



ENERGY AUDIT – FINAL REPORT

**SHAMONG TOWNSHIP
MUNICIPAL BUILDING
105 WILLOW GROVE RD.
SHAMONG, NJ 08088
ATTN: MRS. SUE ONORATO**

CEG PROPOSAL No. 9C08155

CONCORD ENGINEERING GROUP



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I. EXECUTIVE SUMMARY

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

Shamong Township Municipal Building
105 Willow Grove Road
Shamong, NJ 08088

Facility Contact Person:
Municipal Contact Person: Susan D. Onorato

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy's mission, 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	\$6,318
Natural Gas	\$2,528
Total	\$8,846

The potential annual energy cost savings are shown below in Table 1. The cost of each measure for this level of auditing is $\pm 20\%$ until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST ^A	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)	SIMPLE RETURN ON INVESTMENT
1	Lighting Upgrade – Fluorescent Fixtures	\$2,829	\$874	3.2	32.7%
2	Lighting Upgrade – Outdoor Fixtures	\$3,150	\$208	15.1	2.0%
3	Replace Older Rooftop Units	\$13,056	\$901	14.5	2.5%
4	Install Geothermal Heating/Cooling System	\$95,610	\$3,569	26.8	-4.5%

Notes: A. Cost includes applicable incentive and maintenance savings.

The estimated demand and energy savings are shown below in Table 2. The information in this table corresponds to the ECM's in Table 1.

Table 2
Estimated Energy Savings

ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)	NAT GAS (THERMS)
1	Lighting Upgrade – Fluorescent Fixtures	4.24	5,298	-
2	Lighting Upgrade – Outdoor Fixtures	-	1,260	-
3	Replace Older Rooftop Units	-	3,780	173
4	Install Geothermal Heating/Cooling System	4.4	6,308	1577

Recommendation:

Concord Engineering Group (CEG) strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under seven (7) years. The potential energy and cost savings from these ECM's are too great to pass upon. The following Energy Conservation Measures are recommended for the Shamong Township Municipal Building:

- **ECM #1:** Lighting Upgrade – Fluorescent Fixtures
- **ECM #2:** Lighting Upgrade – Outdoor Fixtures

If the Owner decides to package the two (2) recommended energy conservation measures, the approximate total cost would equal \$5,979, total annual savings \$1,082 and a combined simple payback equal to 5.5 years.

Further Evaluation:

Based upon our site inspection and interview with the Owner, CEG was requested to review the HVAC equipment and its current installation condition. Below is a listing of issues uncovered during the inspection:

1. Mayor's Conference Room Overcooling (no heat)
 - a. Add electric reheat coil in the ductwork
 - b. Disconnect room from ductwork system that serves the adjacent space. Add a thru-the-wall heat pump and transfer air from the adjacent space for ventilation air (10 people x 20 CFM = 200 CFM).
 - c. Add automatic damper in ductwork serving this room with thermostat control that will shutdown on overcooling. If lights are on and room is occupied, it should not over cool.
 - d. Close drapes during the winter months.
2. Lennox Rooftop Units over the Meeting/Court Room
 - a. Clean screens and add screen over the gas exhaust vent (safety hazard).
 - b. Add drip legs on gas piping
 - c. Add cleanouts on PVC condensate drains
 - d. Repair condenser screen
3. York Rooftop Unit
 - a. Add drip leg on gas piping
 - b. Add cleanout on PVC condensate drain
 - c. Replace/repair exterior insulation on supply & return ductwork – seal flashing to prevent water leaks.
4. Gas Piping
 - a. Check all gas piping – very rusted (possible leaks)
 - b. Remove insulation from gas piping and clean/paint
5. Door Seals
 - a. Install door sweep and weather stripping on rear exit door.

II. INTRODUCTION

The Municipal Building is a 4,240 square foot facility that includes a meeting/court room, Mayor's office, court administrator office, tax collector/tax assessor offices, and clerk/building office.

The first energy auditing task was to collect and review 2008 utility energy data for electricity and natural gas. This information was used to analyze operational characteristics, calculate energy benchmarks for comparison to industry averages, estimate savings potential, and establish a baseline to monitor the effectiveness of implemented measures. A computer spreadsheet was used to enter, sum, and calculate benchmarks and to graph utility information (see Appendix A).

The Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft²/yr) and can be 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 annual consumption of all fuels to BTU's then dividing by the area (gross square footage) of the building. EUI is a good indicator of the relative potential for energy savings. A comparatively low EUI indicates less potential for large energy savings. Blueprints (where available) were obtained from the municipal and were utilized to calculate/verify the gross area of the facility.

After gathering the utility data and calculating the EUI, the next step in the audit process is obtaining Architectural and Engineering drawings (where available). By reviewing the Architectural and Engineering drawings, questions regarding the building envelope, lighting systems/controls, HVAC equipment and controls are noted. These questions are then compared to the energy usage profiles developed during the utility data gathering step. Furthermore, 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. After this information is gathered the next step in the process is the site visit.

The site visit was spent inspecting the actual systems and answering specific questions from the preliminary review. The building manager provided occupancy schedules, O & M practices, the building energy management program, and other information that has an impact on energy consumption.

The post-site work includes evaluation of the information gathered during the site visit, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on mechanical, lighting and building envelope improvements.

III. METHOD OF ANALYSIS

CEG completed the preliminary audit tasks noted in Section II preparing for the site survey. The site survey is a critical input in deciphering where energy opportunities exist within a facility. The auditor walks the entire site to inventory the building envelope (roof, windows, etc.), the heating, ventilation, and air conditioning equipment (HVAC), the lighting equipment, other facility-specific equipment, and to gain an understanding of how each facility is used.

The collected data is then processed using energy engineering calculations to calculate the anticipated energy usage for the proposed energy conservation measures (ECMs). The actual energy usage is entered directly from the utility bills provided by the Owner. The anticipated energy usage is compared to the actual usage to determine energy savings for the proposed ECMs.

It is pertinent to note, that the savings noted in this report are not duplicative. The savings for each recommendation may actually be higher if the individual recommendations were installed instead of the entire project. For example, the lighting module calculates the change in wattage and multiplies it by the new operating hours instead of the existing operating hours (if there was a change in the hours at all). The lighting controls module calculates the change in hours and multiplies it by the new system wattage instead of the existing wattage. Therefore, if you chose to install the recommended lighting system but not the lighting controls, the savings achieved with the new lighting system would actually be less because there would have been no reduction in the hours of use.

The same principal follows for heating, cooling, and temperature recommendations – even with fuel switching. If there are recommendations to change the temperature settings to reduce fuel use, then the savings for the heating/cooling equipment recommendations are reduced, as well.

Our thermal module calculates the savings for temperature reductions utilizing automated engineering calculations within Microsoft Excel™ spreadsheets. The savings are calculated in “output” values – meaning energy, not fuel savings. To show fuel savings we multiply the energy values times the fuel conversion factor (these factors are different for electricity, natural gas, fuel oil, etc.) and also take into account the heating/cooling equipment efficiency. The temperature recommendation savings are lower when the heating/cooling equipment is more efficient or is using a cheaper fuel.

Thermal recommendations (insulation, windows, etc.) are evaluated by taking the difference in the thermal load due to reduced heat transfer. Again, the “thermal load” is the thermal load after the other recommendations have been accounted for.

Lastly, installation costs are then applied to each recommendation and simple paybacks are calculated. Costs are derived from Means Cost Data, other industry publications, and local contractors and suppliers. The NJ SmartStart Building® program incentives (refer to Appendix C) are calculated for the appropriate ECM’s and subtracted from the installed cost prior to calculation of the simple payback. In addition, where applicable, maintenance cost savings are estimated and applied to the net savings.

Simple return on investment is calculated using the standard formula of the difference of gains minus investments, divided by the investments. Included within the gains are the annual energy savings, utility incentives and maintenance savings as a total sum. The calculation is completed assuming the project is 100% direct purchased by the Owner with an energy cost escalation of 2.4% for natural gas and 2.2% for electricity.

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IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from January-08 to December-08. Atlantic City Electric provides electricity to the facility under the Monthly General Service (MGS) – Secondary Rate Schedules. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. 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 most current rate structure available.

Table 4 and Figure 2 show the natural gas energy usage for the surveyed facility from January-08 to December-08. South Jersey Gas supplies the natural gas for the facility under their General Service Gas Rate.

The average utility costs for the facility are as follows:

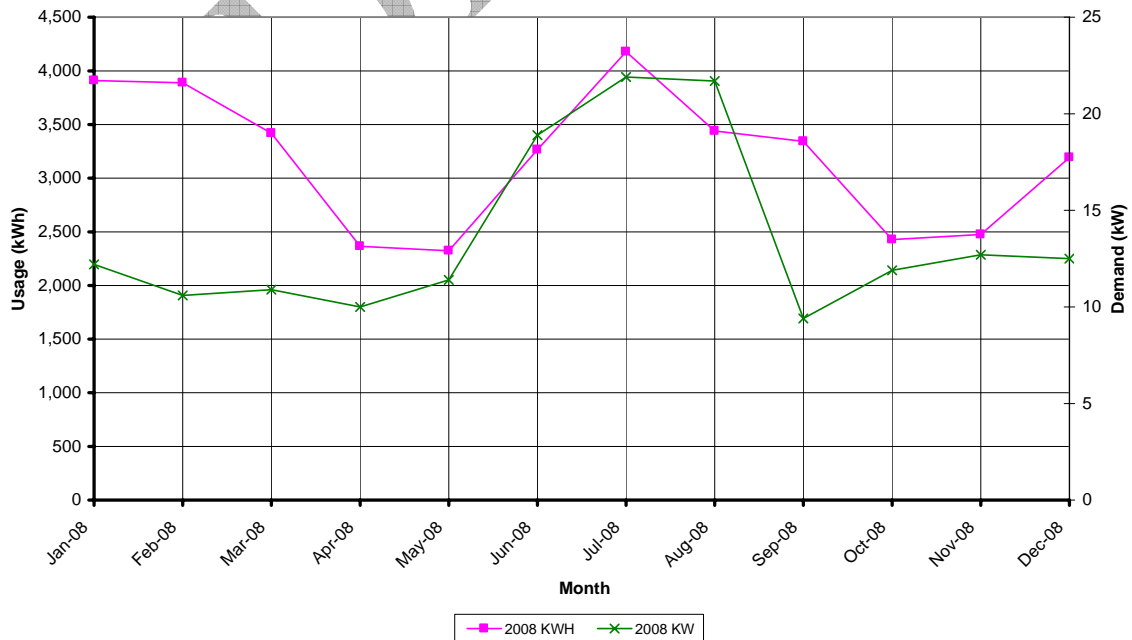
<u>Description</u>	<u>Average</u>
Electricity	16.5¢ / kWh
Natural Gas	\$1.60 / Therm

**Table 3
Electricity Billing Data**

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
1/08	3,911	12	\$585
2/08	3,890	11	\$567
3/08	3,419	11	\$517
4/08	2,365	10	\$370
5/08	2,324	11	\$377
6/08	3,266	19	\$604
7/08	4,179	22	\$775
8/08	3,440	22	\$639
9/08	3,343	9	\$608
10/08	2,428	12	\$389
11/08	2,475	13	\$397
12/08	3,193	13	\$491
Totals	38,233	22 Max	\$6,318

**Figure 1
Electricity Usage Profile**

Shamong Twp Municipal Building
Electric Usage Profile
January through December of 2008

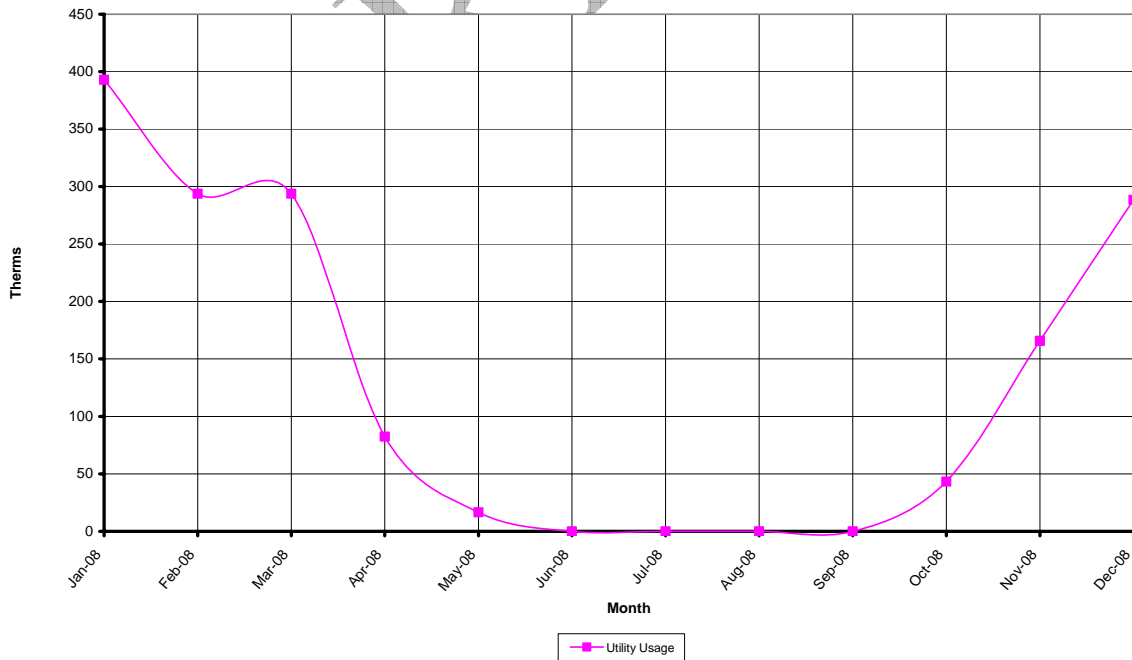


**Table 4
Natural Gas Billing Data**

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
1/08	393	\$555
2/08	294	\$523
3/08	294	\$420
4/08	82	\$130
5/08	17	\$41
6/08	0	\$18
7/08	0	\$20
8/08	0	\$18
9/08	0	\$21
10/08	43	\$78
11/08	166	\$249
12/08	288	\$456
Totals	1,577	\$2,528

**Figure 2
Natural Gas Usage Profile**

Shamong Twp Municipal Building
Gas Usage Profile
January through December of 2008



B. Energy Use Index (EUI)

The Energy Use Index is a measure of the total energy consumed in cooling and heating a building or facility in a year, expressed in British thermal units (Btu) per conditioned gross square footage.

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

$$\begin{aligned}\text{Electric} &= [(38,233) * (1000 \text{ W/kW}) * (3.414 \text{ Btu/h} / 1 \text{ W})] / (1000 \text{ Btu/h} / 1 \text{ kBtu/h}) \\ &= 130,527 \text{ kBtu}\end{aligned}$$

$$\text{Natural Gas} = ((1,577 \text{ therms}) * (100,000 \text{ Btu/Therm})) / (1000 \text{ Btu/h} / 1 \text{ kBtu/h}) = 157,700 \text{ kBtu}$$

$$\text{EUI} = (130,527 \text{ kBtu} + 157,700 \text{ kBtu}) / (4,240 \text{ SF})$$

$$\text{Municipal Building EUI} = 68 \text{ kBtu/SF}$$

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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 you to track and assess energy consumption via the template forms located on the ENERGY STAR website (www.energystar.gov). The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and more emphasis is being placed throughout multiple arenas 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. Therefore, it is vital that local government municipalities assess their energy usage, benchmark this usage utilizing Portfolio Manager, set priorities and goals to lessen their energy usage and move forward with these priorities and goals. Saving energy will in-turn save the environment.

In accordance with the Local Government Energy Audit Program, CEG has created an Energy Star account for the municipality in order to allow the municipality access to monitoring their yearly energy usage as it compares to facilities of similar type. This account can be used to calculate the EUI which can be used to monitor the energy performance of the building. The account can be accessed at the following address; the username and password are also listed below:

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

Username: shamongtwp
Password: lgeaceg2009

Utilizing the utility bills and other information gathered during the energy audit process, CEG entered the respective data into Portfolio Manager and the following is a summary of the results:

Table 4
ENERGY STAR Performance Rating

FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Municipal Building	N/A	N/A

Note: The building energy performance rating and national average is not applicable due to insufficient floor area (Less than 5000 SF not applicable.)

V. FACILITY DESCRIPTION

The Shamong Township Municipal Building is a single-story, cinder block constructed facility built upon a concrete slab. The 4,240 square foot facility was built in 1979, and is in operation for 40 hours during a typical week. The building has a mansard shingle roof and the flat roof section was re-roofed in 1998. The 30" x 42" windows are wood frame with ¾ inch thermopane and interior shading. The cinder block exterior walls are core-filled with vermiculite as was the construction practice in 1979. The Municipal Building consists of a meeting/court room, Mayor's office, court administrator office, tax collector/tax assessor offices, restrooms, and clerk/building office.

Heating System

The majority of the heating is provided via three (3) rooftop gas-fired heating units with the following rated capacities:

York Unit (2003): 125,000 Btu/hr input & 100,000 Btu/hr output

Two (2) Lennox Units (1994): 75,000 Btu/hr each input & 60,000 Btu/hr each output

In addition, the hallway and bathrooms are heated by electric ceiling tile units. The meeting/court room has electric ceiling tile units available as a secondary source of heat.

Domestic Hot Water

A Rheem electric hot water heater is the sole provider of hot water to the Municipal Building. It has a capacity of 15 gallons and runs at 120 V/2,000 Watts

Cooling System

The administration offices are cooled by a York 6-Ton DX coil unit and the Meeting/Court Room & Mayor's office by two (2) Lennox 3.5-Ton DX coil units.

Controls System

The heating/cooling temperature of the building is controlled by three zone thermostats that control the offices and the meeting/court room. The thermostat that controls the meeting/court room is manually set back when not in use.

Exhaust System

A Greenheck Model CE 18 C rooftop fan removes the exhaust air from the building. A smaller rooftop exhaust fan serves the restrooms.

Lighting

The building is lit by varying types and sizes of T-12 lights. Lamp wattages vary from 34W to 40W for the respective T-12 lamps. The canopy lighting and entrance bollards have 70 Watt HPS lamps. The exit signs are newer units with LED technology.

VI. EQUIPMENT LIST

Following the completion of the field survey a detailed equipment list was created. The equipment within this list is considered major energy consuming equipment whose replacement could yield substantial energy savings. In addition, 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 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 below.

**Table 5 thru 7
Existing Equipment Listing**

HEATING EQUIPMENT					
Description	Qty	Rated Capacity (BTUH)	Fuel	ASHRAE Service Life	Remaining Useful Life
York D2CG072 Gas-Fired Heating Rooftop Unit	1	125,000	NG	15	9
Lennox GCS20R-461 Gas-Fired Heating Rooftop Unit	2	75,000	NG	15	0

COOLING EQUIPMENT					
Description	Qty	Rated Capacity (TONS)	Fuel	ASHRAE Service Life	Remaining Useful Life
York D2CG072 DX Cooling Rooftop Unit	1	6	Electric	15	9
Lennox GCS20R-461 DX Cooling Rooftop Unit	2	3.5	Electric	15	0

DOMESTIC HOT WATER SYSTEM						
Description	Qty	Input	Fuel	Approximate Age (yrs)	ASHRAE Service Life (yrs)	Remaining Life (yrs)
Rheem 15-Gallon Capacity	1	2,000 Watts	Electric	5	15	10

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrade – Fluorescent Fixtures

Description:

New lighting fixtures with fluorescent lamps and electronic ballasts are available as a more energy efficient option to older T-12 lighting fixtures. A simple change from the old, T-12 light fixture to the new can provide substantial savings. A typical drop-ceiling lay in fixture with four, 4-foot T12 lamps (34 Watt lamps) has a total wattage of about 154 Watts. By replacing the T-12 fixture with a new fixture containing T8 lamps, reflector and electronic ballasts the total wattage would be reduced to about 91 Watts per fixture and the space light levels and light quality would increase by about 15% and 35%, respectively.

CEG recommends a replacement of the existing fixtures containing T12 lamps and magnetic ballasts with fixtures containing T8 lamps and electronic ballasts. The new energy efficient, T8 fixtures will provide adequate lighting and will save the Owner on electrical costs due to the better performance of the electronic ballasts. In addition to functional cost savings, the fixture replacement will also provide operational cost savings. The operational cost savings will be realized through the lesser number of lamps that will be required to be replaced per year. The expected lamp life of a T8 lamp, approximately 30,000 burn-hours, in comparison to the existing T12 lamps, approximately 20,000 burn-hours, will provide the Owner with fewer lamps to replace per year. Based on the operating hours of this facility, approximately 1460 hours per year, the Owner will be changing approximately 33% less lamps per year.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in Appendix D that outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start[®] Program Incentives are calculated as follows:

From Appendix C, the replacement of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: T-5 or T-8 (1-2 lamp) = \$25 per fixture; T-5 or T-8 (3-4 lamp) = \$30 per fixture.

$$\text{Smart Start}^{\circledR} \text{ Incentive} = (\# \text{ of } 1 - 2 \text{ lamp fixtures} \times \$25) + (\# \text{ of } 3 - 4 \text{ lamp fixtures} \times \$30)$$

$$\text{Smart Start}^{\circledR} \text{ Incentive} = (8 \times \$25) + (49 \times \$30) = \$1,670$$

Maintenance Savings are calculated as follows:

$$\text{Maintenance Savings} = (\# \text{ of lamps} \times \% \text{ reduction} \times \$ \text{ per lamp}) + \text{Installation Labor}$$

$$\text{Maintenance Savings} = (212 \times 33\% \text{ reduction} \times \$2.00) + (212 \times \$10) = \$2,261$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$6,760
NJ Smart Start Equipment Incentive (\$):	(\$1,670)
Maintenance Savings (\$):	(2,261)
Net Installation Cost (\$):	\$2,829
Total Energy Savings (\$ / yr):	\$874
Simple Payback (yrs):	3.2
Simple Return on Investment	32.7%

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ECM #2: Lighting Upgrade – Incandescent Fixtures

Description:

During CEG's site survey it was noted that in numerous outdoor fixtures incandescent lamps are still being used throughout the facility. There are five (5) fixtures at each entrance/exit door and four (4) entrance way bollards with 70-Watt HPS lamps. CEG recommends a replacement of these incandescent lamps with energy-efficient LED lamps. LED is an acronym for light-emitting-diode. LED's are small light sources that are readily associated with electronic equipment. The 70-Watt HPS lamp uses 105 Watts while a LED equivalent uses only 27 Watts, an energy savings of 74%.

This ECM involves replacing the incandescent lamps in the outdoor fixtures with energy efficient LED lamps and new ballasts.

Energy Savings Calculations:

There are nine outdoor lighting fixtures that would be good candidates for this new technology. Assume that each fixture is on for an average of 10 hours per night all year round (1,800 hrs).

Energy cost savings = 9 units x [1,800 hr/yr x (105-27) watts] x \$0.165 = \$208

The cost of a LED lamp retrofit kit with new ballast is \$410 per outdoor fixture.

9 units x \$410/unit = \$3,690

Maintenance savings is from the cost of replacement lamps and labor to install. LED lamps last 50,000 hours while HPS lamps last 20,000 hours. Therefore there is a savings of not having to replace lamps twice during the life of a LED lamp.

Maintenance savings = 18 x \$10 (cost of 70W HPS) + 18 x \$20/Lamp (Labor) = \$540

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$3,690
NJ Smart Start Equipment Incentive (\$):	-
Maintenance Savings (\$):	\$540
Net Installation Cost (\$):	\$3,150
Total Energy Savings (\$ / yr):	\$208
Simple Payback (yrs):	15.1
Simple Return on Investment	2.0%

ECM #3: Replace Older Rooftop Units with Energy-Efficient Units

Description:

The two Lennox commercial rooftop units that provide heating & cooling for the meeting court room and the Mayor's conference room are 1994 vintage units with a SEER=8. These units are at their expected service life and are very inefficient. As outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook, the estimated service life for a commercial rooftop unit is 15 years.

This measure would replace the two (2) existing rooftop units with energy-efficient gas-fired heating and DX cooling units as manufactured by Trane Model YH042 or equivalent. In addition, these units would feature electronic controls and programmable thermostats.

Note: Sizing indicated within the calculation of this ECM is based on a one for one replacement of the existing equipment. Owner should have a Professional Engineer verify heating and cooling loads prior to moving forward with this ECM.

Energy Savings Calculations:

New Cooling Energy Savings =

$[(\text{Tons Refrigeration} \times 12,000 \text{ Btu/Ton}) / (1000) / (\text{New-Old EER}) \times \text{Avg. Load Factor} \times \text{Hrs. of Cooling}] \times \text{No. of Units}$

Existing Rooftop Units

Rated Capacity = 3.5 Tons per Unit
 Condenser Unit Efficiency = 8.0 EER
 Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Proposed High-Efficiency Condensing Unit

Rated Capacity = 3.5 Tons per Unit
 New Cooling Unit Efficiency = 14.0 EER

Cooling Energy Savings = $\{[(3.5 \text{ Tons} \times 12,000 \text{ Btu/Ton}) / 1,000 \text{ Watts/kW}] \div (14-8 \text{ Btu/Watt})\} \times 0.15 \times 1,800 \text{ hrs.} \times 2 \text{ units} = 3,780 \text{ kWh/Yr.}$

Cost Savings (Cooling) = 3,780 kWh x \$0.165/kWh = \$624 / Yr.

Heating Energy Savings = Estimated Therms Used in 2008 (Rooftops) x (AFUE_{new} - AFUE_{exist})

Existing Rooftop Units

150 MBH and AFUE = 70%.

AFUE = Annual Fuel Utilization Efficiency – reflects how efficient a gas furnace converts fuel to energy. A gas furnace with an AFUE of 90% means that approximately 90% of the fuel is utilized to provide warmth to the building.

Proposed High-Efficiency Gas-Fired Heating Unit

150 MBH and AFUE = 90%

Heating Energy Savings = 867 Therms x (0.90 – 0.70) = 173 Therms

Cost Savings (Heating) = 173 Therms x \$1.60 = \$277 / Yr.

Total Energy Cost Savings = \$624 + \$277 = \$901 / Yr.

Installed cost of two (2) new 3.5-Ton commercial packaged heating/cooling units = \$14,000.

The SmartStart Buildings® incentive for cooling is \$92/ton x 7 tons = \$644

The SmartStart Buildings® incentive for gas heating is \$2/MBH but not less than \$300/unit = \$300

Total incentive is \$644 + \$300 = \$944

Energy Savings Summary:

ECM #3 – ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$14,000
NJ Smart Start Equipment Incentive (\$):	(\$944)
Maintenance Savings (\$):	-
Net Installation Cost (\$):	\$13,056
Total Energy Savings (\$ / yr):	\$901
Simple Payback (yrs):	14.5
Simple Return on Investment	2.5%

ECM #4: Install Geothermal Heating/Cooling System

Description:

The municipality asked that CEG investigate the feasibility and energy savings of installing a geothermal heating/cooling system into this building. The geothermal system would require (not limited to) the following major components:

1. 17-Ton bore field located in field adjacent to parking lot.
2. (2) Loop condenser water pumps.
3. Condenser water piping distribution system from the well field to the roof top units
4. Installation of (3) high-efficiency (16 EER) geothermal rooftop units to replace the existing units and ductwork as required for adequate zoning. Basis of design: Climate Master Tranquility Series or equivalent.
5. Removal of the existing rooftop AC units
6. Removal of the existing gas distribution piping.

Energy Model Comparison Results:

Heating and cooling calculations were performed using the Trane Trace® 700 comprehensive building analysis software (See Energy Model Comparison - Appendix F.) The existing building cooling load was calculated to be 12.3 Tons and the heating load was 186.5 MBH. Through the modeling process it was discovered that the building's energy usage was higher than expected for the building type and construction. Therefore a high infiltration factor was modeled to account for the building's high heating energy usage. This is expected only for a building with high occupancy turnover and no means for infiltration reduction such as vestibules or revolving doors.

The existing building model showed that the Court / Meeting room is currently undersized by roughly 1.5 – 2.0 tons during the cooling season. This is a result of high heat loads given off by people when the space is fully occupied in conjunction with elevated ambient temperatures in the summer months.

The model for the geothermal system is based on the same infiltration percentage of the existing building conditions, however it is important to note that significant energy use reduction can be achieved through measures recommended above such as installing door sweeps, weather stripping, exterior ductwork insulation, and closing drapes in the winter months. Implementation of a geothermal system would eliminate the building's need for natural gas service and reduce the building's overall electrical usage. The energy reduction for this ECM would improve Shamong Township Municipal building EUI (energy use index) by 58%.

Existing system EUI = 68 kBtu/SF/Yr.

New geothermal system EUI = 29 kBtu/SF/Yr.

Note: Sizing indicated within the calculation of this ECM is based on a one for one replacement of the existing equipment. Owner should have a Professional Engineer verify heating and cooling loads prior to moving forward with this ECM.

Energy Savings Calculations:

Electrical Energy Savings = 16.5% decrease in electrical energy use per year.

$$38,233 \text{ kWh} - 31,925 \text{ kWh} = 6,308 \text{ kWh / Yr.}$$

Electrical Cost Savings = 6,308 kWh x \$0.165/kWh = \$1041 / Yr.

Gas Energy Savings = 100% decrease in natural gas energy use per year.

$$1577 \text{ Therms} - 0 \text{ Therms} = 1577 \text{ Therms / Yr.}$$

Gas Cost Savings = 1577 Therms x \$1.60/Therm = \$2,528 / Yr.

The SmartStart Buildings® incentive is \$370/ton (including loop and well allowance) = 17 Tons x \$370/Ton = \$6,290

Energy Savings Summary:

ECM #4 – ENERGY SAVINGS SUMMARY	
Total Installation Cost (\$):	\$164,650
AC Equipment Replacement Cost (\$)	-\$62,750
NJ Smart Start Equipment Incentive (\$):	-\$6,290
Maintenance Savings (\$):	-
Net Installation Cost* (\$):	\$95,610
Total Energy Savings (\$ / yr):	\$3,569
Simple Payback (yrs):	26.8
Simple Return on Investment	-4.5%

*Net installation cost is based on geothermal portion of installation costs. They do not include replacement of existing AC equipment that is at the end of its life. The cost estimates do not include site work rehabilitation.

VIII. 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 technologies for the Municipal Building, and concluded that there is not feasible potential for solar and wind energy generation at this site. In regards to renewable energy, CEG comments and findings are as follows:

- *Photovoltaic System:* CEG does not recommend the installation of a PV system for the Municipal Building due to the fact that the facility does not contain adequate roof area for installation of the system. In addition, the building structure appears not sound enough for the addition of more rooftop equipment.
- *Wind Energy:* CEG does not recommend the installation of a Wind system because of low average wind speeds for the Shamong area. Furthermore, the electric demand on the facility is moderate to low because of facility size and operational characteristics. The afore-mentioned characteristics do not lend themselves to a successful wind energy application.

IX. 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 Section IV, Figures 1 and 2 included within this report to reference the respective electricity and natural gas usage load profile for January 2008 through December 2008.

Electricity:

Section IV, Figure 1 demonstrates a typical cooling profile, (April –October), complimenting the heating load. During the months of January through February 2008 higher than expected electrical consumption occurred. This is most likely associated with evening usage of the facility for township events and general meetings.

Natural Gas:

Section IV, Figure 2 demonstrates a typical heating load (November –March), and complimentary cooling load (April –October). The natural gas load profile demonstrates a clear separation between the heating and cooling demands of the building.

Tariff Analysis:

Electricity:

Shamong Township receives electrical service through Atlantic City Electric on the Monthly General Service (MGS) – Secondary Rate Schedule. This utility tariff is for delivery service for general purposes at secondary distribution voltages. The rate schedule has a Delivery Charge, Societal Benefits Charge, Non-utility Generation Charge, Securitization Charge, System Control Charge, Customer Account Services Charge, Standby Fee, Base Rate Distribution Adjustment Charge, Solar Pilot Recovery Charge and RGGI Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS).

Natural Gas:

Shamong Township receives natural gas service through South Jersey Gas on a GSG (General Service Gas) rate class. This utility tariff is for delivery service of natural gas for general purposes. This rate schedule has a Delivery Charge, Balancing Charge, Societal Benefits Charge, Realignment Adjustment Charge, Margin Adjustment Charge, RGGI Charge and Customer Account Service Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS). It is pertinent to note, should the TPS not deliver, the customer may

receive service from PSE&G under Emergency Sales Service. Emergency Sales Service carries an extremely high penalty cost of service.

Imbalances occur when Third Party Suppliers are used to supply natural gas, full-delivery is not made, and when a new supplier is contracted or the customer returns to the utility. It is important when utilizing a Third Party Supplier, that an experienced regional supplier is used. Otherwise, imbalances can occur, jeopardizing economics and scheduling.

Recommendations:

Based on CEG's review of Shamong Township's utility bills and charges, our recommendation is to continue purchasing energy in the current manner. As compared to current market pricing, it does not appear that the electricity and natural gas rates are very far from standard average for facilities on the same consumption level as the Municipal Building. There could very well be opportunities on the natural gas side; however, the relatively low consumption as compared to large users does not allow competitive procurement. On the other hand, if Shamong Township were to aggregate their natural gas demand with other townships in a collaborative effort, utility savings could be realized.

CEG recommends that Shamong Township schedule a meeting with their current utility providers to review their utility charges and current tariff structures for electricity and natural gas. This meeting would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local Distribution Company (LDC), Shamong Township will learn more about the competitive supply process. Shamong Township can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, Shamong Township should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the 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.

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.

XI. 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 in the window AC units periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%. The 3-step process includes cleaning of the coils, rinsing and a micro biocide treatment. Thoroughly cleaned coils are not as susceptible to re-fouling so they stay clean longer, reducing the cleaning cycle frequency
- B. Maintain all weather stripping on windows and doors.
- C. Use cog-belts instead of v-belts on all belt-driven fans, etc. These can reduce electrical consumption of the motor by 2-5%.
- D. Repair/replace damaged or missing ductwork insulation in the ceiling spaces.
- E. Provide more frequent air filter changes to decrease overall fan horsepower requirements and maintain better IAQ.
- F. Recalibrate existing zone thermostats.
- G. Clean all fixtures to maximize light output.
- H. Feel for air drafts around electrical outlets. Inexpensive pads are available, as are plugs for unused sockets.
- I. Ensure entrance doors have adequate automatic door closers that fully close in windy weather conditions.

Electric Cost Summary

Atlantic City Electric - Rate (MGS)

Municipal Building

Account # 0015101-9999-3

Meter # XXXX

2008

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-07	Total
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0
KWH	3,911	3,890	3,419	2,365	2,324	3,266	4,179	3,440	3,343	2,428	2,475	4,013	39,053
KW	12.2	10.6	10.9	10.0	11.4	18.9	21.9	21.7	9.4	11.9	12.7	14.7	21.9
Monthly Load Factor	43%	55%	42%	33%	27%	24%	26%	21%	49%	27%	27%	37%	34%
Total Cost, \$	\$585	\$567	\$517	\$370	\$377	\$604	\$775	\$639	\$608	\$389	\$397	\$603	\$6,430
\$/KWH	\$0.150	\$0.146	\$0.151	\$0.157	\$0.162	\$0.185	\$0.185	\$0.186	\$0.182	\$0.160	\$0.160	\$0.150	\$0.165

Max

Summary of Natural Gas Cost

South Jersey Gas - Rate (BGSS)

Municipal Building

Account # 2 01 01 2228 0 8

Meter # 147150

2008

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	
Therms (Burner Tip)	392.9	293.8	293.8	82.5	16.6	0.0	0.0	0.0	0.0	43.3	165.8	288.6	1577.3
Total Distribution Cost	\$179	\$168	\$139	\$51	\$25	\$18	\$20	\$18	\$21	\$36	\$85	\$139	900
Cost per Therm	\$0.455	\$0.573	\$0.472	\$0.624	\$1.529	\$0.000	\$0.000	\$0.000	\$0.000	\$0.837	\$0.515	\$0.483	\$0.571
Total Commodity Cost	\$376	\$354	\$281	\$79	\$16	\$0	\$0	\$0	\$0	\$41	\$164	\$317	1,628
Cost per Therm	\$0.96	\$1.21	\$0.96	\$0.96	\$0.96	\$0.00	\$0.00	\$0.00	\$0.00	\$0.96	\$0.99	\$1.10	\$1.03
Total Cost	\$555	\$523	\$420	\$130	\$41	\$18	\$20	\$18	\$21	\$78	\$249	\$456	\$2,528
Cost per Therm	\$1.411	\$1.779	\$1.429	\$1.580	\$2.485	\$0.000	\$0.000	\$0.000	\$0.000	\$1.793	\$1.501	\$1.580	\$1.603



STATEMENT OF ENERGY PERFORMANCE

Municipal Building

Building ID: 1794242

For 12-month Period Ending: December 31, 2008¹

Date SEP becomes ineligible: N/A

Date SEP Generated: July 16, 2009

Facility

Municipal Building
105 Willow Grove Rd
Shamong, NJ 08088

Facility Owner

Shamong Township
105 Willowgrove Rd.
Shamong, NJ 08088

Primary Contact for this Facility

Sue Onorato
105 Willowgrove Rd.
Shamong, NJ 08088

Year Built: 1979

Gross Floor Area (ft²): 4,240

Energy Performance Rating² (1-100) N/A

Site Energy Use Summary³

Natural Gas (kBtu) ⁴	157,730
Electricity (kBtu)	133,249
Total Energy (kBtu)	290,979

Energy Intensity⁵

Site (kBtu/ft ² /yr)	69
Source (kBtu/ft ² /yr)	144

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	29
---	----

Electric Distribution Utility

Atlantic City Electric Co

National Average Comparison

National Average Site EUI	77
National Average Source EUI	182
% Difference from National Average Source EUI	-21%
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 Standards⁶ for Indoor Environmental Conditions:

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

Certifying Professional

Raymond Johnson
520 S. 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) 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	<input checked="" type="checkbox"/>
Building Name	Municipal Building	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		<input type="checkbox"/>
Type	Office	Is this an accurate description of the space in question?		<input type="checkbox"/>
Location	105 Willow Grove Rd, Shamong, NJ 08088	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		<input type="checkbox"/>
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		<input type="checkbox"/>

Municipal Building (Office)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
Gross Floor Area	4,240 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"/>
Weekly operating hours	50 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"/>
Workers on Main Shift	12	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"/>
Number of PCs	10	Is this the number of personal computers in the Office?		<input type="checkbox"/>
Percent Cooled	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"/>
Percent Heated	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: Atlantic City Electric Co

Fuel Type: Electricity		
Meter: Electricity (kWh) Space(s): Entire Facility		
Start Date	End Date	Energy Use (kWh)
12/01/2008	12/31/2008	4,013.00
11/01/2008	11/30/2008	2,475.00
10/01/2008	10/31/2008	2,428.00
09/01/2008	09/30/2008	3,343.00
08/01/2008	08/31/2008	3,440.00
07/01/2008	07/31/2008	4,179.00
06/01/2008	06/30/2008	3,266.00
05/01/2008	05/31/2008	2,324.00
04/01/2008	04/30/2008	2,365.00
03/01/2008	03/31/2008	3,419.00
02/01/2008	02/29/2008	3,890.00
01/01/2008	01/31/2008	3,911.00
Electricity Consumption (kWh)		39,053.00
Electricity Consumption (kBtu)		133,248.84
Total Electricity Consumption (kBtu)		133,248.84
Is this the total Electricity consumption at this building including all Electricity meters?		<input type="checkbox"/>

Fuel Type: Natural Gas		
Meter: Natural Gas (therms) Space(s): Entire Facility		
Start Date	End Date	Energy Use (therms)
12/01/2008	12/31/2008	288.60
11/01/2008	11/30/2008	165.80
10/01/2008	10/31/2008	43.30
09/01/2008	09/30/2008	0.00
08/01/2008	08/31/2008	0.00
07/01/2008	07/31/2008	0.00
06/01/2008	06/30/2008	0.00
05/01/2008	05/31/2008	16.60
04/01/2008	04/30/2008	82.50

03/01/2008	03/31/2008	293.80
02/01/2008	02/29/2008	293.80
01/01/2008	01/31/2008	392.90
Natural Gas Consumption (therms)		1,577.30
Natural Gas Consumption (kBtu)		157,730.00
Total Natural Gas Consumption (kBtu)		157,730.00
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		<input type="checkbox"/>

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.	<input type="checkbox"/>

Certifying Professional

(When applying for the ENERGY STAR, this must be the same 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
105 Willow Grove Rd
Shamong, NJ 08088

Facility Owner
Shamong Township
105 Willowgrove Rd.
Shamong, NJ 08088

Primary Contact for this Facility
Sue Onorato
105 Willowgrove Rd.
Shamong, NJ 08088

General Information

Municipal Building	
Gross Floor Area Excluding Parking: (ft ²)	4,240
Year Built	1979
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Municipal Building	
Space Type	Office
Gross Floor Area(ft ²)	4,240
Weekly operating hours	50
Workers on Main Shift	12
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 12/31/2008)	Baseline (Ending Date 12/31/2008)	Rating of 75	Target	National Average
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft ²)	69	69	50	N/A	77
Source (kBtu/ft ²)	144	144	105	N/A	182
Energy Cost					
\$/year	\$ 8,960.00	\$ 8,960.00	\$ 6,555.17	N/A	\$ 10,052.75
\$/ft ² /year	\$ 2.11	\$ 2.11	\$ 1.54	N/A	\$ 2.37
Greenhouse Gas Emissions					
MtCO ₂ e/year	29	29	21	N/A	33
kgCO ₂ e/ft ² /year	7	7	5	N/A	8

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.



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 January, 2009:

Electric Chillers

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

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
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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

Ground Source Heat Pumps

Closed Loop & Open Loop	\$370 per ton
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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

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

Premium Motors

Three-Phase Motors	\$45 - \$700 per motor
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Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	\$10 - \$30 per fixture, (depending on quantity)
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

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

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

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

CEG Job #: 9C08155
 Project: Shamong Twp. Energy Audit
 Address: 105 Willow Grove Road
 City: Shamong
 Building SF: 4,240

Municipal Bldg

DATE: 05/04/2009

KWH COST: \$0.165

EXISTING LIGHTING										PROPOSED LIGHTING										SAVINGS			
Line No.	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr. Fixtures	Yearly \$ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr. Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kWh Savings	Yearly \$ Savings	Yearly Payback				
1	Meeting Room	17	4' x 2' 4-Lamp, T-12, Prism Reflector, MB	216	160	2.72	587.52	\$96.94	17	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N WN	80	1.36	293.76	\$48.47	\$120.00	\$2,040.00	1.36	\$48.47	42.09				
2	Mayor's Office	4	4' x 2' 4-Lamp, T-12, Prism Reflector, MB	216	160	0.64	138.24	\$22.81	4	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N WN	80	0.32	69.12	\$11.40	\$120.00	\$480.00	0.32	\$11.40	42.09				
3	Corridors	8	4' x 2' 4-Lamp, T-12, Prism Reflector, MB	2,080	160	1.28	2662.4	\$439.30	8	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N WN	80	0.64	1331.2	\$219.65	\$120.00	\$960.00	0.64	\$219.65	4.37				
4	Tax Office	4	4' x 2' 4-Lamp, T-12, Prism Reflector, MB	2,080	160	0.64	1331.2	\$219.65	4	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N WN	80	0.32	665.6	\$109.82	\$120.00	\$480.00	0.32	\$109.82	4.37				
5	Township Clerk	5	4' x 2' 4-Lamp, T-12, Prism Reflector, MB	2,080	160	0.80	1664	\$274.56	5	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N WN	80	0.40	832	\$137.28	\$120.00	\$600.00	0.40	\$137.28	4.37				
6	Construction Office	4	4' x 2' 4-Lamp, T-12, Prism Reflector, MB	2,080	160	0.64	1331.2	\$219.65	4	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N WN	80	0.32	665.6	\$109.82	\$120.00	\$480.00	0.32	\$109.82	4.37				
7	Violations Bureau	5	4' x 2' 4-Lamp, T-12, Prism Reflector, MB	2,080	160	0.80	1664	\$274.56	5	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N WN	80	0.40	832	\$137.28	\$120.00	\$600.00	0.40	\$137.28	4.37				
8	File Storage	2	4' x 2' 4-Lamp, T-12, Prism Reflector, MB	800	160	0.32	256	\$42.24	2	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N WN	80	0.16	128	\$21.12	\$120.00	\$240.00	0.16	\$21.12	11.36				
9	Storage Rooms	2	1' x 4' 2-Lamp, T-12, Prism Reflector, MB	400	88	0.18	70.4	\$11.62	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N WN	61	0.12	48.8	\$8.05	\$110.00	\$220.00	0.05	\$3.56	61.73				
10	Restrooms	2	1' x 4' 2-Lamp, T-12, Prism Reflector, MB	400	88	0.18	70.4	\$11.62	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N WN	61	0.12	48.8	\$8.05	\$110.00	\$220.00	0.05	\$3.56	61.73				
11	Restrooms	2	2' x 2' 2-Lamp, T-12, Prism Reflector, MB	400	88	0.18	70.4	\$11.62	2	2'X2' 2-Lamp T-8 Retrofit	34	0.07	27.2	\$4.49	\$110.00	\$220.00	0.11	\$7.13	30.86				

12	Corridors	2	2' x 2' 2-Lamp, T-12, Prism Reflector, MB On Photocell	88	0.18	642.4	\$106.00	2	2'X2' 2-Lamp T-8 Retrofit	34	0.07	248.2	\$40.95	\$110.00	\$220.00	0.11	394.2	\$65.04	3.38
		57		8.54	10488.16	1730.55	57	4.30	5190.28	\$856.40	\$6,760.00	4.24	5,297.88	\$874.15	7.73				
	Totals																		

MONTHLY ENERGY CONSUMPTION

By CEG

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
----- Monthly Energy Consumption -----													

Alternative: 1 Existing Building System

Electric	On-Pk Cons. (kWh)	3,916	3,561	3,663	2,915	3,504	4,136	4,523	4,412	3,089	3,046	3,058	3,315	43,137
	On-Pk Demand (kW)	14	14	14	13	19	23	25	23	20	15	14	14	25
Gas	On-Pk Cons. (therms)	346	332	212	101	0	0	0	0	0	88	138	240	1,457
	On-Pk Demand (therms/hr)	2	2	2	2	0	0	0	0	0	2	2	2	2

Energy Consumption

Building 87,021 Btu/(ft2-year)
 Source 176,792 Btu/(ft2-year)

Floor Area 3,366 ft2

Environmental Impact Analysis

CO2 104,379 lbm/year
 SO2 807 gm/year
 NOX 162 gm/year

Alternative: 2 Geothermal Heat Pump System

Electric	On-Pk Cons. (kWh)	3,993	3,714	3,435	2,595	2,476	2,815	2,973	2,966	2,222	2,690	2,829	3,309	36,015
	On-Pk Demand (kW)	20	19	18	17	12	14	16	14	12	16	17	18	20
Gas	On-Pk Demand (therms/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0

Energy Consumption

Building 36,518 Btu/(ft2-year)
 Source 109,566 Btu/(ft2-year)

Floor Area 3,366 ft2

Environmental Impact Analysis

CO2 43,803 lbm/year
 SO2 339 gm/year
 NOX 68 gm/year