# ENERGY AUDIT – FINAL REPORT

## BUENA VISTA MUNICIPAL BUILDING

**890 HARDING HIGHWAY**
**BUENA VISTA, NJ 08310**
**ATTN: MR. RONALD P. TREBING**
**Administrator / CMFO**

**CEG PROJECT NO. 9C08150**


## CONCORD ENGINEERING GROUP

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# I. EXECUTIVE SUMMARY

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

Buena Vista Township
Municipal Building
890 Harding Highway
Buena, NJ 08310

Municipal Contact Person: Ronald P. Trebing

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 | $ 14,356 |
| Natural Gas | $ 6,687 |
| Total | $ 21,043 |

The potential annual energy cost savings are shown below in Table 1. Be aware that the measures are not additive because of the interrelation of several of the measures. The cost of each measure for this level of auditing is ± 20% until detailed engineering, specifications, and hard proposals are obtained.

**Table 1**
**Energy Conservation Measures (ECM's)**

| ECM NO. | DESCRIPTION | COST | ANNUAL SAVINGS | SIMPLE PAYBACK (YEARS) | SIMPLE RETURN ON INVESTMENT |
|---|---|---|---|---|---|
| 1 | Lighting Upgrade – Fluorescent Lighting | $3,410 | $458 | 7.5 | 41.8 % |
| 2 | Lighting Upgrade – CFL Lighting | $220 | $227 | 1.0 | 103.8 % |
| 3 | Lighting Upgrade – Lighting Controls | $1,045 | $262 | 3.9 | 26.4 % |
| 4 | Split System Upgrade – Common Areas | $14,785 | $1,764 | 8.4 | 10.5 % |
| 5 | Split System Upgrade – Court Room | $29,310 | $6,103 | 4.8 | 21.7 % |
| 6 | Domestic Hot Water Heater Replacement | $6,450 | $559 | 11.5 | 5.6 % |
| 7 | Split System Upgrade – File Storage / Archives Area | $19,620 | $2,414 | 8.1 | 11.1 % |
| 8 | Retro-Commissioning | $1,350 | $1,052 | 1.3 | 80.3 % |
| 9 | 3.22 KW PV Solar Panel System | $28,980 | $2,563 | 11.3 | 7.9 % |

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 Lighting | - | 2,866 | - |
| 2 | Lighting Upgrade – CFL Lighting | - | 1,426 | - |
| 3 | Lighting Upgrade – Lighting Controls | - | 1,642 | - |
| 4 | Split System Upgrade – Common Areas | - | 9,905 | 202 |
| 5 | Split System Upgrade – Court Room | - | 35,250 | 303 |
| 6 | Domestic Hot Water Heater Replacement | 4.5 | 4,680 | (143) |
| 7 | Split System Upgrade – File Storage / Archives Area | - | 12,000 | 323 |
| 8 | Retro-Commissioning | - | - | - |
| 9 | 3.22 KW PV Solar Panel System | 3.22 | 5,025 | |



**Recommendations:**

Concord Engineering Group 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 economically justifiable. The following Energy Conservation Measures are recommended for the Buena Vista Municipal Building:

- **ECM #1:** Interior T-8 Fluorescent Lighting Upgrades
- **ECM #2:** Install Compact Fluorescent Lamps
- **ECM #3:** Interior Lighting Controls – Occupancy Sensors
- **ECM #5:** Split System Upgrade – Court Room
- **ECM #8:** Retro-Commissioning

# II. INTRODUCTION

This comprehensive energy audit covers the 9,000 square foot Municipal Complex facility that includes administrative offices, conference room, court room, restrooms, and attic storage.

The first task was to collect and review one year's worth of 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/$ft^2$/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 municipality 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 (ECM's). 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 ECM's.

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 higher 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, refer to Appendix B, 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.

# 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 AGS / Annual General Service Rate Schedule. 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 Municipal Complex facility from January-08 to December-08. Woodruff Energy supplies the natural gas and South Jersey Gas delivers the fuel to the burner at the facility under the GSG / General Service, firm transportation rate. Below is the average unit cost for the utilities at this facility.

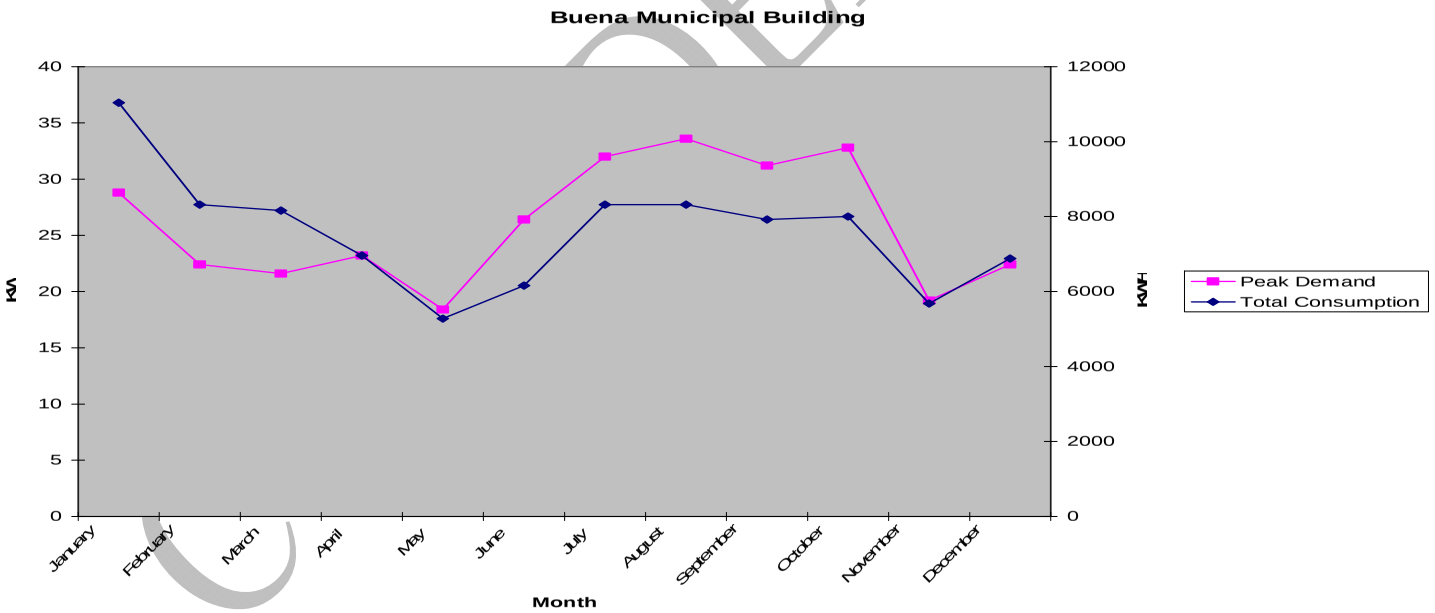
| Description | Average |
|---|---|
| Electricity | 16¢/kWh |
| Natural Gas | $1.53/Therm |

## Table 3
## Electricity Billing Data

**Municipal Building**

| Provider | Month | Start Date | End Date | Account | Utility Type | Billing Days | Peak Demand | Units | Load Factor (%) | Total Consumption | Units | Supply Charge | Delivery Charge | Total $ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atlantic City Electric | January | 12/10/2007 | 1/10/2008 | 0239 8109 9999 | Electric | 31 | 28.8 | kw | 51.52 | 11040 | kwh | $ 523.95 | $ 994.90 | $ 1,518.85 |
| Atlantic City Electric | February | 1/10/2008 | 2/8/2008 | 0239 8109 9999 | Electric | 29 | 22.4 | kw | 53.36 | 8320 | kwh | $ 438.05 | $ 756.44 | $ 1,194.49 |
| Atlantic City Electric | March | 2/8/2008 | 3/11/2008 | 0239 8109 9999 | Electric | 32 | 21.6 | kw | 49.18 | 8160 | kwh | $ 458.52 | $ 746.00 | $ 1,204.52 |
| Atlantic City Electric | April | 3/11/2008 | 4/10/2008 | 0239 8109 9999 | Electric | 30 | 23.2 | kw | 41.66 | 6960 | kwh | $ 413.06 | $ 643.06 | $ 1,056.12 |
| Atlantic City Electric | May | 4/10/2008 | 5/9/2008 | 0239 8109 9999 | Electric | 29 | 18.4 | kw | 41.22 | 5280 | kwh | $ 364.07 | $ 496.15 | $ 860.22 |
| Atlantic City Electric | June | 5/9/2008 | 6/10/2008 | 0239 8109 9999 | Electric | 32 | 26.4 | kw | 30.38 | 6160 | kwh | $ 377.89 | $ 651.63 | $ 1,029.52 |
| Atlantic City Electric | July | 6/10/2008 | 7/10/2008 | 0239 8109 9999 | Electric | 30 | 32 | kw | 36.11 | 8320 | kwh | $ 328.50 | $ 1,091.60 | $ 1,420.10 |
| Atlantic City Electric | August | 7/10/2008 | 8/8/2008 | 0239 8109 9999 | Electric | 29 | 33.6 | kw | 35.57 | 8320 | kwh | $ 327.95 | $ 1,092.26 | $ 1,420.21 |
| Atlantic City Electric | September | 8/8/2008 | 9/9/2008 | 0239 8109 9999 | Electric | 32 | 31.2 | kw | 33.05 | 7920 | kwh | $ 338.46 | $ 1,042.98 | $ 1,381.44 |
| Atlantic City Electric | October | 9/9/2008 | 10/9/2008 | 0239 8109 9999 | Electric | 30 | 32.8 | kw | 33.87 | 8000 | kwh | $ 329.52 | $ 996.28 | $ 1,325.80 |
| Atlantic City Electric | November | 10/9/2008 | 11/7/2008 | 0239 8109 9999 | Electric | 29 | 19.2 | kw | 42.5 | 5680 | kwh | $ 273.13 | $ 618.07 | $ 891.20 |
| Atlantic City Electric | December | 11/7/2008 | 12/9/2008 | 0239 8109 9999 | Electric | 32 | 22.4 | kw | 39.99 | 6880 | kwh | $ 308.62 | $ 744.81 | $ 1,053.43 |
| | | | | | | Max Peak: | 33.6 | kw | Total: | 91040 | kwh | | Total: | $ 14,355.90 |
| | | | | | | | | | | | | | Avg. Cost per kwh: | $ 0.16 |

## Figure 1
## Electricity Usage Profile

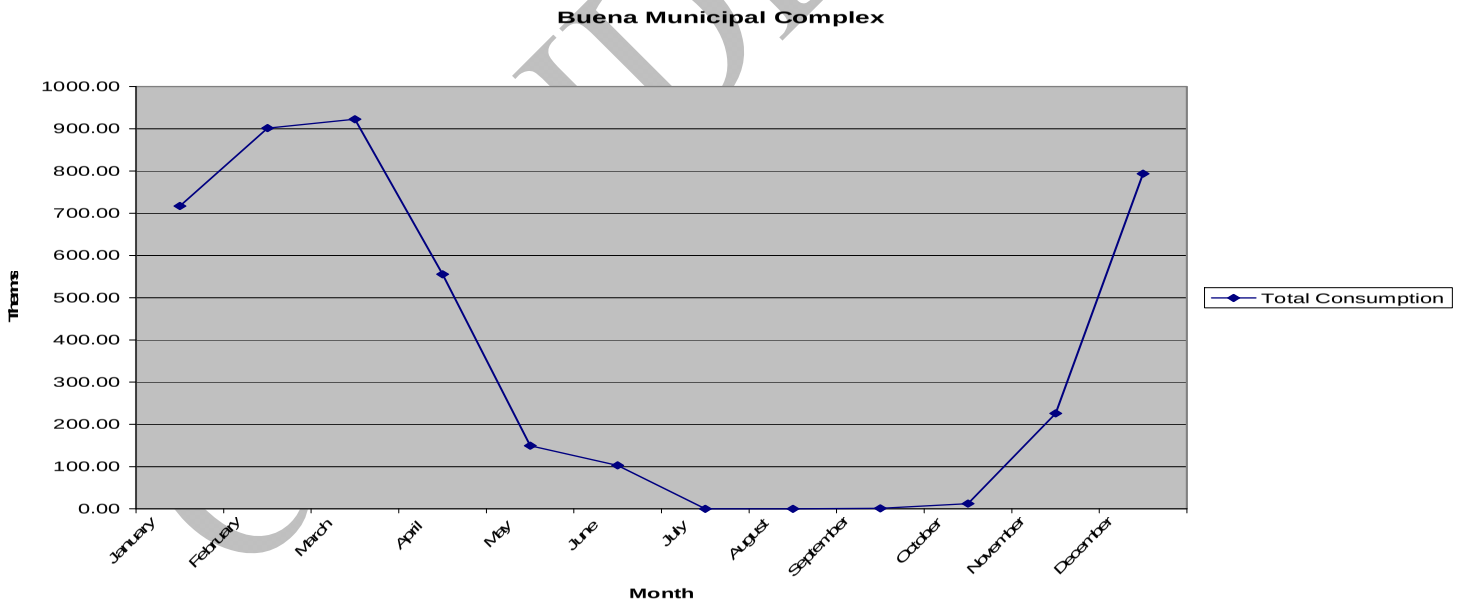


## Table 4
## Natural Gas Billing Data

**Municipal Building**

| Provider | Month | Start Date | End Date | Account | Utility Type | Billing Days | Consumption | Units | Total $ |
|---|---|---|---|---|---|---|---|---|---|
| South Jersey Gas | January | 12/7/2007 | 1/9/2008 | 3 05 18 8203 0 0 | Gas | 33 | 716.90 | therms | $ 1,087.66 |
| South Jersey Gas | February | 1/9/2008 | 2/8/2008 | 3 05 18 8203 0 0 | Gas | 30 | 901.65 | therms | $ 1,361.01 |
| South Jersey Gas | March | 2/8/2008 | 3/10/2008 | 3 05 18 8203 0 0 | Gas | 31 | 922.61 | therms | $ 1,392.88 |
| South Jersey Gas | April | 3/10/2008 | 4/10/2008 | 3 05 18 8203 0 0 | Gas | 31 | 555.71 | therms | $ 846.70 |
| South Jersey Gas | May | 4/10/2008 | 5/8/2008 | 3 05 18 8203 0 0 | Gas | 28 | 149.50 | therms | $ 239.44 |
| South Jersey Gas | June | 5/8/2008 | 6/9/2008 | 3 05 18 8203 0 0 | Gas | 32 | 102.96 | therms | $ 173.25 |
| South Jersey Gas | July | 6/9/2008 | 7/10/2008 | 3 05 18 8203 0 0 | Gas | 31 | 0.00 | therms | $ 19.35 |
| South Jersey Gas | August | 7/10/2008 | 8/8/2008 | 3 05 18 8203 0 0 | Gas | 29 | 0.00 | therms | $ 18.10 |
| South Jersey Gas | September | 8/8/2008 | 9/8/2008 | 3 05 18 8203 0 0 | Gas | 31 | 1.03 | therms | $ 20.76 |
| South Jersey Gas | October | 9/8/2008 | 10/7/2008 | 3 05 18 8203 0 0 | Gas | 29 | 12.43 | therms | $ 35.01 |
| South Jersey Gas | November | 10/7/2008 | 11/6/2008 | 3 05 18 8203 0 0 | Gas | 30 | 226.01 | therms | $ 326.64 |
| South Jersey Gas | December | 11/6/2008 | 12/8/2008 | 3 05 18 8203 0 0 | Gas | 32 | 793.58 | therms | $ 1,166.68 |
| | | | | | | 12 Month Total: | 4382.38 | therms | $ 6,687.48 |
| | | | | | | Average Cost per therm: | $ 1.53 | | |

## Figure 2
## Natural Gas Usage Profile



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's energy utilization per square foot of building. This calculation is completed by converting all utility usage (gas, electric, oil) consumed by a building over a specified time period, typically 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 among buildings of similar type. The EUI for this facility is calculated as follows:

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

Electric = ((91,040 kWh) * (1000 W/kW) * (3.414 Btu/h / 1 W))/ (1000 Btu/h / 1 kBtu/h)
= 310,811 kBtu/h

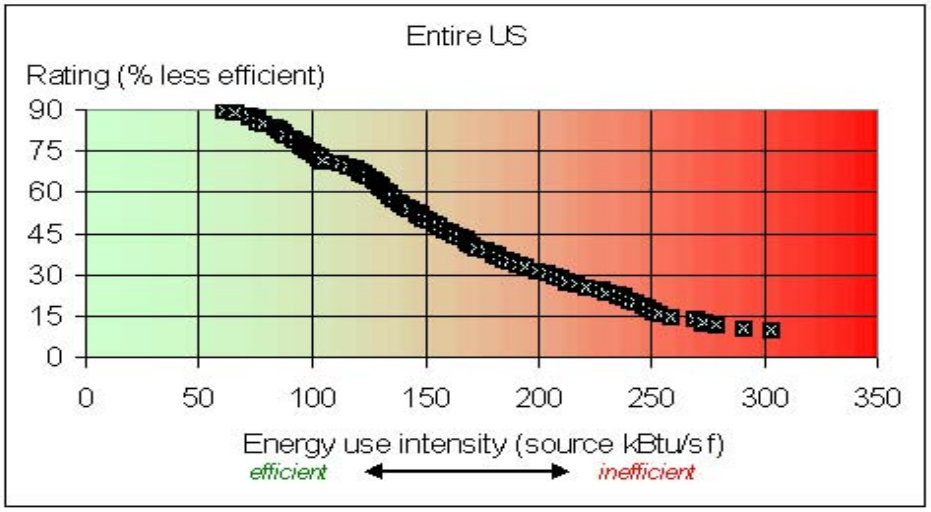
Gas = ((4,382 therms) * (100,000 Btu/h / 1 W)) / (1000 Btu/h / 1 kBtu/h) = 438,238 kBtu/h

$$\text{Building EUI} = \frac{\text{(310,811 kBTU / h + 438,238 kBtu / h)}}{\text{9,000 SF}} = \frac{\text{749,049 kBtu / h}}{\text{9,000 SF}} = 83.2 \text{ kBtu/SF}$$

Municipal Building EUI = 83.2 kBtu/SF

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. Their website allows the user to determine how well the client's building energy use intensity (EUI) compares with similar facilities in the U.S. and NJ.

**Figure 3**
**Energy Use Intensity Distributions: Offices**



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 priorites 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 access to monitor their yearly energy usage as it compares to facilities of similar type. The following is the user name and password for this account:

| | |
|---|---|
| User Name: | concordatlantic |
| Password: | password |

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 5**
**ENERGY STAR Performance Rating**

| FACILITY DESCRIPTION | ENERGY PERFORMANCE RATING | NATIONAL AVERAGE |
|---|---|---|
| Buena Vista Municipal Building | 29 | 50 |

Specific building types are detailed on the ENERGY STAR website. Non-typical buildings are covered by an "Other" category. Refer to Appendix G for detailed energy benchmarking report entitled "STATEMENT OF ENERGY PERFORMANCE."

# V. FACILITY DESCRIPTION

The Municipal Building was constructed in 1979 and is slab on grade with wood frame construction and 4" face brick. Roof truss from hip roofs with asphalt shingles and ventilated attic space is insulated with 6", R-19, fiver glass batt insulation. Windows are clear, double-pane, insulating type. Walls are assumed to be insulated with 3 ½" fiber glass batt insulation. The building houses the Municipal Court, office of the Tax Assessor, Tax Collector, Township Clerk, Zoning, Mayor and other administrative offices. A section of the attic space is used for file storage. The first floor is approximately 6,500 square feet and the conditioned file storage area in the attic is 2,500 square feet.

**Heating System**

The heating system for the building consists of a combination of forced hot air central heating systems for the Court Room and common areas and the use of gas fired, packaged terminal units in office and conference rooms.

The Court Room utilizes a Trane XE80 with 120,000 BTH/H of natural gas input, 95,000 BTU/H output, and 80% Annual Fuel Utilized Efficiency (AFUE). The unit was manufacture din 1998 and is located in the attic space above the Court Room.

The installation of the Court Room furnace is slightly unconventional in that its associated ductwork for air distribution is shared wit a 7 ½ ton air handler that provides air conditioning for the Court Room when necessary. The manual changeover heating and cooling thermostat activates one unit or the other to satisfy heating or cooling needs.

Common areas, such as corridors, the Foyer, and public restrooms are heated with forced hot air generated by the combination of a GE blower coil and inline duct furnace. The duct furnace is manufactured by Reznor, is natural gas fired and is gravity vented through the roof with B-vent. The manufacturer's nameplate was not available for performance data however it is believed that the duct furnace has a natural gas input of 75,000 BTU/H with 60,000 BTU/H output (80% eff.) as this is the lowest capacity available for this product.

The second floor File Storage area is heated with an identical furnace as the one that served the Court Room, a Trane XE80 Furnace model TUD12OC with 120,000 BTU/H natural gas input and 95,000 BTU/H output. This unit was also manufactured in 1998.

Offices and conference rooms around the perimeter of the building are heated with natural-gas fired, through-wall, packaged air conditioners. Installed models are manufactured by Suburban and are "Dynaline 2" PTAC (packaged terminal air conditioner) units with 12,000 BTU/H natural gas input and 9,840 BTU/H output, having 82% efficiency.

The Administrative and Court Office is served by a PTAC unit with electric heat. An American Air Filter (AAF) Nelson Aire Series E model SSAW062410 is installed and possesses a 3.2KW electric heater.

**Domestic Hot Water**

Domestic hot water for Men's and Women's public toilet rooms, the kitchen, and a private toilet room is provided by a State electric water heater model N5662R57 with 4,500 watts input and a 66 gallon capacity. This unit was installed in the early 1980's.

**Cooling System**

Cooling for the building is provided by a number of small independent air conditioning systems. A 7 ½ ton, split system with components manufactured by GE serves the Court Room. A 3 ton split system with indoor air handler manufactured by GE and outdoor condensing unit manufactured by ICP Commercial serve corridors and common areas throughout the first floor a 5 ton split system with components manufactured by Trane serves the second floor archives/file storage area. The remainder of the building is provided air conditioning by means of packaged terminal air conditioners (PTAC's) that are installed in wall openings in the various offices. This configuration of numerous, small, independent systems allows for controlling the temperature of each space individually, providing maximum flexibility regarding temperature settings and occupant comfort.

**Lighting System**

The court room is lit by 2-foot by 4-foot lay-in fixtures containing T8 lamps, incandescent par lamp track lights, and recessed incandescent MR16 down-lights.

Offices are lit by 2-foot by 4-foot lay-in fixtures containing T8 lamps.

Toilet rooms are lit using a mixture of 2-foot by 2-foot recessed T8 U-Tube lamps, 2-foot by 4-foot lay-in fixtures containing T8 lamps, and 4-foot T12 wall mounted fixtures.

The kitchen is lit by 2-foot by 2-foot recessed T8 U-Tube lamps.

Corridors are lit using 2-foot by 2-foot recessed T8 U-Tube lamps and recessed incandescent par lamp downlights.

Storage and utility closets are lit by 2-foot, 3-foot, and 4-foot T8 lamps, 4-foot T12 lamps, and 8-foot T12 lamps.

Standard switching is utilized throughout the facility.

The exterior lighting is mounted on the building and includes an assortment of wall packs.

# VI. MAJOR 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 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 manufacturers 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.

Equipment denoted by an asterisk indicates an estimate of the equipment ratings due to equipment inaccessibility, worn nameplates, lack of nameplates, etc.

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

# VII. ENERGY CONSERVATION MEASURES (ECM)

## ECM #1: Lighting Upgrade - Upgrade the Fluorescent Lighting

**Description:**

Improved fluorescent lamps and ballasts are available as direct replacements for the existing lamps and ballasts. A simple retrofit of the existing fixture can provide substantial savings. A lay-in 2' x 4' fixture with four, 4-foot lamps (34 Watt lamps with a magnetic ballast) has a total wattage of 108 Watts per fixture. By using the improved lamps and ballasts, the total wattage would be reduced to 84 Watts. The light levels would increase by about 15% and the light quality would increase by 35%.

CEG recommends replacement of the existing T8 and T12 lamps and magnetic ballasts with the latest technology T8 lamps and high efficiency electronic ballasts. The new energy efficient, T8 lamps 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 lamp and ballast 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 the latest high efficiency T8 lamps is approximately 30,000 burn-hours, requiring fewer lamps to replace per year. Based on the operating hours of this portion of the facility, approximately 2236 hours per year, the Owner will be changing approximately 33% less lamps per year.

In addition, a single electronic ballast can operate one, two, three, or four lamps in a fixture. The existing magnetic ballasts can only operate up to two lamps. The electronic ballasts could reduce the amount of ballasts in the facility by half. This can be taken advantage of with "tandem wiring" of ballasts. Instead of using one electronic ballast for every one fixture it is sometimes feasible to use one electronic ballast for every two or more fixtures. The electrician wires a single ballast to operate the lamps in adjacent light fixtures which further reduces the amount of ballasts needed.

**Energy Savings Calculations:**

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

Maintenance Savings are calculated as follows:

Maintenance Savings = (# *of lamps* x % *reduction* x $ *per lamp*) + *Installation Labor*

Maintenance Savings = (216 x 33% *reduction* x $2.00) + ($20 x 71) = $1563

**Energy Savings Summary:**

| ECM #1 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | **$6073** |
| **NJ Smart Start Equipment Incentive ($):** | **($1100)** |
| **Maintenance Savings ($):** | **($1563)** |
| **Net Installation Cost ($):** | **$3410** |
| **Total Energy Savings ($ / yr):** | **$458** |
| **Simple Payback (yrs):** | **7.5** |
| **Simple Return on Investment:** | **41.8 %** |

## ECM #2: Lighting Upgrade – Install Compact Fluorescent Lighting

**Description:**

Compact fluorescent lamps (CFL's) were created to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light.

The CFL is available in a myriad of shapes and sizes depending on the specific application. Typical replacements are: a 13-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 25-Watt CFL for a 100-Watt incandescent lamp.

The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output.

A CFL can be chosen to screw right into existing fixtures, or hardwired into existing fixtures.

**Energy Savings Calculations:**

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

Maintenance Savings are calculated as follows:

Maintenance Savings = (# *of lamps* x % *reduction* x $ *per lamp*) + *Installation Labor*

Maintenance Savings = (14 x 75% *reduction* x $.50) + ($15 x 10) = $155

**Energy Savings Summary:**

| ECM #2 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | **$375** |
| **NJ Smart Start Equipment Incentive ($):** | **$0** |
| **Annual Maintenance Savings ($):** | **($155)** |
| **Net Installation Cost ($):** | **$220** |
| **Total Energy Savings ($ / yr):** | **$227** |
| **Simple Payback (yrs):** | **1** |
| **Simple Return on Investment:** | **103.8 %** |

## ECM #3: Lighting Upgrade – Install Lighting Controls

**Description:**

In some areas the lighting is left on unnecessarily. There has been a belief that it is better to keep the lights on rather than to continuously switch them on and off. The on/off dilemma was studied and it was determined that the best option is to turn the lights off whenever possible. Although this practice reduces the lamp life, the energy savings far outweigh the lamp replacement costs.

Lighting controls are available in many forms. Lighting controls can be as simplistic as an additional switch. Time-clocks are often used which allows the user to set an on/off schedule. Time-clocks range from a dial clock with on/off indicators to a small box the size of a thermostat with user programs for on/off schedule in a digital format. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

To determine an estimated savings for lighting controls, we used ASHRAE 90.1-2004 (NJ Energy Code). Appendix G states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. CEG recommends the installation of dual technology occupancy sensors in offices, mechanical rooms, storage rooms, etc.

CEG would recommend wall switches for individual rooms, ceiling mount sensors for large office areas or restrooms, and fixture mount box sensors for some applications as manufactured by Sensorswitch, Watt Stopper, etc.

**Energy Savings Calculations:**

From Appendix E of this report, we calculated the lighting power density (Watts/ft$^2$) of the existing facility to be 1.02 Watts/SF. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

Savings = 10% x 1.02 Watts/SF x 7200 SF x 2,236 hrs/yr.

= 1,642kWh/yr. x $0.16/kWh

Annual Savings = $262 / yr

Installation cost per dual-technology sensor is $75/unit.

The SmartStart Buildings® incentive is $20 per control which equates to an installed cost of $55/unit. Total number of rooms to be retrofitted is 19 (7,200 SF).

Total cost to install sensors is $55 x 19 units = $1045.

**Energy Savings Summary:**

| **ECM #3 - ENERGY SAVINGS SUMMARY** | |
|---|---|
| **Installation Cost ($):** | **$1,425** |
| **NJ Smart Start Equipment Incentive ($):** | **($380)** |
| **Maintenance Savings ($):** | **$0** |
| **Net Installation Cost ($):** | **$1045** |
| **Total Energy Savings ($ / yr):** | **$262** |
| **Simple Payback (yrs):** | **3.9** |
| **Simple Return on Investment:** | **26.4 %** |

## ECM #4: Split System Upgrade– Common Areas System

**Description:**

Heating and cooling is provided within certain areas of the building via split-system air-conditioning and gas-fired furnaces. With respect to cooling, those particular air-conditioning units are inefficient with an estimated seasonal energy efficiency ratio (SEER) of 11.0. The NJ State Energy Code (ASHRAE 90.1-2004) mandates a minimum energy efficiency of 12.0 SEER for units of this type. The existing units are aged and are past their service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. The estimated service life for split system air-conditioning unit is 15 years.

The Common Areas System utilizes a Reznor duct furnace to provide forced hot air through the ducted system for heating. The age of the furnace is beyond its average service life expectancy and is firing at an estimated combustion efficiency of 75% at best. The exact natural gas firing rate of the furnace was unable to be determined however it is estimated at 75,000 BTU/H.

This energy conservation measure would replace the air handler, duct furnace, and condensing unit serving the corridors and common areas in the Municipal Building. The existing equipment will be replaced with an energy efficient, split system with heating and cooling capacities equivalent to the existing system. The average EER of the new cooling equipment will be 16.0 EER and the combustion efficiency for heating will be 94%. The energy efficiency of the new equipment is based on a Lennox G61 gas furnace, cased evaporator coil, and model SSB condensing unit.

**Cooling Energy Savings Calculations:**

$$EnergySavings = \frac{[CoolingTons \times 12{,}000\ Btu/ton \div 1000\ W/kW]}{[(EER_{NEW} - EER_{OLD})]} \times Avg.\ Load\ Factor \times Hrs.\ of\ Cooling$$

Existing Air Conditioning Units

Rated Capacity = 3 Tons

Condensing Unit Efficiency = 11.0 EER

Proposed High-Efficiency Air Conditioning Unit

Rated Capacity = 3 Tons

New Condensing Unit Efficiency = 16.0 EER

Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.16/kWh

$$EnergySavings = \frac{[CoolingTons \times 12{,}000\,Btu/ton \div 1000W/kW]}{[(EER_{NEW} - EER_{OLD})]} \times Avg.LoadFactor \times Hrs.ofCooling$$

$$EnergySavings = \frac{[3CoolingTons \times 12{,}000\,Btu/ton \div 1000W/kW]}{[(16.0EER_{NEW} - 10.3EER_{OLD})]} \times 0.80 \times 1800$$

$$= 9095\ kWh/yr.$$

Cost Savings = (9095 kWh) x $0.16/kWh = $1455 / Yr.

**Heating Energy Savings Calculations:**

To estimate the amount of energy consumed by the existing furnace throughout the heating season, the Degree Day method of energy estimating is be used.

$$EnergyUsed = \frac{H_L \times D \times 24}{\Delta t \times k \times V} \times (C_D)$$

where:

$H_L$ = Building Heat Loss, BTU/Hr.

D = number of 65 F Heating Degree Days

Δt = Design temperature difference, deg. F

k = a correction factor that includes the effects of rated full load efficiency, part load performance, oversizing and energy conservation devices.

V = Heating value of fuel, BTU/Therm

$C_D$ = empirical correction factor for heating effect vs. 65 F degree days

$$EnergyUsed = \frac{(60{,}000) \times (5169) \times 24}{70 \times .6 \times 100{,}000} \times (.6)$$

*Energy Used* = 1063 Therms/Year

As the proposed furnace is 19% more efficient than the existing furnace, the proposed energy used is

*Proposed Energy Used* = (1 - .19) x 1063 = 861 Therms/Year

*Energy Savings* = 1063 – 861 = 202 Therms/Year

Cost Savings = $1.53/Therm x 202 Therms = $309

**Energy Savings Summary:**

| ECM #4 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | **$15,000** |
| **NJ Smart Start Equipment Incentive ($):** | **($215)** |
| **Maintenance Savings ($):** | **($0)** |
| **Net Installation Cost ($):** | **$14,785** |
| **Total Energy Savings ($ / yr):** | **$1,764** |
| **Simple Payback (yrs):** | **8.4** |
| **Simple Return on Investment:** | **10.5 %** |



## ECM #5: Split System Upgrade– Court Room System

**Description:**

Heating and cooling is provided to the Court Room from a split air-conditioning system and separate gas-fired furnace. Both the air handling unit, which provides cooling, and the furnace use the same ducts. With respect to cooling, the air-conditioning units are inefficient with an estimated seasonal energy efficiency ratio (SEER) of 8.9. The NJ State Energy Code (ASHRAE 90.1-2004) mandates a minimum energy efficiency of 10.1 SEER for units of this type. The existing air conditioning units are aged and are past their service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. The estimated service life for split system air-conditioning unit is 15 years.

The Court Room is served by a residential furnace to provide forced hot air through the ducted system for heating. The age of the furnace is 11 years and is firing at an estimated combustion efficiency of 75% at best. The natural gas firing rate of the furnace is 120,000 BTU/Hr. The proposed furnace would fire at 110,000 BTU/Hr with a 94.1% combustion efficiency.

This energy conservation measure would replace the air handler, furnace, and condensing unit serving the Court Room in the Municipal Building. The existing equipment will be replaced with an energy efficient, split system with heating and cooling capacities equivalent to the existing system. The average EER of the new cooling equipment will be 11.3 EER and the combustion efficiency for heating will be 94.1%. The energy efficiency of the new equipment is based on a Lennox G61MP gas furnace, model TSA air handler, and model TAA condensing unit.

**Cooling Energy Savings Calculations:**

$$EnergySavi\ \ ngs\ = \frac{[CoolingTon\ \ s \times 12,000\ Btu\ /\ ton \div 1000\ W\ /\ kW\ ]}{[(EER_{NEW} - EER_{OLD})]} \times Avg\ .\ Load\ \ \ Factor\ \ \times Hrs\ .\ of\ \ Cooling$$

Existing Air Conditioning Units

Rated Capacity = 7.5 Tons

Condensing Unit Efficiency = 8.9 EER

Proposed High-Efficiency Air Conditioning Unit

Rated Capacity = 7.5 Tons

New Condensing Unit Efficiency = 11.3 EER

Cooling Season Hrs. of Operation = 60 hrs/yr at full load (100%), 1740 hrs/yr at 50%. load.

Average Cost of Electricity - $0.16/kWh

$$EnergySavings = \frac{[CoolingTons \times 12,000\,Btu\,/\,ton \div 1000W\,/\,kW]}{[(EER_{NEW} - EER_{OLD})]} \times Avg.LoadFactor \times Hrs.ofCooling$$

$$EnergySavings = \frac{[7.5CoolingTons \times 12,000\,Btu\,/\,ton \div 1000W\,/\,kW]}{[(11.3EER_{NEW} - 8.9EER_{OLD})]} \times 1.0 \times 60$$

$$= 2250\ kWh\,/\,yr.$$

$$EnergySavings = \frac{[7.5CoolingTons \times 12,000\,Btu\,/\,ton \div 1000W\,/\,kW]}{[(11.3EER_{NEW} - 8.9EER_{OLD})]} \times .50 \times 1740$$

$$= 33{,}000\ kWh\,/\,yr.$$

Cost Savings = (35,250 kWh) x $0.16/kWh = $5640 / Yr.

**Heating Energy Savings Calculations:**

To estimate the amount of energy consumed by the existing furnace throughout the heating season, the Degree Day method of energy estimating is be used.

$$EnergyUsed = \frac{H_L \times D \times 24}{\Delta t \times k \times V} \times (C_D)$$

where:

$H_L$ = Building Heat Loss, BTU/Hr.

D = number of 65 F Heating Degree Days
$\Delta t$ = Design temperature difference, deg. F

k = a correction factor that includes the effects of rated full load efficiency, part load performance, oversizing and energy conservation devices.

V = Heating value of fuel, BTU/Therm

$C_D$ = empirical correction factor for heating effect vs. 65 F degree days

$$EnergyUsed = \frac{(90{,}000)\times(5169)\times 24}{70\times .6\times 100{,}000}\times(.6)$$

*Energy Used* = 1595 Therms/Year

As the proposed furnace is 19% more efficient than the existing furnace, the proposed energy used is

*Proposed Energy Used* = (1 - .19) x 1595 = 1292 Therms/Year

*Energy Savings* = 1595 – 1292 = 303 Therms/Year

Cost Savings = $1.53/Therm x 303 Therms/Year = $463/Year

**Energy Savings Summary:**

| **ECM #5 - ENERGY SAVINGS SUMMARY** | |
|---|---|
| **Installation Cost ($):** | **$30,000** |
| **NJ Smart Start Equipment Incentive ($):** | **($690)** |
| **Maintenance Savings ($):** | **($0)** |
| **Net Installation Cost ($):** | **$29,310** |
| **Total Energy Savings ($ / yr):** | **$6,103** |
| **Simple Payback (yrs):** | **4.8** |
| **Simple Return on Investment:** | **21.7 %** |

## ECM #6: Domestic Hot Water Heater Replacement

**Description:**

The electric domestic hot water heater for the building was installed in 1979.
This energy conservation measure will replace the existing electric, 4,500 Watt, 66-gallon capacity domestic hot water heater with a gas-fired, tankless water heater. Tankless water heaters heat water directly without the use of a storage tank. Therefore, they avoid the standby heat losses associated with storage water heaters. In a gas-fired tankless water heater, a gas burner heats the water and provides a constant supply of hot water. Therefore, you do not need to wait for the storage tank to fill up with enough hot water as is typical with storage-type hot water heaters.

**Energy Savings Calculations:**

Existing Electric DHW Heater

Rated Capacity = 4,500 Watts Energy Factor (EF) = 0.90

66 gallons storage

Proposed High-Efficiency Gas-Fired Tankless Water Heater

Rated Capacity = 5 gallons per minute Natural Gas-Fired EF= 0.65

Operating Data for Existing Electric DHW Heater:

Average cost of electricity = 16 ¢/kWh

Electric DHW Heater Operating Hrs/Yr. = 1,040 Hrs.

Electric usage = (1,040 Hrs x 4,500 Watts) ÷ 1,000 Watts/kW = 4,680 kWh

Cost = 16 ¢/kWh x 4,680 kWh = $778

Operating Data for new tankless gas-fired DHW heater:

Average cost of natural gas = $1.53/Therm

Annual gas usage for 5 GPM tankless gas-fired units = 143 Therms

Cost = 143 Therms x $ 1.53 /Therm = $219

Energy Savings = $778 - $219 = $559

Installed cost of gas-fired 5 GPM tankless water heaters = $6,500

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, a natural gas-fired domestic hot water heater less than 50 gallons warrants the following incentive:

$$\text{Smart Start®}\ \textit{Incentive} = \left(\textit{Quantity} \times\ \$50\ \textit{per DHW Heater}\right) = \left(1 \times \$50\right) = \$50$$

**Energy Savings Summary:**

| ECM #6 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | **$6,500** |
| **NJ Smart Start Equipment Incentive ($):** | **($50)** |
| **Maintenance Savings ($):** | **($0)** |
| **Net Installation Cost ($):** | **$6,450** |
| **Total Energy Savings ($ / yr):** | **$559** |
| **Simple Payback (yrs):** | **11.5** |
| **Simple Return on Investment:** | **5.6 %** |

## ECM #7: Split System Upgrade– File Storage/Archives Area System

**Description:**

Heating and cooling is provided within the second floor archive area of the building via a split-system air-conditioning and gas-fired furnaces. With respect to cooling, the installation is typical of residential applications having a 5-ton "add-on" evaporator coil and remote air-cooled condensing unit. The air-conditioning system is not as efficient as a new unit and has an estimated seasonal energy efficiency ratio (SEER) of 10.0. The NJ State Energy Code (ASHRAE 90.1-2004) mandates a minimum energy efficiency of 12.0 SEER for units of this type. The existing units are 11 years old at this time. The estimated service life for split system air-conditioning unit is 15 years as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook..

For heating, the Archive Area System utilizes a Trane furnace to provide forced hot air through the duct system. Due to the age of the unit, it is estimated that it is firing at a combustion efficiency of 75% at best. When new, the listed combustion efficiency of the installed unit was 80%. The natural gas firing rate of the furnace is 120,000 BTU/H.

This energy conservation measure would replace the furnace, cooling coil and condensing unit serving the second floor archive and file storage areas in the Municipal Building. The existing equipment will be replaced with an energy efficient, split system with heating and cooling capacities equivalent to the existing system. The average EER of the new cooling equipment will be 16.0 EER and the combustion efficiency for heating will be 94%. The energy efficiency of the new equipment is based on a Lennox G61 gas furnace, cased evaporator coil, and model SSB condensing unit.

**Cooling Energy Savings Calculations:**

$$EnergySavi\ \ ngs = \frac{[CoolingTon\ \ s \times 12,000\ Btu\ /\ ton \div 1000\ W\ /\ kW\ ]}{[(EER_{NEW} - EER_{OLD})]} \times Avg\ .\ Load\ \ Factor\ \times Hrs\ .\ of\ \ Cooling$$

Existing Air Conditioning Units

Rated Capacity = 5 Tons

Condensing Unit Efficiency = 10.0 EER

Proposed High-Efficiency Air Conditioning Unit

Rated Capacity = 5 Tons

New Condensing Unit Efficiency = 16.0 EER

Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.16/kWh

$$EnergySavings = \frac{[CoolingTons \times 12,000\,Btu\ /\ ton \div 1000W\ /\ kW\ ]}{[(EER_{NEW} - EER_{OLD})]} \times Avg.LoadFactor \times Hrs.ofCooling$$

$$EnergySavings = \frac{[5CoolingTons \times 12,000\,Btu\ /\ ton \div 1000W\ /\ kW\ ]}{[(16.0EER_{NEW} - 10.0EER_{OLD})]} \times 0.80 \times 1800$$

$$= 12,000\ kWh\ /\ yr.$$

Cost Savings = (12,000 kWh) x $0.16/kWh = $1920 / Yr.

**Heating Energy Savings Calculations:**

To estimate the amount of energy consumed by the existing furnace throughout the heating season, the Degree Day method of energy estimating is be used.

$$EnergyUsed = \frac{H_L \times D \times 24}{\Delta t \times k \times V} \times (C_D)$$

where:

$H_L$ = Building Heat Loss, BTU/Hr.

D = number of 65 F Heating Degree Days

$\Delta t$ = Design temperature difference, deg. F

k = a correction factor that includes the effects of rated full load efficiency, part load performance, oversizing and energy conservation devices.

V = Heating value of fuel, BTU/Therm

$C_D$ = empirical correction factor for heating effect vs. 65 F degree days

$$EnergyUsed = \frac{(96{,}000)\times(5169)\times 24}{70\times .6\times 100{,}000}\times(.6)$$

*Energy Used* = 1701 Therms/Year

As the proposed furnace is 19% more efficient than the existing furnace, the proposed energy used is

*Proposed Energy Used* = (1 - .19) x 1701 = 1378 Therms/Year

*Energy Savings* = 1701 – 1378 = 323 Therms/Year

Cost Savings = $1.53/Therm x 323 Therms = $494/Year

**Energy Savings Summary:**

| **ECM #7 - ENERGY SAVINGS SUMMARY** | |
|---|---|
| **Installation Cost ($):** | **$20,000** |
| **NJ Smart Start Equipment Incentive ($):** | **($380)** |
| **Maintenance Savings ($):** | **($0)** |
| **Net Installation Cost ($):** | **$19,620** |
| **Total Energy Savings ($ / yr):** | **$2,414** |
| **Simple Payback (yrs):** | **8.1** |
| **Simple Return on Investment:** | **11.1 %** |

## ECM #8: Retro-Commissioning

**Description:**

Retro-commissioning is a quality-oriented process for verifying and documenting that HVAC systems perform as closely as possible to defined performance criteria. The benefits include documenting accurately the existing system's function and performance; Verifying that system performance meets the facility's requirements; benchmarking the performance of existing systems for future changes; and identifying problems in the system.

The cost of retro-commissioning of the public works facility is between $0.15 and $0.30 per Square Foot (Source: Thorne & Nadel "Retro-Commissioning: Program Strategies To Capture Energy Savings in Existing Buildings (2003)" – average Retro-Commissioning costs of $0.22 in TX, TN, CO, MA, AZ, OR, CA).

The energy savings from retro-commissioning critical systems such as HVAC and power systems is approximately 5% of the total energy used (Source: E. Mills et al, "Cost-effectiveness of Commissioning 224 Buildings across 21 states – 2004").

**Energy Savings Calculations:**

Estimated Cost of Retro-Commissioning = $0.15 x 9,000 SF = $1,350

Estimated Energy Savings = 5% x $21,043 = $1,052

**Energy Savings Summary:**

| ECM #8 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | **$1,350** |
| **NJ Smart Start Equipment Incentive ($):** | **($0)** |
| **Maintenance Savings ($):** | **($0)** |
| **Net Installation Cost ($):** | **$1,350** |
| **Total Energy Savings ($ / yr):** | **$1,052** |
| **Simple Payback (yrs):** | **1.3** |
| **Simple Return on Investment:** | **80.3 %** |

# VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES (ECM #9)

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 Buena Municipal Building, and concluded that there is potential for solar energy generation.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will be mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. (A structural survey of the roof would be necessary before the installation of PV panels is considered). The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around $350, this value was used in our financial calculations. This equates to $0.35 per kWh generated.

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of approximately 800 S.F. is available and can be utilized for a PV system on the Municipal Building roof. A depiction of the area utilized is shown in Appendix F following the financial calculations. Using this square footage it was determined that a system size of 3.22 kilowatts could be installed to match the maximum peak monthly demand. The required square footage for a system of this size is 206 S.F. and has an estimated kilowatt hour production of 5025 KWh annually, reducing the overall electric consumption by approximately 5.5%. A detailed financial analysis can be found in Appendix F. This analysis illustrates the payback of the system over a 25 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

CEG has reviewed financing options for the owner. Two options were studied and they are as follows: Self-financed and direct purchase without finance. Self-finance was calculated with 95% of the total project cost financed at a 7% interest rate over 25 years. Direct purchase involves the local government paying for 100% of the total project cost upfront. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods for the respective method of payment:

| PAYMENT TYPE | SIMPLE PAYBACK | INTERNAL RATE OF RETURN |
|---|---|---|
| Self-Finance | 11.3 Years | 11.9 % |
| Direct Purchase | 11.3 Years | 7.9 % |

Wind energy production is another option available through the Renewable Energy Incentive Program. Small wind turbines can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG has reviewed the applicability of wind energy for Buena Vista Township and has determined it is not a viable option. Low average wind speeds for the area are not adequate for wind turbine generation. Typical wind turbines start producing energy at 8 mph wind speeds. Buena Vista Township averages 4 mph wind speeds making this application impractical.

# 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 2007 through December 2008.

Electricity:

Section IV, Figure 1 demonstrates a fairly level (base-load) consumption profile throughout the year, with possible summertime air conditioning consumption. However t is evident that there is a reduction in the On Peak Load from April through June 2008 and an extreme increase in January 2008. The base-load shaping is important because a flat consumption profiles will yield more competitive pricing. The township might look into why there is such an extreme consumption spike in the month of January 2008. This can be investigated by contacting the Townships Account Manager at the Local Utility Company, Atlantic City Electric.

Natural Gas:

Per the data provided, the Municipal Building has a very typical heating load profile, with increasing consumption in the winter months (November – March) and a lack of consumption in the summer months (June – October). Natural Gas in this situation is used for heating purposes. While the demand is higher for winter-gas, so are the prices. The flatter, (base-load,) the consumption profile the more competitive the pricing in the market. CEG will suggest later that the Township aggregate its loads to take advantage of this process.

**Tariff Analysis:**

Electricity:

The Municipal Building receives electrical service through Atlantic City Electric on a BGS (Basic Generation Service) rate. Since the passing and implementation of the Electricity Discount and Energy Competition Act (EDECA) in 1999, there have been many changes brought about by the deregulation of the electric industry in New Jersey. Since that time, customers in New Jersey have been able to choose their electrical supplier. Customers who do not choose to switch to a Third Party Supplier (TPS), or who leave a TPS to return to their Electric Delivery Company are supplied with Basic Generation Service.

While Buena Vista may be on a typical rate structure with the local utility (BSG), some variations in price do cause some concern, and are worth investigating further. The rates in the

summertime (May – September) are extreme. If the Township were to shop for its supply, these high summertime rates could be avoided.

Natural Gas:

The Municipal Building is serviced by South Jersey Gas Company on its Firm Transportation rate when not being served by a Third Party Supplier (TPS). This rate has a: Customer Charge, Delivery Charge, BSC Volume Charge and Commodity Charge under the Firm Transportation rate structure. Firm denotes that the service cannot and will not be interrupted.

CEG received an example bill for the Municipal Building to review current usage and TPS charges. This account is Firm (not due to interruption) otherwise 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. Should under-deliveries occur for a Firm Account, the client is subject to serious penalties.

From review of the information provided, the Township is utilizing the services of a Third Party Supplier, Woodruff Energy for natural gas service (The Woodruff contract was not supplied). Based on the data available, the Township is paying 50% above the market fixed price for calendar year 2010.

**Recommendations:**

CEG recommends a global approach that will be consistent with all facilities within the scope. CEG's observations are seen in both the electric and natural gas costs. The average price per kWh (kilowatt hour) for all buildings is $0.1335 / kWh (kWh is the common unit of electric measure). The average price per decatherm for natural gas is $15.26 /dth (dth is the common unit of measure). Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. Buena could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on last year's historical consumption (January – December 2008) and current electric rates, a savings of over $7000.00 per year can be realized (Note: Savings were calculated using Buena's Average Annual Consumption of 228,409 kWh and a variance of $3.35/kWh utilizing a fixed one-year commodity contract). CEG recommends aggregating the entire electric load to gain the most optimal energy costs. CEG recommends advisement for alternative sourcing and supply of energy on a "managed approach".

CEG's secondary recommendation coincides with Buena's natural gas costs and the Third Party Supplier, Woodruff Energy. CEG recognized a segment of the natural gas cost is not competitive with current market prices. Based on the current market, Buena is paying approximately $7.83 per unit above market in the South Jersey Gas Company service territory. CEG recommends further advisement on these prices. CEG would also recommend Buena procuring energy (natural gas) on its own. CEG recommends alternative sourcing strategies.

CEG recommends that Buena 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), Buena will learn more about the competitive supply process. The town 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 given to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, they 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.

Finally, if Buena frequently changes its supplier for energy (natural gas), it needs to closely monitor balancing, particularly when the contract is close to termination.

# 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 par 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 periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.

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. Reduce lighting in specified areas where the foot candle levels are above 70 in private offices and above 30 in corridor, lobbies, etc.

E. Provide more frequent air filter changes to decrease overall fan horsepower requirements and maintain better IAQ.

F. Recalibrate existing sensors serving the office spaces

G. Install a Vending Miser system to turn off the vending machines in the lunch room when not in use.

H. Clean all light fixtures to maximize light output.

I. Confirm that outside air economizers on the rooftop units that serve the Office Areas are functioning properly to take advantage of free cooling.

# APPENDIX

**Electric Cost Summary**
**Buena Vista Municipal Building**
**ATLANTIC CITY ELECTRIC**
**Acct.No:0239 8109 9999**



| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Last Meter Read Date | 12/10/2007 | 1/10/2008 | 2/8/2008 | 3/11/2008 | 4/10/2008 | 5/9/2008 | 6/10/2008 | 7/10/2008 | 8/8/2008 | 9/9/2008 | 10/9/2008 | 11/7/2008 | 12/10/2007 |
| Current Meter Read Date | 1/10/2008 | 2/8/2008 | 3/11/2008 | 4/10/2008 | 5/9/2008 | 6/10/2008 | 7/10/2008 | 8/8/2008 | 9/9/2008 | 10/9/2008 | 11/7/2008 | 12/9/2008 | 12/9/2008 |
| Billing Days | 31 | 29 | 32 | 30 | 29 | 32 | 30 | 29 | 32 | 30 | 29 | 32 | 365 |
| KWH | 11,040 | 8,320 | 8,160 | 6,960 | 5,280 | 6,160 | 8,320 | 8,320 | 7,920 | 8,000 | 5,680 | 6,880 | 91,040 |
| KW | 29 | 22 | 22 | 23 | 18 | 26 | 32 | 34 | 31 | 33 | 19 | 22 | 34 |
| Monthly Load Factor | 52% | 53% | 49% | 42% | 41% | 30% | 36% | 36% | 33% | 34% | 43% | 40% | 41% |
| Electric Delivery, $ | $995 | $756 | $746 | $643 | $496 | $652 | $1,092 | $1,092 | $1,043 | $996 | $618 | $745 | $9,874 |
| Delivery $/kwh | $0.090 | $0.091 | $0.091 | $0.092 | $0.094 | $0.106 | $0.131 | $0.131 | $0.132 | $0.125 | $0.109 | $0.108 | $0.108 |
| Electric Supply, $ | $524 | $438 | $459 | $413 | $364 | $378 | $329 | $328 | $338 | $330 | $273 | $309 | $4,482 |
| Supply $/kwh | $0.047 | $0.053 | $0.056 | $0.059 | $0.069 | $0.061 | $0.039 | $0.039 | $0.043 | $0.041 | $0.048 | $0.045 | $0.050 |
| Total Cost, $ | $1,519 | $1,194 | $1,205 | $1,056 | $860 | $1,030 | $1,420 | $1,420 | $1,381 | $1,326 | $891 | $1,053 | $14,356 |
| $/KWH | $0.1376 | $0.1436 | $0.1476 | $0.1517 | $0.1629 | $0.1671 | $0.1707 | $0.1707 | $0.1744 | $0.1657 | $0.1569 | $0.1531 | $0.1577 |

**Natural Gas Cost Summary**
**Buena Vista Municipal Building**
**SOUTH JERSEY GAS**
**Acct. No.305 18 8203 00**



| 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 | 33 | 30 | 31 | 31 | 28 | 32 | 31 | 29 | 31 | 29 | 30 | 32 | 367 |
| Last Meter Read Date | 12/7/2007 | 1/9/2008 | 2/8/2008 | 3/10/2008 | 4/10/2008 | 5/8/2008 | 6/9/2008 | 7/10/2008 | 8/8/2008 | 9/8/2008 | 10/7/2008 | 11/6/2008 | 12/7/2007 |
| Current Meter Read Date | 1/9/2008 | 2/8/2008 | 3/10/2008 | 4/10/2008 | 5/8/2008 | 6/9/2008 | 7/10/2008 | 8/8/2008 | 9/8/2008 | 10/7/2008 | 11/6/2008 | 12/8/2008 | 12/8/2008 |
| Gas Used per 100 cu ft | 694 | 872 | 894 | 539 | 145 | 99 | 0 | 0 | 1 | 12 | 219 | 766 | 4,241 |
| BTU Factor | 1.03 | 1.03 | 1.03 | 1.03 | 1.03 | 1.04 | 1.04 | 1.03 | 1.03 | 1.04 | 1.03 | 1.04 | 1.03 |
| Therms (Burner Tip) | 717 | 902 | 923 | 556 | 149 | 103 | 0 | 0 | 1 | 12 | 226 | 794 | 4,382 |
| Total Distribution Cost | $310 | $383 | $392 | $244 | $78 | $62 | $19 | $18 | $20 | $23 | $110 | $345 | $2,004 |
| Cost per Therm | $0.433 | $0.425 | $0.425 | $0.439 | $0.521 | $0.598 | $0.000 | $0.000 | $19.232 | $1.860 | $0.489 | $0.434 | $2.071 |
| Total Commodity Cost | $777 | $978 | $1,001 | $603 | $162 | $112 | $0 | $0 | $1 | $12 | $216 | $822 | $4,683 |
| Cost per Therm | $1.08 | $1.08 | $1.08 | $1.08 | $1.08 | $1.08 | $0.00 | $0.00 | $0.96 | $0.96 | $0.96 | $1.04 | $0.87 |
| Total Cost | $1,088 | $1,361 | $1,393 | $847 | $239 | $173 | $19 | $18 | $21 | $35 | $327 | $1,167 | $6,687 |
| Cost per Therm | $1.52 | $1.51 | $1.51 | $1.52 | $1.60 | $1.68 | $0.00 | $0.00 | $20.19 | $2.82 | $1.45 | $1.47 | $1.53 |

# MUNICIPAL BUILDING

| CONSTRUCTION COST AND REBATES | | | | | |
|---|---|---|---|---|---|
| **ECM # 1 - UPGRADE FLUORESCENT LIGHTING** | Qty | Unit Cost $ | Material $ | Labor $ | Total $ |
| New T-8 Linear Fluorescent Lamps & Ballasts | 1 | $2,593 | $2,593 | $3,480 | $6,073 |
| **Total Cost** | | | | | $6,073 |
| Annual Maintenance Savings | | | | | -$1,563 |
| Utility Incentive | | | | | -$1,100 |
| **Total Net Cost** | | | | | **$3,410** |
| | | | | | |
| | | | | | |
| **ECM # 2 - INSTALL CFL LIGHTING** | Qty | Unit Cost $ | Material $ | Labor $ | Total $ |
| Compact Fluorescent | 1 | $165 | $165 | $210 | $375 |
| **Total Cost** | | | | | $375 |
| Annual Maintenance Savings | | | | | -$155 |
| **Total Net Cost** | | | | | **$220** |
| | | | | | |
| | | | | | |
| **ECM # 3 - INSTALL LIGHTING CONTROLS** | Qty | Unit Cost $ | Material $ | Labor $ | Total $ |
| Occupancy Sensors | 19 | $75 | $1,425 | $0 | $1,425 |
| **Total Cost** | | | | | $1,425 |
| Utility Incentive | | | | | -$380 |
| **Total Net Cost** | | | | | **$1,045** |
| | | | | | |
| | | | | | |
| **ECM # 4 - SPLIT SYSTEM UPGRADE - COMMON AREAS** | Qty | Unit Cost $ | Material $ | Labor $ | Total $ |
| Demo Existing HVAC Unit | 1 | $0 | $0 | $800 | $800 |
| Ductwork Modifications | 1 | $400 | $400 | $800 | $1,200 |
| New HVAC Equipment | 1 | $4,000 | $4,000 | $8,000 | $12,000 |
| Piping Modification | 1 | $200 | $200 | $800 | $1,000 |
| **Total Cost** | | | | | $15,000 |
| Utility Incentive | | | | | -$215 |
| **Total Net Cost** | | | | | **$14,785** |
| | | | | | |
| | | | | | |
| **ECM # 5 - SPLIT SYSTEM UPGRADE - COURT ROOM SYSTEM** | Qty | Unit Cost $ | Material $ | Labor $ | Total $ |
| Demo Existing HVAC Unit | 1 | $0 | $0 | $2,000 | $2,000 |
| Ductwork Modifications | 1 | $500 | $500 | $1,500 | $2,000 |
| New HVAC Equipment | 1 | $10,000 | $10,000 | $15,000 | $25,000 |
| Piping Modification | 1 | $200 | $200 | $800 | $1,000 |
| **Total Cost** | | | | | $30,000 |
| Utility Incentive | | | | | -$690 |
| **Total Net Cost** | | | | | **$29,310** |

# MUNICIPAL BUILDING

| **ECM # 6 - DOMESTIC HOT WATER HEATER** | Qty | Unit Cost $ | Material $ | Labor $ | Total $ |
|---|---|---|---|---|---|
| Demo Existing Electric Service to HWH | 1 | $0 | $0 | $300 | $300 |
| Demo Hot Water heater | 1 | $0 | $0 | $500 | $500 |
| New Hot Water Heater | 1 | $2,000 | $2,000 | $1,000 | $3,000 |
| Piping Modification & Vent | 1 | $200 | $200 | $1,000 | $1,200 |
| Gas Supply to HWH | 1 | $300 | $300 | $1,200 | $1,500 |
| **Total Cost** | | | | | $6,500 |
| Utility Incentive | | | | | -$50 |
| **Total Net Cost** | | | | | **$6,450** |
| | | | | | |
| **ECM # 7 - SPLIT SYSTEM UPGRADE - FILE STORAGE / ARCHIVES** | Qty | Unit Cost $ | Material $ | Labor $ | Total $ |
| Demo Existing HVAC Unit | 1 | $0 | $0 | $1,200 | $1,200 |
| Ductwork Modifications | 1 | $200 | $200 | $800 | $1,000 |
| New HVAC Equipment | 1 | $5,000 | $5,000 | $10,800 | $15,800 |
| Piping Modification | 1 | $200 | $200 | $800 | $1,000 |
| Electrical Modifications | 1 | $300 | $300 | $700 | $1,000 |
| **Total Cost** | | | | | $20,000 |
| Utility Incentive | | | | | -$380 |
| **Total Net Cost** | | | | | **$19,620** |
| | | | | | |
| **ECM # 8 - PV SOLAR** | Qty | Unit Cost $ | Material $ | Labor $ | Total $ |
| PV Solar | 14 | $2,070 | $28,980 | Included | $28,980 |
| **Total** | | | | | **$28,980** |

# 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 |

### 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 |

### 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 |

## 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 |

# Buena Vista Township Municipal Building

| TAG | MAKE | MODEL | TYPE | CAPACITY | EFFICIENCY | SERVES | LOCATION | REMAINING USEFUL LIFE | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| F-1 | TRANE | TUD120C | GAS-FIRED FURNACE | 120 MBH | 80% | COURT ROOM | ATTIC | 7 YEARS | SHARES DUCTWORK WITH AIR CONDITIONING UNIT FOR COURT ROOM. |
| AC-1 | GE | BWE090C400A | SPLIT SYSTEM AIR HANDLER | 7-1/2 TONS | UNKNOWN | COURT ROOM | ATTIC | 0 YEARS | DX AIR HANDLER, SHARES DUCTWORK WITH FURNACE FOR COURT ROOM. |
| CU-1 | GE | BGWA09003E1 | AIR-COOLED CONDENSING UNIT | 7-1/2 TONS | UNKNOWN | AC-1 | OUTSIDE PAD MOUNTED | 0 YEARS | UNIT NO LONGER MANUFACTURED, MANUFACTURER'S LITERATURE NOT AVAILABLE. |
| AC-2 | GE | BWH936G15OBO | SPLIT SYSTEM AIR HANDLER | 3 TONS | UNKNOWN | COMMON SPACES, CORRIDORS | ATTIC | 0 YEARS | UNIT NO LONGER MANUFACTURED, MANUFACTURER'S LITERATURE NOT AVAILABLE. |
| DF-1 | REZNOR | UNKNOWN | GAS-FIRED DUCT FURNACE | 60 MBH (ESTIMATED) | 70 % (ESTIMATED) | COMMON SPACES, CORRIDORS | ATTIC | 0 YEARS | DUCT-MOUNTED FURNACE INSTALLED IN SERIES WITH AC-2. |
| CU-2 | ICP Commercial | CAC036HCA | AIR-COOLED CONDENSING UNIT | 3 TONS | 10.5 SEER | AC-2 | OUTSIDE PAD MOUNTED | 9 YEARS | REPLACED ORIGINAL UNIT IN 1998 |
| AHU-1 | TRANE | TUD120C | GAS-FIRED FURNACE W/ ADD-ON COOLING COIL | 120 MBH 5 TONS | 80 % 10.0 SEER | 2nd FLOOR ARCHIVES | ATTIC | 9 YEARS | RESIDENTIAL STYLE HEATING AND AIR CONDITIONING SYSTEM. SYSTEM ADDED IN 1998. |
| CU-3 | TRANE | TTR060C100A2 | AIR-COOLED CONDENSING UNIT | 5 TONS | 10.0 SEER | AHU-1 | OUTSIDE PAD MOUNTED | 9 YEARS | UNIT ADDED IN 1998. |
| PTAC-1 | SUBURBAN | DLII-0912E | GAS-FIRED THRU WALL AIR CONDITIOINER | 3/4 TON 12 MBH | 10.0 SEER 80% | VIOLATIONS CLERK | OFFICE | 0 YEARS | PACKAGED THROUGH WALL AIR CONDTIONER WITH GAS HEAT |
| PTAC-2A | SUBURBAN | DLII-0912E | GAS-FIRED THRU WALL AIR CONDITIOINER | 3/4 TON 12 MBH | 10.0 SEER 80% | CONFERENCE | CONFERENCE ROOM | 0 YEARS | PACKAGED THROUGH WALL AIR CONDTIONER WITH GAS HEAT |
| PTAC-2B | AAF NELSON AIRE SERIES E | SSAW 062410 | PACKAGED THRU-WALL AIR CONDTIONER | 1/2 TON | UNKNOWN | CONFERENCE | CONFERENCE ROOM | 0 YEARS | PACKAGED THROUGH WALL AIR CONDTIONER WITH ELECTRIC HEAT. LEAKS IN A/C MODE. USED ONLY FOR HEAT. 3.2KW |
| HP-1 | FUJITSU | ASU12RQ | INDOOR UNIT DUCTLESS SPLIT SYSTEM HEAT PUMP | 1 TON 12 MBH | 13.7 SEER | FINANCE | OFFICE | 15 YEARS | DUCTLESS SPLIT SYSTEM WITH REVERSE CYCLE HEATING |
| CU-4 | FUJITSU | AOU12RQ | OUTDOOR UNIT DUCTLESS SPLIT SYSTEM HEAT PUMP | 1 TON 12 MBH | 13.7 SEER | HP-1 | OUTSIDE PAD MOUNTED | 15 YEARS | DUCTLESS SPLIT SYSTEM WITH REVERSE CYCLE HEATING |
| PTAC-3 | SUBURBAN | DLII-0912E | GAS-FIRED THRU WALL AIR CONDITIOINER | 3/4 TON 12 MBH | 10.0 SEER 80% | ADMIN. OFFICE | OFFICE | 0 YEARS | PACKAGED THROUGH WALL AIR CONDTIONER WITH GAS HEAT |
| PTAC-4A | SUBURBAN | DLII-0912E | GAS-FIRED THRU WALL AIR CONDITIOINER | 3/4 TON 12 MBH | 10.0 SEER 80% | CLERK'S OFFICE | OFFICE | 0 YEARS | PACKAGED THROUGH WALL AIR CONDTIONER WITH GAS HEAT |
| PTAC-4B | SUBURBAN | DLII-0912E | GAS-FIRED THRU WALL AIR CONDITIOINER | 3/4 TON 12 MBH | 10.0 SEER 80% | CLERK'S OFFICE | OFFICE | 0 YEARS | PACKAGED THROUGH WALL AIR CONDTIONER WITH GAS HEAT |
| PTAC-5 | SUBURBAN | DLII-0912E | GAS-FIRED THRU WALL AIR CONDITIOINER | 3/4 TON 12 MBH | 10.0 SEER 80% | TAX ASSESSOR | OFFICE | 0 YEARS | PACKAGED THROUGH WALL AIR CONDTIONER WITH GAS HEAT |
| PTAC-6 | SUBURBAN | DLII-0912E | GAS-FIRED THRU WALL AIR CONDITIOINER | 3/4 TON 12 MBH | 10.0 SEER 80% | TAX COLLECTOR | OFFICE | 0 YEARS | PACKAGED THROUGH WALL AIR CONDTIONER WITH GAS HEAT |
| PTAC-7 | SUBURBAN | DLII-0912E | GAS-FIRED THRU WALL AIR CONDITIOINER | 3/4 TON 12 MBH | 10.0 SEER 80% | MAYOR'S OFFICE | OFFICE | 0 YEARS | PACKAGED THROUGH WALL AIR CONDTIONER WITH GAS HEAT |
| PTAC-8 | SUBURBAN | DLII-0912E | GAS-FIRED THRU WALL AIR CONDITIOINER | 3/4 TON 12 MBH | 10.0 SEER 80% | ZONING OFFICE | OFFICE | 0 YEARS | PACKAGED THROUGH WALL AIR CONDTIONER WITH GAS HEAT |
| EWH | STATE | N5662R57 | ELECTRIC RESIDENTIAL | 66 GALLONS 4.5 KW | 70% (ESTIMATED) | KITCHEN ALL TOILET ROOMS | UTILITY ROOM | 0 YEARS | INSTALLED IN 1979. |

**INVESTMENT GRADE LIGHTING AUDIT**

**CONCORD ENERGY SERVICES**

**CEG Project #: BS09-003**
**Project Name : Buena Vista Township Energy Audit - Municipal Building**
**Address: 890 Harding Highway**
**City, State: Buena, NJ 08310**
**Building SF: 9000**

| | | Existing Fixtures | | | | | Proposed Fixtures | | | | | | | | | Fixtures Retrofitted | | | Unit Installation Cost | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Existing Lighting Fixture Type | Room Name | Lighting Fixture Description | Lamps per Fixture | Watts | Qty of Fixtures | Total Watts | Existing/Replace | Description | Lamps per Fixture | Watts | Qty of Fixtures | Total Watts | Wattage Reduction | Average Burn Hours | Ave $/kwh | Energy Savings, kWh | Energy Savings, $ | Qty | Material Each | Labor Each | Total Each | Total Materials | Total Labor | Total All | Rebate Estimate | Simple Payback |
| | **First Floor** | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | Court Room | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 12 | 1296 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 12 | 1008 | 288 | 2236 | $0.16 | 644 | $103.03 | 12 | 44.6 | 60 | $104.60 | $535.20 | $720.00 | $1,255.20 | $240.00 | 9.9 |
| F | | 1L-MR 16-4" Recessed | 1 | 50 | 3 | 150 | Existing to Remain | Existing to Remain | 1 | 50 | 3 | 150 | 0 | 2236 | $0.16 | 0 | $0.00 | 0 | 0 | 0 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | |
| E | | 1L-Incand. Par Flood Track Lamp | 1 | 75 | 5 | 375 | Relamp | Sylvania Lamp 23W Par Compact Fluorescent | 1 | 25 | 5 | 125 | 250 | 2236 | $0.16 | 559 | $89.44 | 5 | 13.3 | 15 | $28.30 | $66.50 | $75.00 | $141.50 | $0.00 | 1.6 |
| G | Corridor | 1L-Incand. Par Flood-6" Recessed Down Lt. | 1 | 75 | 6 | 450 | Relamp | Sylvania Lamp 23W Par Compact Fluorescent | 1 | 25 | 6 | 150 | 300 | 2236 | $0.16 | 671 | $107.33 | 6 | 13.3 | 15 | $28.30 | $79.80 | $90.00 | $169.80 | $0.00 | 1.6 |
| B | | 2L-T8-U-Tube-32W 2'x2' Recessed | 2 | 55 | 14 | 770 | Existing to Remain | Existing to Remain | 2 | 55 | 14 | 770 | 0 | 2236 | $0.16 | 0 | $0.00 | 0 | 0 | 0 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | |
| A | Tax Collector's Office | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 3 | 324 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 3 | 252 | 72 | 2236 | $0.16 | 161 | $25.76 | 3 | 44.6 | 60 | $104.60 | $133.80 | $180.00 | $313.80 | $60.00 | 9.9 |
| B | | 2L-T8-U-Tube-32W 2'x2' Recessed | 2 | 55 | 2 | 110 | Existing to Remain | Existing to Remain | 2 | 55 | 2 | 110 | 0 | 2236 | $0.16 | 0 | $0.00 | 0 | 0 | 0 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | |
| C | Safe Room | 1L-Incand. "A" Lamp-Surface Mounted | 1 | 75 | 1 | 75 | Relamp | Sylvania CF19EL/MINI/830 | 1 | 18 | 1 | 18 | 57 | 2236 | $0.16 | 127 | $20.39 | 1 | 5.86 | 15 | $20.86 | $5.86 | $15.00 | $20.86 | $0.00 | 1.0 |
| H | Toilet Room | 2L-Compact Fluorescent | 2 | 22 | 2 | 44 | Existing to Remain | Existing to Remain | 2 | 22 | 2 | 44 | 0 | 2236 | $0.16 | 0 | $0.00 | 0 | 0 | 0 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | |
| A | Tax Assessor's Office | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 3 | 324 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 3 | 252 | 72 | 2236 | $0.16 | 161 | $25.76 | 3 | 44.6 | 60 | $104.60 | $133.80 | $180.00 | $313.80 | $60.00 | 9.9 |
| A | Clerk's Office | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 4 | 432 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 4 | 336 | 96 | 2236 | $0.16 | 215 | $34.34 | 4 | 44.6 | 60 | $104.60 | $178.40 | $240.00 | $418.40 | $80.00 | 9.9 |
| A | Admin. Office | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 3 | 324 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 3 | 252 | 72 | 2236 | $0.16 | 161 | $25.76 | 3 | 44.6 | 60 | $104.60 | $133.80 | $180.00 | $313.80 | $60.00 | 9.9 |
| A | Finance Office | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 3 | 324 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 3 | 252 | 72 | 2236 | $0.16 | 161 | $25.76 | 3 | 44.6 | 60 | $104.60 | $133.80 | $180.00 | $313.80 | $60.00 | 9.9 |
| A | Mayor's Office | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 4 | 432 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 4 | 336 | 96 | 2236 | $0.16 | 215 | $34.34 | 4 | 44.6 | 60 | $104.60 | $178.40 | $240.00 | $418.40 | $80.00 | 9.9 |
| A | Zoning Office | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 4 | 432 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 4 | 336 | 96 | 2236 | $0.16 | 215 | $34.34 | 4 | 44.6 | 60 | $104.60 | $178.40 | $240.00 | $418.40 | $80.00 | 9.9 |
| A | Violation Clerk's Office | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 2 | 216 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 2 | 168 | 48 | 2236 | $0.16 | 107 | $17.17 | 2 | 44.6 | 60 | $104.60 | $89.20 | $120.00 | $209.20 | $40.00 | 9.9 |
| J | Toilet Room | 1L-3'-Linear Fluor.T12-Surfaced Mounted | 1 | 48 | 2 | 96 | Relamp, Reballast | Sylvania Lamps FO25/835/XP/ECO Sylvania Ballast QHE 1X32T8/UNV ISN-SC | 1 | 22 | 2 | 44 | 52 | 2236 | $0.16 | 116 | $18.60 | 2 | 27.9 | 60 | $87.90 | $55.80 | $120.00 | $175.80 | $20.00 | 8.4 |
| A | Conference Room | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 8 | 864 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 8 | 672 | 192 | 2236 | $0.16 | 429 | $68.69 | 8 | 44.6 | 60 | $104.60 | $356.80 | $480.00 | $836.80 | $160.00 | 9.9 |
| M | Closet | 1L-T8-2' Linear | 1 | 17 | 1 | 17 | Existing to Remain | Existing to Remain | 1 | 17 | 1 | 17 | 0 | 600 | $0.16 | 0 | $0.00 | 0 | 0 | 0 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | |
| B | Men's Toilet Room | 2L-T8-U-Tube-32W 2'x2' Recessed | 2 | 55 | 2 | 110 | Existing to Remain | Existing to Remain | 2 | 55 | 2 | 110 | 0 | 2236 | $0.16 | 0 | $0.00 | 0 | 0 | 0 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | |
| A | | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 1 | 108 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 1 | 84 | 24 | 2236 | $0.16 | 54 | $8.59 | 1 | 44.6 | 60 | $104.60 | $44.60 | $60.00 | $104.60 | $20.00 | 9.9 |
| K | | 1L-T12-4' Linear | 1 | 44 | 1 | 44 | Relamp, Reballast | Sylvania Lamps FO32/835/XP/ECO Sylvania Ballast QHE 1X32T8/UNV ISN-SC | 1 | 28 | 1 | 28 | 16 | 2236 | $0.16 | 36 | $5.72 | 1 | 25.75 | 60 | $85.75 | $25.75 | $60.00 | $85.75 | $10.00 | 13.2 |

| | | Existing Fixtures | | | | | Proposed Fixtures | | | | | | | | | Fixtures Retrofitted | | | Unit Installation Cost | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Existing Lighting Fixture Type** | **Room Name** | **Lighting Fixture Description** | **Lamps per Fixture** | **Watts** | **Qty of Fixtures** | **Total Watts** | **Existing/Replace** | **Description** | **Lamps per Fixture** | **Watts** | **Qty of Fixtures** | **Total Watts** | **Wattage Reduction** | **Average Burn Hours** | **Ave $/kwh** | **Energy Savings, kWh** | **Energy Savings, $** | **Qty** | **Material Each** | **Labor Each** | **Total Each** | **Total Materials** | **Total Labor** | **Total All** | **Rebate Estimate** | **Simple Payback** |
| **B** | Women's Toilet Room | 2L-T8-U-Tube-32W 2'x2' Recessed | 2 | 55 | 2 | 110 | Existing to Remain | Existing to Remain | 2 | 55 | 2 | 110 | 0 | 2236 | $0.16 | 0 | $0.00 | 0 | 0 | 0 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | |
| **A** | | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 1 | 108 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 1 | 84 | 24 | 2236 | $0.16 | 54 | $8.59 | 1 | 44.6 | 60 | $104.60 | $44.60 | $60.00 | $104.60 | $20.00 | 9.9 |
| **K** | | 1L-T12-4' Linear | 1 | 44 | 1 | 44 | Relamp, Reballast | Sylvania Lamps FO32/835/XP/ECO Sylvania Ballast QHE 1X32T8/UNV ISN-SC | 1 | 28 | 1 | 28 | 16 | 2236 | $0.16 | 36 | $5.72 | 1 | 25.75 | 60 | $85.75 | $25.75 | $60.00 | $85.75 | $10.00 | 13.2 |
| **B** | Kitchen | 2L-T8-U-Tube-32W 2'x2' Recessed | 2 | 55 | 1 | 55 | Existing to Remain | Existing to Remain | 2 | 55 | 1 | 55 | 0 | 2236 | $0.16 | 0 | $0.00 | 0 | 0 | 0 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | |
| **L** | Utility Room | 2L-T12-8' Linear | 2 | 135 | 1 | 135 | Relamp, Reballast | Sylvania Lamps FO96/835/XP/SS/ECO Sylvania Ballast QHE 2X59T8/UNV ISL-SC | 2 | 89 | 1 | 89 | 46 | 600 | $0.16 | 28 | $4.42 | 1 | 137.17 | 60 | $197.17 | $137.17 | $60.00 | $197.17 | $10.00 | 42.4 |
| **I** | Closet | 1L-3'-Linear Fluor.T8-Surfaced Mounted | 1 | 23 | 1 | 23 | Existing to Remain | Existing to Remain | 1 | 23 | 1 | 23 | 0 | 600 | $0.16 | 0 | $0.00 | 0 | 0 | 0 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | |
| **B** | Stair Corridor | 2L-T8-U-Tube-32W 2'x2' Recessed | 2 | 55 | 1 | 55 | Existing to Remain | Existing to Remain | 2 | 55 | 1 | 55 | 0 | 2236 | $0.16 | 0 | $0.00 | 0 | 0 | 0 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | |
| **First Floor Summary** | | | | | **94** | **7847** | | | | | **94** | **5958** | **1889** | | | **4,149** | **$663.77** | **65** | | | | **$2,537** | **$3,360** | **$5,897** | **$1,010** | **7.4** |
| **Second Floor** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **B** | Archive Room - Flr 2 | 2L-T8-U-Tube-32W 2'x2' Recessed | 2 | 55 | 12 | 660 | Existing to Remain | Existing to Remain | 2 | 55 | 12 | 660 | 0 | 600 | $0.16 | 0 | $0.00 | 0 | 0 | 0 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | |
| **A** | | 4L-T8-Linear Fluor.-Recessed 2'x4' | 4 | 108 | 4 | 432 | Relamp, Reballast | Sylvania Lamps FO28/841/XP/SS/ECO Sylvania Ballast QHE 4X32T8/UNV ISL-SC | 4 | 84 | 4 | 336 | 96 | 600 | $0.16 | 58 | $9.22 | 4 | 44.6 | 60 | $104.60 | $178.40 | $240.00 | $418.40 | $80.00 | 36.7 |
| **C** | Tax Collector Storage Room | 1L-Incand. "A" Lamp-Surface Mounted | 1 | 75 | 1 | 75 | Relamp | Sylvania CF19EL/MINI/830 | 1 | 18 | 1 | 18 | 57 | 600 | $0.16 | 34 | $5.47 | 1 | 5.86 | 15 | $20.86 | $5.86 | $15.00 | $20.86 | $0.00 | 3.8 |
| **D** | | 2L-4' Linear Fluorescent-Surface Mounted T12 | 2 | 77 | 1 | 77 | Relamp, Reballast | Sylvania Lamps FO32/835/XP/ECO Sylvania Ballast QHE 2X32T8/UNV ISL-SC | 2 | 48 | 1 | 48 | 29 | 600 | $0.16 | 17 | $2.78 | 1 | 29.05 | 60 | $89.05 | $29.05 | $60.00 | $89.05 | $10.00 | 28.4 |
| **C** | Utility Room | 1L-Incand. "A" Lamp-Surface Mounted | 1 | 75 | 1 | 75 | Relamp | Sylvania CF19EL/MINI/830 | 1 | 18 | 1 | 18 | 57 | 600 | $0.16 | 34 | $5.47 | 1 | 5.86 | 15 | $20.86 | $5.86 | $15.00 | $20.86 | $0.00 | 3.8 |
| **Second Floor Summary** | | | | | **19** | **1319** | | | | | **19** | **1080** | **239** | | | **143** | **$22.94** | **7** | | | | **$219** | **$330** | **$549** | **$90** | **20.0** |

**Project Name: Buena Vista Municipal Building**
**Location: Buena Vista, NJ**
**Description: Photovoltaic System 95% Financing - 20 year**

**Simple Payback Analysis**

| | Photovoltaic System 95% Financing - 20 year |
|---|---|
| Total Construction Cost | $28,980 |
| Annual kWh Production | 5,025 |
| Annual Energy Cost Reduction | $804 |
| Annual SREC Revenue | $1,759 |
| First Cost Premium | **$28,980** |
| Simple Payback: | **11.31** Years |

**Life Cycle Cost Analysis**

| | | | |
|---|---|---|---|
| Analysis Period (years): | 25 | Financing %: | 95% |
| Financing Term (mths): | 240 | Maintenance Escalation Rate: | 3.0% |
| Average Energy Cost ($/kWh) | **$0.160** | Energy Cost Escalation Rate: | 3.0% |
| Financing Rate: | 7.00% | SREC Value ($/kWh) | $0.350 |

| Period | Additional Cash Outlay | Energy kWh Production | Energy Cost Savings | Additional Maint Costs | SREC Revenue | Interest Expense | Loan Principal | Net Cash Flow | Cumulative Cash Flow |
|---|---|---|---|---|---|---|---|---|---|
| 0 | $1,449 | 0 | 0 | 0 | $0 | 0 | 0 | (1,449) | 0 |
| 1 | $0 | 5,025 | $804 | $0 | $1,759 | $1,906 | $655 | $1 | ($1,448) |
| 2 | $0 | 5,000 | $828 | $0 | $1,750 | $1,859 | $702 | $17 | ($1,431) |
| 3 | $0 | 4,975 | $853 | $0 | $1,741 | $1,808 | $753 | $33 | ($1,398) |
| 4 | $0 | 4,950 | $879 | $0 | $1,732 | $1,754 | $808 | $50 | ($1,349) |
| 5 | $0 | 4,925 | $905 | $51 | $1,724 | $1,695 | $866 | $17 | ($1,332) |
| 6 | $0 | 4,901 | $932 | $50 | $1,715 | $1,633 | $928 | $35 | ($1,296) |
| 7 | $0 | 4,876 | $960 | $50 | $1,707 | $1,566 | $996 | $55 | ($1,241) |
| 8 | $0 | 4,852 | $989 | $50 | $1,698 | $1,494 | $1,068 | $76 | ($1,166) |
| 9 | $0 | 4,827 | $1,018 | $50 | $1,690 | $1,417 | $1,145 | $97 | ($1,069) |
| 10 | $0 | 4,803 | $1,049 | $49 | $1,681 | $1,334 | $1,227 | $119 | ($950) |
| 11 | $0 | 4,779 | $1,080 | $49 | $1,673 | $1,245 | $1,316 | $143 | ($807) |
| 12 | $0 | 4,755 | $1,113 | $49 | $1,664 | $1,150 | $1,411 | $167 | ($640) |
| 13 | $0 | 4,732 | $1,146 | $49 | $1,656 | $1,048 | $1,513 | $192 | ($448) |
| 14 | $0 | 4,708 | $1,181 | $48 | $1,648 | $939 | $1,623 | $219 | ($229) |
| 15 | $0 | 4,684 | $1,216 | $48 | $1,640 | $821 | $1,740 | $246 | $17 |
| 16 | $0 | 4,661 | $1,253 | $48 | $1,631 | $695 | $1,866 | $275 | $292 |
| 17 | $0 | 4,638 | $1,290 | $48 | $1,623 | $561 | $2,001 | $304 | $596 |
| 18 | $0 | 4,615 | $1,329 | $48 | $1,615 | $416 | $2,145 | $335 | $931 |
| 19 | $0 | 4,591 | $1,369 | $47 | $1,607 | $261 | $2,301 | $367 | $1,298 |
| 20 | $0 | 4,568 | $1,410 | $47 | $1,599 | $95 | $2,467 | $400 | $1,698 |
| 21 | $0 | 4,546 | $1,452 | $47 | $1,591 | $80 | $2,268 | $648 | $2,347 |
| 22 | $0 | 4,523 | $1,496 | $47 | $1,583 | $55 | $1,866 | $1,111 | $3,458 |
| 23 | $0 | 4,500 | $1,541 | $46 | $1,575 | $0 | $0 | $3,069 | $6,527 |
| 24 | $0 | 4,478 | $1,587 | $46 | $1,567 | $0 | $0 | $3,108 | $9,635 |
| 25 | $0 | 4,455 | $1,634 | $46 | $1,559 | $0 | $0 | $3,148 | $12,783 |
| | **Totals:** | 95,866 | $21,604 | $782 | $33,553 | $23,696 | $27,531 | $31,665 | $24,777 |
| | | | | **Net Present Value (NPV)** | | | **$1,766** | | |
| | | | | **Internal Rate of Return (IRR)** | | | **11.9%** | | |

**Project Name: Buena Vista Municipal Building**
**Location: Buena Vista, NJ**
**Description: Photovoltaic System - Direct Purchase**

**Simple Payback Analysis**

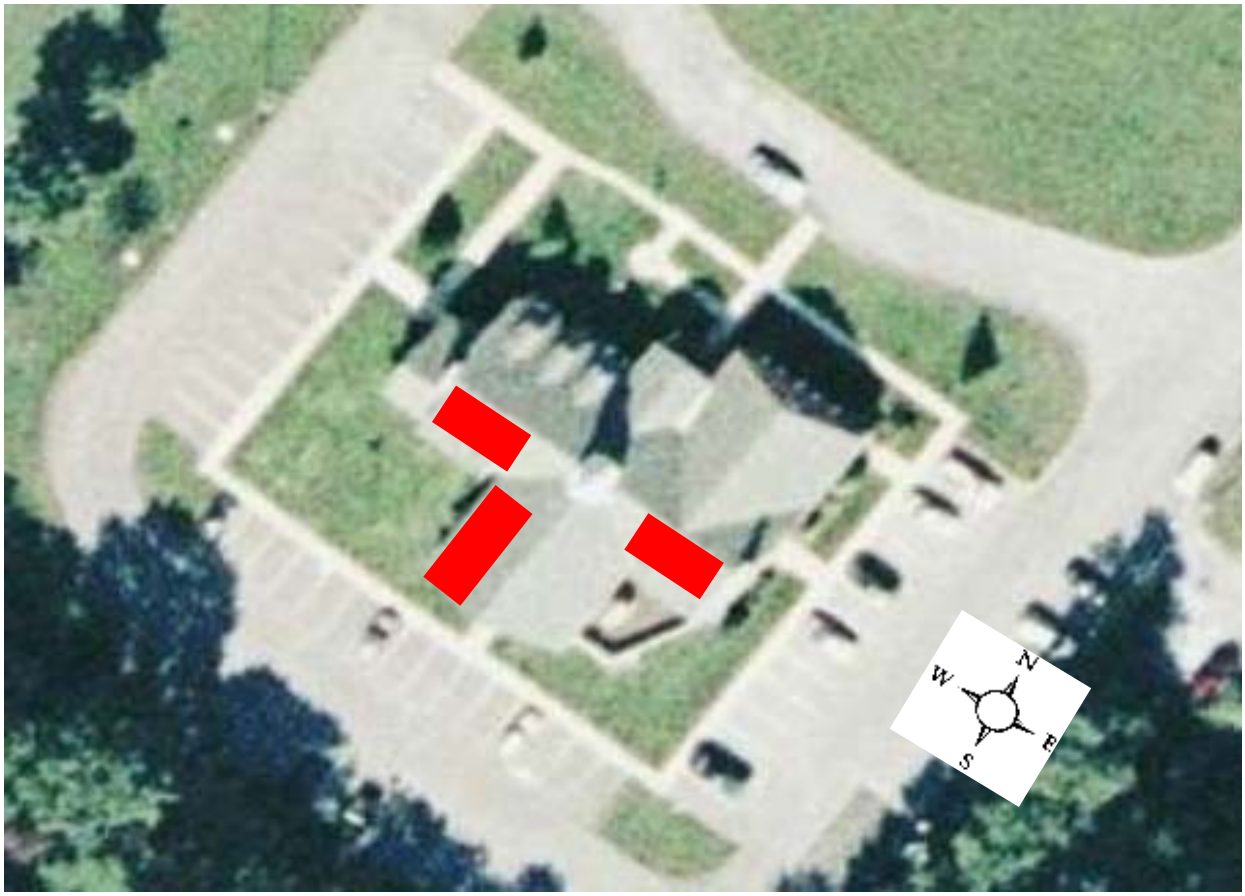
| | Photovoltaic System - Direct Purchase |
|---|---|
| Total Construction Cost | $28,980 |
| Annual kWh Production | 5,025 |
| Annual Energy Cost Reduction | $804 |
| Annual SREC Revenue | $1,759 |
| First Cost Premium | **$28,980** |
| Simple Payback: | **11.31** **Years** |

**Life Cycle Cost Analysis**

| | | | |
|---|---|---|---|
| Analysis Period (years): | 25 | Financing %: | 0% |
| Financing Term (mths): | 0 | Maintenance Escalation Rate: | 3.0% |
| Average Energy Cost ($/kWh) | **$0.160** | Energy Cost Escalation Rate: | 3.0% |
| Financing Rate: | 0.00% | SREC Value ($/kWh) | $0.350 |

| Period | Additional Cash Outlay | Energy kWh Production | Energy Cost Savings | Additional Maint Costs | SREC Revenue | Net Cash Flow | Cumulative Cash Flow |
|---|---|---|---|---|---|---|---|
| 0 | $28,980 | 0 | 0 | 0 | $0 | (28,980) | 0 |
| 1 | $0 | 5,025 | $804 | $0 | $1,759 | $2,563 | ($26,417) |
| 2 | $0 | 5,000 | $828 | $0 | $1,750 | $2,578 | ($23,839) |
| 3 | $0 | 4,975 | $853 | $0 | $1,741 | $2,594 | ($21,245) |
| 4 | $0 | 4,950 | $879 | $0 | $1,732 | $2,611 | ($18,634) |
| 5 | $0 | 4,925 | $905 | $51 | $1,724 | $2,578 | ($16,056) |
| 6 | $0 | 4,901 | $932 | $50 | $1,715 | $2,597 | ($13,459) |
| 7 | $0 | 4,876 | $960 | $50 | $1,707 | $2,616 | ($10,843) |
| 8 | $0 | 4,852 | $989 | $50 | $1,698 | $2,637 | ($8,206) |
| 9 | $0 | 4,827 | $1,018 | $50 | $1,690 | $2,658 | ($5,548) |
| 10 | $0 | 4,803 | $1,049 | $49 | $1,681 | $2,681 | ($2,867) |
| 11 | $0 | 4,779 | $1,080 | $49 | $1,673 | $2,704 | ($163) |
| 12 | $0 | 4,755 | $1,113 | $49 | $1,664 | $2,728 | $2,565 |
| 13 | $0 | 4,732 | $1,146 | $49 | $1,656 | $2,754 | $5,319 |
| 14 | $0 | 4,708 | $1,181 | $48 | $1,648 | $2,780 | $8,099 |
| 15 | $0 | 4,684 | $1,216 | $48 | $1,640 | $2,807 | $10,907 |
| 16 | $0 | 4,661 | $1,253 | $48 | $1,631 | $2,836 | $13,742 |
| 17 | $0 | 4,638 | $1,290 | $48 | $1,623 | $2,866 | $16,608 |
| 18 | $0 | 4,615 | $1,329 | $48 | $1,615 | $2,896 | $19,504 |
| 19 | $0 | 4,591 | $1,369 | $47 | $1,607 | $2,928 | $22,433 |
| 20 | $0 | 4,568 | $1,410 | $47 | $1,599 | $2,962 | $25,395 |
| 21 | $1 | 4,546 | $1,452 | $47 | $1,591 | $2,996 | $28,391 |
| 22 | $2 | 4,523 | $1,496 | $47 | $1,583 | $3,032 | $31,423 |
| 23 | $3 | 4,500 | $1,541 | $46 | $1,575 | $3,069 | $34,492 |
| 24 | $4 | 4,478 | $1,587 | $46 | $1,567 | $3,108 | $37,600 |
| 25 | $5 | 4,455 | $1,634 | $46 | $1,559 | $3,148 | $40,748 |
| | **Totals:** | 95,866 | $21,604 | $782 | $33,553 | $69,728 | $54,375 |
| | | | | **Net Present Value (NPV)** | | **$40,773** | |
| | | | | **Internal Rate of Return (IRR)** | | **7.9%** | |

| Building | Usable Roof Area (sq ft) | Panel | Qty | Panel Sq Ft | Panel Total Sq Ft | Total KW | Total Annual kWh | Panel Weight (33 lbs) | W/SQFT |
|---|---|---|---|---|---|---|---|---|---|
| Municipal Bldg. | 800 | Sunpower SPR230 | 14 | 14.7 | 206 | 3.22 | 5,025 | 462 | 15.64 |




.= Proposed PV Layout

Notes:

1. Estimated kWH based on 4.68 hours full output per day per 365 day year. Actual kWH will vary day to day.

 OMB No. 2060-0347

# STATEMENT OF ENERGY PERFORMANCE
# Municipal Building

**Building ID:** 1774975
**For 12-month Period Ending:** November 30, 2008[1]
**Date SEP becomes ineligible:** N/A
**Date SEP Generated:** June 18, 2009

**Facility**
Municipal Building
Buena Vista Township
890 Harding Highway
Buena, NJ 08310

**Facility Owner**
N/A

**Primary Contact for this Facility**
N/A

**Year Built:** 1979
**Gross Floor Area (ft²):** 9,000

**Energy Performance Rating**[2] (1-100) 29

| **Site Energy Use Summary**[3] | |
|---|---|
| Electricity (kBtu) | 303,586 |
| Natural Gas (kBtu)[4] | 422,366 |
| Total Energy (kBtu) | 725,952 |

| **Energy Intensity**[5] | |
|---|---|
| Site (kBtu/ft²/yr) | 82 |
| Source (kBtu/ft²/yr) | 165 |

| **Emissions** (based on site energy use) | |
|---|---|
| Greenhouse Gas Emissions ($MtCO_2e$/year) | 71 |

**Electric Distribution Utility**
Atlantic City Electric Co

| **National Average Comparison** | |
|---|---|
| National Average Site EUI | 66 |
| National Average Source EUI | 132 |
| % Difference from National Average Source EUI | 25% |
| Building Type | Office |

Stamp of Certifying Professional

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

**Certifying Professional**
N/A

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

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

# ENERGY STAR® Data Checklist for Commercial Buildings

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

**Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.**
NOTE: You must check each box to indicate that each value is correct, OR include a note.

| CRITERION | VALUE AS ENTERED IN PORTFOLIO MANAGER | VERIFICATION QUESTIONS | NOTES | ☑ |
|---|---|---|---|---|
| **Building Name** | Municipal Building | Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings? | | ☐ |
| **Type** | Office | Is this an accurate description of the space in question? | | ☐ |
| **Location** | Buena Vista Township,890 Harding Highway, Buena, NJ 08310 | Is this address accurate and complete? Correct weather normalization requires an accurate zip code. | | ☐ |
| **Single Structure** | Single Facility | Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building | | ☐ |
| Office (Office) | | | | |
| **CRITERION** | **VALUE AS ENTERED IN PORTFOLIO MANAGER** | **VERIFICATION QUESTIONS** | **NOTES** | ☑ |
| **Gross Floor Area** | 9,000 Sq. Ft. | Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area. | | ☐ |
| **Weekly operating hours** | 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. | | ☐ |
| **Workers on Main Shift** | 20 | Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100. The normal worker density ranges between 0.3 and 10 workers per 1000 square feet (92.8 square meters) | | ☐ |
| **Number of PCs** | 10 | Is this the number of personal computers in the Office? | | ☐ |
| **Percent Cooled** | 50% or more | Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment? | | ☐ |
| **Percent Heated** | 50% or more | Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment? | | ☐ |

# ENERGY STAR® Data Checklist for Commercial Buildings

## *Energy Consumption*

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

| **Fuel Type: Electricity** | | |
|---|---|---|
| **Meter: Electric (kWh)**<br>**Space(s):** Entire Facility | | |
| **Start Date** | **End Date** | **Energy Use (kWh)** |
| 10/10/2008 | 11/09/2008 | 5,680.00 |
| 09/10/2008 | 10/09/2008 | 8,000.00 |
| 08/10/2008 | 09/09/2008 | 7,920.00 |
| 07/10/2008 | 08/09/2008 | 8,320.00 |
| 06/10/2008 | 07/09/2008 | 8,320.00 |
| 05/10/2008 | 06/09/2008 | 6,160.00 |
| 04/10/2008 | 05/09/2008 | 5,280.00 |
| 03/10/2008 | 04/09/2008 | 6,960.00 |
| 02/10/2008 | 03/09/2008 | 8,160.00 |
| 01/10/2008 | 02/09/2008 | 8,320.00 |
| 12/10/2007 | 01/09/2008 | 11,040.00 |
| **Electric Consumption (kWh)** | | **84,160.00** |
| **Electric Consumption (kBtu)** | | **287,153.92** |
| **Total Electricity Consumption (kBtu)** | | **287,153.92** |
| **Is this the total Electricity consumption at this building including all Electricity meters?** | | ☐ |

| **Fuel Type: Natural Gas** | | |
|---|---|---|
| **Meter: Gas (therms)**<br>**Space(s):** Entire Facility | | |
| **Start Date** | **End Date** | **Energy Use (therms)** |
| 10/07/2008 | 11/06/2008 | 226.01 |
| 09/07/2008 | 10/06/2008 | 12.43 |
| 08/07/2008 | 09/06/2008 | 1.03 |
| 07/07/2008 | 08/06/2008 | 0.00 |
| 06/07/2008 | 07/06/2008 | 0.00 |
| 05/07/2008 | 06/06/2008 | 102.96 |
| 04/07/2008 | 05/06/2008 | 149.50 |
| 03/07/2008 | 04/06/2008 | 555.71 |
| 02/07/2008 | 03/06/2008 | 922.61 |
| 01/07/2008 | 02/06/2008 | 901.65 |

| | | |
|---|---|---|
| 12/07/2007 | 01/06/2008 | 716.90 |
| **Gas Consumption (therms)** | | **3,588.80** |
| **Gas Consumption (kBtu)** | | **358,880.00** |
| **Total Natural Gas Consumption (kBtu)** | | **358,880.00** |
| **Is this the total Natural Gas consumption at this building including all Natural Gas meters?** | | ☐ |

| **Additional Fuels** | |
|---|---|
| Do the fuel consumption totals shown above represent the total energy use of this building?<br>Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility. | ☐ |

## Certifying Professional

(When applying for the ENERGY STAR, this must be the same PE that signed and stamped the SEP.)

APPENDIX G
Page 4 of 5

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
Buena Vista Township
890 Harding Highway
Buena, NJ 08310

**Facility Owner**
N/A

**Primary Contact for this Facility**
N/A

## General Information

| Municipal Building | |
|---|---|
| Gross Floor Area Excluding Parking: ($ft^2$) | 9,000 |
| Year Built | 1979 |
| For 12-month Evaluation Period Ending Date: | November 30, 2008 |

## Facility Space Use Summary

| Office | |
|---|---|
| Space Type | Office |
| Gross Floor Area($ft^2$) | 9,000 |
| Weekly operating hours | 40 |
| Workers on Main Shift | 20 |
| Number of PCs | 10 |
| Percent Cooled | 50% or more |
| Percent Heated | 50% or more |

## Energy Performance Comparison

| | Evaluation Periods | | Comparisons | | |
|---|---|---|---|---|---|
| **Performance Metrics** | **Current** (Ending Date 11/30/2008) | **Baseline** (Ending Date 11/30/2008) | **Rating of 75** | **Target** | **National Average** |
| Energy Performance Rating | 29 | 29 | 75 | N/A | 50 |
| Energy Intensity | | | | | |
| *Site (kBtu/$ft^2$)* | 82 | 82 | 49 | N/A | 66 |
| *Source (kBtu/$ft^2$)* | 165 | 165 | 98 | N/A | 132 |
| Energy Cost | | | | | |
| *$/year* | $ 20,494.02 | $ 20,494.02 | $ 12,113.62 | N/A | $ 16,376.24 |
| *$/$ft^2$/year* | $ 2.28 | $ 2.28 | $ 1.35 | N/A | $ 1.82 |
| Greenhouse Gas Emissions | | | | | |
| $MtCO_2e$/year | 71 | 71 | 42 | N/A | 57 |
| $kgCO_2e/ft^2$/year | 8 | 8 | 5 | N/A | 6 |

More than 50% of your building is defined as Office. Please note that your rating accounts for all of the spaces listed. The National Average column presents energy performance data your building would have if your building had an average rating of 50.

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