



ENERGY AUDIT – FINAL REPORT

SHAMONG TOWNSHIP

BALL FIELDS

311 FORKED NECK RD.

SHAMONG, NJ 08088

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CEG PROPOSAL No. 9C08155

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Table of Contents

I.	Executive Summary.....	3
II.	Introduction.....	5
III.	Method of Analysis.....	6
IV.	Historic Energy Consumption/Cost.....	7
V.	Facility Description.....	9
VI.	Energy Conservation Measures.....	10
VII.	Renewable / Distributed Energy Measures.....	12
VIII.	Energy Purchasing and Procurement Strategy.....	13
IX.	Installation Funding Options.....	15
X.	Additional Recommendations.....	16
	Appendix A – Detailed Energy Usage and Graphs	
	Appendix B – New Jersey SmartStart Buildings® Incentives	

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I. EXECUTIVE SUMMARY

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

Shamong Township Ball Fields
315 Forked Neck Road
Shamong, NJ 08088

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

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

The annual energy cost at this facility is as follows:

Electricity \$4,650

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

Table 1
Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST ^A	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)	SIMPLE RETURN ON INVESTMENT
1	Lighting – Time Clock / Photo Cell Installation	\$16,200	\$930	17.4	0.3%

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

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

**Table 2
Estimated Energy Savings**

ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)	NAT GAS (THERMS)
1	Lighting – Time Clock / Photo Cell Installation	0	5,252	-

Recommendation:

Concord Engineering Group (CEG) strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under seven (7) years. The current operation is efficient; however it is based on assumptions regarding operations personnel and manual switching. Even though the simple payback is over 7 years CEG would recommend ECM #1 if the owner is interested in implementing an energy saving option in the future.

- **ECM #1:** Lighting – Time Clock / Photo Cell Installation

Further Evaluation:

The existing metal halide lighting is efficient in providing lumen output with respect to wattage used for the application. This lighting is widely accepted and industry standard for high output lighting of large outdoor areas. Regarding energy savings for future lighting designs, large savings can many times be achieved through more strategic lighting placement. Innovative lighting level simulations can provide valuable up-front information to maximize the lighting system efficiency. Added lighting poles with reduced wattages will provide more even lighting levels throughout the field with the total wattage reduced, however at an increase in first cost.

Although not described in the ECM shown above, the following is additional recommends to implement.

1. Clean all fixtures to maximize light output.

II. INTRODUCTION

The Ball Fields are utilized for athletic games which include night time operation. The fields are illuminated with metal halide lighting and are manually operated by staff.

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

The Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft²/yr) and can be used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is not applicable for the ball fields.

The site visit was spent inspecting the lighting system and answering specific questions from the preliminary review. The building manager provided occupancy schedules, O & M practices, 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 the lighting improvements.

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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 lighting equipment, and any other facility-specific equipment, and to gain an understanding of how each facility is used.

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

Lastly, installation costs are then applied to each recommendation and simple paybacks are calculated. Costs are derived from Means Cost Data, other industry publications, and local contractors and suppliers. The NJ SmartStart Building® program incentives (refer to Appendix B) 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

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

The average utility costs for the facility are as follows:

Description

Average

Electricity

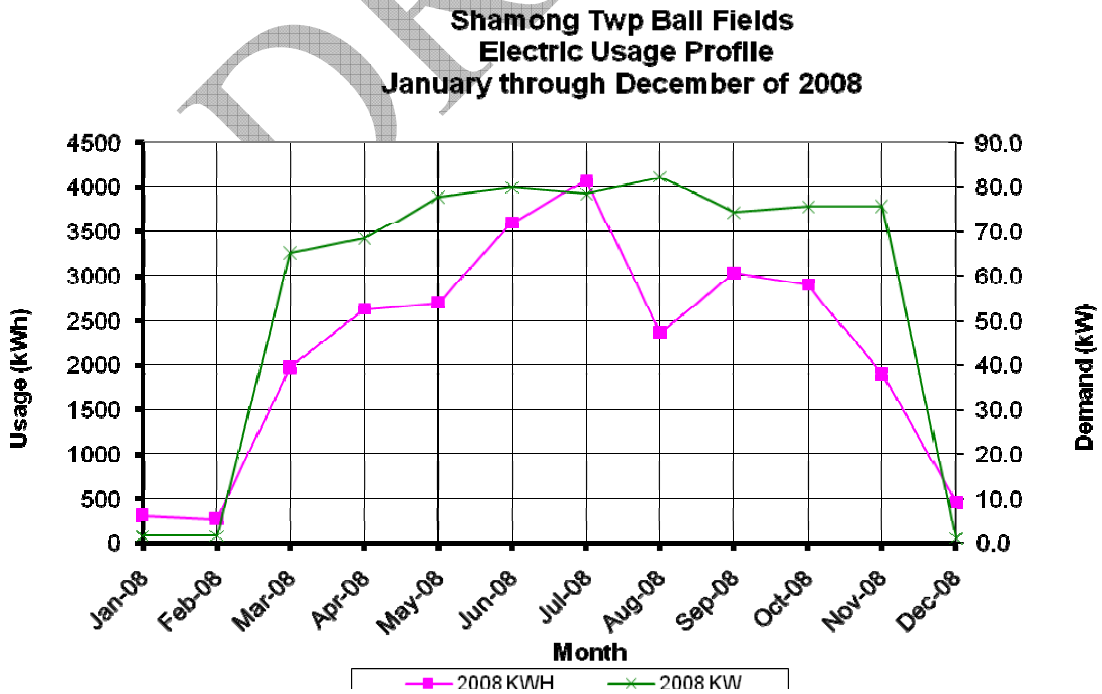
17.7¢ / kWh

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Table 3
Electricity Billing Data

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
1/08	320	1.6	\$85
2/08	280	1.6	\$312
3/08	1,975	65.1	\$470
4/08	2,630	68.3	\$574
5/08	2,707	77.7	\$450
6/08	3,604	79.8	\$764
7/08	4,073	78.4	\$675
8/08	2,369	82.3	\$442
9/08	3,036	74.4	\$429
10/08	2,904	75.7	\$327
11/08	1,897	75.7	\$57
12/08	464	1.1	\$65
Totals	26,259	82 Max	\$4,650

Figure 1
Electricity Usage Profile



V. FACILITY DESCRIPTION

The Shamong Township Ball Fields are utilized for the school district's physical education program and after school games. The fields operation consists of scheduled games and athletic practices. Fall games total roughly 16 games, and Spring games total roughly 22 games. Other events may be held that are in addition to school organized events. Total hours of operation at full illumination are estimated to be 8 – 12 hours per week for 9 months throughout the year.

Lighting

The ball fields are lit with 5 to 6 light poles per field with metal halide light fixtures. Lamp wattages are estimated at 1000W each and 36 lamps per ball field. Currently controls do not exist for any of the lighting at the ball fields.

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VI. ENERGY CONSERVATION MEASURES

ECM #1: Lighting – Time Clock / Photo Cell Installation

Description:

Time clock and photo cell control can be provided for any outdoor lighting system. A simple photocell can provide assurance that outdoor lighting is not turned on before it is needed. A time clock ahead of manual switching will make sure lighting is not left after an event has come to an end or accidentally all night or day. Although the length of time saved will be relatively short on a regular basis, the cumulative savings can add up to be substantial.

CEG recommends the installation of both a photocell and time clock for all outdoor event lighting. The intent of this ECM implementation is not to eliminate the need for manual operation, however to provide backup to the manual switching. The photocell and time clocks would be wired ahead of local switching to ensure that manual intervention will not undermine the intent of the ECM.

Energy Savings Calculations:

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

From Appendix B, the installation of daylight dimming controls warrants the following incentive: = \$75 per fixture controlled.

$$\text{Smart Start}^{\circledR} \text{ Incentive} = (\# \text{ of lamps fixtures} \times \$75)$$

$$\text{Smart Start}^{\circledR} \text{ Incentive} = (36 \times \$75) = \$2,700$$

$$\text{Energy Usage} = 26,259 \text{ kWh} / \text{Yr.}$$

$$\text{Estimated Energy Savings} = 20\%$$

$$\text{Energy Saving} = 26,259 \text{ kWh} / \text{Yr.} \times 0.20 = 5,252 \text{ kWh} / \text{Yr.}$$

$$\text{Total Energy Cost Savings} = 5,252 \text{ kWh} / \text{Yr.} \times \$0.177/\text{kWh} = \$930 / \text{Yr.}$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$18,900
NJ Smart Start Equipment Incentive (\$):	(\$2,700)
Maintenance Savings (\$):	-
Net Installation Cost (\$):	\$16,200
Total Energy Savings (\$ / yr):	\$930
Simple Payback (yrs):	17.4
Simple Return on Investment	0.3%

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VII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy.

CEG has assessed the feasibility of installing renewable energy technologies for the Ball Fields, and concluded that there is not feasible potential for solar and wind energy generation at this site. In regards to renewable energy, CEG comments and findings are as follows:

- *Photovoltaic System:* CEG does not recommend the installation of a PV system for the Ball Fields due to the fact that the facility does not contain protected area for installation of the system.
- *Wind Energy:* CEG does not recommend the installation of a Wind system because of low average wind speeds for the Shamong area. Furthermore, the electric demand on the facility is moderate to low because of facility size and operational characteristics. The afore-mentioned characteristics do not lend themselves to a successful wind energy application.

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VIII. 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 included within this report to reference the respective electricity usage load profile for January 2008 through December 2008.

Electricity:

Section IV, Figure 1 demonstrates a standard profile for a ball field complex. The electric use is highest during months when the fields are active with baseball and softball (May through August). Other peak usage occurs during the spring when early season training happens and during the fall months when the town uses the facility for fall training.

Tariff Analysis:

Electricity:

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

Recommendations:

Based on CEG's review of Shamong Township's utility bills and charges, our recommendation is to continue purchasing energy in the current manner. As compared to current market pricing, it does not appear that the electricity rates are very far from standard average for users in the area.

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

Shamong Township should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

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IX. INSTALLATION FUNDING OPTIONS

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

- i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. The “Energy Savings Improvement Program (ESIP)” law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.
- ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.
- iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as “power purchase agreements.” These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party’s work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

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

X. 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 provide benefits none the less.

1. Clean all fixtures to maximize light output.

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SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of January, 2009:

Electric Chillers

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

Gas Cooling

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

Desiccant Systems

	\$1.00 per cfm – gas or electric
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Electric Unitary HVAC

Unitary AC and Split Systems	\$73 - \$93 per ton
Air-to-Air Heat Pumps	\$73 - \$92 per ton
Water-Source Heat Pumps	\$81 per ton
Packaged Terminal AC & HP	\$65 per ton
Central DX AC Systems	\$40- \$72 per ton
Dual Enthalpy Economizer Controls	\$250

Ground Source Heat Pumps

Closed Loop & Open Loop	\$370 per ton
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Gas Heating

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

Variable Frequency Drives

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

Natural Gas Water Heating

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

Premium Motors

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

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	\$10 - \$30 per fixture, (depending on quantity)
Hard-Wired Compact Fluorescent	\$25 - \$30 per fixture
Metal Halide w/Pulse Start	\$25 per fixture
LED Exit Signs	\$10 - \$20 per fixture
T-5 and T-8 High Bay Fixtures	\$16 - \$284 per fixture

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

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

Other Equipment Incentives

Performance Lighting	\$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive