



ENERGY AUDIT – FINAL REPORT

LOPATCONG Municipal Pool Building

Belvidere Road
Phillipsburg, NJ 08865
ATTN: Betty Dobes

CEG PROPOSAL NO. 9C09058

CONCORD ENGINEERING GROUP



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I. EXECUTIVE SUMMARY

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

Lopatcong
Municipal Pool
 Belvidere Road
 Phillipsburg, NJ 08865

Facility Contact Person: Betty Dobes

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	\$8,258
Natural Gas	N/A
Fuel Oil	N/A
Total	\$8,258

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 $\pm 20\%$ until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST ^A	ANNUAL SAVINGS ^B	SIMPLE PAYBACK (YEARS)	SIMPLE LIFETIME ROI
1	Interior Lighting Upgrades	\$1,915	\$504	3.23	31 %
2	Interior Lighting Controls	\$450	\$34.63	9.53	10.5 %
3	NEMA Premium Efficient Pump Motor	\$3,587	\$617	5.81	17.2 %

Notes: A. Cost takes into consideration applicable NJ Smart StartTM incentives.

B. Savings takes into consideration applicable 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)	NATURAL GAS (MBH)
1	Interior Lighting Upgrades	0.969	1,297.2	-
2	Interior Lighting Controls	.13	174	-
3	NEMA Premium Efficient Pump Motor	2.31	3,100.5	-

Recommendation:

Concord Engineering Group strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under ten (10) years. The potential energy and cost savings from these ECM's are too great to pass upon. The following Energy Conservation Measures are recommended for the Lopatcong, Municipal Pool Building:

- **ECM #1:** Interior Lighting Upgrades
- **ECM #2:** Interior Lighting Controls
- **ECM #3:** NEMA Premium Efficient Pump Motor

Concord Engineering Group has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. This solar energy system is viable for the Municipal Pool building. There are four months with no load and the solar generation must be shut down by throwing the system disconnect switch. Generating more energy than can be utilized by the public facility is not allowed by the utility. CEG recommends the Owner review the implementation in addition to the funding options noted in Section X. The simple payback for either of the two funding options is 10.5 years.

II. INTRODUCTION

This comprehensive energy audit covers the 2,730 square foot Lopatcong, Municipal Pool Building facility that includes the gate office, Guard office, Pool, Men's office, Men's Locker/shower, Women's Locker/shower, storage room, outside covered picnic area and snack shack, etc.

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

The Energy Use Index (EUI) is established for the building. Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft²/yr), which is used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting the annual consumption of all energy sources to BTU's and dividing by the area (gross square footage) of the building. Blueprints (where available) are utilized to verify the gross area of the facility. The EUI is a good indicator of the relative potential for energy savings. A low EUI indicates less potential for energy savings, while a high EUI indicates poor building performance therefore a high potential for energy savings.

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

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

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

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

III. METHOD OF ANALYSIS

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

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

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

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

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

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

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

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

Electric

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from January-08 to December-08. Jersey City Power and Light (JCP&L) provides electricity to the facility under the General Lighting and Power Service (GLP) rate. 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.

Natural Gas and Oil

There is no gas service and no oil service.

<u>Description</u>	<u>Average</u>
Electricity	19.9¢ /kWh
Natural Gas	N/A
Fuel Oil – No. 2	N/A

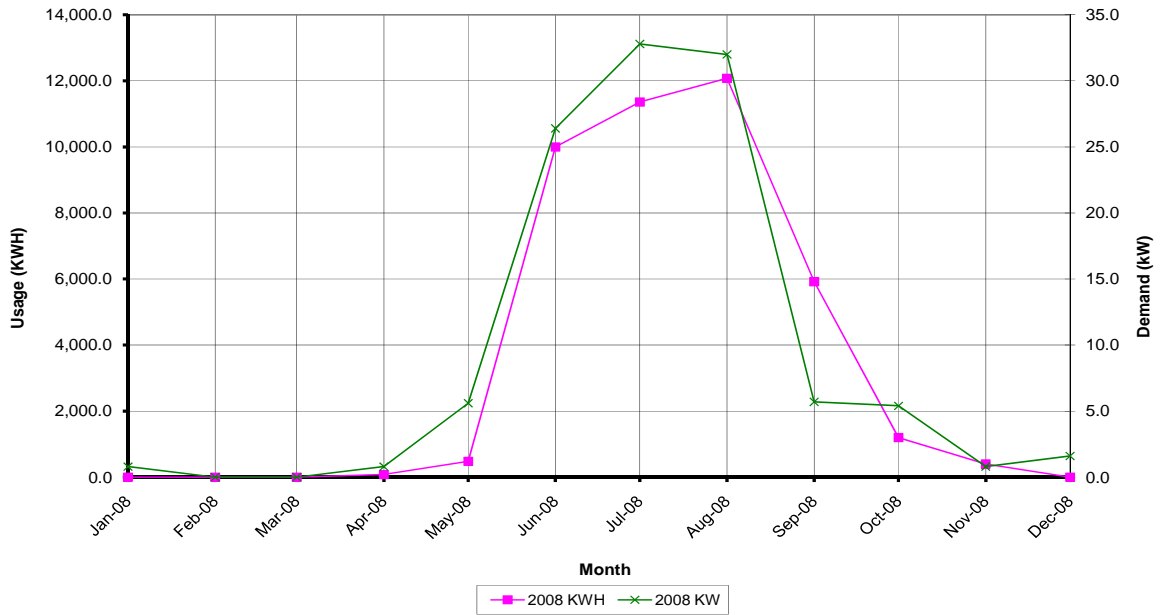
**Table 3
Electricity Billing Data**

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-08	0.8	35.2	\$ 91
Feb-08	0.8	35.2	\$ 91
Mar-08	0.0	35.2	\$ 91
Apr-08	80	35.2	\$ 106
May-08	480	35.2	\$ 177
Jun-08	10,000	26.4	\$ 1,730
Jul-08	11,360	32.8	\$ 2,046
Aug-08	12,080	32.0	\$ 2,156
Sep-08	5,920	32.8	\$ 1,073
Oct-08	1,200	32.8	\$ 299
Nov-08	400	32.8	\$ 159
Dec-08	0	22.8	\$ 237
Totals	41,522	35.2 Max	\$8,258

AVERAGE DEMAND	32.4	KW average
AVERAGE RATE	\$0.199	\$/kWh

**Figure 1
Electricity Usage Profile**

LOPATCONG MUNICIPAL POOL
Electric Usage Profile
January through December of 2008



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 amongst building of similar type. The EUI for this facility is calculated as follows:

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

$$\begin{aligned} \text{Electric} &= ((41,522 \text{ kWh} + 0 \text{ kWh} + 0 \text{ kWh}) * (1000 \text{ W/kW}) * (3.414 \text{ Btu/h} / 1 \text{ W})) / (1000 \text{ Btu/h} / 1 \text{ kBtu/h}) \\ &= 141,715 \text{ kBtu/h} \end{aligned}$$

Gas = N/A

Heating Oil = N/A

$$\text{Building EUI} = \frac{(141,715 \text{ kBtu} / h + 0 \text{ kBtu} / h + 0 \text{ kBtu} / h)}{2,730 \text{ SF}} = \frac{141,715 \text{ kBtu} / h}{2,730 \text{ SF}}$$

Lopatcong Pool Building EUI = 51.9 kBtu/SF (Site Energy); 173.4 kBtu/SF (Source Energy)

As a comparison, data has been gathered by the US Department of Energy (DOE) for various facilities cataloguing the standard site and source energy utilization. This data has been published in the 2003 Commercial Building Energy Consumption Survey and is noted as follows for facilities of this type:

- Public Assembly (Recreation): 65 kBtu/SF Site Energy, 136 kBtu/SF Source Energy.

Based on the information compiled for the studied facility, as compared to the national average the energy usage is approximately 27.5% higher than the baseline data.

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.

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

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

Username: lopatcongtpw

Password: lgeaceg2009

Security Question: What is your birth city?

Security answer: lopatcong township

Specific building types are detailed on the ENERGY STAR website. The Lopatcong, Municipal Pool Building is more than 50% recreational and is designated as RECREATIONAL. Recreational facilities are not given an Energy Performance Rating. Despite this Portfolio Manager calculates the building EUI. The EUI is an important tool that can be used to track the energy efficiency of the building. Baselines for improvement can be set that the municipality can strive to meet. CEG strongly urges Lopatcong to keep their Portfolio Manager account up to date to monitor the performance of the building.

Refer to Appendix D for “Statement of Energy Performance” report.

V. FACILITY DESCRIPTION

The Lopatcong Municipal Pool Building consists of the gate office, Guard office, Pool, Men's office, Men's Locker/shower, Women's Locker/shower, storage room, outside covered picnic area and snack shack; totaling approximately 2,730 SF. The un-insulated block facility was built in 1967. The building is used seasonally May through September and is occupied 56 hours a week.

Heating System

The Municipal Pool Building is not heated.

Domestic Hot Water

Domestic hot water for the Gate Office is provided by a Ruud "Ruudglas Pacemaker", electric domestic water heater, 50-gallon capacity rated at 4500 Watts input. The water heater is approximately 10 years old and has about 2 years of useful service life remaining.

Cooling System

The Municipal Pool Building is cooled by a 10,000 BTUH window air conditioning unit serving the Gate Office. The cooling unit utilizes R-22 refrigerant and is approximately one (1) year old.

Lighting

Most of the Municipal Pool Building is lit via incandescent Marine (vapor tight) light fixtures, 4 foot long industrial fixtures having two (2) T-12 fluorescent lamps and magnetic ballast, 4 foot long industrial fixtures having one (1) T-8 fluorescent lamps and electronic ballast, 3 foot long industrial fixtures having two (2) T-12 fluorescent lamps and magnetic ballast, 4 foot long industrial fixtures having one (1) T-12 fluorescent lamps and magnetic ballast, and 8 foot industrial fixtures having two (2) T-12 fluorescent lamps and magnetic ballast.

The outdoor light poles at the main pool area are Halogen spot lights and the pole lights near the snack shack are flood lamps.

Pool System

The existing pool pump motor is an original 42 year old spare motor. It has been recently installed and is in good condition. The motor is inefficient compared to new motors today.

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 energy savings. In addition, the list shows the major equipment in the facility and all pertinent information utilized in energy savings calculations. An approximate age was assigned to the equipment if a manufactures date was not shown on the equipment's nameplate. The ASHRAE service life for the equipment along with the remaining useful life is also shown in the Appendix.

Table 4
Existing Equipment Listing

Cooling Equipment							
Description	Qty	Cooling Capacity (Tons)	Cooling Capacity (BTUH)	Fuel Type	Approx. Age (yrs)	ASHRAE Service Life (yrs)	Remaining Life (yrs)
Frigidaire Model FAH106S1T window unit	1	0.83	10,000	ELECTRIC	1	10	9
* - Denotes capacity estimated due to information being unavailable.							

Table 5
Existing Equipment Listing

HEATING EQUIPMENT						
Description	Qty	Rated Capacity(BTUH)	Fuel Type	Approx. Age (yrs)	ASHRAE Service Life (yrs)	Remaining Life (yrs)
N/A	-	-	-	-	-	-
Note: Building does not have heat.						

**Table 6
Existing Equipment Listing**

DOMESTIC WATER HEATING SYSTEM						
Description	Qty	Capacity	Fuel Type	Approx. Age (yrs)	Service Life (yrs)	Remaining Life (yrs)
Ruud Ruudglas Pacemaker M/N PL52-2 Water Heater	1	35 gallon	Electric 4500 Watt Input	10 *	12	2
* - Manufacture date estimated due to information is unavailable.						

Note: Equipment noted as having a negative (#) remaining life is considered past its standard service life as described in 2007 ASHRAE Applications Handbook and is most likely a good candidate for replacement.

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrades

Description – Fluorescent Lighting:

Replacing the 8 foot, two T12 lamp fluorescent fixture with new is a simple change that can provide substantial savings. A typical 8 foot, two T12 lamp fluorescent fixture has a total wattage of about 222 Watts. By replacing with two (2) new 4 foot two lamp fixture that have T8 lamps, reflector and electronic ballasts the total wattage would be reduced to 118 Watts per fixture and the space light levels and light quality would increase by about 15% and 35%, respectively.

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

Energy Savings Calculations:

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

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

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

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

$$\text{Smart Start}^{\circledR} \text{ Incentive} = (13 \times \$ 25) + (0 \times \$ 30) = \$325$$

Maintenance Savings are calculated as follows:

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

$$\text{Maintenance Savings} = (18 \times 33\% \text{ reduction} \times \$ 2.00) = \$11.88$$

Description – Compact Fluorescent:

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 40-Watt incandescent lamp, a 15-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 23-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 your existing fixtures, or hardwired into your existing fixtures. This ECM involves replacing all incandescent lamps in the facility with energy efficient compact fluorescent lamps.

Energy Savings Calculations:

There are nine (9) 60-Watt incandescent lamps in the facility that can be upgraded to 15 Watt CFL units. The average operating hours for these lamps is estimated to be 2600.

Energy cost savings:

$$9 \text{ units} * (60\text{W} - 15\text{W}) * 1339 \text{ hours} * 1 \text{ kW}/1,000 \text{ W} * \$0.199 \text{ kWh}] = \underline{\$108/\text{yr}}$$

The installed cost of three (9) 15-Watt CFL’s is \$45

This ECM shall replace all T12 fixtures throughout the facility with new T8 lay-in type fixtures where there are ceilings and pendant type where it is exposed to structure. This ECM shall replace incandescent lamps with compact fluorescent lamps.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$1,915
NJ Smart Start Equipment Incentive (\$):	(\$325)
Net Installation Cost (\$):	\$1,590
Maintenance Savings (\$ / yr):	\$12
Energy Savings (\$ / yr):	\$492
Total Yearly Savings (\$ / yr):	\$504
Simple Payback (yrs):	3.15
Simple Lifetime ROI (%):	692.5%
Estimated ECM Lifetime (yr):	25
Simple Lifetime Savings (\$):	\$12,600

ECM #2: Interior Lighting Controls

Description:

In some areas the lighting is left on unnecessarily. Many times this is due to the idea 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 found that the best option is to turn the lights off whenever possible. Although this does reduce the lamp life, the energy savings far outweigh the lamp replacement costs. The cutoff for when to turn the lights off is around two minutes. If the lights can be off for only a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is all it would take. 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 of the referenced standard, states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. Concord Engineering group believes this building's occupancy profile and area would provide for a 25% power adjustment factor. CEG typically will recommend the installation of dual technology occupancy sensors in all offices, storage rooms, kitchen, files, electrical room, and rest rooms, etc. In the Municipal Pool Building facility, this would equate to 6 spaces covering approximately 1650 square feet. Site lights can be operated by a photocell which would bring the lights on only when lighting levels are inadequate.

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 F of this report, we calculated the lighting power density (Watts/ft²) of the Gate Office, Life Guard Offices, File Card Offices, Men's Locker/Restroom, Women's Locker/Restroom and Storage room. the facility to be ±0.315 Watts/SF. Twenty-five percent of this value is the resultant energy savings due to installation of occupancy sensors:

$$\text{Savings} = 25\% \times 0.315 \text{ Watts/SF} \times 1,650 \text{ SF} \times 1,339 \text{ hrs/yr} \times 1 \text{ kWh}/1000 \text{ Watts.}$$

$$\text{Savings} = 174 \text{ kWh} \times \$0.199/\text{kWh}$$

$$\text{Savings} = \underline{\$34.63} \text{ per year}$$

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is \$75/unit including material and labor.

The SmartStart Buildings® incentive is \$20 per control which equates to an installed cost of \$55/unit. Total number of spaces to be retrofitted is 6.

Total cost to install sensors is \$55/unit x 6 units = \$330.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$450
NJ Smart Start Equipment Incentive (\$):	(\$120)
Net Installation Cost (\$):	\$330
Maintenance Savings (\$ / yr):	\$0
Energy Savings (\$ / yr):	\$34.63
Total Yearly Savings (\$ / yr):	\$34.63
Simple Payback (yrs):	9.53
Simple Lifetime ROI (%):	57.3%
Estimated ECM Lifetime (yr):	15
Simple Lifetime Savings (\$):	\$519

ECM #3: Install NEMA Premium Efficient Pump Motor

Description:

Replacing the old pool pump motor with new efficient motor is a simple change that can provide substantial savings.

Existing electric motors equal to or greater than one horsepower ranged from 78 to 93% efficient. The improved efficiency of the NEMA premium efficient motors is primarily due to better designs with use of better materials to reduce losses. Surprisingly, the electricity used to power a motor represents 95 % of its total lifetime operating cost. Because many motors operate 40-80 hours per week, even small increases in efficiency can yield substantial energy and dollar savings.

This energy conservation measure would replace all motors equal to or greater than 1 HP with NEMA Premium® Efficient Motors. NEMA Premium® is the most efficient motor designation in the marketplace today. Using MotorMaster+, Version 4, the energy & cost savings were calculated for the fan/pump motors in this facility that are greater than or equal to 1 HP.

Energy Savings Calculations:

Existing: A 20 HP pool pump Motor with the following characteristics:

Existing Motor Efficiency = 78%
 Annual Hours of Operations = 1,339 (Average)
 1 HP = 0.746 Watt
 Load Factor = 75%
 Cost of electricity = \$0.199 / kWh

Existing 20HP Motor Operating Cost =

$\{0.746 \text{ Watt/HP} \times \text{Motor HP} \times \text{Load Factor} \times \text{Hours of Operation} \times \text{Cost of Electricity}\} \div \text{Motor Efficiency}$
 $= [0.746 \times 20 \times 0.75 \times 1,339 \times 0.199] \div 0.78 = \$3823 / \text{Year}$

New NEMA Premium Motor Efficiency = 93%

New NEMA Premium Efficiency Motor Operating Cost =

$\{0.746 \times 20 \times 0.75 \times 1,339 \times 0.199\} \div 0.93 = \$3206 / \text{Year}$

Savings = \$3823 - \$3206 = \$617 / Year

Installed Cost of a 20 HP NEMA Premium® Efficiency Motor = \$3,700 minus the SmartStart Building® incentive of \$113 is \$3,587

Simple Payback = \$3,587 / \$617 = 5.8 Years

kWh saved = \$617 / \$0.199/kWh = 3100.5 kWh

kW saved = 3100.5 kWh / 1339 hrs./yr. = 2.31 kW

The following table outlines the motor replacement plan for this facility:

MOTOR REPLACEMENT PLAN

MOTOR HP	QTY	ENCLOSURE TYPE	NUMBER OF POLES	INSTALLED COST **	TOTAL COST	TOTAL SAVINGS	SIMPLE PAYBACK	SIMPLE RETURN ON INVESTMENT
20	1	ODP	4-Pole	\$3,587	\$3,587	\$617	5.81	17.2 %
Totals:					<i>\$3,587</i>	<i>\$617</i>	<i>5.81</i>	<i>17.2 %</i>

**** Net Cost after the SmartStart Buildings® incentive is applied.**

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$3700
NJ Smart Start Equipment Incentive (\$):	(\$113)
Net Installation Cost (\$):	\$3,587
Maintenance Savings (\$ / yr):	\$0
Energy Savings (\$ / yr):	\$617
Total Yearly Savings (\$ / yr):	\$617
Simple Payback (yrs):	5.81
Simple Lifetime ROI (%):	209.6%
Estimated ECM Lifetime (yr):	18
Simple Lifetime Savings (\$):	\$11,106

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy technologies for Branchburg NJ, 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 335 S.F. can be utilized for a PV system. A depiction of the area utilized is shown in Renewable / Distributed Energy Measures Calculation appendix. Using this square footage it was determined that a system size of 5.29 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 8,255 KWh annually, reducing the overall utility bill by approximately 99.9% percent. A detailed financial analysis can be found in the Renewable / Distributed Energy Measures Calculation appendix. 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.

The solar panel system analysis is based on Sun Power SPR-230 panels. The panel efficiency is 18% with an inverter efficiency of 95%. This region allows for a typical range of sunlight between 4.5 and 4.9 hours per day. The calculations are based on an average 4.68 hours per day. The operating hours are calculated based on 351 days per year accounting for two weeks per year of service down time. The calculations are also based on a solar PV system which utilizes the New Jersey guidelines for net metering. Net metering allows excess energy generated at production peaks to flow onto the grid. The excess energy is metered and subtracted from the facility's total energy usage on an annual basis. Due to this allowance the system design excludes the use of inefficient battery storage.

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 via one of the methods noted in the Installation Funding Options section below. 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	10.5 Years	21.2%
Direct Purchase	10.5 Years	9.0%

The resultant Internal Rate of Return indicates that if the Owner was able to “self-finance” the solar project, the project would be slightly more beneficial to the Owner. However, if the Owner was able to work out a Power Purchase Agreement with a third-party and agree upon a decent base energy rate for kilowatt hour production, the “direct purchase” option could also, prove to be a beneficial route.

In addition to the Solar Analysis, CEG also conducted a review of the applicability of wind energy for the facility. Wind energy production is another option available through the Renewable Energy Incentive Program. Wind turbines of various types 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 Lopatcong Municipal Pool 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. An average of 6 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, Figure 1 included within this report to reference the respective electricity load profile for January 2008 through December 2008.

Electricity:

Section IV, Figure 1 demonstrates a very typical summer air conditioning load profile. The summer (May-September) is a substantial load caused by the electric hot water heating system. The balance of the year is very flat with little to no usage. There is a drop-off in electric use beginning January through April, and October, November and December. Base-load shaping is important because a flat consumption profile will yield more competitive energy prices when procuring energy. This facility is not heated and hot water is supplied through electric hot water heating system.

Natural Gas:

There is no natural gas service at the Municipal Pool.

Tariff Analysis:

Electricity:

This facility receives electrical service through Jersey Central Power & Light (JCP&L) on a GSS (General Service Secondary) rate. Service classification GS is available for general service purposes on secondary voltages not included under Service Classifications RS, RT, RGT or GST. This is a single or three phase service at secondary voltages. For electric supply (generation), the customer will use the utilities Basic Generation Service (BGS) or a Third Party Supplier (TPS). If they use the utility BGS then they will pay according to the BGS default service. The Delivery Service includes the following charges: Customer Charge, Supplemental Customer Charge, Distribution Charge (kW Demand), kWh Charge, Non-utility Generation Charge, TEFA, SBC, SCC, Standby Fee and RGGI

Natural Gas:

There is no natural gas service at the Municipal Pool.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within the Township. CEG's primary observation is seen in the electric costs. The average price per kWh (kilowatt hour) for all buildings based on 1-year historical average price is \$.145/kWh (kWh is the common unit of electric measure). The average price per decatherm for natural gas is \$ 10.5 / 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. The Township could see improvement in its energy costs if it were to take advantage of these current market

prices quickly, before energy increases. Based on annual historical consumption (January through December 2008) and current electric rates, the Township could see an improvement in its electric costs of up to 25% annually. (Note: Savings were calculated using Lopatcong's Average Annual Consumption and a variance to a Fixed Average 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 Lopatcong's natural gas costs. Based on the current market, Lopatcong could improve its natural gas costs up to 25% annually. CEG recommends further advisement on these prices. The Township should also consider procuring energy (natural gas) through alternative supply sources. CEG recommends energy advisory services.

CEG also recommends that the city 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), the city will learn more about the competitive supply process. Lopatcong 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, 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 Lopatcong changes or plans on changing its supplier for energy (natural gas), it needs to closely monitor balancing, particularly when the contract is close to termination. This could be performed with the aid of an "energy advisor".

X. INSTALLATION FUNDING OPTIONS

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

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

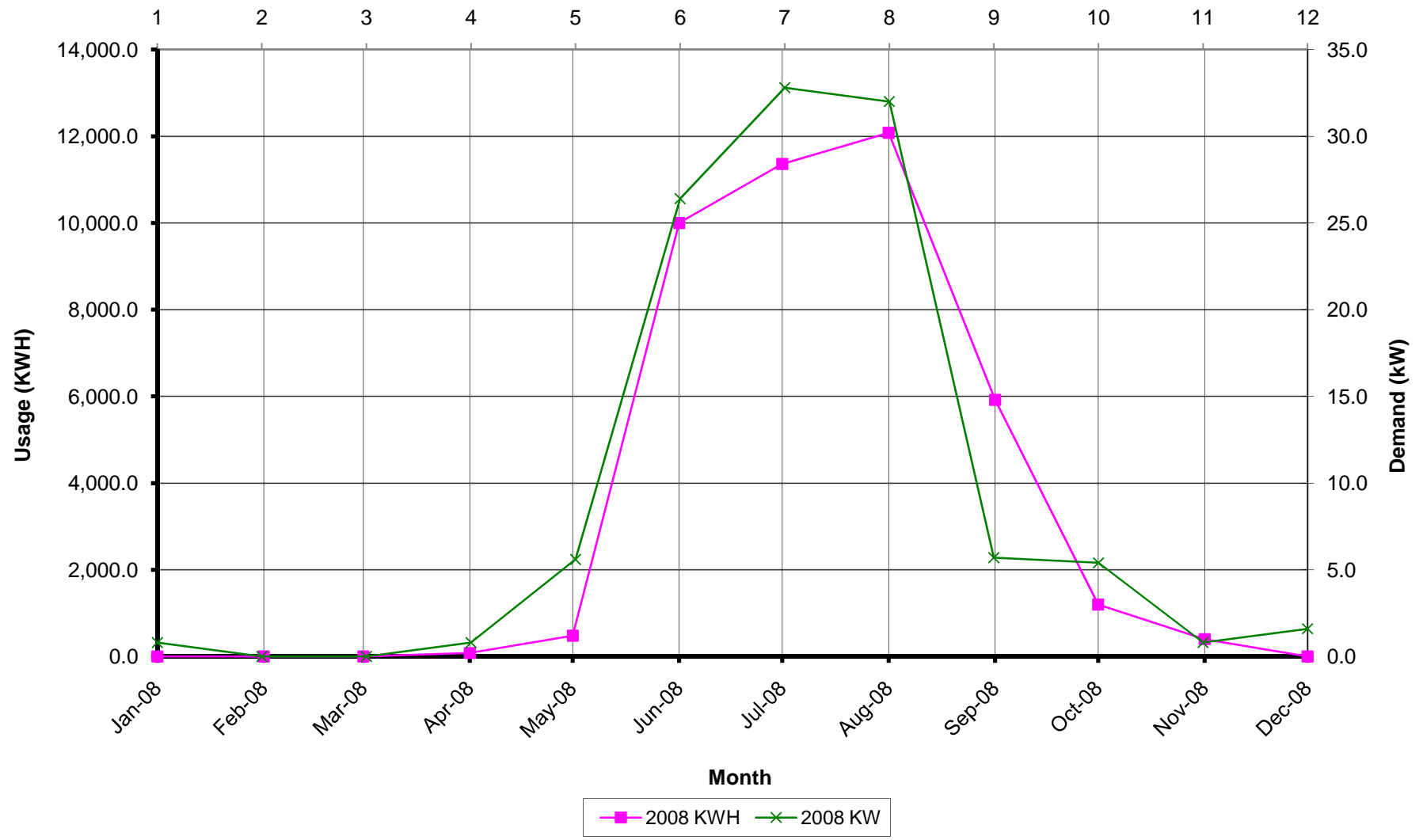
CEG recommends the Owner review the use of the above-listed funding options in addition to utilizing their standard method of financing for facilities upgrades in order to fund the proposed energy conservation measures.

XI. ADDITIONAL RECOMMENDATIONS

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

- A. Maintain all weather stripping on windows and doors.
- B. Clean all light fixtures to maximize light output.

**LOPATCONG MUNICIPAL POOL
Electric Usage Profile
January through December of 2008**



Electric Cost Summary

JCP&L

Belvidere Rd, Phillipsburg NJ, 08865

Project #9C08143

Municipal Pool

2008

Account # 100038232235

Meter # -----

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0
KWH	0.8	0.8	0.0	80	480	10,000	11,360	12,080	5,920	1,200	400	0	41,522
Billed KW	35	35	35	35	35	26	33	32	33	33	33	23	
Actual KW	0.8	0.0	0.0	0.8	5.6	26.4	32.8	32.0	5.7	5.4	0.8	1.6	32.8
Monthly Load Factor	0%	N/A	N/A	14%	12%	53%	47%	51%	144%	30%	69%	0%	42%
Electric Cost, \$	\$ 91	\$ 91	\$ 91	\$ 106	\$ 177	\$ 1,730	\$ 2,046	\$ 2,156	\$ 1,073	\$ 299	\$ 159	\$ 237	\$8,258
\$/KWH	\$114.100	\$114.100	#DIV/0!	\$1.320	\$0.369	\$0.173	\$0.180	\$0.178	\$0.181	\$0.249	\$0.399	#DIV/0!	\$0.199

Max

.-=2007 Utility Data used for December

.- The Municipal Pool's demand is billed based on the peak usage in the year 2007 due to local tariffs.

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-08	0.8	35.2	\$ 91
Feb-08	0.8	35.2	\$ 91
Mar-08	0.0	35.2	\$ 91
Apr-08	80	35.2	\$ 106
May-08	480	35.2	\$ 177
Jun-08	10,000	26.4	\$ 1,730
Jul-08	11,360	32.8	\$ 2,046
Aug-08	12,080	32.0	\$ 2,156
Sep-08	5,920	32.8	\$ 1,073
Oct-08	1,200	32.8	\$ 299
Nov-08	400	32.8	\$ 159
Dec-08	0	22.8	\$ 237
Totals	41,522	35.2 Max	\$8,258
AVERAGE DEMAND 32.4 KW average AVERAGE RATE \$0.199 \$/kWh			

For CEG internal use only

Solar Production 220,021 kWh
% of total 529.90

Pay for Performance: Not Eligible

ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	41,522			141,755	3.340	473,461
NATURAL GAS		0.00		0	1.047	0
FUEL OIL			0.00	0	1.010	0
PROPANE			0.00	0	1.010	0
TOTAL				141,755		473,461
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA	2,730			SQUARE FEET		
BUILDING SITE EUI	51.92			kBtu/SF/YR		
BUILDING SOURCE EUI	173.43			kBtu/SF/YR		

DETAILED COST BREAKDOWN PER ECM

CONCORD ENGINEERING GROUP

Lopatcong Municipal Pool

ECM 1 Lighting Upgrade

	Qty	Unit Cost \$	Material \$	Labor \$	Total \$
Lighting Retrofit	LS	\$1,915	<u>\$0</u>	<u>\$0</u>	<u>\$1,915</u>
Total Cost			\$0	\$0	\$1,915
Utility Incentive - NJ Smart Start (1-2 lamp fixture \$25, 3-4 lamp fixture \$30)					<u>(\$325)</u>
Total Cost Less Incentive					\$1,590

ECM 2 Interior Lighting Controls

	Qty	Unit Cost \$	Material \$	Labor \$	Total \$
Dual - Technology Sensor	6	\$75	<u>\$180</u>	<u>\$270</u>	<u>\$450</u>
Total Cost			\$180	\$270	\$450
Utility Incentive - NJ Smart Start (\$20 per Sensor)					<u>(\$120)</u>
Total Cost Less Incentive					\$330

ECM 3 NEMA Premium Efficient Pump Motor

	Qty	Unit Cost \$	Material \$	Labor \$	Total \$
NEMA Premium Efficient 20 HP Pump Motor	1	\$3,700	<u>\$0</u>	<u>\$0</u>	<u>\$3,700</u>
Total Cost					\$3,700
Smart Start® Incentive (\$113/motor)	1				<u>(\$113)</u>
Total Cost Less Incentive					\$3,587



Concord Engineering Group, Inc.

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

SmartStart Building Incentives

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

Electric Chillers

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

Gas Cooling

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

Desiccant Systems

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

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

Ground Source Heat Pumps

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

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

Variable Frequency Drives

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

Natural Gas Water Heating

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

Premium Motors

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

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



STATEMENT OF ENERGY PERFORMANCE

Lopatcong Municipal Pool

Building ID: 1794405
For 12-month Period Ending: December 31, 2008¹
Date SEP becomes ineligible: N/A

Date SEP Generated: August 10, 2009

Facility
 Lopatcong Municipal Pool
 Belvidere Road
 Phillipsburg, NJ 08865

Facility Owner
 Lopatcong Township
 232 South Third Street
 Phillipsburg, NJ 08865

Primary Contact for this Facility
 Ray Johnson
 520 South Burnt Mill Road
 Voorhees, NJ 08043

Year Built: 1967
Gross Floor Area (ft²): 2,730

Energy Performance Rating² (1-100) N/A

Site Energy Use Summary³

Electricity (kBtu)	141,676
Natural Gas (kBtu) ⁴	0
Total Energy (kBtu)	141,676

Energy Intensity⁵

Site (kBtu/ft ² /yr)	52
Source (kBtu/ft ² /yr)	173

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	24
---	----

Electric Distribution Utility

Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	65
National Average Source EUI	136
% Difference from National Average Source EUI	27%
Building Type	Recreation

Stamp of Certifying Professional

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

Meets Industry Standards⁶ for Indoor Environmental Conditions:

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

Certifying Professional

Ray Johnson
 520 South Burnt Mill Road
 Voorhees, NJ 08043

Notes:

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
Building Name	Lopatcong Municipal Pool	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		<input type="checkbox"/>
Type	Recreation	Is this an accurate description of the space in question?		<input type="checkbox"/>
Location	Belvidere Road, Phillipsburg, NJ 08865	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		<input type="checkbox"/>
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		<input type="checkbox"/>

Pool Building (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
Gross Floor Area	2,730 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		<input type="checkbox"/>
Number of PCs	0 (Optional)	Is this the number of personal computers in the space?		<input type="checkbox"/>
Weekly operating hours	56 Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		<input type="checkbox"/>
Workers on Main Shift	4 (Optional)	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.		<input type="checkbox"/>

Municipal pool (Swimming Pool)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
Pool Size	Short Course (25 yards x 20 yards)	Is this the correct size of the swimming pool?		<input type="checkbox"/>
Indoor Outdoor	Outdoor	Is the pool located inside or outside the building?		<input type="checkbox"/>
Months in Use	05 (Optional)	Is this the total months out of the year that the pool is open for use?		<input type="checkbox"/>

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Jersey Central Power & Lt Co

Fuel Type: Electricity		
Meter: Lopatcong Municipal Pool (kWh (thousand Watt-hours)) Space(s): Entire Facility		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
11/01/2008	11/30/2008	400.00
10/01/2008	10/31/2008	1,200.00
09/01/2008	09/30/2008	5,920.00
08/01/2008	08/31/2008	12,080.00
07/01/2008	07/31/2008	11,360.00
06/01/2008	06/30/2008	10,000.00
05/01/2008	05/31/2008	480.00
04/01/2008	04/30/2008	80.00
03/01/2008	03/31/2008	1.00
02/01/2008	02/29/2008	1.00
01/01/2008	01/31/2008	1.00
Lopatcong Municipal Pool Consumption (kWh (thousand Watt-hours))		41,523.00
Lopatcong Municipal Pool Consumption (kBtu)		141,676.48
Total Electricity Consumption (kBtu)		141,676.48
Is this the total Electricity consumption at this building including all Electricity meters?		<input type="checkbox"/>

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	<input type="checkbox"/>

Certifying Professional

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

Name: _____ Date: _____

Signature: _____
Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility

Lopatcong Municipal Pool
Belvidere Road
Phillipsburg, NJ 08865

Facility Owner

Lopatcong Township
232 South Third Street
Phillipsburg, NJ 08865

Primary Contact for this Facility

Ray Johnson
520 South Burnt Mill Road
Voorhees, NJ 08043

General Information

Lopatcong Municipal Pool	
Gross Floor Area Excluding Parking: (ft ²)	2,730
Year Built	1967
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Pool Building		Municipal pool	
Space Type	Other - Recreation	Space Type	Swimming Pool
Gross Floor Area(ft ²)	2,730	Pool Size	Short Course (25 yards x 20 yards)
Number of PCs ^o	0		Indoor Outdoor
Weekly operating hours ^o	56	Months in Use ^o	05
Workers on Main Shift ^o	4		

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 12/31/2008)	Baseline (Ending Date 11/30/2008)	Rating of 75	Target	National Average
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft ²)	52	53	22	N/A	65
Source (kBtu/ft ²)	173	177	74	N/A	136
Energy Cost					
\$/year	\$ 8,069.88	\$ 8,256.00	\$ 3,422.31	N/A	\$ 10,106.79
\$/ft ² /year	\$ 2.96	\$ 3.02	\$ 1.26	N/A	\$ 3.71
Greenhouse Gas Emissions					
MtCO ₂ e/year	24	22	10	N/A	30
kgCO ₂ e/ft ² /year	9	8	4	N/A	11

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

Notes:

o - This attribute is optional.

d - A default value has been supplied by Portfolio Manager.

INVESTMENT GRADE LIGHTNG AUDIT

CONCORD ENGINEERING GROUP

Lopatcong Municipal Pool

CEG Job #: 9C09056
 Project: Lopatcong Energy Audit
 Address: Belvidere Road
 Phillipsburg, NJ 08865
 Building SF: 2,730

DATE: 08/10/2009
 KWH COST: \$0.199

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING							SAVINGS					
Line No.	CEG Type	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
1	B	GATE OFFICE	1	4' - 2 lamp T-12	1339	84	0.08	112.455	\$22.38	1	2'x4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	61	0.061	81.66375	\$16.25	\$120.00	\$120.00	0.02	30.79125	\$6.13	19.58	
2	D	TROPHY CASES	1	4' - 1-Lamp 32W T-8 Industrial Strip, No Lens w/ Elect Ballast	1339	28	0.03	37.485	\$7.46		No Change Required.		0	0	\$0.00		\$0.00	0.00	0	\$0.00	0.00	
3	E	LIFE GUARD OFFICES	1	3' - 2 Lamp T-12, No Lens, Magnetic Ballast	1339	79	0.08	105.76125	\$21.05	1	3' - 2-Lamp 25W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF225	53	0.053	70.95375	\$14.12	\$150.00	\$150.00	0.03	34.8075	\$6.93	21.66	
4	F	FILE CARD OFFICE	1	4' - 1 lamp T-12, No Lens, Magnetic Ballast	1339	57	0.06	76.30875	\$15.19	1	4' - 1-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF132	28	0.028	37.485	\$7.46	\$140.00	\$140.00	0.03	38.82375	\$7.73	18.12	
5	F	SNACK AREA	6	4' - 1 lamp T-12, No Lens, Magnetic Ballast	1339	57	0.34	457.8525	\$91.11	6	4' - 1-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF132	28	0.168	224.91	\$44.76	\$140.00	\$840.00	0.17	232.9425	\$46.36	18.12	
6	G	SNACK STAND	3	8' 2 Lamp T-12 HO, No lens, Magnetic Ballast 96W	1339	222	0.67	891.6075	\$177.43	3	8' 2-Lamp T-8 Cooper Metalux, Electronic Ballast M/N 8TDIM-232-UNV-EB81-U	118	0.354	473.9175	\$94.31	\$207.00	\$621.00	0.31	417.69	\$83.12	7.47	
7	H	LIGHT POLES	6	Flood Light, 150 W	100	150	0.90	90	\$17.91		No Change Required.		0	0	\$0.00		\$0.00	0.00	0	\$0.00	0.00	
8	I		14	Halogen Pole Light, 150 W Cooper	100	150	2.10	210	\$41.79		No Change Required.		0	0	\$0.00		\$0.00	0.00	0	\$0.00	0.00	
9	A	MEN'S LOCKER / RESTROOM	2	Marine - Vapor Tight - Incandescent 60 W	1339	60	0.12	160.65	\$31.97	2	Eiko-15w mini sprial	15	0.03	40.1625	\$15.98	\$4.92	\$9.84	0.09	120.4875	\$47.95	0.21	
10	A	HALL - MEN'S LOCKER	4	Marine - Vapor Tight - Incandescent 60 W	1339	60	0.24	321.3	\$63.94	4	Eiko-15w mini sprial	15	0.06	80.325	\$7.99	\$4.92	\$19.68	0.18	240.975	\$23.98	0.82	
11	A	WOMAN'S LOCKER / RESTROOM	2	Marine - Vapor Tight - Incandescent 60 W	1339	60	0.12	160.65	\$31.97	2	Eiko-15w mini sprial	15	0.03	40.1625	\$4.00	\$4.92	\$9.84	0.09	120.4875	\$11.99	0.82	
12	A	STORAGE	1	Marine - Vapor Tight - Incandescent 60 W	1339	60	0.06	80.325	\$15.98	1	Eiko-15w mini sprial	15	0.015	20.08125	\$212.86	\$4.92	\$4.92	0.05	60.24375	\$258.15	0.02	
Totals			42				4.796	2704.395	538.174605	21			0.799	1069.6613	417.73284		1915.28	0.969	1297.24875	492.32799	3.89	

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

INVESTMENT GRADE LIGHTNG AUDIT

CONCORD ENGINEERING GROUP

Lopatcong Municipal Pool

CEG Job #: 9C09056
 Project: Lopatcong Energy Audit
 Address: Belvidere Road
 Phillipsburg, NJ 08865
 Building SF: 2,730

DATE: 08/10/2009
 KWH COST: **\$0.199**

ECM #2: Lighting Control

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	CEG Type	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback
1	B	GATE OFFICE	1	4' - 2 lamp T-12	1339	84	0.08	112.455	\$22.38	1	2'x4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	61	0.061	81.66375	\$16.25	\$120.00	\$120.00	0.02	30.79125	\$6.13	19.58
2	E	LIFE GUARD OFFICES	1	3' - 2 Lamp T-12, No Lens, Magnetic Ballast	1339	79	0.08	105.76125	\$21.05	1	3' - 2-Lamp 25W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF225	53	0.053	70.95375	\$14.12	\$150.00	\$150.00	0.03	34.8075	\$6.93	21.66
3	F	FILE CARD OFFICE	1	4' - 1 lamp T-12, No Lens, Magnetic Ballast	1339	57	0.06	76.30875	\$15.19	1	4' - 1-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF132	28	0.028	37.485	\$7.46	\$140.00	\$140.00	0.03	38.82375	\$7.73	18.12
#REF!	A	MEN'S LOCKER / RESTROOM	2	Marine - Vapor Tight - Incadescent 60 W	1339	60	0.12	160.65	\$31.97	2	Eiko-15w mini sprial	15	0.03	40.1625	\$7.99	\$4.92	\$9.84	0.09	120.4875	\$23.98	0.41
#REF!	A	WOMAN'S LOCKER / RESTROOM	2	Marine - Vapor Tight - Incadescent 60 W	1339	60	0.12	160.65	\$31.97	2	Eiko-15w mini sprial	15	0.03	40.1625	\$4.00	\$4.92	\$9.84	0.09	120.4875	\$11.99	0.82
#REF!	A	STORAGE	1	Marine - Vapor Tight - Incadescent 60 W	1339	60	0.06	80.325	\$15.98	1	Eiko-15w mini sprial	15	0.015	20.08125	\$57.81	\$4.92	\$4.92	0.05	60.24375	\$80.72	0.06
Totals			8				0.52	696.15	138.53385	8			0.217	290.50875	\$107.63		\$434.60	0.303	405.64125	\$137.47	3.16

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

Room Sensor 0.25 x 696.15 = 174
 174 x \$0.199 = \$34.63

Project Name: LGEA Solar PV Project - Lopatcong Municipal Pool										
Location: Phillipsburg, NJ										
Description: Photovoltaic System 95% Financing - 20 year										
Simple Payback Analysis										
	Photovoltaic System 95% Financing - 20 year									
Total Construction Cost	\$47,610									
Annual kWh Production	8,255									
Annual Energy Cost Reduction	\$1,643									
Annual SREC Revenue	\$2,889									
First Cost Premium	\$47,610									
Simple Payback:	10.50 Years									
Life Cycle Cost Analysis										
Analysis Period (years):	25						Financing %:			95%
Financing Term (mths):	240						Maintenance Escalation Rate:			3.0%
Average Energy Cost (\$/kWh):	\$0.199						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	\$2,381	0	0	0	\$0	0	0	(2,381)	0	
1	\$0	8,255	\$1,643	\$0	\$2,889	\$3,132	\$1,076	\$324	(\$2,056)	
2	\$0	8,214	\$1,692	\$0	\$2,875	\$3,054	\$1,154	\$359	(\$1,697)	
3	\$0	8,173	\$1,743	\$0	\$2,861	\$2,971	\$1,237	\$395	(\$1,302)	
4	\$0	8,132	\$1,795	\$0	\$2,846	\$2,881	\$1,327	\$433	(\$868)	
5	\$0	8,091	\$1,849	\$83	\$2,832	\$2,785	\$1,423	\$390	(\$479)	
6	\$0	8,051	\$1,904	\$83	\$2,818	\$2,683	\$1,525	\$431	(\$47)	
7	\$0	8,011	\$1,962	\$83	\$2,804	\$2,572	\$1,636	\$475	\$427	
8	\$0	7,971	\$2,020	\$82	\$2,790	\$2,454	\$1,754	\$520	\$948	
9	\$0	7,931	\$2,081	\$82	\$2,776	\$2,327	\$1,881	\$567	\$1,515	
10	\$0	7,891	\$2,143	\$81	\$2,762	\$2,191	\$2,017	\$616	\$2,131	
11	\$0	7,852	\$2,208	\$81	\$2,748	\$2,046	\$2,162	\$667	\$2,798	
12	\$0	7,812	\$2,274	\$80	\$2,734	\$1,889	\$2,319	\$720	\$3,518	
13	\$0	7,773	\$2,342	\$80	\$2,721	\$1,722	\$2,486	\$775	\$4,293	
14	\$0	7,735	\$2,413	\$80	\$2,707	\$1,542	\$2,666	\$832	\$5,125	
15	\$0	7,696	\$2,485	\$79	\$2,694	\$1,349	\$2,859	\$891	\$6,016	
16	\$0	7,657	\$2,559	\$79	\$2,680	\$1,143	\$3,065	\$953	\$6,969	
17	\$0	7,619	\$2,636	\$78	\$2,667	\$921	\$3,287	\$1,016	\$7,985	
18	\$0	7,581	\$2,715	\$78	\$2,653	\$683	\$3,525	\$1,083	\$9,068	
19	\$0	7,543	\$2,797	\$78	\$2,640	\$429	\$3,779	\$1,151	\$10,219	
20	\$0	7,505	\$2,881	\$77	\$2,627	\$155	\$4,053	\$1,222	\$11,441	
21	\$0	7,468	\$2,967	\$77	\$2,614	\$132	\$3,726	\$1,647	\$13,088	
22	\$0	7,430	\$3,056	\$77	\$2,601	\$90	\$3,066	\$2,424	\$15,512	
23	\$0	7,393	\$3,148	\$76	\$2,588	\$0	\$0	\$5,659	\$21,171	
24	\$0	7,356	\$3,242	\$76	\$2,575	\$0	\$0	\$5,741	\$26,912	
25	\$0	7,320	\$3,339	\$75	\$2,562	\$0	\$0	\$5,826	\$32,738	
Totals:	157,494	157,494	\$44,143	\$1,285	\$55,123	\$38,930	\$45,229	\$52,021	\$175,422	
Net Present Value (NPV)							\$7,204			
Internal Rate of Return (IRR)							21.2%			

Project Name: LGEA Solar PV Project - Lopatcong Municipal Pool							
Location: Phillipsburg, NJ							
Description: Photovoltaic System - Direct Purchase							
Simple Payback Analysis							
	Photovoltaic System - Direct Purchase						
Total Construction Cost	\$47,610						
Annual kWh Production	8,255						
Annual Energy Cost Reduction	\$1,643						
Annual SREC Revenue	\$2,889						
First Cost Premium	\$47,610						
Simple Payback:	10.50						Years
Life Cycle Cost Analysis							
Analysis Period (years):	25			Financing %:	0%		
Financing Term (mths):	0			Maintenance Escalation Rate:	3.0%		
Average Energy Cost (\$/kWh)	\$0.199			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	\$47,610	0	0	0	\$0	(47,610)	0
1	\$0	8,255	\$1,643	\$0	\$2,889	\$4,532	(\$43,078)
2	\$0	8,214	\$1,692	\$0	\$2,875	\$4,567	(\$38,511)
3	\$0	8,173	\$1,743	\$0	\$2,861	\$4,603	(\$33,907)
4	\$0	8,132	\$1,795	\$0	\$2,846	\$4,641	(\$29,266)
5	\$0	8,091	\$1,849	\$83	\$2,832	\$4,598	(\$24,668)
6	\$0	8,051	\$1,904	\$83	\$2,818	\$4,639	(\$20,029)
7	\$0	8,011	\$1,962	\$83	\$2,804	\$4,683	(\$15,346)
8	\$0	7,971	\$2,020	\$82	\$2,790	\$4,728	(\$10,618)
9	\$0	7,931	\$2,081	\$82	\$2,776	\$4,775	(\$5,843)
10	\$0	7,891	\$2,143	\$81	\$2,762	\$4,824	(\$1,019)
11	\$0	7,852	\$2,208	\$81	\$2,748	\$4,875	\$3,856
12	\$0	7,812	\$2,274	\$80	\$2,734	\$4,928	\$8,784
13	\$0	7,773	\$2,342	\$80	\$2,721	\$4,983	\$13,767
14	\$0	7,735	\$2,413	\$80	\$2,707	\$5,040	\$18,807
15	\$0	7,696	\$2,485	\$79	\$2,694	\$5,099	\$23,906
16	\$0	7,657	\$2,559	\$79	\$2,680	\$5,161	\$29,067
17	\$0	7,619	\$2,636	\$78	\$2,667	\$5,224	\$34,291
18	\$0	7,581	\$2,715	\$78	\$2,653	\$5,291	\$39,581
19	\$0	7,543	\$2,797	\$78	\$2,640	\$5,359	\$44,941
20	\$0	7,505	\$2,881	\$77	\$2,627	\$5,430	\$50,371
21	\$1	7,468	\$2,967	\$77	\$2,614	\$5,504	\$55,875
22	\$2	7,430	\$3,056	\$77	\$2,601	\$5,580	\$61,455
23	\$3	7,393	\$3,148	\$76	\$2,588	\$5,659	\$67,114
24	\$4	7,356	\$3,242	\$76	\$2,575	\$5,741	\$72,855
25	\$5	7,320	\$3,339	\$75	\$2,562	\$5,826	\$78,681
Totals:		157,494	\$44,143	\$1,285	\$55,123	\$126,291	\$97,981
Net Present Value (NPV)						\$78,706	
Internal Rate of Return (IRR)						9.0%	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Pool Building	335	Sunpower SPR230	23	14.7	338	5.29	8,255	759	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.
2. Solar Generation shall be shut down when building is not in use and would be accomplished by throwing the circuit breaker disconnect switch.