPENDIX C

ECM-2 Modify Night Setback

Tabernacle Township
CHA #-21063
Building: Municipal Building

ECM-2 Night Setback

Building Footprint	3,360	SF	Ex Occupied Clng Temp.	73	*F	Ex Occupied Htg Temp.	68	*F	**Heating Energy Savings**	152	gallons
Heating Efficiency	70%		Ex Unoccupied Clng Temp.	80	*F	Ex Unoccupied Htg Temp.	62	*F		213	**therms**
Cooling Efficiency	1.3	kW/ton	Prop Occupied Clng Temp.	73	*F	Prop Occupied Htg Temp.	68	*F	**Cooling Energy Savings**	325	**kWh**
Building Balance Temp.	60	*F	Prop Unoccupied Clng Temp.	80	*F	Prop Unoccupied Htg Temp.	60	*F			
Internal Gains	19,340	btu/h	Occupied Cooling UA	-2,105	btu/hr/°F	Occupied Heating UA	687	btu/hr/°F			
Unoc Internal Gain factor	0.3		Unoccupied Cooling UA	-1,217	btu/hr/°F	Unoccupied Heating UA	687	btu/hr/°F			
Ave Occ Internal Gain Factor	0.7		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb						
			Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb						

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

							EXISTING LOADS						PROPOSED LOADS									
							Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Bin Hours (total)	Existing Occupied Bin Hours	Remainder Unoccupied Bin Hours	Weekend hrs	Remainder weekend hrs	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	D-0	D-1	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	0	0	-62,096	-40,858	-13,538	-27,377	-40,858	-5,802	-62,096	-40,858	-13,538	-27,377	-40,858	-5,802	0	0	0	0
97.5	42.5	3	1	2	0	3	-51,571	-28,374	-13,538	-21,293	-28,374	-5,802	-51,571	-28,374	-13,538	-21,293	-28,374	-5,802	21	19	0	0
87.5	36.6	131	37	94	12	119	-30,522	-17,213	-13,538	-9,126	-17,213	-5,802	-30,522	-17,213	-13,538	-9,126	-17,213	-5,802	553	496	0	0
82.5	34	500	143	357	48	452	-19,997	-12,295	-13,538	-3,042	-12,295	-5,802	-19,997	-12,295	-13,538	-3,042	-12,295	-5,802	1,447	1,272	0	0
77.5	31.6	620	177	443	59	561	-9,472	-7,755	-13,538	0	0	-5,802	-9,472	-7,755	-13,538	0	0	-5,802	770	549	0	0
72.5	29.2	664	190	474	63	601	0	0	-13,538	0	0	-5,802	0	0	-13,538	0	0	-5,802	470	470	0	0
67.5	27	854	244	610	81	773	344	227	-13,538	0	0	-5,802	344	227	-13,538	0	0	-5,802	590	600	0	0
62.5	24.5	927	265	662	88	839	3,780	2,497	-13,538	0	0	-5,802	3,780	2,497	-13,538	0	0	-5,802	477	597	0	0
57.5	21.4	600	171	429	57	543	7,216	4,767	-13,538	3,093	2,043	-5,802	7,216	4,767	-13,538	1,718	1,135	-5,802	0	0	0	0
52.5	18.7	610	174	436	58	552	10,653	7,037	-13,538	6,529	4,313	-5,802	10,653	7,037	-13,538	5,154	3,405	-5,802	0	0	55	25
47.5	16.2	611	175	436	58	553	14,089	9,307	-13,538	9,965	6,583	-5,802	14,089	9,307	-13,538	8,591	5,675	-5,802	0	0	104	75
42.5	14.4	656	187	469	62	594	17,525	11,576	-13,538	13,402	8,853	-5,802	17,525	11,576	-13,538	12,027	7,945	-5,802	0	0	166	134
37.5	12.6	1,023	292	731	97	926	20,961	13,846	-13,538	16,838	11,122	-5,802	20,961	13,846	-13,538	15,463	10,215	-5,802	0	0	342	292
32.5	10.7	734	210	524	70	664	24,398	16,116	-13,538	20,274	13,392	-5,802	24,398	16,116	-13,538	18,900	12,484	-5,802	0	0	305	270
27.5	8.6	334	95	239	32	302	27,834	18,386	-13,538	23,711	15,662	-5,802	27,834	18,386	-13,538	22,336	14,754	-5,802	0	0	166	150
22.5	6.8	252	72	180	24	228	31,270	20,656	-13,538	27,147	17,932	-5,802	31,270	20,656	-13,538	25,772	17,024	-5,802	0	0	146	134
17.5	5.5	125	36	89	12	113	34,707	22,926	-13,538	30,583	20,202	-5,802	34,707	22,926	-13,538	29,209	19,294	-5,802	0	0	83	76
12.5	4.1	47	13	34	4	43	38,143	25,196	-13,538	34,019	22,472	-5,802	38,143	25,196	-13,538	32,645	21,564	-5,802	0	0	35	33
7.5	2.6	22	6	16	2	20	41,579	27,466	-13,538	37,456	24,742	-5,802	41,579	27,466	-13,538	36,081	23,834	-5,802	0	0	18	17
2.5	1	13	4	9	1	12	45,016	29,736	-13,538	40,892	27,012	-5,802	45,016	29,736	-13,538	39,518	26,104	-5,802	0	0	12	11
-2.5	0	0	0	0	0	0	48,452	32,005	-13,538	44,328	29,282	-5,802	48,452	32,005	-13,538	42,954	28,374	-5,802	0	0	0	0
-7.5	-1.5	0	0	0	0	0	51,888	34,275	-13,538	47,765	31,551	-5,802	51,888	34,275	-13,538	46,390	30,644	-5,802	0	0	0	0
TOTALS		**8,726**	**2,493**	**6,233**	**831**	**7,895**													**4,328**	**4,003**	**1,430**	**1,217**

Existing Building Ventilation & Infiltration (occ)	**420**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**420**	**cfm**

HEAT GAIN/LOSS WORKSHEET

Project Name:	Tabernacle Township	**Project No.:**	CHA #-21063		
Location		**Site Elevation:**	460 Feet	**Specific Volume**	13.50 CF/#
Building Name	Municipal Building	**Date:**			
Engineer:	Frank Cuttita				

Building/Facility Designation General Offices, Tax Office and Administration.

Outdoor Winter Design DB Temperature	14 *F	**Indoor Winter Design DB Temperature**	68 *F
Outdoor Summer Design DB Temperature	91 *F	**Indoor Summer Design DB Temperature**	73 *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**	0.0078 ##

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

		R Value	Wall Type
	Steel Siding, 4" Insulation, Steel Siding	15.2	1
	Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
	4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
	Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
	4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
	4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
	Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
	Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
	Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
	4" Block, 1" insulation, 8" Block	19.9	16
x	Gypsum, Wood framed, Blown Insulation,siding	10.0	

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
x	Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	14.0	10
	Wood Deck, 6" insulation, Felt & Membrane	18.0	
	Other		

Windows (Select One)

		U Value
	Aluminum Frame, 1/8" SP Glazing	1.05
	Aluminum Frame, 1/4" DP Glazing	0.60
	Aluminum Frame, 3/16" DP Glazing	0.62
	Aluminum Frame, 1/2" DP Glazing	0.50
	Skylights	0.90
x	wood framed & single pane	0.70

	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	1,680 SF		
Occupied Area	3,360 SF	**Return Plenum?**	n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	70 Ft	10.0 Ft	8.0 Ft	117 SF	36 SF	547 SF
East Exposure	100 Ft	10.0 Ft	8.0 Ft	93 SF	21 SF	886 SF
South Exposure	70 Ft	10.0 Ft	8.0 Ft	150 SF	0 SF	550 SF
West Exposure	100 Ft	10.0 Ft	8.0 Ft	15 SF	0 SF	985 SF

Forced Ventilation 0 cfm

HEAT GAIN/LOSS WORKSHEET

Project Name:	Tabernacle Township	Project No.:	CHA #-21063		
Location		Site Elevation:	460 Feet	Specific Volume	13.50 CF/#
Building Name	Municipal Building	Date:			
Engineer:	Frank Cuttita				

Building/Facility Designation: General Offices, Tax Office and Administration.

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor		Solar Heat Gain	
North Exposure	117	38 btu/h/sf	0.8	0.75	Glass Type C	2,668 Btu/hr	
East Exposure	93	216 btu/h/sf	0.8	0.31	Glass Type C	4,982 Btu/hr	
South Exposure	150	109 btu/h/sf	0.8	0.58	Glass Type C	7,586 Btu/hr	
West Exposure	15	216 btu/h/sf	0.8	0.29	Glass Type C	752 Btu/hr	
							15,988 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain	
North Exposure	407	0.10	20 *F	1.0	814 Btu/hr	
East Exposure	686	0.10	39 *F	1.0	2,675 Btu/hr	
South Exposure	410	0.10	27 *F	1.0	1,107 Btu/hr	
West Exposure	785	0.10	22 *F	1.0	1,727 Btu/hr	
Roof	1,680	0.07	73 *F	1.0	8,760 Btu/hr	
Fenestration	375	0.70	18 *F		4,725 Btu/hr	
Doors	57	0.14	27 *F		215 Btu/hr	
Ceiling	3,360	0.14	0 *F		0 Btu/hr	
Partition	0	0.05	0 *F		0 Btu/hr	
Floor	3,360	0.04	0 *F		0 Btu/hr	
						20,023 Btu/h

INTERNAL HEAT GAINS

								Room Heat Gain
Lights	1.20 w/sf x	3,360	Occ Area =	4.0	kW x 3.4x	1.0	RAF =	13,761 Btu/h
Plug Load	0.00 w/sf x	3,360	Occ Area =	0.0	kW x 3.4x	1.0	RAF =	0 Btu/h
People	3 people x	255	btu/person x	60%	time in space =			459 Btu/h
Computer Work Stations		3	Units x	500	W/Unit x 3414 =			5,120 Btu/h
Equipment	0.0 kW x 3.413 =							0 Btu/h
Misc.								0 Btu/h
								19,340 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain	
Walls	2,288 SF	0.10 CFM/SF		1.08	18 *F	4,814 Btu/h	
Doors	57 SF	0.25 CFM/LF	0.75 LF/SF	1.08	18 *F	226 Btu/h	
Windows	375 SF	0.30 CFM/LF	1.00 LF/SF	1.08	18 *F	2,373 Btu/h	
Ventilation	0 cfm			1.08	18 *F	0 Btu/h	
							7,413 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	140	0.10	20	1.0	280 Btu/hr	
East Exposure	200	0.10	39	1.0	780 Btu/hr	
South Exposure	140	0.10	27	1.0	378 Btu/hr	
West Exposure	200	0.10	22	1.0	440 Btu/hr	
Roof	1,680	0.07	73	0.0	0 Btu/hr	
						1,878 Btu/h

INTERNAL HEAT GAINS

							Room Heat Gain
Lights	1.20 w/sf x	3,360	Occ Area =	4.0	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	15,988	Internal Gains to Room	19,340
Conduction to Room	20,023	Internal Gains to Plenum	0
Conduction to Plenum	1,878		
Ventilaton and Infiltration	7,413		
Sub Total	45,302	Sub Total	19,340

HEAT GAIN/LOSS WORKSHEET

Project Name:	Tabernacle Township	Project No.:	CHA #-21063		
Location		Site Elevation:	460 Feet	Specific Volume	13.50 CF/#
Building Name	Municipal Building	Date:			
Engineer:	Frank Cuttita				

Building/Facility Designation: General Offices, Tax Office and Administration.

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	2,360 SF	0.10 CFM/SF	4,800	0.0043 ##	4,871 Btu/h
Doors	57 SF	0.25 CFM/LF	4,800	0.0043 ##	222 Btu/h
Windows	375 SF	0.30 CFM/LF	4,800	0.0043 ##	2,328 Btu/h
Ventilation	0 cfm		4,800	0.0043 ##	0 Btu/h
People	3 people	0.60 time in space		250 Btu/hr/person	450 Btu/h
					7,871 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	
Temperature Dependent Gains	45,302	7,871	53,173	
Temperature Indep. Gains	19,340	0	19,340	SHR= 0.89
Total	64,642	7,871	72,513	

Building Cooling Load: 6.0 Tons at 556 SF/Ton

Building Air Flow to Condition Space based on a 12*F Temp Rise is: 4,833 CFM (1.44 CFM/sf)

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	547	0.10	54	2,954 Btu/h
East Exposure	886	0.10	54	4,784 Btu/h
South Exposure	550	0.10	54	2,970 Btu/h
West Exposure	985	0.10	54	5,319 Btu/h
Fenestration	375	0.70	54	14,175 Btu/h
Roof	1,680	0.07	54	6,480 Btu/h
Doors	57	0.14	54	430 Btu/h
Ceiling	3,360	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	1,680	0.04	0	0 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	2,968 SF	0.10 CFM/SF	1.08	54	297 cfm	17,346 Btu/h
Doors	57 SF	0.25 CFM/LF	1.08	54	11 cfm	628 Btu/h
Windows	375 SF	0.30 CFM/LF	1.08	54	113 cfm	6,592 Btu/h
Ventilation Load	0 cfm		1.08	54	0 cfm	0 Btu/h
Total Ventilation & Infiltration Load					420 cfm	24,566 Btu/h

Building Heating Load: 61,678 btu/h (18.4 btu/sf)

Tabernacle Township
CHA #-21063
Building: Municipal Building

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	6.0	6.0	1	36.0	24.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	36.0	24.0
East	3.5	6.0	1	21.0	19.0
				0.0	0.0
				0.0	0.0
			Sub-total	21.0	19.0
South	3.0	7.0	0	0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
West	3.5	7.0	0	0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
			Total	**57.0**	**43.0**

LF/SF
0.75

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North	35.0	10.0	1	350.0	90.0		All wall quantities must remain equal to 1
	35.0	10.0	1	350.0	90.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	70.0			700.0	180.0	10.0	Average height wall automatically linked to
East	50.0	10.0	1	500.0	120.0		
	50.0	10.0	1	500.0	120.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	100.0			1000.0	240.0	10.0	Average height wall automatically linked to
South	35.0	10.0	1	350.0	90.0		
	35.0	10.0	1	350.0	90.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	70.0			700.0	180.0	10.0	Average height wall automatically linked to
West	50.0	10.0	1	500.0	120.0		
	50.0	10.0	1	500.0	120.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	100.0			1000.0	240.0	10.0	Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	3.0	2.0	2	12.0	20.0
	3.0	7.0	5	105.0	100.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	117.0	120.0
East	3.0	5.0	2	30.0	32.0
	3.0	7.0	3	63.0	60.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	93.0	92.0
South	3.0	5.0	3	45.0	48.0
	3.0	7.0	5	105.0	100.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	150.0	148.0
West	3.0	5.0	1	15.0	16.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	15.0	16.0
						LF/SF
			Total	375.0	376.0	1.00

Tabernacle Township
CHA #-21063
Building: Municipal Building

Reconcile Thermal Model

Building Footprint	3,360	SF	Ex Occupied Clng Temp.	73	*F	Ex Occupied Htg Temp.	68 *F
Heating Efficiency	70%		Ex Unoccupied Clng Temp.	80	*F	Ex Unoccupied Htg Temp.	62 *F
Cooling Efficiency	1.30	kW/ton	Occupied Cooling UA	(2,105)	btu/hr/*F	Occupied Heating UA	687 btu/hr/*F
Internal Gains	19,340	btu/h	Unoccupied Cooling UA	(1,217)	btu/hr/*F	Unoccupied Heating UA	687 btu/hr/*F
Unoc Internal Gain factor	0.3		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	Equipment Occupied Equipment Bin Hours	Equipment Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-62,096	-40,858	-13,538	-27,377	-40,858	-5,802	0	0	0	0
97.5	42.5	3	1	2	-51,571	-28,374	-13,538	-21,293	-28,374	-5,802	0	22	22	0
87.5	36.6	131	37	94	-30,522	-17,213	-13,538	-9,126	-17,213	-5,802	0	574	574	0
82.5	34.0	500	143	357	-19,997	-12,295	-13,538	-3,042	-12,295	-5,802	0	1,527	1,527	0
77.5	31.6	620	177	443	-9,472	-7,755	-13,538	0	0	-5,802	0	869	869	0
72.5	29.2	664	190	474	0	0	-13,538	0	0	-5,802	0	576	576	0
67.5	27.0	854	244	610	344	227	-13,538	0	0	-5,802	0	726	726	0
62.5	24.5	927	265	662	3,780	2,497	-13,538	0	0	-5,802	0	625	625	0
57.5	21.4	600	171	429	7,216	4,767	-13,538	3,093	2,043	-5,802	0	60	60	0
52.5	18.7	610	174	436	10,653	7,037	-13,538	6,529	4,313	-5,802	0	0	0	42
47.5	16.2	611	175	436	14,089	9,307	-13,538	9,965	6,583	-5,802	0	0	0	92
42.5	14.4	656	187	469	17,525	11,576	-13,538	13,402	8,853	-5,802	0	0	0	152
37.5	12.6	1,023	292	731	20,961	13,846	-13,538	16,838	11,122	-5,802	0	0	0	320
32.5	10.7	734	210	524	24,398	16,116	-13,538	20,274	13,392	-5,802	0	0	0	290
27.5	8.6	334	95	239	27,834	18,386	-13,538	23,711	15,662	-5,802	0	0	0	159
22.5	6.8	252	72	180	31,270	20,656	-13,538	27,147	17,932	-5,802	0	0	0	140
17.5	5.5	125	36	89	34,707	22,926	-13,538	30,583	20,202	-5,802	0	0	0	80
12.5	4.1	47	13	34	38,143	25,196	-13,538	34,019	22,472	-5,802	0	0	0	34
7.5	2.6	22	6	16	41,579	27,466	-13,538	37,456	24,742	-5,802	0	0	0	18
2.5	1.0	13	4	9	45,016	29,736	-13,538	40,892	27,012	-5,802	0	0	0	11
-2.5	0.0	0	0	0	48,452	32,005	-13,538	44,328	29,282	-5,802	0	0	0	0
-7.5	-1.5	0	0	0	51,888	34,275	-13,538	47,765	31,551	-5,802	0	0	0	0
TOTALS		8,726	2,493	6,233								4,979	4,979	1,337

Existing Building Ventilation & Infiltration (occ)	**420**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**420**	**cfm**
Economizer Ventilation (from AHU's)	**0**	**cfm**

cooling for 5 ton ac unit	
amps	17
ph	3
volts	208
hrs	1,918
pf	0.8
runtime	0.35
kwhr/machine	3285
for 2 units	4928

Energy Use Indices (calculated)

	Base Case
Heating	1,337
Target ->	1,334
	100.2%

	Base Case
Cooling	4,979
Target ->	4,928
	101.0%

APPENDIX D

ECM-3 Replace Windows

Tabernacle Township
CHA #-21063
Building: Municipal Building

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

ECM-3 Window Replacement/Upgrade

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

	Occupied Cooling Hours per Week		48	Hours		
	Occupied Heating Hours per Week		48	Hours		
Given	Heating Energy Cost		$1.20	$/therm		
	Cooling Cost		$0.176	$/kWh		
	Occupied Cooling Setpoint Temperature		73.0	Degrees F		(Assumption)
	Occupied Cooling Avg Space Air Enthalpy		25.5	btu/# air		(Assumption)
	Occupied Heatng Setpoint Temperature		68.0	Degrees F	Occupied	(Assumption)
	Unoccupied Heating Setpoint Temperature		62.0	Degrees F	Unoccupied	(Assumption)
	Window Area	only upstairs	186	sq.ft.		(From window survey)
	Window Perimeter	only upstairs	188	ft		(From window survey)
	Proposed U factor		0.45	Btu/(h*sqft*degf)		(From window vendor)
	Proposed Air Infiltration		0.20	cfm/ft		(From window vendor)
	Cooling Conversion		12,000	Btu/ton		
	Heating Btu Conversion		1,000,000	Btu/MMBtu		
Assumptions	Existing U factor		0.70	Btu/(h*sqft*degf)		(From ASHRAE Fundamentals)
	Existing Air Infiltration		0.30	cfm/ft		(From ASHRAE Fundamentals)
	Heating System Efficiency		70%			
	Cooling System Efficiency		1.30	kW/ton		

Formula

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

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

Existing	Operation	OA Enthalpy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
	Cooling	38.3	92.5	3	0.9	0.0	0.0	2,194	0	0	2,785	0	0
	Cooling	36.6	87.5	131	37.4	0.0	0.0	71,231	0	0	105,443	0	0
	Cooling	33.5	82.5	500	142.9	0.0	0.0	178,125	0	0	290,057	0	0
	Cooling	31.6	77.5	620	177.1	0.0	0.0	104,625	0	0	274,249	0	0
	Heating	30.3	72.5	664	0.0	0.0	0.0	0	0	0	0	0	0
	Heating	27.9	67.5	854	0.0	244.0	0.0	0	16,013	0	0	7,431	0
	Heating	24.6	62.5	927	0.0	264.9	0.0	0	191,194	0	0	88,731	0
	Heating	21.6	57.5	600	0.0	171.4	428.6	0	236,250	253,125	0	109,642	117,473
	Heating	18.7	52.5	610	0.0	174.3	435.7	0	354,563	543,281	0	164,549	252,132
	Heating	16.2	47.5	611	0.0	174.6	436.4	0	469,706	830,578	0	217,987	385,464
	Heating	14.3	42.5	656	0.0	187.4	468.6	0	627,300	1,199,250	0	291,125	556,562
	Heating	12.4	37.5	1,023	0.0	292.3	730.7	0	1,170,056	2,349,703	0	543,013	1,090,477
	Heating	10.4	32.5	734	0.0	209.7	524.3	0	977,138	2,029,969	0	453,481	942,091
	Heating	8.7	27.5	334	0.0	95.4	238.6	0	507,263	1,080,281	0	235,416	501,349
	Heating	7	22.5	252	0.0	72.0	180.0	0	429,975	933,188	0	199,548	433,084
	Heating	5.4	17.5	125	0.0	35.7	89.3	0	236,719	521,484	0	109,859	242,016
	Heating	3.9	12.5	47	0.0	13.4	33.6	0	97,819	218,109	0	45,397	101,223
	Heating	2.5	7.5	22	0.0	6.3	15.7	0	49,913	112,406	0	23,164	52,167
	Heating	1.2	2.5	13	0.0	3.7	9.3	0	31,931	72,516	0	14,819	33,654
	Heating	-0.2	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
	Heating	-1.4	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
	Subtotal =			**8,726**	**358**	**1,945**	**3,591**	**356,175**	**5,395,838**	**10,143,891 btu**	**672,534**	**2,504,162**	**4,707,693 btu**

	Conduction	Infiltration			
Cooling Load =	(356175) + (	672534) =			**1,028,709 btu**
	Cooling Load				
Cooling Energy =	(1028709)/(	12000) * (	1.30) =		**111 kWh**
	Cooling Energy	Cooling Cost			
Cooling Energy Cost =	(111.44) x (	$0.176) =			**$ 19.60**
	Conduction	Infiltration			
Heating Load =	(15539728) + (	7211855) =			**22,751,583 btu**
	Heating Load	Heat Content			
Heating Energy =	(22751583)/(	70%)/(	100000) =		**325 therms**
	Heating Energy	Heating Cost			
Heating Energy Cost =	(325.02) x (	$1.200) =			**$ 390**

Operation	OA Enthalphy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
Cooling	38.3	92.5	3	0.9	0.0	0.0	1,410	0	0	1,856	0	0
Cooling	36.6	87.5	131	37.4	0.0	0.0	45,792	0	0	70,295	0	0
Cooling	33.5	82.5	500	142.9	0.0	0.0	114,509	0	0	193,371	0	0
Cooling	31.6	77.5	620	177.1	0.0	0.0	67,259	0	0	182,833	0	0
Heating	30.3	72.5	664	0.0	0.0	0.0	0	0	0	0	0	0
Heating	27.9	67.5	854	0.0	244.0	0.0	0	10,294	0	0	4,954	0
Heating	24.6	62.5	927	0.0	264.9	0.0	0	122,910	0	0	59,154	0
Heating	21.6	57.5	600	0.0	171.4	428.6	0	151,875	162,723	0	73,094	78,315
Heating	18.7	52.5	610	0.0	174.3	435.7	0	227,933	349,252	0	109,700	168,088
Heating	16.2	47.5	611	0.0	174.6	436.4	0	301,954	533,943	0	145,324	256,976
Heating	14.3	42.5	656	0.0	187.4	468.6	0	403,264	770,946	0	194,083	371,041
Heating	12.4	37.5	1,023	0.0	292.3	730.7	0	752,179	1,510,523	0	362,009	726,985
Heating	10.4	32.5	734	0.0	209.7	524.3	0	628,160	1,304,980	0	302,321	628,061
Heating	8.7	27.5	334	0.0	95.4	238.6	0	326,097	694,467	0	156,944	334,233
Heating	7	22.5	252	0.0	72.0	180.0	0	276,413	599,906	0	133,032	288,723
Heating	5.4	17.5	125	0.0	35.7	89.3	0	152,176	335,240	0	73,239	161,344
Heating	3.9	12.5	47	0.0	13.4	33.6	0	62,883	140,213	0	30,265	67,482
Heating	2.5	7.5	22	0.0	6.3	15.7	0	32,087	72,261	0	15,443	34,778
Heating	1.2	2.5	13	0.0	3.7	9.3	0	20,527	46,617	0	9,879	22,436
Heating	-0.2	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Heating	-1.4	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Subtotal =			8,726	358	1,945	3,591	228,970	3,468,753	6,521,073 btu	448,356	1,669,441	3,138,462 btu

	Conduction		Infiltration		
Cooling Load =	(228970) + (	448356) =			677,325 btu
	Cooling Load				
Cooling Energy =	(677325)/(	12000) * (	1.30) =		73 kWh
	Cooling Energy	Cooling Cost			
Cooling Energy Cost =	(73.38) x (	$0.176) =			$ 12.91
	Conduction		Infiltration		
Heating Load =	(9989825) + (	4807903) =			14,797,728 btu
	Heating Load		Heat Content		
Heating Energy =	(14797728)/(	70%) / (	100000) =		211 therms
	Heating Energy	Heating Cost			
Heating Energy Cost =	(211.40) x (	$1.200) =			$ 254

Summary

EXISTING COOLING ENERGY	111.44	kWh	$	19.60
EXISTING HEATING ENERGY	325.02	therms	$	390.03
EXISTING ENERGY COST			$	409.63
PROPOSED COOLING ENERGY	73.38	kWh	$	12.91
PROPOSED HEATING ENERGY	211.40	therms	$	253.68
PROPOSED ENERGY COST			$	266.58
COOLING ENERGY SAVINGS	38.07	kWh	$	6.69
HEATING ENERGY SAVINGS	113.63	therms	$	136.35
ENERGY COST SAVINGS			$	143.05

	34.2% of existing
	35.0% of existing
	34.9% of existing

Comments

Tabernacle Township
CHA #-21063
Building: Municipal Building

ECM-3 Window Replacement/Upgrade

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
windows for second floor	12	ea	$ 340	$ 74		$ 3,998	$ 1,067	$ -	$ 5,066	
Removal of old windows	12	ea	$ 150	$ 350		$ 1,764	$ 5,082	$ -	$ 6,846	
trim and finishing	1	ls	$ 4,800	$ 6,000		$ 4,704	$ 7,260	$ -	$ 11,964	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 23,876	Subtotal	
$ 7,163	30%	Contingency
$ 4,656	15%	Contractor O&P
$ 7,139	20%	Engineering
$ 42,833	**Total**	

APPENDIX E

ECM-4 Lighting Replacement

Tabernacle Township
CHA #-21063
Building: Municipal Building

ECM-4 Replacement of incandescent and T-12 lights

Building Schedule:

Existing conditions (master switch): hrs/week
Supply Electric Rate $ 0.167 /kWh
Demand Rate $ 1.52 /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	Simple Payback
Main Area & Offices	15	F42ES	80	0	81.6	1.2	switch	10	3,650	4,380	15	F42ILL	59	0.885	switch	10	3,650	3,230	0	1,150	$ 198	$ 1,882	9.5
Second Floor	12	F42ES	80	0	81.6	0.96	switch	6	2,190	2,102	12	F42ILL	0	0	switch	6	2,190	-	1	2,102	$ 369	$ 1,506	4.1
Misc	6	I40	40	0	40.8	0.24	switch	1	365	88	6	CF23	23	0.138	switch	1	365	50	0	37	$ 8	$ 753	93.2
Outdoor	3	I150	150	0	153	0.45	timer	10	3,650	1,643	3	CF42	42	0.126	timer	10	3,650	460	0	1,183	$ 203	$ 376	1.9
Outdoor	1	I60	60	0	61.2	0.06	timer	10	3,650	219	1	CF42	42	0.042	timer	10	3,650	153	0	66	$ 11	$ 125	11.1
TOTALS -	37			0		2.9				8,432	37			1.2				3,894	1.7	4,538	$ 789	$ 4,643	5.9

APPENDIX F

New Jersey Incentive Program

Tabernacle Township
CHA #-21063
Building: Municipal Building

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)	3,400
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)	$5,600	$0
Existing Usage (from utility)	32,080	0
Proposed Savings	4,901	(974)
Existing Total MMBtus	109	
Proposed Savings MMBtus	(81)	
% Energy Reduction	**-73.7%**	
Proposed Annual Savings	$1,384	

	≥ %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	$170
Incentive #2	$0	$0	$0
Incentive #3	$0	$0	$0
Total All Incentives	**$0**	**$0**	**$170**

Total Project Cost	$62,400
% Incentives #1 of Utility Cost*	3.0%
% Incentives #2 & #3 of Project Cost**	0.0%
Total Eligible Incentives***	$170
Project Cost w/ Incentives	$62,230

Project Payback (years)	
w/o Incentives	w/ Incentives
45.1	45.0

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

** Maximum allowable amount of Incentive #2 & #3 is 80% of total project cost.

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

APPENDIX G

Photovoltaic (PV) Rooftop Solar Power Generation

Township of Tabernacle
Municipal Building

Cost of Electricity $0.170 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-12kW 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
$84,000	**0.0**	**14,470**	**0**	**$2,500**	**0**	**$2,500**	**$12,000**	**$7,000**	**33.6**	**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:	12.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	9.2 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	972	165.24
2	4.16	1106	188.02
3	4.74	1333	226.61
4	5.06	1336	227.12
5	5.20	1367	232.39
6	5.43	1339	227.63
7	5.51	1386	235.62
8	5.67	1438	244.46
9	5.07	1274	216.58
10	4.59	1245	211.65
11	3.37	915	155.55
12	2.67	760	129.20
Year	4.57	14472	2460.24

Output Hourly Performance Data * Output Results as Text

About the Hourly Performance Data Saving Text from a Browser

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

Please send questions and comments regarding PVWATTS to Webmaster

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.

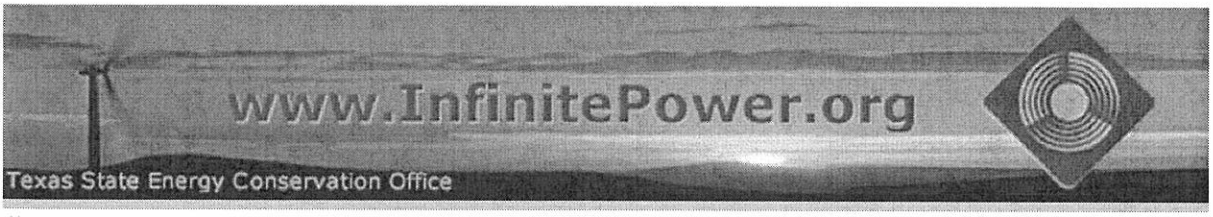
If net-metering isn't available and the PV system sends surplus electricity to the utility grid, the utility generally buys the electricity from the owner at a lower price than the owner pays the utility for electricity. In this case, the cost savings shown in the table should be reduced.

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.

APPENDIX H

Solar Thermal Domestic Hot Water Plant



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)	.75	? Water Inlet Temperature (Degrees F)	50
? Capacity (gallons)	19	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	14.43	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	40
Energy Use			
957.8		? 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	977.3 BTU/hr
Cost		
$ 0 /Therm	? Utility Rates	$ 0.17 /kWh
$ NaN	? Yearly Water Heating Cost	$ 426.248
How Does Solar Compare?		
? Solar Water Heater Cost: $ 27100		? Percentage Solar: 70
NaN years for gas	? Payback Time for Solar System	90.8255 years for electric

NJBPU Energy Audits
CHA #21063
Municipal Building
Tabernacle Township

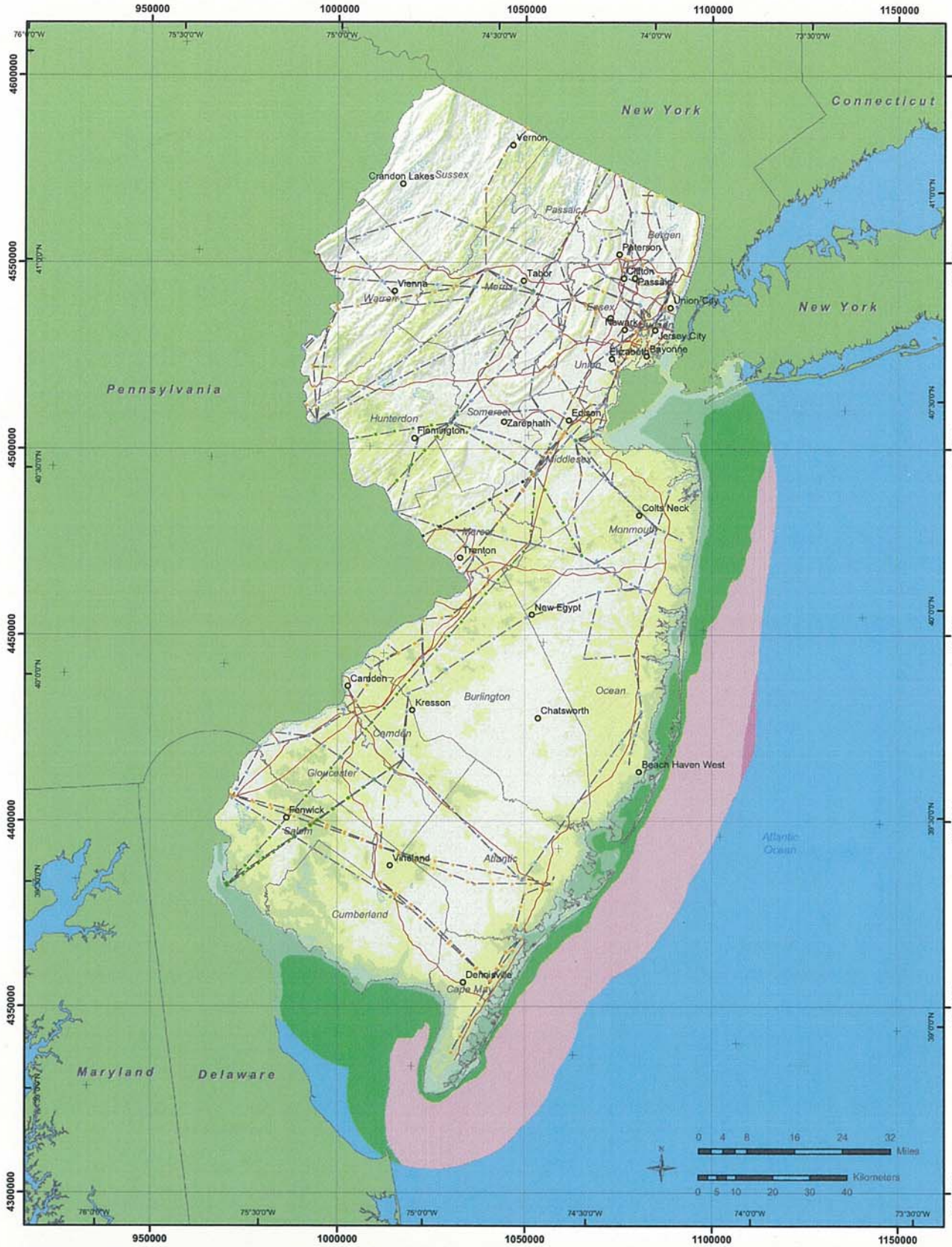
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

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 I

Wind



Wind Resource of New Jersey

Mean Annual Wind Speed at 30 Meters

Features

- City
- Interstate Highway
- County Boundary
- Water Body

Generalized Transmission Line

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

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

AWS Truewind

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

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

Bing Maps

163 Carranza Rd, Tabernacle, NJ 08088-9304

My Notes

APPENDIX J

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Municipal Building

Building ID: 2209599
For 12-month Period Ending: December 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: April 12, 2010

Facility
Municipal Building
6 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

Year Built: 1875
Gross Floor Area (ft²): 3,400

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	109,505
Fuel Oil (No. 2) (kBtu)	133,637
Natural Gas - (kBtu)[4]	0
Total Energy (kBtu)	243,142

Energy Intensity[5]	
Site (kBtu/ft²/yr)	72
Source (kBtu/ft²/yr)	147

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	27

Electric Distribution Utility
Pepco - Atlantic City Electric Co

National Average Comparison	
National Average Site EUI	77
National Average Source EUI	182
% Difference from National Average Source EUI	-19%
Building Type	Office

Stamp of Certifying Professional

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

Certifying Professional
N/A

Meets Industry Standards[6] **for Indoor Environmental Conditions:**	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

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

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) 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	Municipal Building	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Office	Is this an accurate description of the space in question?		☐
Location	6 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		☐
Municipal Building (Office)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	3,400 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Weekly operating hours	45 Hours	Is this the total number of hours per week that the Office space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	4	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100. The normal worker density ranges between 0.3 and 10 workers per 1000 square feet (92.8 square meters)		☐
Number of PCs	5	Is this the number of personal computers in the Office?		☐
Percent Cooled	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Pepco - Atlantic City Electric Co

Fuel Type: Electricity

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

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
11/05/2009	12/04/2009	2,100.00
10/05/2009	11/04/2009	2,043.00
09/05/2009	10/04/2009	2,525.00
08/05/2009	09/04/2009	3,410.00
07/05/2009	08/04/2009	3,785.00
06/05/2009	07/04/2009	2,654.00
05/05/2009	06/04/2009	2,451.00
04/05/2009	05/04/2009	2,370.00
03/05/2009	04/04/2009	2,313.00
02/05/2009	03/04/2009	2,816.00
01/05/2009	02/04/2009	2,996.00
main electric Consumption (kWh (thousand Watt-hours))		**29,463.00**
main electric Consumption (kBtu (thousand Btu))		**100,527.76**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**100,527.76**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Fuel Oil (No. 2)

Meter: Oil (Gallons)
Space(s): Municipal Building

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	214.00
07/05/2009	08/04/2009	49.00
06/05/2009	07/04/2009	166.00
05/05/2009	06/04/2009	64.00
04/05/2009	05/04/2009	69.00
03/05/2009	04/04/2009	64.00
02/05/2009	03/04/2009	170.00
01/05/2009	02/04/2009	157.00

Oil Consumption (Gallons)	**953.00**
Oil Consumption (kBtu (thousand Btu))	**132,172.05**
Total Fuel Oil (No. 2) Consumption (kBtu (thousand Btu))	**132,172.05**
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
Municipal Building
6 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

Municipal Building	
Gross Floor Area Excluding Parking: (ft²)	3,400
Year Built	1875
For 12-month Evaluation Period Ending Date:	December 31, 2009

Facility Space Use Summary

Municipal Building	
Space Type	Office
Gross Floor Area(ft²)	3,400
Weekly operating hours	45
Workers on Main Shift	4
Number of PCs	5
Percent Cooled	50% or more
Percent Heated	50% or more

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2009)	**Baseline**	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A		75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	72	N/A	38	N/A	77
Source (kBtu/ft²)	147	N/A	78	N/A	182
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	27	N/A	14	N/A	29
$kgCO_2e/ft^2$/year	8	N/A	4	N/A	9

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

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

APPENDIX K

Equipment Inventory

New Jersey BPU Energy Audit Program

Borough of Tabernacle, NJ

CHA#21063

Municipal Building										
Item	**Qty.**	**Manuf**	**Model No.**	**Serial No.**	**Capacity**	**Condition**	**Gas**	**MBH**	**Refrig.**	**Comments**
Split System A/C Units										
1	1	INTER CITY PODUCTS	OHD125A	D924174311		P		120	R-22	SYNDER GENERAL CC- MODEL H801060
2	1	HEAT CONTROLLER	ODHA125D5	4607A82984		P		120	R-22	SYNDER GENERAL CC- MODEL H801060
Window AC Unit										
3	1	GE	AGN06LAG1		6,000 BTU	E				EER 8.8
Shallow Well Pump										
4	1	ProSource	PSP35-T05			E				Cushion Tank
5	1	Meyers	5KC33MN2702BX		3/4 HP	G				
Condensing Units										
6	1	Nordyne	JS5BD-060	JSF070802120		G				5 TON
7	1	INT COMFORT PRODUCTS	CAC060	LB2302		P				
Domestic Hot Water Heater										
8	1	Bradford White	M120OU6SS	FL12627558	19 gallon	E				1.5 KW
Exhaust Fans										
9	1	Broan				G				mens room
10	1	Broan				G				womens room

E = Excellent
G = Good
P = Poor