



# **LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT**

**PREPARED FOR:**

**CAPE MAY BRIDGE COMMISSION  
153 CREST HAVEN ROAD  
CAPE MAY COURT HOUSE, NJ 08210  
ATTN: STEPHEN O' CONNOR  
COUNTY ADMINISTRATOR**

**PREPARED BY:**

**CONCORD ENGINEERING GROUP**  
**520 S. BURNT MILL ROAD  
VOORHEES, NJ 08043  
TELEPHONE: (856) 427-0200  
FACSIMILE: (856) 427-6529  
[WWW.CEG-INC.NET](http://WWW.CEG-INC.NET)**

**CEG CONTACT:**

**KEVIN BLANKENBUEHLER  
DIRECTOR OF ENERGY SERVICES  
EMAIL: [KBLANK@CEG-INC.NET](mailto:KBLANK@CEG-INC.NET)**

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## I. EXECUTIVE SUMMARY

This report presents the findings of the energy audit conducted for:

Cape May County Bridge Commission  
Bridge Commission Administration Building  
153 Crest Haven Road  
Cape May Court House, NJ 08210

County Contact Person: Stephen O' Connor  
Facility Contact Person: Linda Gilles

This audit is performed in connection with the New Jersey Clean Energy - Local Government Energy Audit Program. The energy audit is conducted to promote the mission of the office of Clean Energy, which is to use innovation and technology to solve energy and environmental problems in a way that improves the State's economy. This can be achieved through the wiser and more efficient use of energy.

The annual energy costs at this facility are as follows:

Electricity	\$ 4,547
Natural Gas	\$ 3,219
Total	\$ 7,766

The potential annual energy cost savings for each energy conservation measure (ECM) and renewable energy measure (REM) are shown below in Table 1. Be aware that the ECM's and REM's are not additive because of the interrelation of some of the measures. This audit is consistent with an ASHRAE level 2 audit. The cost and savings for each measure is  $\pm 20\%$ . The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

**Table 1**  
**Financial Summary Table**

<b>ENERGY CONSERVATION MEASURES (ECM's)</b>					
<b>ECM NO.</b>	<b>DESCRIPTION</b>	<b>NET INSTALLATION COST<sup>A</sup></b>	<b>ANNUAL SAVINGS<sup>B</sup></b>	<b>SIMPLE PAYBACK (Yrs)</b>	<b>SIMPLE LIFETIME ROI</b>
ECM #06-1	Install Programmable Thermostats	\$540	\$266	2.0	638.9%
ECM #06-2	Lighting Occupancy Controls	\$135	\$58	2.3	546.8%
ECM #06-3	High Efficiency Split Systems	\$25,598	\$1,036	24.7	-39.3%
ECM #06-4	Instant Electric Hot Water Heater	\$2,150	\$57	37.7	-60.2%

**Notes:**  
 A. Cost takes into consideration applicable NJ Smart Start<sup>TM</sup> incentives.  
 B. Savings takes into consideration applicable maintenance savings.

The estimated demand and energy savings for each ECM is shown below in Table 2. The descriptions in this table correspond to the ECM's listed in Table 1.

**Table 2**  
**Estimated Energy Savings Summary Table**

<b>ENERGY CONSERVATION MEASURES (ECM's)</b>				
<b>ECM NO.</b>	<b>DESCRIPTION</b>	<b>ANNUAL UTILITY REDUCTION</b>		
		<b>ELECTRIC DEMAND (KW)</b>	<b>ELECTRIC CONSUMPTION (KWH)</b>	<b>NATURAL GAS (THERMS)</b>
ECM #06-1	Install Programmable Thermostats	0.0	5000.0	0.0
ECM #06-2	Lighting Occupancy Controls	0.2	331.0	0.0
ECM #06-3	High Efficiency Split Systems	3.5	5885.0	0.0
ECM #06-4	Instant Electric Hot Water Heater	0.0	322.0	0.0

Concord Engineering Group (CEG) recommends proceeding with the implementation of all ECM's that provide a calculated simple payback at or under ten (10) years. The following Energy Conservation Measures are recommended for the facility:

- **ECM #6-1:** Install Programmable Thermostats
- **ECM #6-2:** Lighting Occupancy Controls

Although ECM #6-3 does not provide a payback less than 10 years, it is recommended to proceed with the installation of a more efficient split system due to the phasing out of R-22 refrigerant and the potential cost increase to perform maintenance on the unit.

In addition to the ECMs, there are maintenance and operational measures that can provide significant energy savings and provide immediate benefit. The ECMs listed above represent investments that can be made to the facility which are justified by the savings seen overtime. However, the maintenance items and small operational improvements below are typically achievable with on site staff or maintenance contractors and in turn have the potential to provide substantial operational savings compared to the costs associated. The following are recommendations which should be considered a priority in achieving an energy efficient building:

1. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
2. Maintain all weather stripping on entrance doors.
3. Clean all light fixtures to maximize light output.
4. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

Overall, the Bridge Commission Administration Buildings will see a benefit from the implementation of the above recommended measures as well as pursuing operation changes that ensure areas of the building that are not being utilized are shut down during those time periods.

## II. INTRODUCTION

The comprehensive energy audit covers the 1,750 square foot Bridge Commission Building, which includes the following spaces office, storage rooms, break room, reception/lobby, and mechanical space.

Electrical and natural gas utility information is collected and analyzed for one full year's energy use of the building. The utility information allows for analysis of the building's operational characteristics; calculate energy benchmarks for comparison to industry averages, estimated savings potential, and baseline usage/cost to monitor the effectiveness of implemented measures. A computer spreadsheet is used to calculate benchmarks and to graph utility information (see the utility profiles below).

The Energy Use Index (EUI) is established for the building. Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft<sup>2</sup>/yr), which is used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting the annual consumption of all energy sources to BTU's and dividing by the area (gross square footage) of the building. Blueprints (where available) are utilized to verify the gross area of the facility. The EUI is a good indicator of the relative potential for energy savings. A low EUI indicates less potential for energy savings, while a high EUI indicates poor building performance therefore a high potential for energy savings.

Existing building architectural and engineering drawings (where available) are utilized for additional background information. The building envelope, lighting systems, HVAC equipment, and controls information gathered from building drawings allow for a more accurate and detailed review of the building. The information is compared to the energy usage profiles developed from utility data. Through the review of the architectural and engineering drawings a building profile can be defined that documents building age, type, usage, major energy consuming equipment or systems, etc.

The preliminary audit information is gathered in preparation for the site survey. The site survey provides critical information in deciphering where energy is spent and opportunities exist within a facility. The entire site is surveyed to inventory the following to gain an understanding of how each facility operates:

- Building envelope (roof, windows, etc.)
- Heating, ventilation, and air conditioning equipment (HVAC)
- Lighting systems and controls
- Facility-specific equipment

The building site visit is performed to survey all major building components and systems. The site visit includes detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs provided by the building manager are collected along with the system and components to determine a more accurate impact on energy consumption.

### III. METHOD OF ANALYSIS

Post site visit work includes evaluation of the information gathered, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on HVAC, lighting and building envelope improvements. Data collected is processed using energy engineering calculations to anticipate energy usage for each of the proposed energy conservation measures (ECMs). The actual building's energy usage is entered directly from the utility bills provided by the owner. The anticipated energy usage is compared to the historical data to determine energy savings for the proposed ECMs.

It is pertinent to note, that the savings noted in this report are not additive. The savings for each recommendation is calculated as standalone energy conservation measures. Implementation of more than one ECM may in some cases affect the savings of each ECM. The savings may in some cases be relatively higher if an individual ECM is implemented in lieu of multiple recommended ECMs. For example implementing reduced operating schedules for inefficient lighting will result in a greater relative savings. Implementing reduced operating schedules for newly installed efficient lighting will result in a lower relative savings, because there is less energy to be saved. If multiple ECM's are recommended to be implemented, the combined savings is calculated and identified appropriately.

ECMs are determined by identifying the building's unique properties and deciphering the most beneficial energy saving measures available that meet the specific needs of the facility. The building construction type, function, operational schedule, existing conditions, and foreseen future plans are critical in the evaluation and final recommendations. Energy savings are calculated base on industry standard methods and engineering estimations. Energy consumption is calculated based on manufacturer's cataloged information when new equipment is proposed.

Cost savings are calculated based on the actual historical energy costs for the facility. Installation costs include labor and equipment costs to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers. The NJ Smart Start Building® program incentives savings (where applicable) are included for the appropriate ECM's and subtracted from the installed cost. Maintenance savings are calculated where applicable and added to the energy savings for each ECM. The life-time for each ECM is estimated based on the typical life of the equipment being replaced or altered. The costs and savings are applied and a simple payback, simple lifetime savings, and simple return on investment are calculated. See below for calculation methods:

ECM Calculation Equations:

$$\text{Simple Payback} = \left( \frac{\text{Net Cost}}{\text{Yearly Savings}} \right)$$

$$\text{Simple Lifetime Savings} = (\text{Yearly Savings} \times \text{ECM Lifetime})$$

$$\text{Simple Lifetime ROI} = \frac{(\text{Simple Lifetime Savings} - \text{Net Cost})}{\text{Net Cost}}$$

$$\text{Lifetime Maintenance Savings} = (\text{Yearly Maintenance Savings} \times \text{ECM Lifetime})$$

$$\text{Internal Rate of Return} = \sum_{n=0}^N \left( \frac{\text{Cash Flow of Period}}{(1 + \text{IRR})^n} \right)$$

$$\text{Net Present Value} = \sum_{n=0}^N \left( \frac{\text{Cash Flow of Period}}{(1 + \text{DR})^n} \right)$$

Net Present Value calculations based on Interest Rate of 3%.

#### IV. HISTORIC ENERGY CONSUMPTION/COST

##### A. Energy Usage / Tariffs

The energy usage for the facility has been tabulated and plotted in graph form as depicted within this section. Each energy source has been identified and monthly consumption and cost noted per the information provided by the Owner.

The electric usage profile represents the actual electrical usage for the facility. Atlantic City Electric (ACE) provides electricity to the facility under their Monthly General Service rate structure. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

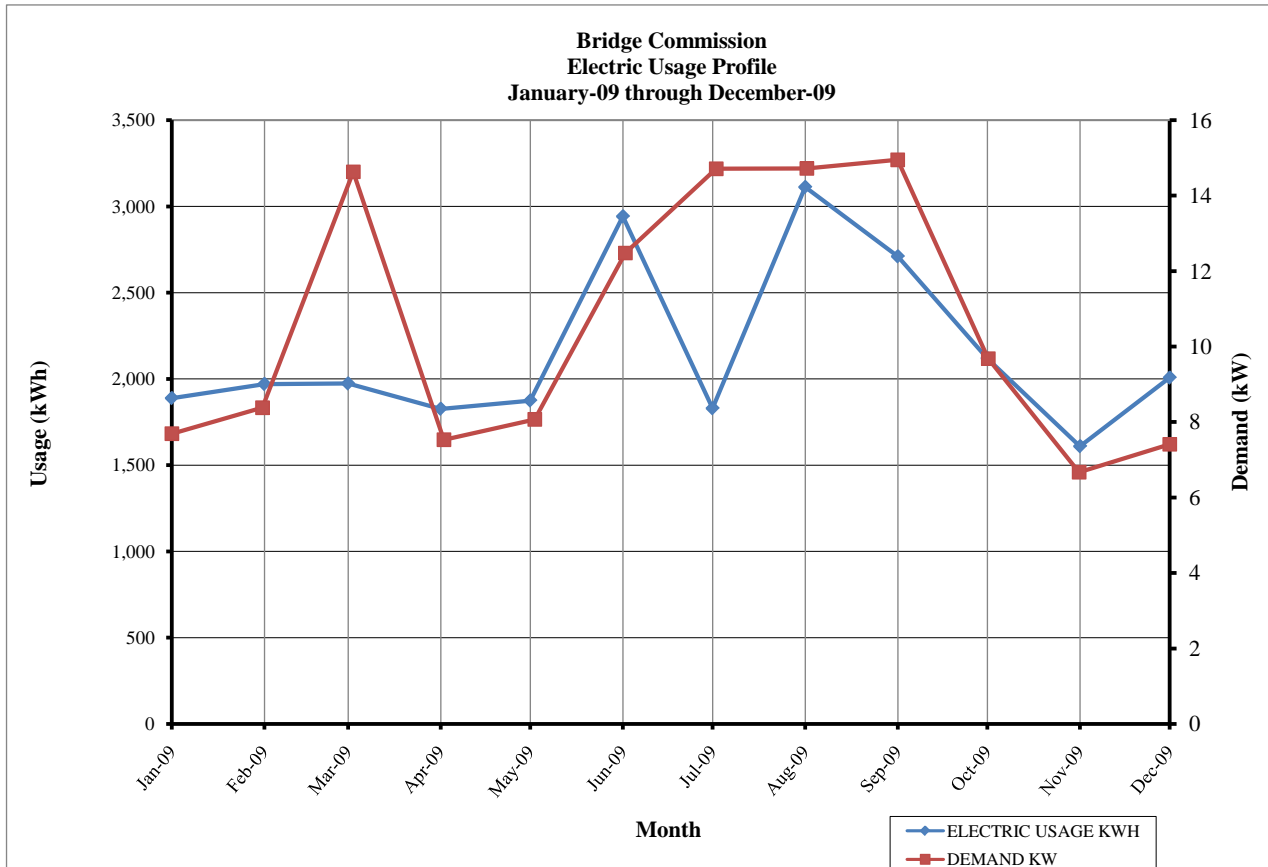
The gas usage profile shows the actual natural gas energy usage for the facility. South Jersey Gas (SJG) provides natural gas to the facility under the General Service Gas (GSG) rate structure. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

<u>Description</u>	<u>Average</u>
Electricity	17.6¢ / kWh
Natural Gas	\$1.55 / Therm

**Table 3  
Electricity Billing Data**

<b>ELECTRIC USAGE SUMMARY</b>			
Utility Provider: Atlantic City Electric			
Rate: Monthly General Service			
Meter No: 95310718			
Customer ID No: 0280 7219 9996			
Third Party Utility			
TPS Meter / Acct No:			
<b>MONTH OF USE</b>	<b>CONSUMPTION KWH</b>	<b>DEMAND</b>	<b>TOTAL BILL</b>
Jan-09	1,888	7.7	\$294
Feb-09	1,970	8.4	\$312
Mar-09	1,973	14.6	\$316
Apr-09	1,826	7.5	\$283
May-09	1,874	8.1	\$292
Jun-09	2,942	12.5	\$565
Jul-09	1,829	14.7	\$363
Aug-09	3,112	14.7	\$613
Sep-09	2,710	15.0	\$535
Oct-09	2,119	9.7	\$379
Nov-09	1,609	6.7	\$265
Dec-09	2,007	7.4	\$330
<b>Totals</b>	<b>25,859</b>	<b>15.0 Max</b>	<b>\$4,547</b>
<b>AVERAGE DEMAND</b>		<b>10.6 KW average</b>	
<b>AVERAGE RATE</b>		<b>\$0.176 \$/kWh</b>	

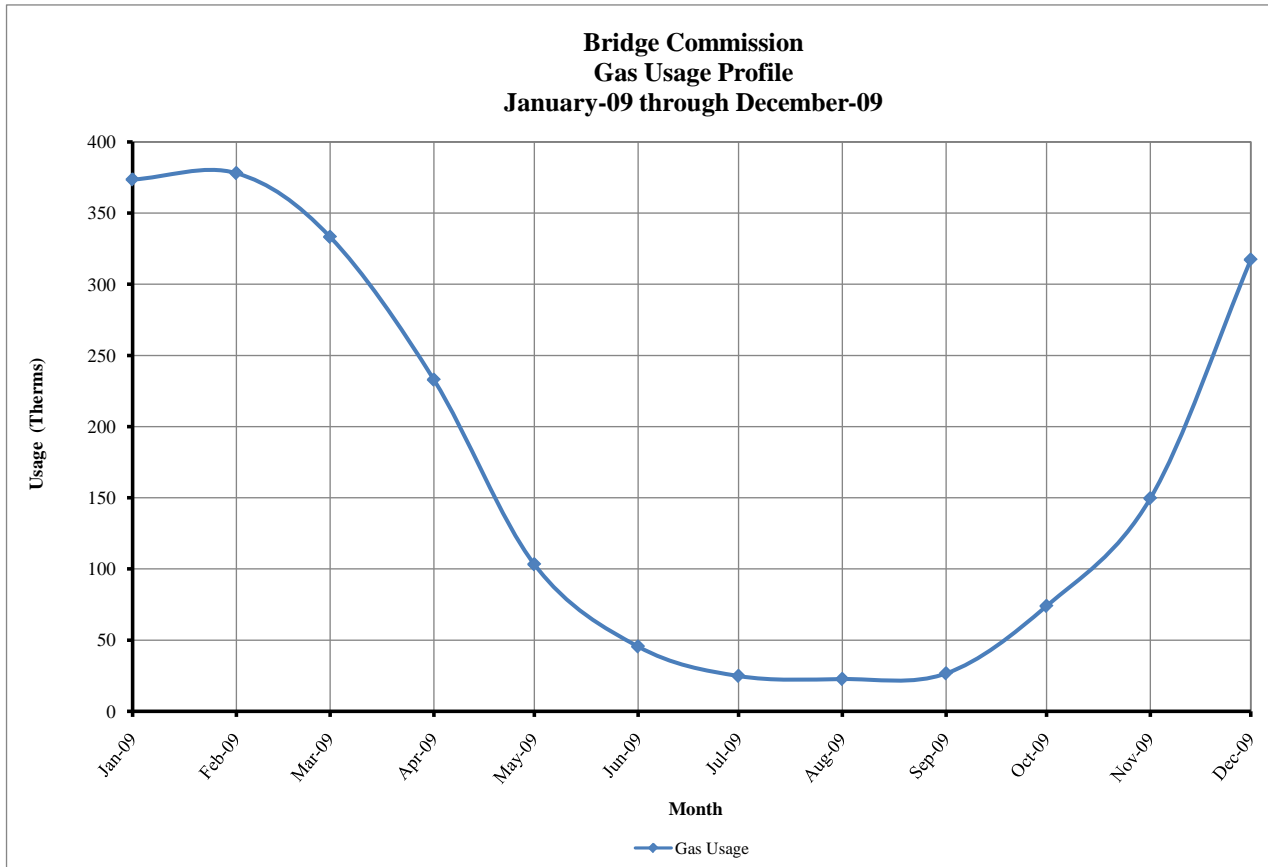
**Figure 1**  
**Electricity Usage Profile**



**Table 4  
Natural Gas Billing Data**

<b>NATURAL GAS USAGE SUMMARY</b>		
Utility Provider: South Jersey Gas		
Rate: General Service Gas		
Meter No: 464341		
Point of Delivery ID: 4 10 56 0033 0 8		
Third Party Utility Provider:		
TPS Meter No:		
<b>MONTH OF USE</b>	<b>CONSUMPTION (THERMS)</b>	<b>TOTAL BILL</b>
Jan-09	373.68	\$577.67
Feb-09	378.14	\$582.85
Mar-09	333.34	\$516.63
Apr-09	233.01	\$366.34
May-09	103.30	\$173.00
Jun-09	45.54	\$88.34
Jul-09	24.84	\$56.01
Aug-09	22.70	\$51.58
Sep-09	26.65	\$58.23
Oct-09	74.00	\$110.26
Nov-09	149.65	\$209.58
Dec-09	317.34	\$428.54
<b>TOTALS</b>	<b>2,082.19</b>	<b>\$3,219.03</b>
<b>AVERAGE RATE:</b>	<b>\$1.55</b>	<b>\$/THERM</b>

**Figure 2**  
**Natural Gas Usage Profile**



**B. Energy Use Index (EUI)**

Energy Use Index (EUI) is a measure of a building's annual energy utilization per square foot of building. This calculation is completed by converting all utility usage consumed by a building for one year, to British Thermal Units (BTU) and dividing this number by the building square footage. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types. The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. The ORNL website determines how a building's energy use compares with similar facilities throughout the U.S. and in a specific region or state.

Source use differs from site usage when comparing a building's energy consumption with the national average. Site energy use is the energy consumed by the building at the building site only. Source energy use includes the site energy use as well as all of the losses to create and distribute the energy to the building. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, which allows for a complete assessment of energy efficiency in a building. The type of utility purchased has a substantial impact on the source energy use of a building. The EPA has determined that source energy is the most comparable unit for evaluation purposes and overall global impact. Both the site and source EUI ratings for the building are provided to understand and compare the differences in energy use.

The site and source EUI for this facility is calculated as follows:

$$\text{Building Site EUI} = \frac{(\text{Electric Usage in kBtu} + \text{Gas Usage in kBtu})}{\text{Building Square Footage}}$$

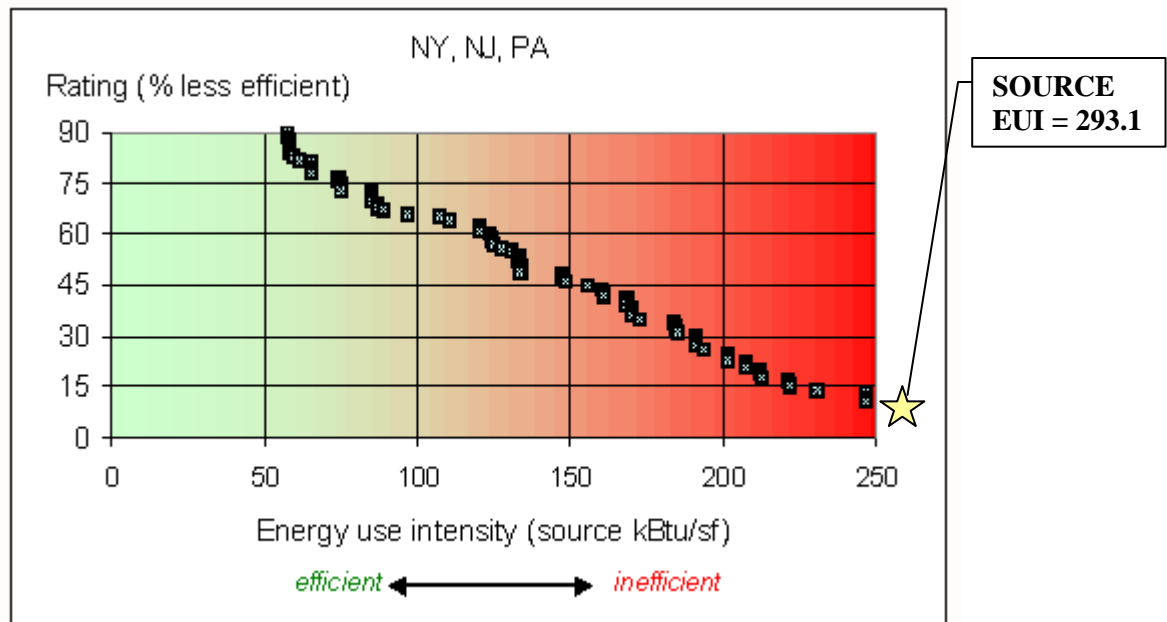
$$\text{Building Source EUI} = \frac{(\text{Electric Usage in kBtu} \times \text{SS Ratio} + \text{Gas Usage in kBtu} \times \text{SS Ratio})}{\text{Building Square Footage}}$$

**Table 5**  
**Facility Energy Use Index (EUI) Calculation**

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	25859.0			88,283	3.340	294,864
NATURAL GAS		2082.2		208,219	1.047	218,005
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				296,502		512,869
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
<b>BUILDING AREA</b>	1,750 SQUARE FEET					
<b>BUILDING SITE EUI</b>	169.43 kBtu/SF/YR					
<b>BUILDING SOURCE EUI</b>	293.07 kBtu/SF/YR					

Figure 3 below depicts a national EUI grading for the source use of *Office Buildings*.

**Figure 3**  
**Source Energy Use Intensity Distributions: Office Buildings**



**C. EPA Energy Benchmarking System**

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows tracking and assessment of energy consumption via the template forms located on the ENERGY STAR website ([www.energystar.gov](http://www.energystar.gov)). The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and emphasis is being placed on carbon reduction, greenhouse gas emissions and other environmental impacts.

Based on information gathered from the ENERGY STAR website, Government agencies spend more than \$10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions. It is vital that local government municipalities assess facility energy usage, benchmark energy usage utilizing Portfolio Manager, set priorities and goals to lessen energy usage and move forward with priorities and goals.

In accordance with the Local Government Energy Audit Program, CEG has created an ENERGY STAR account for the municipality to access and monitoring the facility’s yearly energy usage as it compares to facilities of similar type. The login page for the account can be accessed at the following web address; the username and password are also listed below:

<https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=login.login>

User Name: capemaybridge  
 Password: lgeaceg2010  
 Security Question: What city were you born in?  
 Security Answer: “Cape May”

The utility bills and other information gathered during the energy audit process are entered into the Portfolio Manager. The following is a summary of the results for the facility:

**Table 6  
 ENERGY STAR Performance Rating**

ENERGY STAR PERFORMANCE RATING		
FACILITY ADESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Bridge Commission Administration	N/A	N/A

Refer to **Statement of Energy Performance Appendix** for the detailed energy summary.

No rating is available for the Bridge Commission Building due to the area of the building being under the 5,000 square-foot threshold that is required to receive a rating for a building of office space type.

## V. FACILITY DESCRIPTION

The 1,750 sq-ft. Bridge Commission Building is a one story facility comprised of an open office area, reception and waiting entrance, private offices, kitchenette, and a mechanical closet. The typical hours of operation for this facility are between 8:00 am and 4:30 pm. Exterior walls are brick construction with minimum insulation typical of the time period. The windows throughout the facility are in good condition and appear to be well maintained. Typical windows throughout the facility are single pane, ¼” clear glass with wood frames. Blinds are utilized through the facility per occupant comfort. The roof is standard asphalt shingle roof with A-frame style truss system below.

### HVAC Systems

The building is conditioned by two HVAC systems one for cooling and one for heating. The air conditioning is provided by two split system Carrier rated at 3 and 5 tons of direct expansion cooling capacity and one 5,000 Btu per hour cooling only window unit. The split system indoor units are mounted in the drop ceiling. The window unit is additional cooling for one of the larger offices.

Heating is provided to the facility via a hot water baseboard system located along the perimeter walls. The hot water is generated by a Utica natural gas fired boiler rated at 200 MBH. Water is circulated with one small Grundfos circulator pump.

### Exhaust System

Air is exhausted from the toilet rooms through the roof exhausters. The toilet room exhaust fan is operated based on the facility occupancy schedule.

### HVAC System Controls

The Carrier Split units are controlled by wall mounted digital thermostats dedicated to each unit. The hot water based board is operated with separate thermostats that operate two way control valves.

### Domestic Hot Water

Domestic hot water for the restrooms and kitchenette is provided by a 40 gallon RUUD electric hot water heater, capacity of 4500 Watts. The domestic hot water is circulated throughout the building by a hot water re-circ pump. The domestic hot water piping insulation appeared to be in good condition.

### Lighting

Typical lighting throughout building is fluorescent tube lay-in fixtures with T-8 lamps and electronic ballasts. Lighting controlled by standard wall mounted switches.

**VI. MAJOR EQUIPMENT LIST**

The equipment list contains major energy consuming equipment that through implementation of energy conservation measures could yield substantial energy savings. The list shows the major equipment in the facility and all pertinent information utilized in energy savings calculations. An approximate age was assigned to the equipment in some cases if a manufactures date was not shown on the equipment's nameplate. The ASHRAE service life for the equipment along with the remaining useful life is also shown in the Appendix.

Refer to the **Major Equipment List Appendix** for this facility.

## VII. ENERGY CONSERVATION MEASURES

### ECM #06-1: Install Programmable Thermostats

#### Description:

The Cape May County Bridge Commission is cooled by several air handling units that condition the entire building. The thermostats controlling these units are standard non-programmable Dial Type thermostats with no set point capability.

Programmable thermostats provide automatic control of the space temperature during occupied and unoccupied periods of the day. When the space is not occupied the equipment can operate at the unoccupied set point. Once the space becomes occupied the thermostat raises the temperature of the space to the occupied set point. This control system approach is ideal for facilities with low occupancy levels and long unoccupied periods. New programmable have built in capability to adjust heating start times to ensure the space is up to temperature by the specified occupancy period. This is an added comfort feature so programming does not need to be re-adjusted as the season heating load changes.

This ECM includes replacement of the unit thermostats with programmable 7-day thermostats with night time setback control. The recommended thermostat set points for heating and cooling in the Shelter as follows:

Occupied Cooling = 72° F (8:00AM – 4:00 PM)

Unoccupied Cooling = 78° F (4:00 PM – 8:00 AM)

CEG recommends installing a new Honeywell RTH7500D 7-day programmable thermostat or equivalent to control the main air handling unit.

#### Energy Savings Calculations:

The energy savings of the 7-day programmable thermostats was calculated by using Energy Star Life Cycle Cost Estimate software for qualified programmable thermostats. Additional information on the referenced calculator can be found at [www.energystar.gov](http://www.energystar.gov) or refer to the **Programmable Thermostats Calculator Appendix** for a detailed energy savings calculation for the replacement of the thermostats in the facility.

**Energy Savings Summary:**

<b>ECM #06-1 - ENERGY SAVINGS SUMMARY</b>	
<b>Installation Cost (\$):</b>	\$540
<b>NJ Smart Start Equipment Incentive (\$):</b>	\$0
<b>Net Installation Cost (\$):</b>	\$540
<b>Maintenance Savings (\$/Yr):</b>	\$0
<b>Energy Savings (\$/Yr):</b>	\$266
<b>Total Yearly Savings (\$/Yr):</b>	\$266
<b>Estimated ECM Lifetime (Yr):</b>	15
<b>Simple Payback</b>	2.0
<b>Simple Lifetime ROI</b>	638.9%
<b>Simple Lifetime Maintenance Savings</b>	\$0
<b>Simple Lifetime Savings</b>	\$3,990
<b>Internal Rate of Return (IRR)</b>	49%
<b>Net Present Value (NPV)</b>	\$2,635.49

## ECM #06-2: Lighting Occupancy Controls

### Description:

In some areas the lighting is left on unnecessarily. In many cases the lights are left on because of the inconvenience to manually switch lights off when a room is left or on when a room is first occupied. This is common in rooms that are occupied for only short periods and only a few times per day. In some instances lights are left on due to the misconception that it is better to keep the lights on rather than to continuously switch lights on and off. Although increased switching reduces lamp life, the energy savings outweigh the lamp replacement costs. The payback timeframe for when to turn the lights off is approximately two minutes. If the lights are expected to be off for at least a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed. Occupancy sensors detect motion and will switch the lights on when the room is occupied. Occupancy sensors can either be mounted in place of a current wall switch, or on the ceiling to cover large areas.

The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the “Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways,” document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the report:

- Occupancy Sensors for Lighting Control                      10% - 20% energy savings.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 10% of the total light energy controlled by occupancy sensors (savings vary depending on space type and conditions surveyed in the field. The majority of the savings are expected to be after office hours when rooms are left with lights on.

This ECM includes replacement of standard wall switches with sensors wall switches for all individual offices, bathrooms, and meeting rooms. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent.

The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by the applicable percent savings for each area that includes lighting controls.

### Energy Savings Calculations:

$$\text{Energy Savings} = (10\% \times \text{Occupancy Sensored Light Energy (kWh/Yr)})$$

$$\text{Savings.} = \text{Energy Savings (kWh)} \times \text{Ave Elec Cost} \left( \frac{\$}{\text{kWh}} \right)$$

Installation cost per dual-technology sensors (Basis: Sensor switch or equivalent) are as follows:

Wall Mounted Sensor = \$75/unit including material and labor.

See the **Investment Grade Lighting Audit Appendix** for details.

From the **NJ Smart Start® Program Incentives Appendix**, the installation of a lighting control device warrants the following incentive:

Occupancy Sensor Wall Mounted (existing facility only) = \$20 per sensor.

Occupancy Sensor Remote Mounted (existing facility only) = \$35 per sensor

$$\begin{aligned} \text{Smart Start}^{\circledR} \text{ Incentive} &= (\# \text{ of wall mount} \times \$ 20) + (\# \text{ of ceiling mount} \times 35) \\ &= (0 \times \$35) + (2 \times \$20) = \$40 \end{aligned}$$

### Energy Savings Summary:

<b>ECM #06-2 - ENERGY SAVINGS SUMMARY</b>	
<b>Installation Cost (\$):</b>	\$175
<b>NJ Smart Start Equipment Incentive (\$):</b>	\$40
<b>Net Installation Cost (\$):</b>	\$135
<b>Maintenance Savings (\$/Yr):</b>	\$0
<b>Energy Savings (\$/Yr):</b>	\$58
<b>Total Yearly Savings (\$/Yr):</b>	\$58
<b>Estimated ECM Lifetime (Yr):</b>	15
<b>Simple Payback</b>	2.3
<b>Simple Lifetime ROI</b>	546.8%
<b>Simple Lifetime Maintenance Savings</b>	\$0
<b>Simple Lifetime Savings</b>	\$873
<b>Internal Rate of Return (IRR)</b>	43%
<b>Net Present Value (NPV)</b>	\$559.91

### ECM#06-3: High Efficiency Split Systems

**Description:**

The Bridge Commission currently has two (2) cooling only split systems which serve the office areas. These units have surpassed their useful service life and should be replaced. This ECM will replace one 3-Ton and one 5-Ton air-cooled split systems with high-efficiency split systems.

Basis for the replacement systems are Trane XL20i Series High Efficiency (20 SEER) Split System Units.

**Energy Savings Calculations:**

Estimated Full Load Cooling Hours. = 1,121 hrs/yr.  
 Average Cost of Electricity = \$0.176/kWh

		EXISTING	PROPOSED
Unit No.	Cooling Tons	Cooling SEER	Cooling SEER
CU-1	3.0	10.00	18.00
CU-2	5.0	9.00	17.00

Cooling Savings Calculation:

$$\text{Electric Demand Savings} = \frac{\text{Cooling(Tons)} \times 12,000 \left( \frac{\text{Btu}}{\text{Ton hr}} \right)}{1000 \left( \frac{\text{W}}{\text{kW}} \right)} \times \left( \frac{1}{\text{EER}_{\text{OLD}}} - \frac{1}{\text{EER}_{\text{NEW}}} \right) \times \text{CF}$$

$$\text{Electric Usage Savings} = \frac{\text{Cooling(Tons)} \times 12,000 \left( \frac{\text{Btu}}{\text{Ton hr}} \right)}{1000 \left( \frac{\text{W}}{\text{kW}} \right)} \times \left( \frac{1}{\text{EER}_{\text{OLD}}} - \frac{1}{\text{EER}_{\text{NEW}}} \right) \times \text{Full Load Hrs.}$$

**Energy Savings Summary:**

<b>ECM #06-3 - ENERGY SAVINGS SUMMARY</b>	
<b>Installation Cost (\$):</b>	\$26,334
<b>NJ Smart Start Equipment Incentive (\$):</b>	\$736
<b>Net Installation Cost (\$):</b>	\$25,598
<b>Maintenance Savings (\$/Yr):</b>	\$0
<b>Energy Savings (\$/Yr):</b>	\$1,036
<b>Total Yearly Savings (\$/Yr):</b>	\$1,036
<b>Estimated ECM Lifetime (Yr):</b>	15
<b>Simple Payback</b>	24.7
<b>Simple Lifetime ROI</b>	-39.3%
<b>Simple Lifetime Maintenance Savings</b>	\$0
<b>Simple Lifetime Savings</b>	\$15,540
<b>Internal Rate of Return (IRR)</b>	-6%
<b>Net Present Value (NPV)</b>	<b>(\$13,230.30)</b>

**ECM #06-4: Instant Electric Hot Water Heater****Description:**

The existing 40 gallon electric hot water heater is near the end of its useful life. Given the varied hot water use in an office type facility, water is being stored in the tank for longer periods of time at the supply temperature. Due to the age of the existing heater storage losses are significantly higher than with a newer model storage hot water heater. Considering the light use of an office it is recommended that a tank-less on demand type water heater be installed.

This ECM will remove the existing Ruud electric hot water heater and replace with a new on demand electric hot water heater, reducing standby storage losses for the system to zero.

**Energy Savings Calculations:**

Calculation Constants	
Hours per Tank Empty	4
Days Occupied per Week	5
Electric Cost, \$/kWh	\$0.176
Natural Gas Cost, \$/therm	\$1.55

$$R\text{-Value} = 8.0 \text{ h-F-ft}^2/\text{Btu}$$

$$\text{Water Temp} = 120 \text{ F}$$

$$\text{Air Temp} = 65 \text{ F}$$

$$\text{Tank Losses (Btu/h)} = \frac{\text{Surface Area of Tank} \times (\text{Storage Water Temperature} - \text{Air Temperature})}{\text{Tank R - Value}}$$

$$\text{Losses Electric Usage (kWh)} = \frac{\text{Tank Losses (Btu/h)}}{3,412 \frac{\text{Btu}}{\text{kWh}}} \times 24 \text{ Hrs} \times 365 \text{ Days}$$

$$\text{Hot Water Usage} \left( \frac{\text{gal}}{\text{day}} \right) = \frac{\text{Occupied Hours per day}}{\text{Hours per tank empty}} \times \text{Tank Size (gal)}$$

$$\text{Heating Usage (Btu)} = \text{Hot Water Usage} \times 8.34 \frac{\text{Btu}}{\text{gal}} \times (120 \text{ F} - 50 \text{ F}) \times 52 \frac{\text{Weeks}}{\text{year}} \times \text{Occupied Days per week}$$

*Existing Domestic Hot Water Usage:*

$$\text{Total Usage (Btu)} = \text{Losses Usage} + \text{Heating Usage}$$

$$\text{Electric Usage (kWh)} = \frac{\text{Total Usage (Btu)}}{\% \text{ Eff.} \times 3,412 \frac{\text{Btu}}{\text{kWh}}}$$

*Proposed Domestic Hot Water Usage:*

$$ElectricUsage(kWh) = \frac{Heating\ Usage(Btu)}{\% Eff. \times 3,412 \frac{Btu}{kWh}}$$

**Energy Savings Summary:**

<b>ECM #06-4 - ENERGY SAVINGS SUMMARY</b>	
<b>Installation Cost (\$):</b>	\$2,150
<b>NJ Smart Start Equipment Incentive (\$):</b>	\$0
<b>Net Installation Cost (\$):</b>	\$2,150
<b>Maintenance Savings (\$/Yr):</b>	\$0
<b>Energy Savings (\$/Yr):</b>	\$57
<b>Total Yearly Savings (\$/Yr):</b>	\$57
<b>Estimated ECM Lifetime (Yr):</b>	15
<b>Simple Payback</b>	37.7
<b>Simple Lifetime ROI</b>	-60.2%
<b>Simple Lifetime Maintenance Savings</b>	\$0
<b>Simple Lifetime Savings</b>	\$855
<b>Internal Rate of Return (IRR)</b>	-10%
<b>Net Present Value (NPV)</b>	(\$1,469.54)

**VIII. CARBON FOOTPRINT IMPACT**

CEG was tasked with developing a baseline and revised Carbon footprint based on collected utility data and the recommended energy conservation measures. The “baseline” carbon footprint will indicate the current state of the Bridge Commission’s energy usage as it pertains to carbon production and the “revised” carbon footprint will calculate the estimated future decrease in carbon production based on the implementation of the recommended energy conservation and renewable measures.

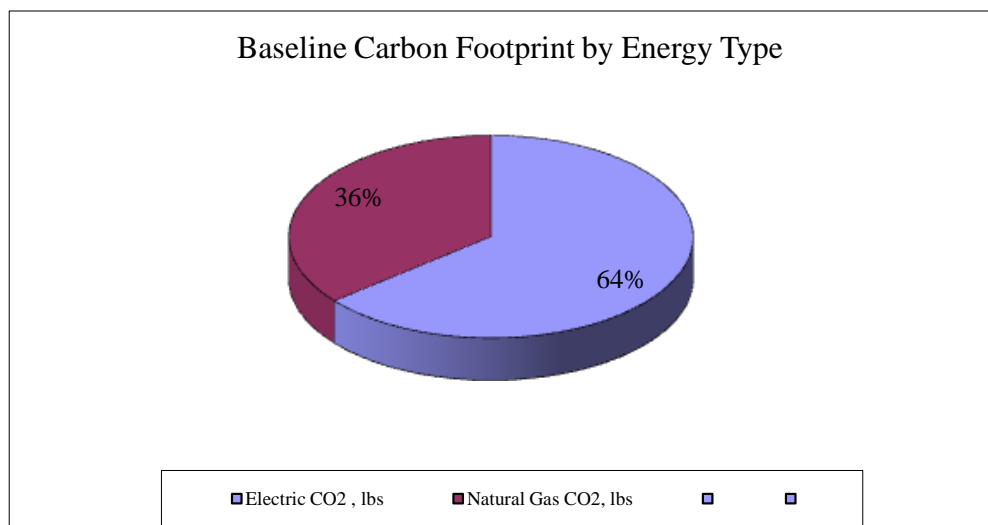
The Carbon Emissions were calculated based on emissions factor data published by the U.S. Environmental Protection Agency (EPA). These factors show equivalent pounds (or metric tons) of Carbon Dioxide per unit of fuel usage. The following table of factors were used to calculate the baseline and revised Carbon Footprints.

**Table 8  
EPA Emissions Factors**

Energy Type	Emissions Factor	
Electricity	1.583	lbs CO <sub>2</sub> / kWh
Natural Gas	11.023	lbs CO <sub>2</sub> / therm
Fuel Oil	22.200	lbs CO <sub>2</sub> / gallon
Propane	13.440	lbs CO <sub>2</sub> / gallon

**Baseline Carbon Footprint**

No.	Building/Source	Electric CO2 Emissions, lbs	Natural Gas CO2, lbs	Total CO2 Emissions, lbs
6	Bridge Commission	40,932.7	22,952.2	63,884.9



**Energy Conservation Measures Carbon Reduction**

No.	Building/Source	Electric CO2 Emissions, lbs	Natural Gas CO2, lbs	Total CO2 Emissions, lbs
ECM #06-1	Install Programmable Thermostats	7,914.6	0.0	7,914.6
ECM #06-2	Lighting Occupancy Controls	523.9	0.0	523.9
ECM #06-3	High Efficiency Split Systems	9,315.5	0.0	9,315.5
ECM #06-4	Instant Electric Hot Water Heater	509.7	0.0	509.7
	<b>TOTAL CARBON REDUCTION</b>	<b>18,263.7</b>	<b>0.0</b>	<b>18,263.7</b>
	<b>TOTAL RECOMMENDED</b>	<b>8,438.5</b>	<b>0.0</b>	<b>8,438.5</b>

**Revised Carbon Footprint –Recommended Options**

No.	Building/Source	Electric CO2 Emissions, lbs	Natural Gas CO2, lbs	Total CO2 Emissions, lbs
6	Bridge Commission	32,494.2	22,952.2	55,446.4

**IX. RENEWABLE/DISTRIBUTED ENERGY MEASURES**

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy measures (REM) for the Bridge Commission utilizing renewable technologies and concluded that there is not a potential for solar energy or wind energy at the Administration Building. The following are the conclusions that have been drawn:

- *Solar Energy Analysis:* The available roof space for the Administration Building is limited and given the current tree coverage around the building a roof mounted system would be too shaded to produce any power. Therefore, a solar photovoltaic system is not recommended.
- *Wind Energy Analysis:* Based on CEG's review of the applicability of wind energy for the facility; the limited site space and substantial foliage around the building make it a poor candidate for wind energy production.

## **X. ENERGY PURCHASING AND PROCUREMENT STRATEGY**

### **Load Profile:**

Load Profile analysis was performed to determine the seasonal energy usage of the facility. Irregularities in the load profile will indicate potential problems within the facility. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facility's energy consumption data was gathered in table format and plotted in graph form to create the load profile. Refer to The Electric and Natural Gas Usage Profiles included within this report to reference the respective electricity and natural gas usage load profiles.

### Electricity:

The electricity usage profile demonstrates a typical summer cooling and domestic water load profile. Historical usage is relatively steady throughout the year with an average monthly usage of 2,155kWh and an average monthly demand of 10.6kW. Largest consumption months were June, August and September.

The historical usage profile is not beneficial for competitive energy prices when shopping for alternative suppliers mainly due to the low monthly and yearly usage. However, if aggregated with other like accounts, the steady year-long load profile would allow for more competitive energy prices when shopping for alternative suppliers. Third Party Supplier (TPS) electric commodity contracts that offer's a firm, fixed price for 100% of the facilities electric requirements and are lower than the Atlantic City Electric's BGS-FP default rate are recommended.

### Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical natural gas (heat load) profile. A base-load shaping (flat) will secure more competitive energy prices when procuring through an alternative energy source.

This load profile will yield less favorable natural gas pricing when shopping for alternative suppliers. This is because the higher winter month consumption will yield higher pricing which will not be offset by similar summer month consumption. Nymex commodity pricing is generally higher in the winter months of November – March and lower in the summer months of April – October. Obtaining a flat load profile, (usage is similar each month), will yield optimum natural gas pricing when shopping for alternative suppliers. Third Party Supplier (TPS) natural gas commodity contracts that offer a firm, fixed price for 100% of the facilities natural gas requirements are recommended.

**Tariff Analysis:**Electricity:

The facility receives electric distribution service through Atlantic City Electric (AECO) on rate schedule's MGS (Monthly General Service). The facility is not currently contracted with a Third Party Supplier (TPS) to provide electric commodity service. For electric supply (generation) service, the client has a choice to either use AECO's default service rate BGS-FP or contract with a Third Party Supplier (TPS) to supply electric.

Each year since 2002, the four New Jersey Electric Distribution Companies (EDCs) - Public Service Gas & Electric Company (PSE&G), Atlantic City Electric Company (ACE), Jersey Central Power & Light Company (JCP&L), and Rockland Electric Company (RECO) - have procured several billion dollars of electric supply to serve their Basic Generation Service (BGS) customers through a statewide auction process held in February.

BGS refers to the service of customers who are not served by a third party supplier or competitive retailer. This service is sometimes known as Standard Offer Service, Default Service, or Provider of Last Resort Service.

The Auction Process has consisted of two auctions that are held concurrently, one for larger customers on an hourly price plan (BGS-CIEP) and one for smaller commercial and residential customers on a fixed-price plan (BGS-FP). This facility's rate structure is based on the fixed-price plan (BGS-FP).

The current BGS-FP average price to compare for AECO's MGS rate schedule is \$0.1159/kWh.

The utility, AECO will continue to be responsible for maintaining the existing network of wires, pipes and poles that make up the delivery system, which will serve all consumers, regardless of whom they choose to purchase their electricity from. AECO's delivery service rate includes the following charges: Customer Service Charge, Distribution Charge, Market Transition, Transition Bond Charge, Non Utility Generation Charge, Societal Benefits Charge (SBC), Infrastructure Investment Charge, System Control Charge, Regulatory Assets Recovery Charge, and Regional Greenhouse Gas Initiative Charge.

Natural Gas & Fuel Oil:

The facility currently receives natural gas distribution service through South Jersey Gas (SJG) on rate schedule GSG (General Service Gas). These sites are currently receiving natural gas commodity supply from the utility, SJG on Basic Gas Supply Service (BGSS).

SJG provides basic gas supply service (BGSS) to customers who choose not to shop from a Third Party Supplier (TPS) for natural gas commodity. The option is essential to protect the reliability of service to consumers as well as protecting consumers if a third party supplier defaults or fails to provide commodity service. Please refer to the link below for a recap of

monthly natural gas BGSS charges from SJG.

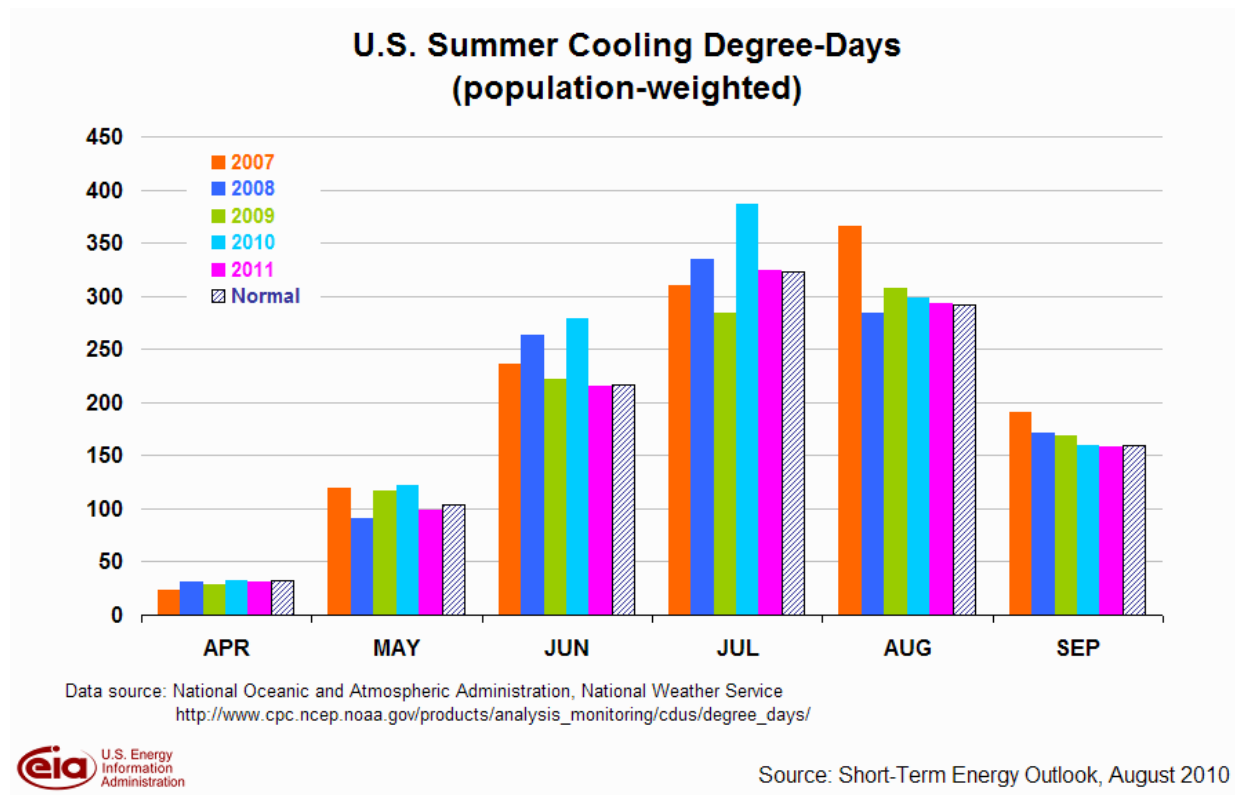
<http://www.southjerseygas.com/108/tariff/bgssrates.pdf>

The utility, SJG is responsible for maintaining the existing network of underground pipes that make up the delivery system, which will serve all consumers, regardless of whom they choose to purchase their natural gas from. SJG's delivery service rates includes the following charges: Customer Service Charge, Delivery Charge, Line Loss, and Applicable Riders that include: Societal Benefits Charge (SBC), Balancing Service Clause, Temperature Adjustment Clause, Conservation Incentive Program and Energy Efficient Tracker.

### **Electric and Natural Gas Market Overview:**

*Current electricity and natural gas market pricing has remained relatively stable over the last year. Commodity pricing in 2008 marked historical highs in both natural gas and electricity commodity. Commodity pricing commencing spring of 2009 continuing through 2010, has decreased dramatically over 2008 historic highs and continues to be favorable for locking in long term (2-5 year) contracts with 3<sup>rd</sup> Party Supplier's for both natural gas and electricity supply requirements.*

It is important to note that both natural gas and electric commodity market prices are moved by supply and demand, political conditions, market technicals and trader sentiment. This market is continuously changing Energy commodity pricing is also correlated to weather forecasts. Because weather forecasts are dependable only in the short-term, prolonged temperature extremes can really cause extreme price swings.



### **Short Term Energy Outlook - US Energy Information Administration (8/10/2010):**

**U.S. Natural Gas Prices.** *The Henry Hub spot price averaged \$4.63 per MMBtu in July, \$0.17 per MMBtu lower than the average spot price in June.). The forecast price for the second half of 2010 averages \$4.66 per MMBtu, about the same as last month's Outlook. A small decline in U.S. production and increased consumption are projected to lead to higher prices in 2011, when the projected Henry Hub spot price averages \$4.98 per MMBtu.*

*Uncertainty over future natural gas prices is lower this year compared with last year at this time. Natural gas futures for October 2010 delivery for the 5-day period ending August 5 averaged \$4.74 per MMBtu, and the average implied volatility over the same period was 51 percent. This produced lower and upper bounds for the 95-percent confidence interval of \$3.26 and \$6.89 per MMBtu, respectively. At this time last year the natural gas October 2009 futures contract averaged \$4.16 per MMBtu and implied volatility averaged 80 percent. The corresponding lower and upper limits of the 95-percent confidence interval were \$2.32 and \$7.47 per MMBtu.*

**U.S. Electricity Consumption.** *Temperatures during this year's summer season continue to be well above normal in sharp contrast to the mild summer of 2009. Weather has been particularly hot in the Northeast during June and July. Total cooling degree-days during the last 2 months were 54 percent higher than normal in the Mid-Atlantic region and 73*

percent higher than normal in New England ([U.S. Summer Cooling Degree Days](#)). EIA projects that total consumption of electricity will grow by 4 percent during 2010. Growth is expected to slow to a rate of 0.4 percent in 2011 as summer temperatures are assumed to return to more normal levels.

**U.S. Electricity Retail Prices.** EIA estimates that residential retail electricity prices during the first half of 2010 were about the same as in the first half of 2009. However, rising fuel costs for natural gas and coal are likely to push up retail prices later this year, causing prices over the entire year to grow by about 0.6 percent. Increased fuel costs are expected to push residential prices higher by about 2.9 percent during 2011.

## Recommendations:

1. CEG recommends an aggregated approach for 3<sup>rd</sup> party commodity supply procurement strategies for both electric and natural gas supply service. By aggregating all sites in the county for electricity and natural gas procurement, the County could see a significant reduction in energy supply costs. Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. Cape May County could realize up to a 20% reduction in energy supply costs for both electricity and natural gas, if it were to aggregate usage and take advantage of these current market prices quickly, before energy increases.

*The below recommendations presented by CEG are based on current information provided by the county for its utility usage, any savings presented with these recommendations are estimates only based on that information. It is recommended that further analysis and review of more recent utility data and any current 3<sup>rd</sup> party supply contracts be performed prior to performing any of the presented recommendations.*

Overall, after review of the utility consumption, billing, and current commodity pricing outlook, CEG recommends that the Bridge Commission, in conjunction with the Library Facilities, County Facilities, Technical High School and Special Services School utilize the advisement of 3<sup>rd</sup> party unbiased Energy Consulting Firm experienced in the aggregation of facilities and procurement of retail natural gas and electricity commodity. The Energy Consulting Firm should incorporate a rational, defensible strategy for purchasing commodity in volatile markets based upon the following:

- Budgets that reflect sound market intelligence
  - An understanding of historical prices and trends
  - Awareness of seasonal opportunities (e.g. shoulder months)
  - Negotiation of fair contractual terms
  - An aggressive, market based price
2. CEG recommends that the County consider utilizing a third party utility billing-auditing service to further analyze historical utility invoices such as water, sewer, electric and natural gas for incorrect billings and rate tariff optimization services. This service could provide refunds on potential over billings experienced by the County.

## XI. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the facility owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

- i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. The “Energy Savings Improvement Program (ESIP)” law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.
- ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.
- iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as “power purchase agreements.” These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party’s work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.
- iv. *Direct Install Program* – The New Jersey Clean Energy’s Direct Install Program is a state funded program that targets small commercial and industrial facilities with peak demand of less than 200 kW. This turnkey program is aimed at providing owners a seamless, comprehensive process for analysis, equipment replacement and financial incentives to reduce consumption, lower utility costs and improve profitability. The program covers up to 80% of the cost for eligible upgrades including lighting, lighting controls, refrigeration, HVAC, motors, variable speed drives, natural gas and food service. Participating contractors (refer to [www.njcleanenergy.com](http://www.njcleanenergy.com)) conduct energy assessments in addition to your standard local government energy audit and install the cost-effective measures.

CEG recommends the Owner review the use of the above-listed funding options in addition to utilizing their standard method of financing for facilities upgrades in order to fund the proposed energy conservation measures.

The following table provides an outline of the potential applicability of the available funding options to each energy conservation measure proposed in the report. This table should be used as a guideline only and further review of these program funds should be verified with their respective administrators.

ECM No.	Description	I	II	III	IV
		ESIP	Municipal Bonds	PPA	Direct Install
ECM #06-1	Install Programmable Thermostats		X		X
ECM #06-2	Lighting Occupancy Controls		X		X
ECM #06-3	High Efficiency Split Systems		X		X
ECM #06-4	Instant Electric Hot Water Heater		X		X

**XII. ADDITIONAL RECOMMENDATIONS**

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

- A. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
- B. Maintain all weather stripping on windows and doors.
- C. Clean all light fixtures to maximize light output.
- D. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

### XIII. ENERGY AUDIT ASSUMPTIONS

The assumptions utilized in this energy audit include but are not limited to following:

- A. Cost Estimates noted within this report are based on industry accepted costing data such as RS Means<sup>TM</sup> Cost Data, contractor pricing and engineering estimates. All cost estimates for this level of auditing are +/- 20%. Prevailing wage rates for the specified region has been utilized to calculate installation costs. The cost estimates indicated within this audit should be utilized by the owner for prioritizing further project development post the energy audit. Project development would include investment grade auditing and detailed engineering.
- B. Energy savings noted within this audit are calculated utilizing industry standard procedures and accepted engineering assumptions. For this level of auditing, energy savings are not guaranteed.
- C. Information gathering for each facility is strongly based on interviews with operations personnel. Information dependent on verbal feedback is used for calculation assumptions including but not limited to the following:
  - a. operating hours
  - b. equipment type
  - c. control strategies
  - d. scheduling
- D. Information contained within the major equipment list is based on the existing owner documentation where available (drawings, O&M manuals, etc.). If existing owner documentation is not available, catalog information is utilized to populate the required information.
- E. Equipment incentives and energy credits are based on current pricing and status of rebate programs. Rebate availability is dependent on the individual program funding and applicability.
- F. Equipment (HVAC, Plumbing, Electrical, & Lighting) noted within an ECM recommendation is strictly noted as a **basis for calculation** of energy savings. The owner should use this equipment information as a benchmark when pursuing further investment grade project development and detailed engineering for specific energy conservation measures.

Utility bill annual averages are utilized for calculation of all energy costs unless otherwise noted. Accuracy of the utility energy usage and costs are based on the information provided. Utility information including usage and costs is estimated where incomplete data is provided.

**ECM COST & SAVINGS BREAKDOWN**

CONCORD ENGINEERING GROUP

Cape May County Bridge Commission

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Saving * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^N \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^N \frac{C_n}{(1+DR)^n}$
		(\$)	(\$)	(\$)	(\$)	(\$/Yr)	(\$/Yr)	(\$/Yr)		(Yr)	(\$)	(\$)	(%)	(Yr)	(\$)
ECM #06-1	Install Programmable Thermostats	\$360	\$180	\$0	\$540	\$266	\$0	\$266	15	\$3,990	\$0	638.9%	2.0	49.14%	\$2,635.49
ECM #06-2	Lighting Occupancy Controls	\$175	\$0	\$40	\$135	\$58	\$0	\$58	15	\$873	\$0	546.8%	2.3	42.92%	\$559.91
ECM #06-3	High Efficiency Split Systems	\$21,107	\$5,227	\$736	\$25,598	\$1,036	\$0	\$1,036	15	\$15,540	\$0	-39.3%	24.7	-5.68%	(\$13,230.30)
ECM #06-4	Instant Electric Hot Water Heater	\$950	\$1,200	\$0	\$2,150	\$57	\$0	\$57	15	\$855	\$0	-60.2%	37.7	-9.80%	(\$1,469.54)

- Notes: 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.  
 2) The variable DR in the NPV equation stands for Discount Rate  
 3) For NPV and IRR calculations: From n=0 to N periods where N is the lifetime of ECM and Cn is the cash flow during each period.



# Concord Engineering Group, Inc.

520 BURNT MILL ROAD  
VOORHEES, NEW JERSEY 08043  
PHONE: (856) 427-0200  
FAX: (856) 427-6508

## SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of February, 2010:

### **Electric Chillers**

Water-Cooled Chillers	\$12 - \$170 per ton
Air-Cooled Chillers	\$8 - \$52 per ton

Energy Efficiency must comply with ASHRAE 90.1-2004

### **Gas Cooling**

Gas Absorption Chillers	\$185 - \$400 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

### **Desiccant Systems**

\$1.00 per cfm – gas or electric
----------------------------------

### **Electric Unitary HVAC**

Unitary AC and Split Systems	\$73 - \$93 per ton
Air-to-Air Heat Pumps	\$73 - \$92 per ton
Water-Source Heat Pumps	\$81 per ton
Packaged Terminal AC & HP	\$65 per ton
Central DX AC Systems	\$40- \$72 per ton
Dual Enthalpy Economizer Controls	\$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	\$75 per thermostat

Energy Efficiency must comply with ASHRAE 90.1-2004

### **Ground Source Heat Pumps**

Closed Loop & Open Loop	\$450 per ton, EER ≥ 16
	\$600 per ton, EER ≥ 18
	\$750 per ton, EER ≥ 20

Energy Efficiency must comply with ASHRAE 90.1-2004

### Gas Heating

Gas Fired Boilers < 300 MBH	\$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	\$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	\$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	\$300 - \$400 per unit, AFUE ≥ 92%

### Variable Frequency Drives

Variable Air Volume	\$65 - \$155 per hp
Chilled-Water Pumps	\$60 per hp
Compressors	\$5,250 to \$12,500 per drive

### Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	\$50 per unit
Gas-Fired Water Heaters > 50 gallons	\$1.00 - \$2.00 per MBH
Gas-Fired Booster Water Heaters	\$17 - \$35 per MBH
Gas Fired Tankless Water Heaters	\$300 per unit

### Prescriptive Lighting

Retro fit of T12 to T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	\$10 per fixture (1-4 lamps)
Replacement of T12 with new T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	\$25 per fixture (1-2 lamps) \$30 per fixture (3-4 lamps)
Replacement of incandescent with screw-in PAR 38 or PAR 30 (CFL) bulb	\$7 per bulb
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	\$10 per fixture
Hard-Wired Compact Fluorescent	\$25 - \$30 per fixture
Metal Halide w/Pulse Start	\$25 per fixture
LED Exit Signs	\$10 - \$20 per fixture
T-5 and T-8 High Bay Fixtures	\$16 - \$284 per fixture
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	\$50 per fixture
HID ≥ 100w Replacement with new HID ≥ 100w	\$70 per fixture
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	\$42 per 5 foot \$65 per 6 foot

**Lighting Controls – Occupancy Sensors**

Wall Mounted	\$20 per control
Remote Mounted	\$35 per control
Daylight Dimmers	\$25 per fixture
Occupancy Controlled hi-low Fluorescent Controls	\$25 per fixture controlled

**Lighting Controls – HID or Fluorescent Hi-Bay Controls**

Occupancy hi-low	\$75 per fixture controlled
Daylight Dimming	\$75 per fixture controlled
Daylight Dimming - office	\$50 per fixture controlled

**Premium Motors**

Three-Phase Motors	\$45 - \$700 per motor
Fractional HP Motors Electronic Communicated Motors (replacing shaded pole motors in refrigerator/freezer cases)	\$40 per electronic communicated motor

**Other Equipment Incentives**

Performance Lighting	\$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1- 2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	\$0.16 KWh and \$1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and a IRR of at least 10%.
Multi Measures Bonus	15%



# STATEMENT OF ENERGY PERFORMANCE

## 01.06 Bridge Commission

**Building ID:** 2405463  
**For 12-month Period Ending:** December 31, 2009<sup>1</sup>  
**Date SEP becomes ineligible:** N/A

**Date SEP Generated:** September 02, 2010

**Facility**

01.06 Bridge Commission  
 153 Crest Haven Road  
 Cape May Court House, NJ 08210

**Facility Owner**

Cape May County  
 4 Moore Road  
 Cape May Court House, NJ 08210

**Primary Contact for this Facility**

AnnMarie McMahon  
 4 Moore Road  
 Cape May Court House, NJ 08210

**Year Built:** 1980  
**Gross Floor Area (ft<sup>2</sup>):** 1,750

**Energy Performance Rating<sup>2</sup> (1-100)** N/A

**Site Energy Use Summary<sup>3</sup>**

Electricity - Grid Purchase(kBtu)	88,231
Natural Gas (kBtu) <sup>4</sup>	208,219
Total Energy (kBtu)	296,450

**Energy Intensity<sup>5</sup>**

Site (kBtu/ft <sup>2</sup> /yr)	169
Source (kBtu/ft <sup>2</sup> /yr)	293

**Emissions (based on site energy use)**

Greenhouse Gas Emissions (MtCO <sub>2</sub> e/year)	25
---	----

**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	61%
Building Type	Office

Stamp of Certifying Professional

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

**Meets Industry Standards<sup>6</sup> for Indoor Environmental Conditions:**

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

**Certifying Professional**

Michael Fischette  
 520 South Burnt Mill Road  
 Voorhees, NJ 08043

**Notes:**

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

## ENERGY STAR® Data Checklist for Commercial Buildings

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

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
<b>Building Name</b>	01.06 Bridge Commission	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		<input type="checkbox"/>
<b>Type</b>	Office	Is this an accurate description of the space in question?		<input type="checkbox"/>
<b>Location</b>	153 Crest Haven Road, Cape May Court House, NJ 08210	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		<input type="checkbox"/>
<b>Single Structure</b>	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		<input type="checkbox"/>
Bridge Commission - Admin (Office)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
<b>Gross Floor Area</b>	1,750 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.		<input type="checkbox"/>
<b>Weekly operating hours</b>	40 Hours	Is this the total number of hours per week that the Office space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		<input type="checkbox"/>
<b>Workers on Main Shift</b>	10	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)		<input type="checkbox"/>
<b>Number of PCs</b>	10	Is this the number of personal computers in the Office?		<input type="checkbox"/>
<b>Percent Cooled</b>	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		<input type="checkbox"/>
<b>Percent Heated</b>	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		<input type="checkbox"/>

## ENERGY STAR® Data Checklist for Commercial Buildings

### Energy Consumption

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

Fuel Type: Electricity		
<b>Meter: Electric - 95310718 (kWh (thousand Watt-hours))</b> <b>Space(s):</b> Entire Facility <b>Generation Method:</b> Grid Purchase		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/01/2009	12/31/2009	2,007.00
11/01/2009	11/30/2009	1,609.00
10/01/2009	10/31/2009	2,119.00
09/01/2009	09/30/2009	2,710.00
08/01/2009	08/31/2009	3,112.00
07/01/2009	07/31/2009	1,829.00
06/01/2009	06/30/2009	2,942.00
05/01/2009	05/31/2009	1,874.00
04/01/2009	04/30/2009	1,826.00
03/01/2009	03/31/2009	1,973.00
02/01/2009	02/28/2009	1,970.00
01/01/2009	01/31/2009	1,888.00
<b>Electric - 95310718 Consumption (kWh (thousand Watt-hours))</b>		<b>25,859.00</b>
<b>Electric - 95310718 Consumption (kBtu (thousand Btu))</b>		<b>88,230.91</b>
<b>Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))</b>		<b>88,230.91</b>
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		<input type="checkbox"/>

Fuel Type: Natural Gas		
<b>Meter: Natural Gas - 464341 (therms)</b> <b>Space(s):</b> Entire Facility		
Start Date	End Date	Energy Use (therms)
12/01/2009	12/31/2009	317.34
11/01/2009	11/30/2009	149.65
10/01/2009	10/31/2009	74.00
09/01/2009	09/30/2009	26.65
08/01/2009	08/31/2009	22.70
07/01/2009	07/31/2009	24.84
06/01/2009	06/30/2009	45.54
05/01/2009	05/31/2009	103.30
04/01/2009	04/30/2009	233.01
03/01/2009	03/31/2009	333.34

02/01/2009	02/28/2009	378.14
01/01/2009	01/31/2009	373.68
<b>Natural Gas - 464341 Consumption (therms)</b>		<b>2,082.19</b>
<b>Natural Gas - 464341 Consumption (kBtu (thousand Btu))</b>		<b>208,219.00</b>
<b>Total Natural Gas Consumption (kBtu (thousand Btu))</b>		<b>208,219.00</b>
<b>Is this the total Natural Gas consumption at this building including all Natural Gas meters?</b>		<input type="checkbox"/>

<b>Additional Fuels</b>	
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.	<input type="checkbox"/>

<b>On-Site Solar and Wind Energy</b>	
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.	<input type="checkbox"/>

### Certifying Professional

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

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Signature is required when applying for the ENERGY STAR.

# FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

**Facility**

01.06 Bridge Commission  
153 Crest Haven Road  
Cape May Court House, NJ 08210

**Facility Owner**

Cape May County  
4 Moore Road  
Cape May Court House, NJ 08210

**Primary Contact for this Facility**

AnnMarie McMahon  
4 Moore Road  
Cape May Court House, NJ 08210

**General Information**

01.06 Bridge Commission	
Gross Floor Area Excluding Parking: (ft <sup>2</sup> )	1,750
Year Built	1980
For 12-month Evaluation Period Ending Date:	December 31, 2009

**Facility Space Use Summary**

Bridge Commission - Admin	
Space Type	Office
Gross Floor Area(ft <sup>2</sup> )	1,750
Weekly operating hours	40
Workers on Main Shift	10
Number of PCs	10
Percent Cooled	50% or more
Percent Heated	50% or more

**Energy Performance Comparison**

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 12/31/2009)	Baseline (Ending Date 12/31/2009)	Rating of 75	Target	National Average
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft <sup>2</sup> )	169	169	69	N/A	77
Source (kBtu/ft <sup>2</sup> )	293	293	118	N/A	182
Energy Cost					
\$/year	N/A	N/A	N/A	N/A	N/A
\$/ft <sup>2</sup> /year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
MtCO <sub>2</sub> e/year	25	25	10	N/A	11
kgCO <sub>2</sub> e/ft <sup>2</sup> /year	14	14	6	N/A	6

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.

# MAJOR EQUIPMENT LIST

**Concord Engineering Group**

**Cape May - Bridge Commission**

## Boilers

Tag	Boiler-1 & 2		
Unit Type			
Qty	1		
Location	Mechanical Room		
Area Served	Bridge Commission		
Manufacturer	Utica Boilers		
Model #	M-200-AGB-2		
Serial #	GE21555		
Input Capacity (MBH)	200 MBH		
Rated Output Capacity (MBH)	-		
Approx. Efficiency %	-		
Fuel	-		
Approx Age	15		
Ashrae Service Life	30		
Remaining Life	15		
Comments			

# MAJOR EQUIPMENT LIST

**Concord Engineering Group**

**Cape May - Bridge Commission**

## Domestic Hot Water Heaters

<b>Tag</b>			
<b>Unit Type</b>	Electric Hot Water Heater		
<b>Qty</b>	1		
<b>Location</b>	Mechanical Room		
<b>Area Served</b>	Bridge Commission		
<b>Manufacturer</b>	RUUD		
<b>Model #</b>	RP40-2		
<b>Serial #</b>	-		
<b>Size (Gallons)</b>	40 Gallon		
<b>Input Capacity (MBH/KW)</b>	4.5 kW		
<b>Recovery (Gal/Hr)</b>	-		
<b>Efficiency %</b>	100%		
<b>Fuel</b>	Electric		
<b>Approx Age</b>	10		
<b>Ashrae Service Life</b>	12		
<b>Remaining Life</b>	2		
<b>Comments</b>			

## MAJOR EQUIPMENT LIST

### Concord Engineering Group

#### Cape May - Bridge Commission

### Rooftop / AC Units

<b>Tag</b>			
<b>Unit Type</b>	<b>Split System Air Conditioner</b>	<b>Split System Air Conditioner</b>	<b>Window AC Unit</b>
<b>Qty</b>	1	1	1
<b>Location</b>	Outside	Outside	Bridge Commission
<b>Area Served</b>	Bridge Commission	Bridge Commission	Office
<b>Manufacturer</b>	Carrier	Carrier	Gold Star
<b>Model #</b>	38CK036310	38TE060300	GWHD5000
<b>Serial #</b>	0993E09242	Y051496	601TAAC64936
<b>Cooling Type</b>	DX	DX	
<b>Cooling Capacity (Tons)</b>	3 Tons	5 Tons	5000 BTU
<b>Cooling Efficiency (SEER/EER)</b>		8 SEER	9.7 EER
<b>Heating Type</b>	N/A	N/A	N/A
<b>Heating Input (MBH)</b>	N/A	N/A	N/A
<b>Efficiency</b>	N/A	N/A	N/A
<b>Fuel</b>	R-22	R-22	R-22
<b>Approx Age</b>	17	5	9
<b>Ashrae Service Life</b>	15	15	15
<b>Remaining Life</b>	(2)	10	6
<b>Comments</b>			

CEG Job #: 9C10037  
 Project: Bridge Commission Building  
 Address: 153 Crest Haven Road  
 Cape May, NJ  
 Building SF: 1,750

Bridge Commission Building

KWH COST: \$0.176

**ECM #2: Lighting Controls**

EXISTING LIGHTING					PROPOSED LIGHTING CONTROLS													SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback
232.21	Storage Closet	800	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.086	68.8	\$12.11	1	0	No Change	86	0.09	0%	68.8	\$12.11	\$0.00	\$0.00	0.00	0	\$0.00	0.00
242.21	Break Room	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.208	540.8	\$95.18	2	0	No Change	104	0.21	0%	540.8	\$95.18	\$0.00	\$0.00	0.00	0	\$0.00	0.00
242.21	Office	2600	5	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.52	1352	\$237.95	5	0	No Change	104	0.52	0%	1352	\$237.95	\$0.00	\$0.00	0.00	0	\$0.00	0.00
221.41	Men's RR	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	75.4	\$13.27	1	0	No Change	58	0.06	0%	75.4	\$13.27	\$0.00	\$0.00	0.00	0	\$0.00	0.00
221.41	Women's RR	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	75.4	\$13.27	1	0	No Change	58	0.06	0%	75.4	\$13.27	\$0.00	\$0.00	0.00	0	\$0.00	0.00
221.11	Server / File Room	2600	3	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.174	452.4	\$79.62	3	0	No Change	58	0.17	0%	452.4	\$79.62	\$0.00	\$0.00	0.00	0	\$0.00	0.00
227.21	Hall	2600	5	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.29	754	\$132.70	5	0	No Change	58	0.29	0%	754	\$132.70	\$0.00	\$0.00	0.00	0	\$0.00	0.00
242.21	Reception Area	2600	5	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.52	1352	\$237.95	5	0	No Change	104	0.52	0%	1352	\$237.95	\$0.00	\$0.00	0.00	0	\$0.00	0.00
242.21	Purchasing Office	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.208	540.8	\$95.18	2	0	No Change	104	0.21	0%	540.8	\$95.18	\$0.00	\$0.00	0.00	0	\$0.00	0.00
242.21	Conference Room	1800	9	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.936	1684.8	\$296.52	9	1	Dual Technology Occupancy Sensor	104	0.84	10%	1516.32	\$266.87	\$75.00	\$75.00	0.09	168.48	\$29.65	2.53
242.21	Chairman's Office	2600	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.624	1622.4	\$285.54	6	1	Dual Technology Occupancy Sensor	104	0.56	10%	1460.16	\$256.99	\$75.00	\$75.00	0.06	162.24	\$28.55	2.63
227.21	Vestibule	2600	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.058	150.8	\$26.54	1	0	No Change	58	0.06	0%	150.8	\$26.54	\$0.00	\$0.00	0.00	0	\$0.00	0.00
1	Front Exit and Rear	4200	3	1	Wall Mnt. Fixture, (1) 26w CFL	26	0.078	327.6	\$57.66	3	0	No Change	26	0.08	0%	327.6	\$57.66	\$0.00	\$0.00	0.00	0	\$0.00	0.00
<b>Totals</b>			44	38			3.82	8,997	\$1,584	44	2			3.7		8,666	\$1,525		150.0	0.16	331	\$58.21	2.58

## Life Cycle Cost Estimate for 2 Programmable Thermostat(s)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

Number of Units <input style="width: 50px;" type="text" value="2"/> Initial Cost for one programmable thermostat <input style="width: 50px;" type="text" value="\$180"/> Initial Cost for one manual thermostat <input style="width: 50px;" type="text" value="\$1"/> Unit Fuel Cost (Cooling) (\$/kWh) <input style="width: 50px;" type="text" value="\$0.176"/> Unit Fuel Cost (Heating) <input style="width: 50px;" type="text" value="\$0.00"/>	<h3 style="text-align: center;">24 Hour Typical Usage Patterns*</h3> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Weekday</th> <th style="text-align: center;">Weekend</th> </tr> </thead> <tbody> <tr> <td>Nighttime Set-Back/Set-Up Hours</td> <td style="text-align: center;">12</td> <td style="text-align: center;">12</td> </tr> <tr> <td>Daytime Set-Back/Set-Up Hours</td> <td style="text-align: center;">4</td> <td style="text-align: center;">4</td> </tr> <tr> <td>Hours without Set-Back/Set-Up</td> <td style="text-align: center;">8</td> <td style="text-align: center;">8</td> </tr> </tbody> </table>		Weekday	Weekend	Nighttime Set-Back/Set-Up Hours	12	12	Daytime Set-Back/Set-Up Hours	4	4	Hours without Set-Back/Set-Up	8	8
	Weekday	Weekend											
Nighttime Set-Back/Set-Up Hours	12	12											
Daytime Set-Back/Set-Up Hours	4	4											
Hours without Set-Back/Set-Up	8	8											
City <input style="width: 100%;" type="text" value="Choose your city from the drop-down menu"/> <div style="display: flex; justify-content: center; align-items: center;"> <div style="font-size: 2em; margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 2px;">                     City                      NJ-Atlantic City                 </div> </div>													
<h3>Heating Season*</h3> Typical Indoor Temperature w/o Set-Back <input style="width: 50px;" type="text" value="70"/> Nighttime Set-Back Temperature (Average) <input style="width: 50px;" type="text" value="65"/> Daytime Set-Back Temperature (Average) <input style="width: 50px;" type="text" value="65"/> Heating System Type <input style="width: 50px;" type="text" value="None"/>	<h3>Cooling Season*</h3> Typical Indoor Temperature w/o Set-Up <input style="width: 50px;" type="text" value="72"/> Nighttime Set-Up Temperature (Average) <input style="width: 50px;" type="text" value="78"/> Daytime Set-Up Temperature (Average) <input style="width: 50px;" type="text" value="78"/> Cooling System Type <input style="width: 50px;" type="text" value="Central AC"/>												

*\*All temperatures are in degrees Fahrenheit. Setpoint is defined as the temperature setting for any given time period. Set-back temperature is defined as the lower setpoint temperature for the energy-savings periods during the heating season, generally nighttime and daytime. Set-up temperature is defined as the higher setpoint temperature for the energy-savings periods during the cooling season, generally nighttime and daytime.*

### Annual and Life Cycle Costs and Savings for 2 Programmable Thermostat(s)

	2 Programmable Thermostat(s)	2 Manual Thermostat(s)	Savings
<b>Annual Energy Costs</b>			
Heating Energy Cost	\$0	\$0	\$0
Heating Energy Consumption (MBTU)	0	0	0
Cooling Energy Cost	\$1,240	\$1,506	\$266
Cooling Energy Consumption (MBTU)	24.0	29.1	5
<b>Total</b>	<b>\$1,240</b>	<b>\$1,506</b>	<b>\$266</b>
<b>Life Cycle Costs</b>			
Energy Costs	\$13,789	\$16,744	\$2,955
Heating Energy Costs	\$0	\$0	\$0
Heating Energy Consumption (MBTU)	0	0	0
Cooling Energy Costs	\$13,789	\$16,744	\$2,955
Cooling Energy Consumption (MBTU)	359	436	77
Purchase Price for 2 Unit(s)	\$360	\$2	-\$358
<b>Total</b>	<b>\$14,149</b>	<b>\$16,746</b>	<b>\$2,597</b>
		Simple payback of initial cost (years)	<b>1.3</b>

### Summary of Benefits for 2 Programmable Thermostat(s)

Initial cost difference	<b>\$358</b>
Life cycle savings	<b>\$2,955</b>
Net life cycle savings (life cycle savings - additional cost)	<b>\$2,597</b>
Life cycle energy saved (MBTU)-includes both Heating and Cooling	<b>77</b>
Simple payback of additional cost (years)	<b>1.3</b>
Life cycle air pollution reduction (lbs of CO <sub>2</sub> )	<b>22,571</b>
Air pollution reduction equivalence (number of cars removed from the road for a year)	<b>2</b>
Air pollution reduction equivalence (acres of forest)	<b>2</b>
Savings as a percent of retail price	<b>721%</b>