LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR: **BOROUGH OF AVALON**
COMMUNITY CENTER
2900 AVALON AVENUE
AVALON, NJ 08202
ATTN: MR. JEFF HESLEY
TOWNSHIP ADMINISTRATOR

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

CEG CONTACT: SAM DORIA
DIRECTOR, CX AND ENERGY AUDITS
EMAIL: SDORIA@CEG-INC.NET

REPORT ISSUANCE: FINAL , JULY 29, 2010

PROJECT NO: 9C09187

TABLE OF CONTENTS

REPORT DISCLAIMER

The information contained within this report, including any attachment(s), is intended solely for use by the named addressee(s). If you are not the intended recipient, or a person designated as responsible for delivering such messages to the intended recipient, you are not authorized to disclose, copy, distribute or retain this report, in whole or in part, without written authorization from Concord Engineering Group, Inc., 520 S. Burnt Mill Road, Voorhees, NJ 08043.

This report may contain proprietary, confidential or privileged information. If you have received this report in error, please notify the sender immediately. Thank you for your anticipated cooperation.

I. EXECUTIVE SUMMARY

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

Borough of Avalon
Community Center
2900 Avalon Avenue
Avalon, NJ 08202

Municipal Contact Person: Jeff Hesley, Municipal Green Team Liaison
Facility Contact Person: Dave Haberle, Recreation Director

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

The annual energy costs at this facility are as follows:

Electricity	$ 43,190
Natural Gas	$ 5,764
Total	$ 48,954

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

Table 1
Financial Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	HID Lighting Upgrades	$5,310	$993	5.3	180.6%
ECM #2	Interior T-12 Lighting Upgrade	$2,630	$1,038	2.5	492.0%
ECM #3	LED Exit Signs	$270	$211	1.3	1072.8%
ECM #4	Interior Incandescent Lighting Upgrade	$380	$480	0.8	1796.1%
ECM #5	Occupancy Sensors	$660	$130	5.1	195.8%
ECM #6	Water Conservation Opportunities	$992	$201	4.9	102.6%
ECM #7	Install High Efficiency Low-E Windows	$35,000	$2,757	12.7	96.9%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	43.7 KW PV System	$393,300	$26,479	14.9	68.3%
REM #2	4.2 KW Rooftop Wind Generation System	$41,313	$1,469	28.1	-46.7%

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

Table 2
Estimated Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	HID Lighting Upgrades	1.26	6,804	0
ECM #2	Interior T-12 Lighting Upgrade	1.58	7,109	0
ECM #3	LED Exit Signs	0.09	788	0
ECM #4	Interior Incandescent Lighting Upgrade	1.55	3,290	0
ECM #5	Occupancy Sensors	12.92	892	0
ECM #6	Water Conservation Opportunities	0.00	610	0
ECM #7	Install High Efficiency Low-E Windows	0.00	7,855	953
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	43.7 KW PV System	0.00	53,386	0
REM #2	4.2 KW Rooftop Wind Generation System	0.00	6,994	0

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

- **ECM #1:** HID Lighting Upgrades

- **ECM #2:** Interior T-12 Lighting Upgrade
- **ECM #3:** New LED Exit Signs
- **ECM #4:** Interior Incandescent Lighting Upgrade
- **ECM #5:** Occupancy Sensors
- **ECM #6:** Low Flow High Performance Sink Aerators

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

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

Renewable Energy Measures (REMs) were also reviewed for implementation at the Avalon Community Center. CEG utilized a roof mounted solar array to house a substantial PV system. The recommended 12.19 kW PV system will produce approximately 14,892 kWh of electricity annually and will reduce the schools electrical consumption from the grid by 4.7%. The system's calculated simple payback of 14.85 years is past the standard 10 year simple payback threshold; however, with alternative funding this payback could be lessened. CEG recommends the Owner review all funding options before deciding to not implement this renewable energy measure.

Overall, after reviewing the utility information, existing building documentation and performing the detailed site inspections, there are several energy savings opportunities in lighting, lighting controls and water conservation measures at the Community Center. In addition, a review of the renewable energy conservation recommendation should be completed as well as investigating the available funding through the New Jersey Clean Energy Programs.

II. INTRODUCTION

The comprehensive energy audit covers the 12,176 square foot Community Center, which includes a gym, recreation office, dressing rooms, storage room, kitchen/serving area, and restrooms. This recreational facility is used by the entire community 12 to 14 hours per day on weekdays and weekends.

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

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

Existing building architectural and engineering drawings (where available) are utilized for additional background information. The building envelope, lighting systems, HVAC equipment, and controls information gathered from building drawings allow for a more accurate and detailed review of the building. The information is compared to the energy usage profiles developed from utility data. Through the review of the architectural and engineering drawings a building profile can be defined that documents building age, type, usage, major energy consuming equipment or systems, etc. The preliminary audit information is gathered in preparation for the site survey. The site survey provides critical information in deciphering where energy is spent and opportunities exist within a facility. The entire site is surveyed to inventory the following to gain an understanding of how each facility operates:

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

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

III. METHOD OF ANALYSIS

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

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

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

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

ECM Calculation Equations:

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

$$Simple\ Lifetime\ Savings = \left(Yearly\ Savings \times ECM\ Lifetime \right)$$

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

$$Lifetime\ Ma\,\mathrm{int}\,enance\ Savings = \left(Yearly\ Ma\,\mathrm{int}\,enance\ Savings \times ECM\ Lifetime \right)$$

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

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

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

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

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

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

In the first half of 2009, the facility was heated by a temporary unit since the two (2) gas-fired rooftop units had failed. Fuel usage data for this temporary unit was not available. The gas usage profile shows the actual natural gas energy usage for the facility. South Jersey Gas Company provides natural gas to the facility under the Basic General Supply Service (GSG) rate structure. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

The overall cost for utilities is calculated by dividing the total cost by the total usage. Based on the utility history provided, the average cost for utilities at this facility is as follows:

Description	Average
Electricity	14.6¢ / kWh
Natural Gas	$1.69 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Atlantic City Electric
Rate: AGS
Meter No:
Customer ID No:
Third Party Utility
TPS Meter / Acct No:

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-09	46,560	66.8	$5,694
Feb-09	51,000	98.8	$6,508
Mar-09	31,960	98.4	$4,315
Apr-09	16,720	53.1	$2,312
May-09	11,400	54.0	$1,789
Jun-09	19,840	65.6	$3,403
Jul-09	26,440	55.6	$4,302
Aug-09	26,840	63.2	$4,396
Sep-09	23,440	68.4	$4,001
Oct-09	12,600	60.0	$2,048
Nov-09	10,400	52.5	$1,749
Dec-09	17,760	61.6	$2,674
Totals	**294,960**	**98.8 Max**	**$43,190**

AVERAGE DEMAND 66.5 KW average

AVERAGE RATE $0.146 $/kWh

Figure 1
Electricity Usage Profile

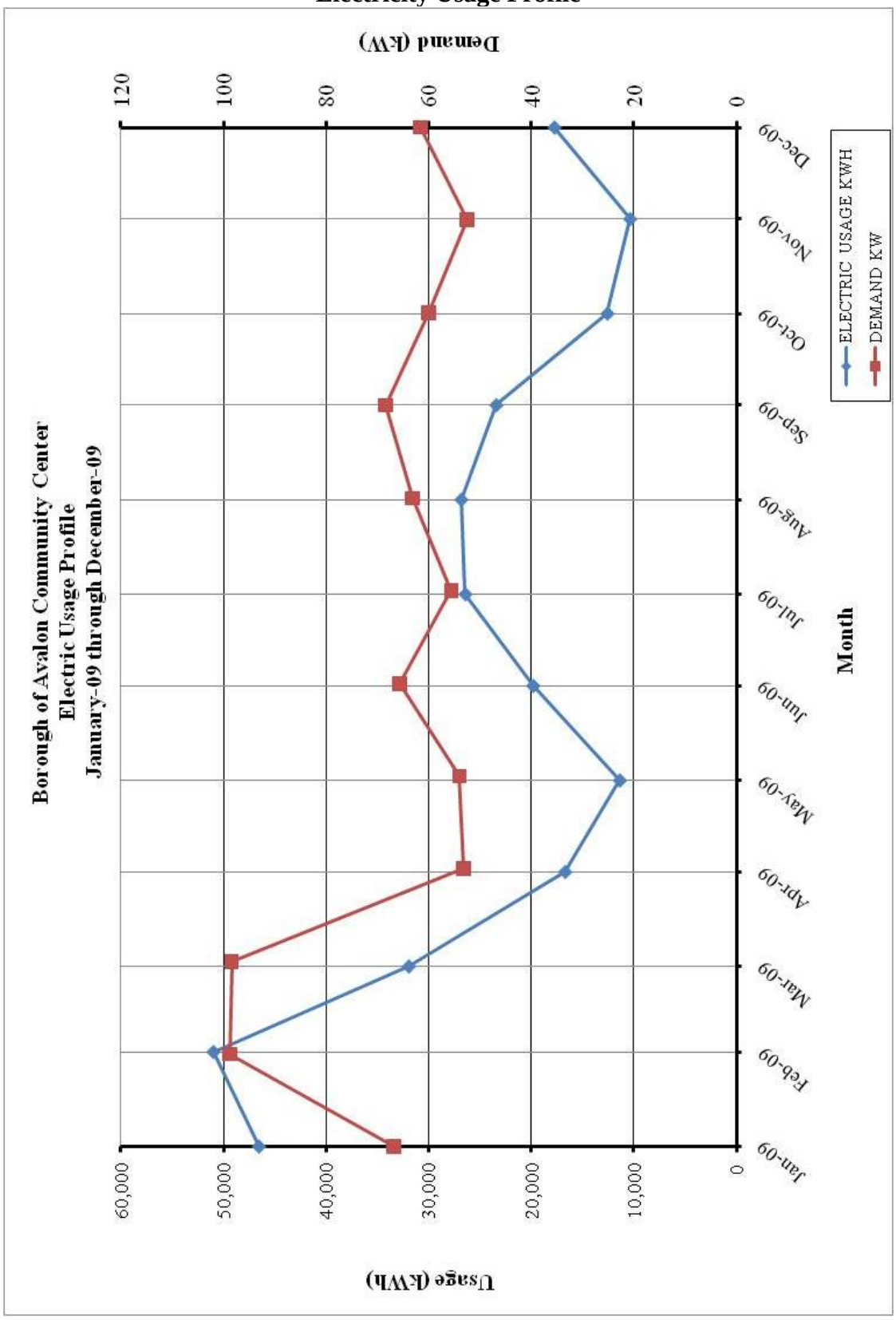
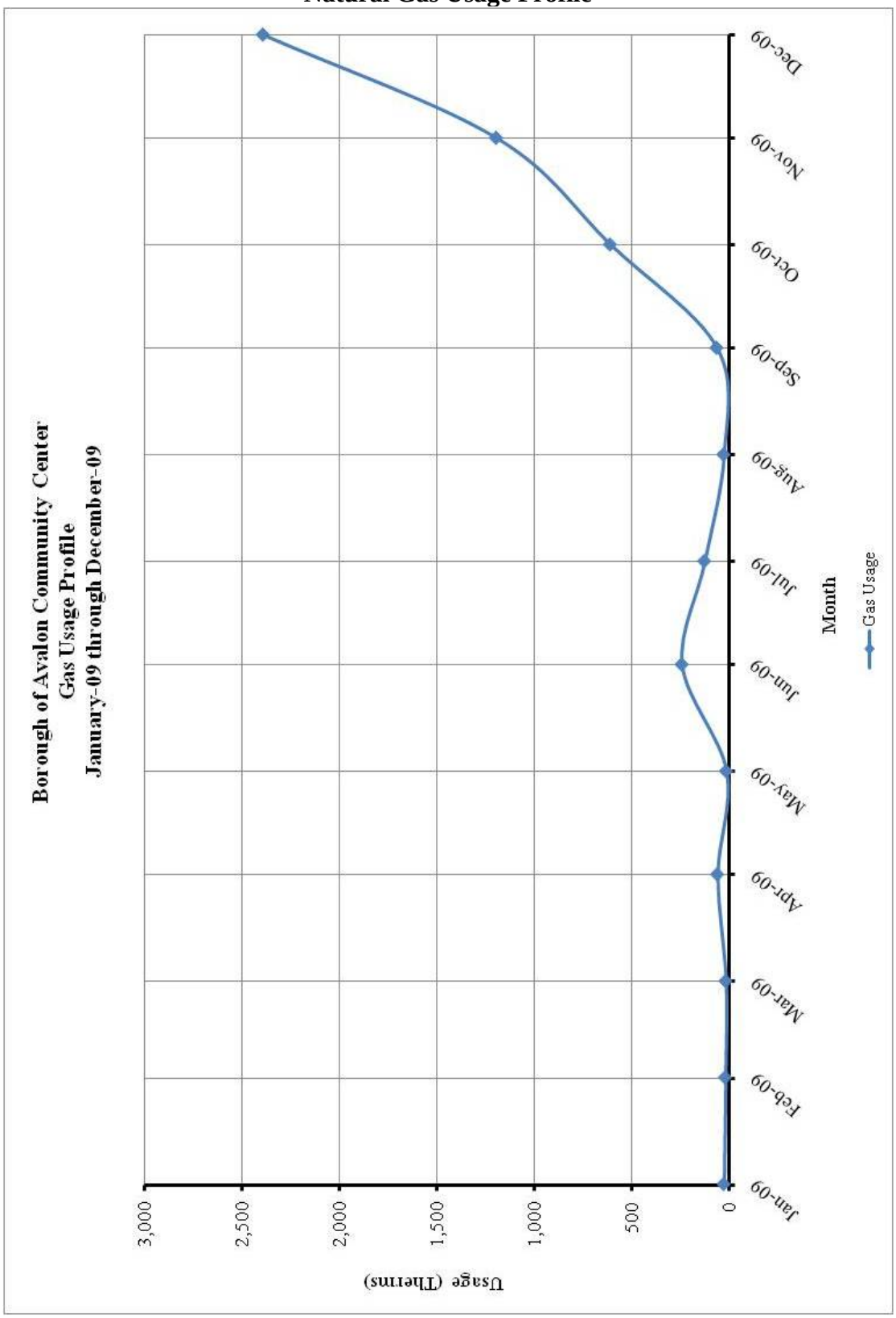


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	South Jersey Gas	
Rate:	GSG	
Meter No:	219734	
Point of Delivery ID:		
Third Party Utility Provider:	Woodruff Energy	
TPS Meter No:		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Jan-09	26.83	$64.23
Feb-09	19.59	$49.68
Mar-09	17.56	$46.54
Apr-09	60.03	$115.80
May-09	14.49	$41.69
Jun-09	242.52	$414.76
Jul-09	126.33	$288.43
Aug-09	28.00	$61.53
Sep-09	63.49	$125.48
Oct-09	609.88	$1,018.52
Nov-09	1,194.40	$1,968.67
Dec-09	2,390.86	$3,925.73
TOTALS	**4,793.98**	**$8,121.06**
AVERAGE RATE:	**$1.69**	**$/THERM**

NOTE: For the first five (5) months of 2009, the facility was heated by a temporary unit since the gas-fired rooftop units had failed. The fuel usage data for this temporary unit was not available. Gas consumption for the first five (5) months above is for the kitchen gas-fired hot water heater only.

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

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

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

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

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

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

Table 5
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	**BUILDING USE**			**SITE ENERGY**	**SITE-SOURCE RATIO**	**SOURCE ENERGY**
	kWh	**Therms**	**Gallons**	**kBtu**		**kBtu**
ELECTRIC	294960.0			1,006,993	3.340	3,363,358
NATURAL GAS		2310.9		231,089	1.047	241,950
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				1,238,082		3,605,308
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		12,176	SQUARE FEET			
BUILDING SITE EUI		*101.68*	kBtu/SF/YR			
BUILDING SOURCE EUI		*296.10*	kBtu/SF/YR			

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 218% higher than the baseline data. This is due in a large part to the 12-14 hours this facility is used during the weekdays and weekends by the entire community.

C. EPA Energy Benchmarking System

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

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

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

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

User Name: avalonboro
Password: lgeaceg2009

Security Question: What city were you born in?
Security Answer: "avalon"

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

Table 6
ENERGY STAR Performance Rating

ENERGY STAR PERFORMANCE RATING		
FACILITY DESCRIPTION	**ENERGY PERFORMANCE RATING**	**NATIONAL AVERAGE**
Community Center	N/A	N/A

The Avalon Community Center falls under the "other" category which is not applicable for Energy Performance Rating. See the **Statement of Energy Performance Appendix** for the detailed energy summary.

V. FACILITY DESCRIPTION

The 12,176 SF Community Center is a single story facility comprised of a gym, recreation office, locker rooms, storage room, kitchen/serving area, and restrooms. The typical hours of operation for this facility are between 8:00 am and 10:00 pm for both weekdays and weekends. Exterior walls are brick construction with minimum insulation typical of the time period. The amount of insulation within the wall is unknown. The windows throughout the facility are in poor condition. Typical windows throughout the facility are single pane, ¼" clear glass with aluminum frames. The roof is constructed of a built-up roof, 2-ply, and is where all rooftop HVAC equipment is located. The building was built in 1965 with no additions since the original construction.

HVAC Systems

The two (2) 20-Ton rooftop gas-fired heating and DX cooling units that serve the gym/stage area were replaced in the spring of 2009 along with the respective exhaust fans that are interlocked with the units. The supply air fans on these rooftop units are equipped with variable speed drives. The recreation office, kitchen, sales area, restrooms, gym perimeter, locker rooms, storage, and entrance vestibules are all heated with electric cabinet heaters. The kitchen is cooled by a 12,000 BTUH window unit.

Exhaust System

Air is exhausted from the toilet rooms and gym through the roof exhausters. The kitchen hood is exhausted by a Captive Aire unit on the roof.

HVAC System Controls

The HVAC rooftop units are controlled by Honeywell standalone programmable thermostats.

Domestic Hot Water

Domestic hot water for the showers, restrooms and sinks is provided by an electric water heater with a 65-gallon capacity. Domestic hot water for the kitchen is a gas-fired unit with a 40-gallon capacity.

Lighting

The gym has thirty (30) 175-Watt metal halide fixtures while the stage has 100-Watt incandescent and 34-Watt T-12 fixtures. The office, kitchen, storage, restrooms, main entrance, etc. have 34-Watt T-12 fixtures. Exit signs are lit by two (2) 10-watt incandescent lamps.

VI. MAJOR EQUIPMENT LIST

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

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: HID Lighting Upgrades

Description:

For indoor spaces with high ceilings, the Illuminating Engineering Society of North America (IESNA) categorizes spaces as either hi-bay (>25 ft.) or lo-bay (< 25 ft.). The gym is lit by thirty (30) 175-Watt, 2x2, Metal Halide (MH) fixtures. These conventional lo-bay fixtures have poor lumen maintenance, color shifts, noisy ballasts, and require up to 10 minutes to re-strike the lamps after shutdown. The new generation of lo-bay fixtures use Super T-8 lamps with electronic ballasts. Compared to metal-halide systems, T8s offer better lighting quality due to a higher color-rendering index, better light distribution, and lumen maintenance. The metal halide systems have a steep lumen depreciation rate – a 25% to 35% reduction in lighting output at 40% of the rated lamp life. The lumen depreciation becomes even greater as the lamp approaches the end of its life with losses of 60% being quite common. The Super T-8 lamp will only lose about 5% of its initial lumens.

This ECM would replace all Metal Halide (MH) Lo-Bay fixtures with a system consisting of six 3,100-lumen Super T8 lamps operating on 1.18 BF ballasts producing 21,950 initial lumens.

The basis of design is the GE-132-MAX-L/Ultra Instant Start Low Power system with 168 input watts or equal.

Energy Savings Calculations:

Refer to the **Investment Grade Lighting Audit Appendix** for a detailed energy savings calculation for the replacement of the MH system with the T-8 system.

From the **NJ Smart Start Appendix**, the replacement of a 175-Watt HID fixture with a T-8 fixture warrants a $43 incentive per fixture.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,600
NJ Smart Start Equipment Incentive ($):	$1,290
Net Installation Cost ($):	$5,310
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$993
Total Yearly Savings ($/Yr):	$993
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.3
Simple Lifetime ROI	180.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$14,901
Internal Rate of Return (IRR)	17%
Net Present Value (NPV)	$6,548.91

ECM #2: Interior T-12 Lighting Upgrades

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 conventional drop-ceiling lay in fixture with four, 4-foot lamps (34 Watt lamps with magnetic ballast) has a total wattage of 144 Watts per fixture. By using the improved lamps and ballasts, the total wattage would be reduced to 86 Watts. The light levels would increase by about 15% and the light quality would increase by 35%.

Typically, T-8 lamps can fit into the existing fixtures with minimal fixture modifications. The lamps are 1" in diameter instead of the 1.5' diameter of the existing T-12 lamps. (The number after the "T" indicates the diameter in 8ths of an inch. Hence, T-8=8/8 or 1", while T-12=12/8 or 1.5".) The reduced surface area allows the use of more costly inside coatings (phosphors). The improved phosphors provide a greatly improved color rendering index (CRI). A T-12 typically has a CRI of about 55. A typical T-8 has a CRI of about 75.

Magnetic ballasts are replaced with electronic ballasts which also fit into the existing fixtures with minimal fixture modifications. Magnetic ballasts increase the energy usage of the lighting system due to their operating characteristics. An electronic ballast reduces energy usage of the lighting system. In addition, a single electronic ballast can operate up to four lamps in a fixture. Magnetic ballasts can only operate up to two lamps. The electronic ballasts could reduce the amount of ballasts in your facility by half. This is accomplished by "tandem wiring" of ballasts. Rather than using one electronic ballast for every one fixture, one ballast may be used for two or more fixtures. The electrician wires a single ballast to operate the lamps in adjacent light fixtures which further reduces the number of ballasts needed.

This ECM includes retrofitting each of the existing T-12 fluorescent lamp and magnetic ballast fixtures with F32T8 lamps and high-power electronic ballasts. High efficiency electronic ballasts reduce overall wattage while maintaining the existing lumen levels of the offices and shops. The average hours of operation for this facility are 5,400 hours per year. The replacement lamps are based on General Electric Super T8 lamps and the replacement ballast is GE-432-MAX-N/Ultra Instant Start Low Power Ballast.

Energy Savings Calculations:

Refer to the **Investment Grade Lighting Audit Appendix** for a detailed energy savings calculation for retrofit of T-12 fixtures to T-8 lamps and electronic ballasts.

From the **NJ Smart Start Appendix**, the retrofit of T-12 fixtures to T-8 with electronic ballasts warrants a $15 incentive per fixture.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,080
NJ Smart Start Equipment Incentive ($):	$450
Net Installation Cost ($):	$2,630
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,038
Total Yearly Savings ($/Yr):	$1,038
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.5
Simple Lifetime ROI	492.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$15,570
Internal Rate of Return (IRR)	39%
Net Present Value (NPV)	$9,761.22

ECM #3: LED Exit Signs

Description:

The six (6) existing exit signs are lit by two (2) 10-watt incandescent lamps with a total fixture input of 20 Watts. These exit signs should be replaced with more energy efficient LED units. LED is an acronym for light-emitting-diode. LED's are small light sources that are readily associated with electronic equipment. LED exit signs have been manufactured in a variety of shapes and sizes. The benefits of LED technology are substantial. LED exit signs will last for 20-30 years without maintenance. This results in tremendous maintenance savings considering that the incandescent lamps in the existing fixtures need to be replaced at a rate of 1-5 times per year. Lamp costs ($2 each) and labor costs ($12 per lamp) add up rapidly. Additionally, a LED exit sign total fixture input is only 5 Watts.

This ECM will replace the six (6) existing exit signs with new LED exit fixtures. The basis of design is the Progress Lighting PE001 LED Exit Sign or equal. The included battery provides 1-1/2 hours of emergency power. The maintenance savings for this ECM are as follows: 12 lamps x $2/lamp + 6 units x $12/ unit for labor = $96.

Energy Savings Calculations:

Refer to the **Investment Grade Lighting Audit Appendix** for a detailed energy savings calculation for the replacement of the existing CFL exit signs with LED units.

From the **NJ Smart Start Appendix**, the replacement of an existing exit sign fixture with a new LED fixture warrants a $20 incentive per fixture.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$390
NJ Smart Start Equipment Incentive ($):	$120
Net Installation Cost ($):	$270
Maintenance Savings ($/Yr):	$96
Energy Savings ($/Yr):	$115
Total Yearly Savings ($/Yr):	$211
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.3
Simple Lifetime ROI	1072.8%
Simple Lifetime Maintenance Savings	$1,440
Simple Lifetime Savings	$3,167
Internal Rate of Return (IRR)	78%
Net Present Value (NPV)	$2,250.22

ECM #4: Interior Incandescent Lighting Upgrades

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 26-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.

Energy Savings Calculations:

Refer to the **Investment Grade Lighting Audit Appendix** for a detailed energy savings calculation for the replacement of the incandescent lamps with compact fluorescent lamps.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$380
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$380
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$480
Total Yearly Savings ($/Yr):	$480
Estimated ECM Lifetime (Yr):	15
Simple Payback	0.8
Simple Lifetime ROI	1796.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$7,205
Internal Rate of Return (IRR)	126%
Net Present Value (NPV)	$5,354.39

ECM #5: Occupancy Sensors

Description:

A common occurrence in many facilities is lighting fixtures being 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. To better control lighting according to occupancy and reduce lighting energy consumption, CEG recommends installing occupancy sensors. Private offices, file rooms, conference rooms, etc. are good candidates for wall-mounted or ceiling mounted occupancy sensors. Dual technology sensors (ultrasonic and infrared) detect human motion and presence to ensure proper activation of lights. The basis of calculation is the SensorSwitch Model WSD wall switch and Model CS ceiling switch or equivalent.

Energy Savings Calculations:

To determine an estimated savings for lighting controls, CEG 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 all private offices, conference rooms, small-sized mechanical rooms, storage rooms, data rooms, file rooms, etc. This energy conservation measure can be applied to four (4) rooms throughout the facility which amounts to approximately 800 square feet of space. From the lighting survey for this site, CEG calculated the lighting power density (Watts/ft^2) of the existing facility to be 1.06 Watts/SF. Ten percent of this value is the resultant energy savings due to installation of the occupancy sensors:

10% x .135 Watts/SF x 12,176 SF x 5,400 hrs/yr. = 891 kWh/year

Annual Energy Savings = 891 kWh/yr. x $0.146/kWh = $130 / yr

The installed cost of each type of occupancy sensor including rewiring, relays, J-Boxes, sensors, power packs, on/off photocells, inhibit photocells, etc. is as follows:

Wall Switches	$160/Unit x 2Units = $ 320
Ceiling Mounted Sensors	$240/Unit x 2Units = $ 480
	TOTAL COST = $ 800

From the **NJ Smart Start Appendix**, the installation of Occupancy Sensor Remote Mounted (OSR) lighting controls warrants a $35 incentive per control.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$800
NJ Smart Start Equipment Incentive ($):	$140
Net Installation Cost ($):	$660
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$130
Total Yearly Savings ($/Yr):	$130
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.1
Simple Lifetime ROI	195.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,952
Internal Rate of Return (IRR)	18%
Net Present Value (NPV)	$893.84

ECM #6: Water Conservation Opportunities

Description:

Water conservation is defined as any action that reduces the amount of water withdrawn from water supply sources, reduces consumptive use, reduces the loss or waste of water, improves the efficiency of water use, increases recycling and reuse of water, or prevents the pollution of water. Conversely, water waste is the excessive use of potable water that is unproductive or does not reasonably sustain economic benefits or life forms, particularly where there is a shortage of potable water.

A conventional showerhead is rated to use 3 to 5 gallons per minute at normal water pressure, about 60 psi. A 5-minute shower with a conventional showerhead typically consumes 15 to 25 gallons of water. High quality replacement showerheads that deliver 1 to 2.5 gallons per minute can save many gallons per shower. Products vary in price from $10 to $50.

Faucets for restrooms, kitchen, and workroom sinks vary in flow rates. Restroom sinks need no more than 1.5 gallons per minute and kitchen sinks need about 2.5 gallons per minute while workroom sinks may include automated controls and pre-mixed temperatures. Toilets and urinals account for almost half of a typical building's water consumption. According to the Plumbing Foundation, replacing all existing toilets with 1.6 gallons per flush, ultra-low flow models and urinals with 1.0 gallons per flush models would save almost 5,000 gallons of water per person each year.

Toilets and urinals can be retrofitted with electronic controls. Potential water savings are greater with retrofits because current fixtures generally do not meet the latest water conservation standards. Electronic controls for plumbing fixtures usually function by transmitting a continuous beam of infrared (IR) light. With toilets and urinals, the flush is actuated when the user moves away and the IR beam is no longer blocked. With toilets and urinals, some of the water savings may be attributable to reduced incidence of intentional multiple-flushing – a common practice with toilets and urinals.

This ECM would only install low flow high performance sink aerators. The other ECMs discussed above were investigated but the payback periods were longer than 10 years and therefore would not benefit the Owner.

Water Savings Calculations:

The water savings for the faucets, showerheads and urinals were calculated by using the U. S. Department of Energy Federal Energy Management Program (FEMP) energy cost calculators for faucets, showerheads and urinals. Additional information on the referenced calculators can be found at www1.eere.energy.gov/femp/technologies. The toilet water savings were calculated using the Sloan water savings calculator. Water and sewer rates obtained from the borough are as follows:

Water: $2.051/1,000 gallons + **Sewer**: $3.351/1,000 gallons = **Total**: $5.40/1,000 gallons

Summary of these water savings for the Community Center are as follows:

Plumbing Fixture	# of Units	Water Cost Savings	Installed Cost	Payback(Yrs.)
Faucet	2	$132	$76	0.57
Toilet	2	$69	$420	6.1
	Totals:	$201	$496	3.3 Avg.

The basis of calculation for the low flow high performance sink aerator is the UtilitySavers™ high performance Spray Stream.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$992
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$992
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$201
Total Yearly Savings ($/Yr):	$201
Estimated ECM Lifetime (Yr):	10
Simple Payback	4.9
Simple Lifetime ROI	102.6%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$2,010
Internal Rate of Return (IRR)	15%
Net Present Value (NPV)	$722.57

* ECM Calculations encompass savings for all plumbing fixtures but CEG recommends the implementation of high performance sink aerators and high performance toilets **only**. This is because the faucet and toilet replacement have low payback periods of .57 and 6.1 years, respectively. The payback period for the remaining plumbing fixture exceeds 10 years when implemented on a singular basis making it an unfavorable choice for replacement.

ECM #7: Install High-Efficiency Low-E Windows

Description:

The entrance, gym and office windows have single-pane, un-insulated windows with aluminum frames which allow heat losses and gains resulting in cooler interior surfaces during the heating season and warmer interior surfaces during the cooling season. In addition, these windows are a source of cold air leakage into the room and often result in condensation-related problems when this cold air contacts warmer surfaces.

High-performance, Low-E windows can provide many benefits including:

- Improved comfort by reducing radiant heat exchange
- Improved indoor air quality by reducing air leakage that can bring dirt, dust, and other impurities into the building
- Lower utility bills since these windows are better insulated and more air-tight
- Fewer condensation problems since these windows stay warmer in the heating season resulting in drier windows
- Reduced wear on furnishings, carpeting, window treatments, etc. since low-e coatings block up to 98 % of the ultraviolet radiation of the sun.

This energy conservation measure would replace these single-pane windows with high performance, low-e window units. CEG measured the Community Hall windows and obtained 280 SF of window area to be retrofitted. The installed cost of these windows is estimated at $125 per square foot x 280 SF = $35,000 (Installation budget cost obtained from a window contractor including rental of a high lift for one week).

Energy Savings Calculations:

Heating Degree Days (HDD) = 4,806°F – day/yr. (Atlantic City Airport Weather Data)

Cooling Degree Days (CDD) = 1,354°F – day/yr. (Atlantic City Airport Weather Data)

Total window area to be retrofitted = 280 SF

Uexist. = 0.87 Btu/hr – ft^2 - °F (Single-Pane Un-insulated Glass with Aluminum Frame)

CEG would recommend replacement of the existing single-pane, un-insulated windows with a commercial window system that meets or exceeds the following performance characteristics: U-Factor = 0.28, Solar Heat Gain Coefficient = 0.21 and Visible Transmittance = 0.49.

Unew = 0.28 Btu/hr – ft^2 - °F (Low-E Insulated Glass with Thermal Break)

<u>Annual Energy Savings (Heating)</u> =

12 hrs * Window Area * (Uexist-Unew) * HDD

= 12 * 280 * (0.87-0.28) * 4,806 = 95.27 MMBTU = 952.7 Therms

Energy Savings = 952.7 Therms x $1.69 = $1,610

Annual Energy Savings (Cooling) =

12 hrs * Window Area * (Uexist-Unew) * CDD Day

= 12 * 280 * (0.87-0.28) * 1,354 = 26.8 MMBTU x 293.1 kWh / MMBTU = 7,855 kWh

Energy Savings = 7,855 kWh x $0.146/kWh = $1,147

Total energy savings for this ECM = $1,610 + $1,147 = $2,757

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$35,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$35,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,757
Total Yearly Savings ($/Yr):	$2,757
Estimated ECM Lifetime (Yr):	25
Simple Payback	12.7
Simple Lifetime ROI	96.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$68,925
Internal Rate of Return (IRR)	6%
Net Present Value (NPV)	$13,008.05

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 measures (REM) for the municipality utilizing renewable technologies and concluded that there is potential for solar energy generation. The solar photovoltaic system calculation summary will be concluded as **REM#1** within this report.

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 3,100 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 43.7 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 53,386 KWh annually, reducing the overall utility bill by approximately 18% 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 proposed photovoltaic array layout is designed based on the specifications for the Sun Power SPR-230 panel. This panel has a "DC" rated full load output of 230 watts, and has a total panel conversion efficiency of 18%. Although panels rated at higher wattages are available through Sun Power and other various manufacturers, in general most manufacturers who produce commercially available solar panels produce a similar panel in the 200 to 250 watt range. This provides more manufacturer options to the public entity if they wish to pursue the proposed solar recommendation without losing significant system capacity.

The array system capacity was sized on available roof space on the existing facility. Estimated solar array generation was then calculated based on the National Renewable Energy Laboratory

PVWatts Version 1.0 Calculator. In order to calculate the array generation an appropriate location with solar data on file must be selected. In addition the system DC rated kilowatt (kW) capacity must be inputted, a DC to AC de-rate factor, panel tilt angle, and array azimuth angle. The DC to AC de-rate factor is based on the panel nameplate DC rating, inverter and transformer efficiencies (95%), mismatch factor (98%), diodes and connections (100%), dc and ac wiring(98%, 99%), soiling, (95%), system availability (95%), shading (if applicable), and age(new/100%). The overall DC to AC de-rate factor has been calculated at an overall rating of 81%. The PVWatts Calculator program then calculates estimated system generation based on average monthly solar irradiance and user provided inputs. The monthly energy generation and offset electric costs from the PVWatts calculator is shown in the **Renewable/Distributed Energy Measures Calculation Appendix**.

The proposed solar array is qualified by the New Jersey Board of Public Utilities Net Metering Guidelines as a Class I Renewable Energy Source. These guidelines allow onsite customer generation using renewable energy sources such as solar and wind with a capacity of 2 megawatts (MW) or less. This limits a customer system design capacity to being a net user and not a net generator of electricity on an annual basis. Although these guidelines state that if a customer does net generate (produce more electricity than they use), the customer will be credited those kilowatt-hours generated to be carried over for future usage on a month to month basis. Then, on an annual basis if the customer is a net generator the customer will then be compensated by the utility the average annual PJM Grid LMP price per kilowatt-hour for the over generation. Due to the aforementioned legislation, the customer is at limited risk if they generate more than they use at times throughout the year. With the inefficiency of today's energy storage systems, such as batteries, the added cost of storage systems is not warranted and was not considered in the proposed design.

Direct purchase involves the Borough paying for 100% of the total project cost upfront. Calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following is the payback period:

Table 7
Financial Summary – Photovoltaic System

FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM			
PAYMENT TYPE	**SIMPLE PAYBACK**	**SIMPLE ROI**	**INTERNAL RATE OF RETURN**
Direct Purchase	14.85 Years	68.3%	5.0%

*The solar energy measure is shown for reference in the executive summary Renewable Energy Measure (REM) table

Given the large amount of capital required by the Borough to invest in a solar system through a Direct Purchase CEG does not recommend the Borough pursue this route. It would be more advantageous for the Borough to solicit Power Purchase Agreement (PPA) Providers who will own, operate, and maintain the system for a period of 15 years. During this time the PPA

Provider would sell all of the electric generated by Solar Arrays to the Borough at a reduced rate compared to their existing electric rate.

Wind Generation

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. Based on CEG's review of the applicability of wind energy for the facility; with an average annual wind speed of 6.99 meters per second, it is sufficient enough to reach the cut in speed for most commercial sized wind turbines of 3.5 meters per second. Through the use of roof mounted Tangarie Gale Vertical Axis Wind Turbine the Community Center would be able to produce approximately 6,994 kWh for just one turbine. Although the power generation from one turbine is acceptable, the turbine itself is not cost effective, being priced at around $70,000 installed for just one turbine. In addition to the overwhelming price, space requirements force the Community Center to be a candidate for a roof mounted system. Based on our calculations the following is the payback period:

Table 8
Financial Summary – Wind Turbine System

REM #2 - WIND TURBINES	
Installation Cost ($):	$70,744
NJ Smart Start Equipment Incentive ($):	$29,431
Net Installation Cost ($):	$41,313
REC Revenue ($/Yr):	$230
Energy Savings ($/Yr):	$1,239
Total Yearly Savings ($/Yr):	$1,469
Estimated ECM Lifetime (Yr):	15
Simple Payback	28.13
Lifetime Energy Savings	$22,032

For further wind analysis refer to the **Wind Analysis Calculation Appendix.**

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 the Electric and Natural Gas Usage Profiles included within this report to reference the respective electricity and natural gas usage load profiles.

Electricity:

The Electric Usage Profile for the Community Center is fairly constant throughout the months of April through January with some fluctuation in consumption (kWh). The points along this profile that should be further studied by the Owner for correctness and reason are the peak of demand and consumption in February. Typically the reason for such a peak would be extended operating hours for lighting and HVAC equipment that contains electric resistance heating.

Natural Gas:

The Natural Gas Usage Profile for the Community Center is irregular. This is due to the minimum consumption in the major heating months (Jan through March) and the increase in consumption occurring only in the months of October through December. This should be reviewed by the Owner and compared with current usage for this calendar year. The main heating equipment throughout the various parts of the Community Center is a mix of gas-fired and electric resistance HVAC equipment so the issue could be malfunctioning of the original rooftop units that fed the Gym/Stage area that were note operating until Spring of 2009.

Tariff Analysis:

Electricity:

This facility receives electrical Delivery Service from Atlantic City Electric on an AGS Secondary (Annual General Service) utility rate. The AGS rate is available at any point of Company's system where facilities of adequate character and capacity exist for the entire electric service requirements of any customer contracting for annual service delivered at one point and metered at or compensated to the voltage of delivery. This delivery service includes the following charges: Delivery Service Charges, Distribution Demand Charges, Reactive Demand Charges, Distribution Rates, Non-Utility Generation Charges, Societal Benefits Charges, Regulatory Assets Recovery Charges, Transition Bond Charges, Market Transition Charge Tax, Transmission Demand Charge, Regional Greenhouse Gas Initiative Recovery Charge, and Infrastructure Investment Surcharge.

Natural Gas:

This facility has natural gas serviced by South Jersey Gas Company (SJG) on its firm delivery rate, General Service Gas (GSG) from the utility and BGSS (Basic Generation Supply Service) commodity when not being served by a Third Party Supplier (TPS). This Delivery Rate has the following charges: Customer Charge, Delivery Charge, BSC Volume Charge and Commodity Charge under this rate structure. The BGSS Supply rates are designed to recover SJG's cost of gas applicable to customers who purchase gas from SJG. The company earns no profit from BGSS. BGSS consists of two (2) pricing mechanisms: Residential and Commercial customers that use less than 5,000 therms annually and Commercial and Industrial customers that consume at least 5,000 therms annually.

Imbalances occur when Third Party Suppliers (TPS) are used to supply natural gas and full-delivery is not made, and when a new supplier is contracted or the customer returns to the utility. Note: It is important when utilizing a Third Party Supplier, that an experienced regional supplier is used otherwise, imbalances can occur, jeopardizing economics and scheduling. If the supplier does not deliver they can be placed on a very costly rate. A customer can automatically be put on an alternative supply rate by the utility.

A "firm account" refers to the type of interstate pipeline service that the utility has subscribed for and delivered on behalf of the customer. Much like the telecom industry, the pipeline space (capacity) has been deregulated. The pipeline capacity is broken down into reliability of service. "Firm service" is the highest level of reliability and is the last, in pecking order, for interruption.

Recommendations:

CEG recommends a global approach that will be consistent with the facilities operated by the Borough of Avalon with their own electrical and natural gas service. This applies to the Community Center, Public Safety Building and the Public Works facilities as included within the scope of this project. The basic recommendation is to aggregate all energy loads of the facilities with single services (electric and natural gas) and procure energy for the commodity side of these utilities utilizing a "managed approach" through an energy procurement specialist. CEG's observations are seen in both the electric and natural gas costs for the noted facilities. The average "price to compare" per kWh (kilowatt hour) for all buildings is $.152 / kWh (kWh is the common unit of electric measure). The average "price to compare" per deca-therm for natural gas is $16.28 /dth (dth is the common unit of measure). These Weighted Average Prices are as supplied via current Borough of Avalon utility suppliers.

Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. The Borough of Avalon could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on the study period's historical consumption and current electric rates, the BOE could see an improvement of up to 15 % or up to $9,903 in its electric costs annually. (Note: Savings were calculated using an Average Annual Consumption of 622,360 kWh and an Average fixed one-year commodity contract). CEG recommends aggregating the entire electric load to gain the most

optimal energy costs. CEG recommends that the Borough of Avalon seek an energy advisor to maximize energy savings and to apply a "managed approach" to procuring energy.

CEG's secondary recommendation coincides with the Borough of Avalon's natural gas costs. Based on the current market, (which is very competitive), the Borough of Avalon could see a savings of over 20% or up to $7,142 annually in its natural gas expenditures. Again, CEG recommends the use of any energy advisor to review alternative energy sourcing strategies and to install a "managed approach" to energy procurement.

CEG also recommends that the Borough of Avalon review their current energy purchasing strategies in order to create a future plan for purchasing. This plan should utilize, as noted above, a "managed approach." The "managed approach" will take into account creating an "energy budget" that is in line with the Borough of Avalon's budget year and risk tolerance. Risk tolerance is the appetite that a customer has for risk. Based on the reduced state and local government budgets and the general aversion for risk, the local government is required to manage this risk. The Borough of Avalon should utilize a consultant familiar with energy purchasing and contracts to ensure "best practice" is utilized when joining into a fixed term pricing contract for commodity. Typical contracts last for one to two years and are a fixed-term commitment.

Finally, CEG recommends the Borough of Avalon 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), they will learn more about the competitive supply process. They 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 is given to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, the Borough of Avalon 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. It is pertinent to note, that if the Borough of Avalon decides to enter into a commodity contract and frequently changes its suppliers, balancing of the current account should be closely monitored so that overages do not appear when the contract is close to termination.

X. INSTALLATION FUNDING OPTIONS

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

i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and 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.

iv. *Pay For Performance* – The New Jersey Smart Start Pay for Performance program includes incentives based on savings resulted from implemented ECMs. The program is available for all buildings that were audited as part of the NJ Clean Energy's Local Government Energy Audit Program. The facility's participation in the program is assisted by an approved program partner. An "Energy Reduction Plan" is created with the facility and approved partner to shown at least 15% reduction in the building's current energy use. Multiple energy conservation measures implemented together are applicable toward the total savings of at least 15%. No more than 50% of the total energy savings can result from lighting upgrades / changes.

Total incentive is capped at 50% of the project cost. The program savings is broken down into three benchmarks; Energy Reduction Plan, Project Implementation, and Measurement and Verification. Each step provides additional incentives as the energy reduction project continues. The benchmark incentives are as follows:

1. *Energy Reduction Plan* – Upon completion of an energy reduction plan by an approved program partner, the incentive will grant $0.10 per square foot between $5,000 and $50,000, and not to exceed 50% of the facility's annual energy expense. (Benchmark #1 is not provided in addition to the local government energy audit program incentive.)

2. *Project Implementation* – Upon installation of the recommended measures along with the "Substantial Completion Construction Report," the incentive will grant savings per KWH or Therm based on the program's rates. Minimum saving must be 15%. (Example $0.11 / kWh for 15% savings, $0.12/ kWh for 17% savings, … and $1.10 / Therm for 15% savings, $1.20 / Therm for 17% saving, …) Increased incentives result from projected savings above 15%.

3. *Measurement and Verification* – Upon verification 12 months after implementation of all recommended measures, that actual savings have been achieved, based on a completed verification report, the incentive will grant additional savings per kWh or Therm based on the program's rates. Minimum savings must be 15%. (Example $0.07 / kWh for 15% savings, $0.08/ kWh for 17% savings, … and $0.70 / Therm for 15% savings, $0.80 / Therm for 17% saving, …) Increased incentives result from verified savings above 15%.

v. *Direct Install Program* – The New Jersey Clean Energy's Direct Install Program is a state funded program that targets small commercial and industrial facilities with peak demand of less than 200 kW. This turnkey program is aimed at providing owners a seamless, comprehensive process for analysis, equipment replacement and financial incentives to reduce consumption, lower utility costs and improve profitability. The program covers up to 80% of the cost for eligible upgrades including lighting, lighting controls, refrigeration, HVAC, motors, variable speed drives, natural gas and food service. Participating contractors (refer to www.njcleanenergy.com) conduct energy assessments in addition to your standard local government energy audit and install the cost-effective measures.

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

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. Clean all light fixtures to maximize light output.

D. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

E. Confirm that outside air economizers on the rooftop units are functioning properly to take advantage of free cooling and avoid excess outside air during occupied periods.

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Borough of Avalon - Community Center

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM #1	HID Lighting Upgrades	$6,600	$0	$1,290	$5,310	$993	$0	$993	15	$14,901	$0	180.6%	5.3	16.91%	$6,548.91
ECM #2	Interior T-12 Lighting Upgrade	$3,080	$0	$450	$2,630	$1,038	$0	$1,038	15	$15,570	$0	492.0%	2.5	39.19%	$9,761.22
ECM #3	LED Exit Signs	$390	$0	$120	$270	$115	$96	$211	15	$3,167	$1,440	1072.8%	1.3	78.18%	$2,250.22
ECM #4	Interior Incandescent Lighting Upgrade	$380	$0	$0	$380	$480	$0	$480	15	$7,205	$0	1796.1%	0.8	126.41%	$5,354.39
ECM #5	Occupancy Sensors	$800	$0	$140	$660	$130	$0	$130	15	$1,952	$0	195.8%	5.1	18.09%	$893.84
ECM #6	Water Conservation Opportunities	$992	$0	$0	$992	$201	$0	$201	10	$2,010	$0	102.6%	4.9	15.44%	$722.57
ECM #7	Install High Efficiency Low-E Windows	$35,000	$0	$0	$35,000	$2,757	$0	$2,757	25	$68,925	$0	96.9%	12.7	6.07%	$13,008.05
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	43.7 KW PV System	$393,300	$0	$0	$393,300	$7,794	$18,685	$26,479	25	$661,975	$467,125	68.3%	14.9	4.48%	$67,782.74
REM #2	4.2 KW Rooftop Wind Generation System	$70,744	$0	$29,431	$41,313	$1,239	$230	$1,469	15	$22,035	$3,450	-46.7%	28.1	-6.99%	($23,776.17)

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

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

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

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Cooling

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

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

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

Energy Efficiency must comply with ASHRAE 90.1-2004

Ground Source Heat Pumps

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

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Heating

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

Variable Frequency Drives

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

Natural Gas Water Heating

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

Premium Motors

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

Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	$15 per fixture (1-4 lamps)
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
Hard-Wired Compact Fluorescent	$25 - $30 per fixture
Metal Halide w/Pulse Start	$25 per fixture
LED Exit Signs	$10 - $20 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $284 per fixture
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture
HID ≥ 100w Replacement with new HID ≥ 100w	$70 per fixture
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$42 per 5 foot $65 per 6 foot

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

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

Other Equipment Incentives

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

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Community Center

Building ID: 2241130
For 12-month Period Ending: December 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: April 07, 2010

Facility
Community Center
2900 Avalon Ave.
Avalon, NJ 08202

Facility Owner
Borough of Avalon
3100 Dune Drive
Avalon, NJ 08202

Primary Contact for this Facility
Jeffrey Hesley
3100 Dune Drive
Avalon, NJ 08202

Year Built: 1965
Gross Floor Area (ft²): 12,176

Energy Performance Rating[2] (1-100) N/A

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	1,006,404
Natural Gas (kBtu)[4]	231,089
Total Energy (kBtu)	1,237,493

Energy Intensity[5]

Site (kBtu/ft²/yr)	102
Source (kBtu/ft²/yr)	296

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	166

Electric Distribution Utility
Pepco - Atlantic City Electric Co

National Average Comparison

National Average Site EUI	65
National Average Source EUI	136
% Difference from National Average Source EUI	118%
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 Standards[6] **for Indoor Environmental Conditions:**

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

Certifying Professional
Michael Fischette
520 South Burnt Mill Road
Voorhees, NJ 08043

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

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) 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	Community Center	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Recreation	Is this an accurate description of the space in question?		☐
Location	2900 Avalon Ave., Avalon, NJ 08202	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		☐
Community Center (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	12,176 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.		☐
Number of PCs	5(Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	40Hours(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.		☐
Workers on Main Shift	10(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.		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

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

Fuel Type: Electricity

Meter: Electricity (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/01/2009	12/31/2009	17,760.00
11/01/2009	11/30/2009	10,400.00
10/01/2009	10/31/2009	12,600.00
09/01/2009	09/30/2009	23,440.00
08/01/2009	08/31/2009	26,840.00
07/01/2009	07/31/2009	26,440.00
06/01/2009	06/30/2009	19,840.00
05/01/2009	05/31/2009	11,400.00
04/01/2009	04/30/2009	16,720.00
03/01/2009	03/31/2009	31,960.00
02/01/2009	02/28/2009	51,000.00
01/01/2009	01/31/2009	46,560.00
Electricity Consumption (kWh (thousand Watt-hours))		**294,960.00**
Electricity Consumption (kBtu (thousand Btu))		**1,006,403.52**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**1,006,403.52**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Gas (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
12/01/2009	12/31/2009	1,082.28
11/01/2009	11/30/2009	548.17
10/01/2009	10/31/2009	293.20
09/01/2009	09/30/2009	46.97
08/01/2009	08/31/2009	29.84
07/01/2009	07/31/2009	126.33
06/01/2009	06/30/2009	139.69
05/01/2009	05/31/2009	44.41
04/01/2009	04/30/2009	0.00
03/01/2009	03/31/2009	0.00

02/01/2009	02/28/2009	0.00
01/01/2009	01/31/2009	0.00
Gas Consumption (therms)		**2,310.89**
Gas Consumption (kBtu (thousand Btu))		**231,089.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**231,089.00**
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? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same as the 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
Community Center
2900 Avalon Ave.
Avalon, NJ 08202

Facility Owner
Borough of Avalon
3100 Dune Drive
Avalon, NJ 08202

Primary Contact for this Facility
Jeffrey Hesley
3100 Dune Drive
Avalon, NJ 08202

General Information

Community Center	
Gross Floor Area Excluding Parking: (ft^2)	12,176
Year Built	1965
For 12-month Evaluation Period Ending Date:	December 31, 2009

Facility Space Use Summary

Community Center	
Space Type	Other - Recreation
Gross Floor Area(ft^2)	12,176
Number of PCs[o]	5
Weekly operating hours[o]	40
Workers on Main Shift[o]	10

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2009)	**Baseline** (Ending Date 12/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft^2)	102	102	0	N/A	65
Source (kBtu/ft^2)	296	296	0	N/A	136
Energy Cost					
$/year	$ 48,954.94	$ 48,954.94	N/A	N/A	$ 31,310.35
$/$ft^2$/year	$ 4.02	$ 4.02	N/A	N/A	$ 2.57
Greenhouse Gas Emissions					
$MtCO_2e$/year	166	166	0	N/A	106
$kgCO_2e/ft^2$/year	14	14	0	N/A	9

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.

MAJOR EQUIPMENT LIST

Concord Engineering Group
COMMUNITY CENTER

Rooftop Gas-Fired/DX Unit	
Tag	**AC-1**
Unit Type	Rooftop
Qty	2
Location	Roof
Area Served	Gym/Stage
Manufacturer	Aaon
Model #	RN-020-8-A-EA-19-389
Cooling Capacity	20-Ton
Cooling Efficiency	-
Heating Capacity	325 MBH
Heating Efficiency	80%
S/A Fan	5 HP
Approx Age	1
Ashrae Service Life	20
Remaining Life	19
Comments	

MAJOR EQUIPMENT LIST

Concord Engineering Group
COMMUNITY CENTER

Domestic Hot Water Heaters		
Tag		
Unit Type	DHW Heater	DHW Heater
Qty	1	1
Location	Kitchen	
Area Served	Kitchen	Restrooms, Showers
Manufacturer	Bradford White	Ruud
Model #	M-I-40S5LN-B	PL66-2
Serial #	FM8370743	0189B29205
Size (Gallons)	40	65
Input Capacity (MBH/KW)	34,000 MBH	4,500 kW Upper 4,500 kW Lower
Fuel	Natural Gas	Electric
Approx Age		
Ashrae Service Life	13	13
Remaining Life	13	13
Comments		

MAJOR EQUIPMENT LIST

Concord Engineering Group
COMMUNITY CENTER

Exhaust Fans			
Unit Type	Roof Exhauster	Ceiling	Upblast Roof Exhauster
Qty	2	2	1
Location	Roof	Restrooms	Roof
Area Served	Gym/Stage	Restrooms	Kitchen Hood
Manufacturer	Greenheck	Nutone	Captive Aire
Model #	GB-141-4	QT300	4824 CND-100
Fan HP	0.25		1.00
Fan CFM	750	300	
Approx Age	1	17	17
Ashrae Service Life	20	20	20
Remaining Life	19	3	3
Comments			

Investment Grade Lighting Audit

CEG Job #: 9C09187
Project: Avalon Boro Energy Audit
Address: 2900 Avalon Ave
Avalon, NJ
Building SF: 12,176

"Community Center"

KWH COST: $0.146

ECM #1 Through 4: Lighting Upgrades

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
655	Gymnasium	5400	30	1	175w MH, 2x2, Recessed Mnt., Prismatic Lens	210	6.30	34,020.0	$4,966.92	30	6	2x4, 6 Lamp, 32w T8, Elect. Ballast, Lo Bay	168	5.04	27216	$3,973.54	$220.00	$6,600.00	1.26	6804	$993.38	6.64
142.11	Kitchen	5400	4	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	144	0.58	3,110.4	$454.12	4	3	3 Lamp , 32w T8, Elect. Ballast; retrofit	86	0.34	1857.6	$271.21	$100.00	$400.00	0.23	1252.8	$182.91	2.19
602	Various	8760	6	2	Incandescent Exit Sign	20	0.12	1,051.2	$153.48	6	1	LED Exit Sign	5	0.03	262.8	$38.37	$65.00	$390.00	0.09	788.4	$115.11	3.39
142.21	Storage	1350	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	388.8	$56.76	2	3	3 Lamp , 32w T8, Elect. Ballast; retrofit	86	0.17	232.2	$33.90	$100.00	$200.00	0.12	156.6	$22.86	8.75
142.21	Concession Stand	5400	4	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.58	3,110.4	$454.12	4	3	3 Lamp , 32w T8, Elect. Ballast; retrofit	86	0.34	1857.6	$271.21	$100.00	$400.00	0.23	1252.8	$182.91	2.19
142.11	Lobby	5400	6	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	144	0.86	4,665.6	$681.18	6	3	3 Lamp , 32w T8, Elect. Ballast; retrofit	86	0.52	2786.4	$406.81	$100.00	$600.00	0.35	1879.2	$274.36	2.19
142.21	Men's Restroom	5400	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	1,555.2	$227.06	2	3	3 Lamp , 32w T8, Elect. Ballast; retrofit	86	0.17	928.8	$135.60	$100.00	$200.00	0.12	626.4	$91.45	2.19
126.45		5400	1	2	6"x4, 2 Lamp, 34w T12, Mag. Ballast, Wall Mnt., White Diffuser	75	0.08	405.0	$59.13	1	2	6'x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., White Diffuser	58	0.06	313.2	$45.73	$140.00	$140.00	0.02	91.8	$13.40	10.45
610	Electrical Closet	1350	1	2	Wall Mnt., (2) 60w A19 Lamps	120	0.12	162.0	$23.65	1	2	13w CFL Lamps	26	0.03	35.1	$5.12	$20.00	$20.00	0.09	126.9	$18.53	1.08
142.21	Women's Restroom	5400	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	1,555.2	$227.06	2	3	3 Lamp , 32w T8, Elect. Ballast; retrofit	86	0.17	928.8	$135.60	$100.00	$200.00	0.12	626.4	$91.45	2.19
127.21		5400	2	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	68	0.14	734.4	$107.22	2	3	3 Lamp, 17w T8, Elect. Ballast; retorfit	47	0.09	507.6	$74.11	$100.00	$200.00	0.04	226.8	$33.11	6.04
126.45		5400	1	2	6"x4, 2 Lamp, 34w T12, Mag. Ballast, Wall Mnt., White Diffuser	75	0.08	405.0	$59.13	1	2	6'x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., White Diffuser	58	0.06	313.2	$45.73	$140.00	$140.00	0.02	91.8	$13.40	10.45
142.21	Office	5400	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	1,555.2	$227.06	2	3	3 Lamp , 32w T8, Elect. Ballast; retrofit	86	0.17	928.8	$135.60	$100.00	$200.00	0.12	626.4	$91.45	2.19
611	Stage	1200	4	1	Pendant Mnt., 100w A19 Lamp	100	0.40	480.0	$70.08	4	1	(1) 26w CFL Lamp	26	0.10	124.8	$18.22	$20.00	$80.00	0.30	355.2	$51.86	1.54
610	Stage Locker Room - Right	1200	3	2	Wall Mnt., (2) 60w A19 Lamps	120	0.36	432.0	$63.07	3	2	13w CFL Lamps	26	0.08	93.6	$13.67	$20.00	$60.00	0.28	338.4	$49.41	1.21
142.21		1200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	345.6	$50.46	2	3	3 Lamp , 32w T8, Elect. Ballast; retrofit	86	0.17	206.4	$30.13	$100.00	$200.00	0.12	139.2	$20.32	9.84

Investment Grade Lighting Audit

610	Stage Locker Room - Left	1200	3	2	Wall Mnt., (2) 60w A19 Lamps	120	0.36	432.0	$63.07	3	2	13w CFL Lamps	26	0.08	93.6	$13.67	$20.00	$60.00	0.28	338.4	$49.41	1.21
142.21		1200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	345.6	$50.46	2	3	3 Lamp , 32w T8, Elect. Ballast; retrofit	86	0.17	206.4	$30.13	$100.00	$200.00	0.12	139.2	$20.32	9.84
550	Exterior	3600	8	1	Recessed Down Light, 100w A19 Lamp	100	0.80	2,880.0	$420.48	8	1	26w CFL Lamp	26	0.21	748.8	$109.32	$20.00	$160.00	0.59	2131.2	$311.16	0.51
560		3600	2	1	Recessed Down Light, 26w CFL Lamp	26	0.05	187.2	$27.33	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
631		3600	2	1	150w HPS Wallpack	188	0.38	1,353.6	$197.63	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		89	55			12.92	59,174.4	$8,639.46	89	49			8.01	39641.7	$5,787.69		$10,450.00	4.48	17991.9	$2,626.82	3.98

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.
2. Lamp totals only include T-12 tube replacment calculations

CEG Job #: 9C09187
Project: Avalon Boro Energy Audit
Address: 2900 Avalon Ave
Avalon, NJ
Building SF: 12176

"Community Center"

KWH COST: $0.146

ECM #5: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
655	Gymnasium	5400	30	1	175w MH, 2x2, Recessed Mnt., Prismatic Lens	210	6.30	34,020.0	$4,966.92	30	0	No Change	210	6.30	0%	34020	$4,966.92	$0.00	$0.00	0.00	0	$0.00	0.00
142.11	Kitchen	5400	4	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	144	0.58	3,110.4	$454.12	4	0	No Change	144	0.58	0%	3110.4	$454.12	$0.00	$0.00	0.00	0	$0.00	0.00
602	Various	8760	6	2	Incandescent Exit Sign	20	0.12	1,051.2	$153.48	6	1	No Change	20	0.12	0%	1051.2	$153.48	$0.00	$0.00	0.00	0	$0.00	0.00
142.21	Storage	1350	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	388.8	$56.76	2	1	No Change	144	0.29	0%	388.8	$56.76	$0.00	$0.00	0.00	0	$0.00	0.00
142.21	Concession Stand	5400	4	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.58	3,110.4	$454.12	4	1	Dual Technology Occupancy Sensor	144	0.58	10%	2799.36	$408.71	$160.00	$160.00	0.00	311.04	$45.41	3.52
142.11	Lobby	5400	6	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	144	0.86	4,665.6	$681.18	6	0	No Change	144	0.86	0%	4665.6	$681.18	$0.00	$0.00	0.00	0	$0.00	0.00
142.21	Men's Restroom	5400	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	1,555.2	$227.06	2	1	Dual Technology Occupancy Sensor	144	0.29	10%	1399.68	$204.35	$240.00	$240.00	0.00	155.52	$22.71	16.48
126.45		5400	1	2	6"x4, 2 Lamp, 34w T12, Mag. Ballast, Wall Mnt., White Diffuser	75	0.08	405.0	$59.13	1	0		75	0.08	10%	364.5	$53.22	$0.00	$0.00	0.00	40.5	$5.91	0.00
610	Electrical Closet	1350	1	2	Wall Mnt., (2) 60w A19 Lamps	120	0.12	162.0	$23.65	1	0	No Change	120	0.12	0%	162	$23.65	$0.00	$0.00	0.00	0	$0.00	0.00
142.21	Women's Restroom	5400	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	1,555.2	$227.06	2	1	Daylight Sensor	144	0.29	10%	1399.68	$204.35	$240.00	$240.00	0.00	155.52	$22.71	7.18
127.21		5400	2	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	68	0.14	734.4	$107.22	2	0		68	0.14	10%	660.96	$96.50	$0.00	$0.00	0.00	73.44	$10.72	0.00

126.45		5400	1	2	6"x4, 2 Lamp, 34w T12, Mag. Ballast, Wall Mnt., White Diffuser	75	0.08	405.0	$59.13	1	0	No Change	75	0.08	0%	405	$59.13	$0.00	$0.00	0.00	0	$0.00	0.00
142.21	Office	5400	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	1,555.2	$227.06	2	1	Dual Technology Occupancy Sensor	144	0.29	10%	1399.68	$204.35	$160.00	$160.00	0.00	155.52	$22.71	7.05
611	Stage	1200	4	1	Pendant Mnt., 100w A19 Lamp	100	0.40	480.0	$70.08	4	0	No Change	100	0.40	0%	480	$70.08	$0.00	$0.00	0.00	0	$0.00	0.00
610	Stage Locker Room - Right	1200	3	2	Wall Mnt., (2) 60w A19 Lamps	120	0.36	432.0	$63.07	3	0	No Change	120	0.36	0%	432	$63.07	$0.00	$0.00	0.00	0	$0.00	0.00
142.21		1200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	345.6	$50.46	2	0	No Change	144	0.29	0%	345.6	$50.46	$0.00	$0.00	0.00	0	$0.00	0.00
610	Stage Locker Room - Left	1200	3	2	Wall Mnt., (2) 60w A19 Lamps	120	0.36	432.0	$63.07	3	0	No Change	120	0.36	0%	432	$63.07	$0.00	$0.00	0.00	0	$0.00	0.00
142.21		1200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	345.6	$50.46	2	0	No Change	144	0.29	0%	345.6	$50.46	$0.00	$0.00	0.00	0	$0.00	0.00
550	Exterior	3600	8	1	Recessed Down Light, 100w A19 Lamp	100	0.80	2,880.0	$420.48	8	0	No Change	100	0.80	0%	2880	$420.48	$0.00	$0.00	0.00	0	$0.00	0.00
560		3600	2	1	Recessed Down Light, 26w CFL Lamp	26	0.05	187.2	$27.33	2	0	No Change	26	0.05	0%	187.2	$27.33	$0.00	$0.00	0.00	0	$0.00	0.00
631		3600	2	1	150w HPS Wallpack	188	0.38	1,353.6	$197.63	2	0	No Change	188	0.38	0%	1353.6	$197.63	$0.00	$0.00	0.00	0	$0.00	0.00
0	Totals	0	89	55			12.92	59,174.4	$8,639.46	89	6		0	0.00		58282.86	$8,509.30		$800.00	12.92	891.54	$130.16	6.15

Project Name: LGEA Solar PV Project - Community Center
Location: Avalon, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$393,300
Annual kWh Production	53,386
Annual Energy Cost Reduction	$7,794
Annual SREC Revenue	$18,685
First Cost Premium	**$393,300**
Simple Payback:	**14.85** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.146**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$393,300	0	0	0	$0	(393,300)	0
1	$0	53,386	$7,794	$0	$18,685	$26,479	($366,821)
2	$0	53,119	$8,028	$0	$18,592	$26,620	($340,201)
3	$0	52,853	$8,269	$0	$18,499	$26,768	($313,433)
4	$0	52,589	$8,517	$0	$18,406	$26,923	($286,510)
5	$0	52,326	$8,773	$539	$18,314	$26,548	($259,962)
6	$0	52,065	$9,036	$536	$18,223	$26,722	($233,240)
7	$0	51,804	$9,307	$534	$18,132	$26,905	($206,335)
8	$0	51,545	$9,586	$531	$18,041	$27,096	($179,239)
9	$0	51,288	$9,874	$528	$17,951	$27,296	($151,943)
10	$0	51,031	$10,170	$526	$17,861	$27,505	($124,438)
11	$0	50,776	$10,475	$523	$17,772	$27,724	($96,714)
12	$0	50,522	$10,789	$520	$17,683	$27,952	($68,763)
13	$0	50,269	$11,113	$518	$17,594	$28,189	($40,573)
14	$0	50,018	$11,446	$515	$17,506	$28,437	($12,136)
15	$0	49,768	$11,790	$513	$17,419	$28,696	$16,560
16	$0	49,519	$12,143	$510	$17,332	$28,965	$45,525
17	$0	49,272	$12,508	$507	$17,245	$29,245	$74,770
18	$0	49,025	$12,883	$505	$17,159	$29,537	$104,307
19	$0	48,780	$13,269	$502	$17,073	$29,840	$134,147
20	$0	48,536	$13,667	$500	$16,988	$30,155	$164,302
21	$1	48,294	$14,077	$497	$16,903	$30,483	$194,785
22	$2	48,052	$14,500	$495	$16,818	$30,823	$225,608
23	$3	47,812	$14,935	$492	$16,734	$31,176	$256,785
24	$4	47,573	$15,383	$490	$16,650	$31,543	$288,328
25	$5	47,335	$15,844	$488	$16,567	$31,924	$320,252
	Totals:	1,257,558	$284,176	$10,770	$440,145	$713,552	($854,934)
				Net Present Value (NPV)		**$320,277**	
				Internal Rate of Return (IRR)		**5.0%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Community Center	3100	Sunpower SPR230	190	14.7	2,794	43.70	53,386	6,270	15.64

PVWatts

AC Energy & Cost Savings

Cautions for Interpreting the Results

(Type comments here to appear on printout; maximum 1 row of 80 characters.)

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	43.7 kW
DC to AC Derate Factor:	0.810
AC Rating:	35.4 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	0.1 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	2.58	2839	4.14
2	3.33	3352	4.89
3	4.31	4681	6.83
4	5.20	5332	7.78
5	5.85	6090	8.89
6	6.14	5928	8.65
7	6.06	5988	8.74
8	5.54	5503	8.03
9	4.85	4732	6.91
10	3.76	3864	5.64
11	2.65	2707	3.95
12	2.23	2371	3.46
Year	4.38	53386	77.94

.= Proposed PV Layout

Notes:

1. Estimated kWH based on the National Renewable Energy Laboratory PVWatts Version 1 Calculator Program.

Energy Cost Calculator for Faucets and Showerheads

Vary utility cost, hours of operation, and / or efficiency level.

INPUT SECTION

Input the following data (if any parameter is missing, calculator will set to the default value).			Defaults	
Water Saving Product	Faucet		*Faucet*	*Showerhead*
Flow Rate	1	gpm	*2.2 gpm*	*2.5 gpm*
Water Cost (including waste water charges)	5.4	$/1000 gal	*$4/1000 gal*	*$4/1000 gal*
Gas Cost	1.69	$/therm	*0.60 $/therm*	*0.60 $/therm*
Electricity Cost	.146	$/kWh	*0.06 $/kWh*	*0.06 $/kWh*
Minutes per Day of Operation	30	minutes	*30 minutes*	*20 minutes*
Days per Year of Operation	240	days	*260 days*	*365 days*
Quantity to be Purchased	2	unit(s)	*1 unit*	*1 unit*

Calculate | Reset

OUTPUT SECTION

Performance per Faucet	Your Choice	Base Model	FEMP Recommended Level	Best Available	Self Closing Faucet (gallon per cycle)
WATER USE ONLY					
Gallon per Minute	1 gpm	2.2	2	1.5	0.25
Annual Water Use	7200 gal	15840	14400	10800	3600
Annual Water Cost	$ 39	$ 86	$ 78	$ 58	$ 19
Lifetime Water Cost	$ 328	$ 722	$ 655	$ 487	$ 160
WITH ELECTRIC WATER HEATING					
Annual Energy Use	407 kWh	895	814	610	203
Annual Energy Cost	$ 59	$ 131	$ 119	$ 89	$ 30
Lifetime Energy Cost	$ 466	$ 1024	$ 932	$ 698	$ 232
Lifetime Energy and Water Cost Savings	$ 952	$ 0	$ 159	$ 561	$ 1354
Lifetime Energy and Water Cost Savings for 2 Faucet(s)	$ 1904	$ 0	$ 318	$ 1122	$ 2708
WITH GAS WATER HEATING					
Annual Energy Use	23 therms	50	45	34	11
Annual Energy Cost	$ 39	$ 85	$ 76	$ 57	$ 19
Lifetime Energy Cost	$ 324	$ 706	$ 631	$ 473	$ 158
Lifetime Energy and Water Cost Savings	$ 776	$ 0	$ 142	$ 468	$ 1110
Lifetime Energy and Water Cost Savings for 2 Faucet(s)	$ 1552	$ 0	$ 284	$ 936	$ 2220

For electric water heating applications, your selection of an energy saving faucet with a flow rate of 1 gallon(s) per minute will have a combined energy and water cost savings (per faucet) of $ 952 over an estimated 10 year life expectancy compared to the base model.

For gas water heating applications, your selection of an energy saving faucet with a flow rate of 1 gallon(s) per minute will have a combined energy and water cost savings (per faucet) of $ 776 over an estimated 10 year life expectancy compared to the base model.

Assumptions

- "Base model" has an efficiency that just meets the national minimum standard for faucets or showerheads.
- Lifetime energy cost and lifetime water cost is the sum of the discounted value of the annual energy and water costs based on an assumed faucet or showerhead life of 10 years.
- Future gas and electricity price trends and a discount rate of 3.2% are based on Federal guidelines.
- $0.06 per kWh is the Federal average electricity price in the U.S.
- $0.60 per therm is the Federal average gas price in the U.S.
- The assumed combined water and waste-water price is $4.00/1000 gallons.

Disclaimer

This cost calculator is a screening tool that estimates a product's lifetime energy cost savings at various efficiency levels. Maintenance and installation costs do not vary significantly among the same product having different efficiencies; so, these costs are not included in this calculator tool. For a detailed life-cycle cost analysis, FEMP has developed a tool called Building Life-Cycle Cost (BLCC). This downloadable tool allows the user to vary interest rates, installation costs, maintenance costs, salvage values, and life expectancy for a product or an entire energy project.

Water Saving Product Flow Rate in gallons per minute. Default for a faucet is 2.2 gallons per minute. Default for a showerhead is 2.5 gallons per minute. Waster cost including waste water charges in dollars per 1000 gallons. Default for a faucet is 4 dollars per 1000 gallons. Default for a showerhead is 4 dollars per 1000 gallons. Gas cost in dollars per therm. Default for a faucet is 0.60 dollars per therm. Default for a showerhead is 0.60 per therm. Electricity cost in dollars per kilowatt hour. Default for a faucet is 0.06 dollars per kilowatt hour. Default for a showerhead is 0.06 dollars per kilowatt hour. Minutes per day of operation, measured in minutes. Default for a faucet is 30 minutes. Default for a showerhead is 20 minutes. Days per year of operation, measured in days. Default for a faucet is 260 days. Default for a showerhead is 365 days. Quantity to be purchased, measured in units. Default for a faucet is 1 unit. Default for a showerhead is 1 unit. Performance for faucet or showerhead, depending on selection above. Your Choice with Water Use Only Form Labels Gallons per minute based on your choice, for water use only. Annual water use based on your choice, for water use only. Annual water cost based on your choice, for water use only. Lifetime water cost based on your choice, for water use only. Base Model with Water Use Only Form Labels Gallons per minute based on the base model, for water use only. Annual water use based on the base model, for water use only. Annual water cost based on the base model, for water use only. Lifetime water cost based on the base model, for water use only. FEMP Recommended Levels with Water Use Only Form Labels Gallons per minute based on FEMP recommended levels, for water use only. Annual water use based on FEMP recommended levels, for water use only. Annual water cost based on FEMP recommended levels, for water use only. Lifetime water cost based on FEMP recommended levels, for water use only. Best Available with Water Use Only Form Labels Gallons per minute based on best available levels, for water use only. Annual water use based on best available levels, for water use only. Annual water cost based on best available levels, for water use only. Lifetime water cost based on best available levels, for water use only. Self Closing Faucet with Water Use Only Form Labels Gallons per minute based on self closing faucet, measured in gallon per cycle, for water use only. Annual water use based on self closing faucet, measured in gallon per cycle, for water use only. Annual water cost based on self closing faucet, measured in gallon per cycle, for water use only. Lifetime water cost based on self closing faucet, measured in gallon per cycle, for water use only. Your Choice with Electric Water Heating Form Labels Annual energy use, based on your choice and measured in kilowatt hour, for water use with electric water heating. Annual energy cost, based on your choice and measured in dollars, for water use with electric water heating. Lifetime energy cost, based on your choice and measured in dollars, for water use with electric water heating. Lifetime energy and water cost savings, based on your choice and measured in dollars, for water use with electric water heating. Lifetime energy and water cost savings for the number of units and item you selected, based on your choice and measured in dollars, for water use with electric water heating. Base Model with Electric Water Heating Form Labels Annual energy use, based on the base model and measured in dollars, for water use with electric water heating. Annual energy cost, based on the base model and measured in dollars, for water use with electric water heating. Lifetime energy cost, based on the base model and measured in dollars, for water use with electric water heating. Lifetime energy and water cost savings, based on the base model and measured in dollars,, for water use with electric water heating. Lifetime energy and water cost savings for the number of units and item you selected, based on the base model and measured in dollars, for water use with electric water heating. FEMP Recommended Levels with Electric Water Heating Form Labels Annual energy use, based on FEMP recommended levels and measured in dollars,, for water use with electric water heating. Annual energy cost, based on FEMP recommended levels and measured in dollars, for water use with electric water heating. Lifetime energy cost, based on FEMP recommended levels and measured in dollars, for water use with electric water heating. Lifetime energy and water cost savings, based on FEMP recommended levels and measured in dollars,, for water use with electric water heating. Lifetime energy and water cost savings for the number of units and item you selected, based on FEMP recommended levels and measured in dollars, for water use with electric water heating. Best Available with Electric Water Heating Form Labels Annual energy use, based on best available levels and measured in dollars,, for water use with electric water heating. Annual energy cost, based on best available levels and measured in dollars, for water use with electric water heating. Lifetime energy cost, based on best available levels and measured in dollars, for water use with electric water heating. Lifetime energy and water cost savings, based on best available levels and measured in dollars,, for water use with electric water heating. Lifetime energy and water cost savings for the number of units and item you selected, based on best available levels and measured in dollars, for water use with electric water heating. Self Closing Faucet with Electric Water Heating Form Labels Annual energy use, based on self closing faucet and measured in dollars, for water use with electric water heating. Annual energy cost, based on self closing faucet and measured in dollars, measured in gallon per cycle, for water use with electric water heating. Lifetime energy cost, based on self closing faucet and measured in dollars, for water use with electric water heating. Lifetime energy and water cost savings, based on self closing faucet and measured in dollars, for water use with electric water heating. Units to be purchased. Either Faucet or Showerhead, based on selection above. Lifetime energy and water cost savings for the number of units and item you selected, based on self closing faucet and measured in dollars, for water use with electric water heating. Your Choice with Gas Water Heating Form Labels Annual energy use, based on your choice and measured in kilowatt hour, for water use with gas water heating. Annual energy cost, based on your choice and measured in dollars, for water use with gas water heating. Lifetime energy cost, based on your choice and measured in dollars, for water use with gas water heating. Lifetime energy and water cost savings, based on your choice and measured in dollars, for water use with gas water heating. Lifetime energy and water cost savings for the number of units and item you selected, based on your choice and measured in dollars, for water use with gas water heating. Base Model with Gas Water Heating Form Labels Annual energy use, based on the base model and measured in dollars, for water use with gas water heating. Annual energy cost, based on the base model and measured in dollars, for water use with gas water heating. Lifetime energy cost, based on the base model and measured in dollars, for water use with gas water heating. Lifetime energy and water cost savings, based on the base model and measured in dollars,, for water use with gas water heating. Lifetime energy and water cost savings for the number of units and item you selected, based on the base model and measured in dollars, for water use with gas water heating. FEMP Recommended Levels with Gas Water Heating Form Labels Annual energy use, based on FEMP recommended levels and measured in dollars,, for water use with gas water heating. Annual energy cost, based on FEMP recommended levels and measured in dollars, for water use with gas water heating. Lifetime energy cost, based on FEMP recommended levels and measured in dollars, for water use with gas water heating. Lifetime energy and water cost savings, based on FEMP recommended levels and measured in dollars, for water use with gas water heating. Lifetime energy and water cost savings for the number of units and item you selected, based on FEMP recommended levels and measured in dollars, for water use with gas water heating. Best Available with Gas Water Heating Form Labels Annual energy use, based on best available levels and measured in dollars,, for water use with gas water heating. Annual energy cost, based on best available levels and measured in dollars, for water use with gas water heating. Lifetime energy cost, based on best available levels and measured in dollars, for water use with gas water heating. Lifetime energy and water cost savings, based on best available levels and measured in dollars,, for water use with gas water heating. Lifetime energy and water cost savings for the number of units and item you selected, based on best available levels and measured in dollars, for water use with gas water heating. Self Closing Faucet with Gas Water Heating Form Labels Annual energy use, based on self closing faucet and measured in dollars, for water use with gas water heating. Annual energy cost, based on self closing faucet and measured in dollars, measured in gallon per cycle, for water use with gas water heating. Lifetime

energy cost, based on self closing faucet and measured in dollars, for water use with gas water heating. Lifetime energy and water cost savings, based on self closing faucet and measured in dollars, for water use with gas water heating. Units to be purchased. Either Faucet or Showerhead, based on selection above. Lifetime energy and water cost savings for the number of units and item you selected, based on self closing faucet and measured in dollars, for water use with gas water heating. For electric water heating applications, your selection of an energy saving with a flow rate of gallon(s) per minute will have a combined energy and cost savings (per) of For gas water heating applications, your selection of an energy saving with a flow rate of gallon(s) per minute will have a combined energy and water cost savings (per) of

Printable Version

Energy-Efficient Products
Federal Requirements
Purchasing Specifications
Product Designation Process
Energy Cost Calculators
FEMP Standby Power Data Center
Model Language
Resources
New & Emerging Technologies
Renewable Energy
Distributed Energy Resources / Combined Heat & Power

Printable Version
Site Map
EERE Information Center
Programs and Offices

Energy Cost Calculator for Urinals

Vary water cost, frequency of operation, and /or efficiency level.

INPUT SECTION

This calculator assumes that early replacement of a urinal or toilet will take place with 10 years of life remaining for existing fixture.

Input the following data (if any parameter is missing, calculator will set to default value).		Defaults
Water Saving Product	Urinal	*Urinal*
Gallons per Flush	1 gpf	*1.0 gpf*
Quantity to be Purchased	2	*1*
Water Cost (including waste water charges)	5.4 $/1000 gal	*$4/1000 gal*
Flushes per Day	20 flushes	*30 flushes*
Days per Year	240 days	*260 days*

Calculate Reset

OUTPUT SECTION

Performance per urinal	Your Choice	Typical Existing Unit	Recommended Level (New Unit)	Best Available
Gallon per Flush	1 gpf	3	1	0
Annual Water Use	4800 gal	14400	4800	0
Annual Water Cost	$ 25	$ 77	$ 25	$ 0
10-Year Water Cost	$ 211	$ 649	$ 211	$ 0
Water Cost Savings (for replacing existing unit 10 years early)	$ 438	$ 0	$ 438	$ 649

By replacing your existing urinal, having a flow rate of 1 gallon(s) per flush, you will have a water cost savings (per unit) of $ 438 over 10 years.

Assumptions

- "Base model" has an efficiency that just meets the national minimum standard for toilets or urinals.
- The assumed combined water and waste-water price is $4/1000 gallons.

Disclaimer

This cost calculator is a screening tool that estimates a product's lifetime energy cost savings at various efficiency levels. Maintenance and installation costs do not vary significantly among the same product having different efficiencies; so, these costs are not included in this calculator tool. For a detailed life-cycle cost analysis, FEMP has developed a tool called Building Life-Cycle Cost (BLCC). This downloadable tool allows the user to vary interest rates, installation costs, maintenance costs, salvage values, and life expectancy for a product or an entire energy project.

Gallons per Flush. Default is Urinal 1.0 gpf, Toilet 1.0 gpf Quantity to be purchased. Default is Urinal 1, Toilet 1 Water Cost (including waste water charges) amount per 1000 gallons. Default is Urinal $4/1000 gal, Toilet $4/1000 gal Flushes per day. Default is Urinal 30 flushes, Toilet 30 flushes Days per year. Default is Urinal 260 days, Toilet 260 days Performance per Gallon per flush your choice Gallon per flush typical existing unit Gallon per flush recommended level (new unit) Gallon per flush best available Annual Water Use your choice per gallon Annual Water Use typical existing unit Annual Water Use recommended level (new unit) Annual Water Use best bvailable Annual Water Cost your choice amount of Annual Water Cost typical existing unit amount of Annual Water Cost recommended level (new unit) amount of Annual Water Cost best bvailable amount of 10-year Water Cost your choice amount of 10-year Water Cost typical existing unit amount of 10-year Water Cost recommended level (new unit) amount of 10-year Water Cost best bvailable amount of Water Cost Savings (for replacing existing unit 10 years early) your choice amount of Water Cost Savings (for replacing existing unit 10 years early) typical existing unit amount of Water Cost Savings (for replacing existing unit 10 years early) recommended level (new unit) amount of Water Cost Savings (for replacing existing unit 10 years early) best bvailable amount of By replacing your existing having a flow rate of gallon(s) per flush, you will have a water cost savings (per unit) of $ over 10 years.

Printable Version

REM #2 - WIND TURBINES	
Installation Cost ($):	$70,744
NJ Smart Start Equipment Incentive ($):	$29,431
Net Installation Cost ($):	$41,313
REC Revenue ($/Yr):	$230
Energy Savings ($/Yr):	$1,239
Total Yearly Savings ($/Yr):	$1,469
Estimated ECM Lifetime (Yr):	15
Simple Payback	28.13
Lifetime Energy Savings	$22,032

VINELAND DEVELOPMENT CENTER WIND CALCULATIONS

ANALYSIS - 1

Month	Days	Hours	Data Avg.Wind Speed, mph	Adjusted Avg. Wind Speed, mph	Adjusted Avg. Wind Speed, m/s	Rated Power kWe	Turbine #1 Generation, kWh	Total Generation, kWh	Electric Cost Offset	Annual Maint Cost	Wind REC Revenue
January	31	744	16.097	15.729	7.03	0.761	566	566	$76		$14
February	28	672	19.214	18.775	8.39	1.277	858	858	$116		$21
March	31	744	16.290	15.918	7.12	0.791	588	588	$79		$15
April	30	720	17.900	17.491	7.82	1.037	746	746	$101		$19
May	31	744	14.806	14.468	6.47	0.617	459	459	$62		$11
June	30	720	14.900	14.559	6.51	0.627	452	452	$61		$11
July	31	744	13.323	13.018	5.82	0.473	352	352	$47		$0
August	31	744	13.677	13.365	5.97	0.496	369	369	$50		$0
September	30	720	17.267	16.872	7.54	0.940	677	677	$91		$17
October	31	744	16.806	16.422	7.34	0.869	647	647	$87		$16
November	30	720	12.567	12.279	5.49	0.423	305	305	$41		$8
December	31	744	19.387	18.944	8.47	1.311	975	975	$131		$24
Annual	**365**	**8760**		**15.653**	**6.998**		**6,994**	**6,994**	**$942**	**$12,600**	**$157**

Wind REC	$0.0250
Electric Cost	$0.1347
Wind Shear Exponent alpha	0.150
Wind Data Height (m)	11
Hub height (m)	9

35 feet\
30

Wind Systems
Production Rebate Amount
Feasibility Study 50% of project costs up to $50,000 Incentive
1-16,000 $3.20 per kWh $29,430.63
16,000-750,000 $0.50 per kWh

$29,430.63

ANALYSIS - 2

Wind Speed, mph	Hours at Speed	Adjusted Speed, mph	Adjusted Speed, m/s	Rate Output (kWe)	Generated kWh
0.00	504	0.000	0.00	0.00	0
3.00	24	2.931	1.31	0.07	2
6.00	24	5.863	2.62	0.13	3
7.00	24	6.840	3.06	0.16	4
8.00	192	7.817	3.49	0.20	38
9.00	120	8.794	3.93	0.24	29
10.00	528	9.771	4.37	0.29	151
11.00	600	10.749	4.81	0.33	198
12.00	336	11.726	5.24	0.39	130
13.00	1032	12.703	5.68	0.45	466
14.00	480	13.680	6.12	0.53	254
15.00	1032	14.657	6.55	0.64	659
16.00	432	15.634	6.99	0.75	323
17.00	1008	16.611	7.43	0.90	906
18.00	360	17.589	7.86	1.05	379
19.00	168	18.566	8.30	1.23	207
20.00	216	19.543	8.74	1.43	309
21.00	120	20.520	9.17	1.68	202
22.00	168	21.497	9.61	2.01	337
23.00	192	22.474	10.05	2.34	449
24.00	240	23.451	10.48	2.69	645
25.00	120	24.429	10.92	3.04	364
26.00	216	25.406	11.36	3.42	739
27.00	48	26.383	11.79	3.81	183
28.00	96	27.360	12.23	4.07	391
29.00	48	28.337	12.67	4.20	202
30.00	24	29.314	13.10	4.29	103
31.00	96	30.291	13.54	4.27	410
32.00	24	31.269	13.98	4.25	102
33.00	120	32.246	14.42	4.23	508
34.00	48	33.223	14.85	4.21	202
35.00	24	34.200	15.29	4.20	101
36.00	24	35.177	15.73	4.20	101
38.00	24	37.131	16.60	4.20	101
62.00	24	60.583	27.08	0.000	0
126.00	24	123.120	55.04	0.000	0
		AVG	10.68		
	8,760				9,197
					0.2624735

Power Curve Data	
Vm (m/s)	Power (kWe)
0.00	0.00
3.00	0.15
4.00	0.25
5.00	0.35
6.00	0.50
7.00	0.75
8.00	1.10
9.00	1.55
10.00	2.30
11.00	3.10
12.00	4.00
13.00	4.30
14.00	4.25
15.00	4.20
16.00	4.20
17.00	4.20
18.00	4.20
19.00	4.20
20.00	4.20

	Turbine #1 Generation, kWh	Turbine #2 Generation, kWh	Turbine #3 Generation, kWh	Total Generation, kWh	Electric Cost Offset	Annual Maint Cost
Annual	9,197			9,197	$1,239	$12,600

Description	Qty	$/Unit	Material Cost	Labor Cost	Total
Gale Vertical Axis	1	$28,496	$28,496	$14,248	$42,744
Misc Costs	1	$20,000	$20,000	$0	$20,000
Crane	1	$8,000	$8,000	$0	$8,000
Sub-Total			$56,496	$14,248	$70,744
NJ Incentive					$29,431
Total Cose Less Incentive					$41,313
					$138
Annual Maintenance	1	$250	$250		