OLD BRIDGE TOWNSHIP

ICE RINK

ONE OLD BRIDGE PLAZA
OLD BRIDGE, NJ 08857

FACILITY ENERGY REPORT

TABLE OF CONTENTS

I. HISTORIC ENERGY CONSUMPTION/COST

The energy usage for the facility has been tabulated and plotted in graph form as depicted within this section.

The electric usage profile represents the actual electrical usage for the facility. 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.

The gas usage profile shows the actual natural gas energy usage for the facility. 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.

Table 1
Electricity Billing Data

ELECTRIC USAGE SUMMARY			
Utility Provider: JCP&L			
Rate: General Service Secondary 3 Phase			
Meter No: G17995277			
Account # 10 00 10 2843 60			
Third Party Utility N/A			
TPS Meter / Acct No: N/A			
MONTH OF USE	**CONSUMPTION KWH**	**DEMAND KW**	**TOTAL BILL**
Dec-10	63,760	223.6	$10,737
Jan-11	34,960	223.6	$6,522
Feb-11	61,280	221.3	$10,329
Mar-11	54,240	223.1	$8,849
Apr-11	38,480	219.0	$2,297
May-11	5,600	216.0	$1,525
Jun-11	12,400	245.0	$1,095
Jul-11	4,480	220.2	$1,630
Aug-11	7,440	223.1	$1,718
Sep-11	61,280	229.8	$2,995
Oct-11	67,120	236.0	$3,061
Nov-11	25,920	236.0	$2,128
Totals	**436,960**	**245.0 Max**	**$52,886**
	AVERAGE DEMAND	**226.4 KW average**	
	AVERAGE RATE	**$0.121 $/kWh**	

Figure 1
Electricity Usage Profile

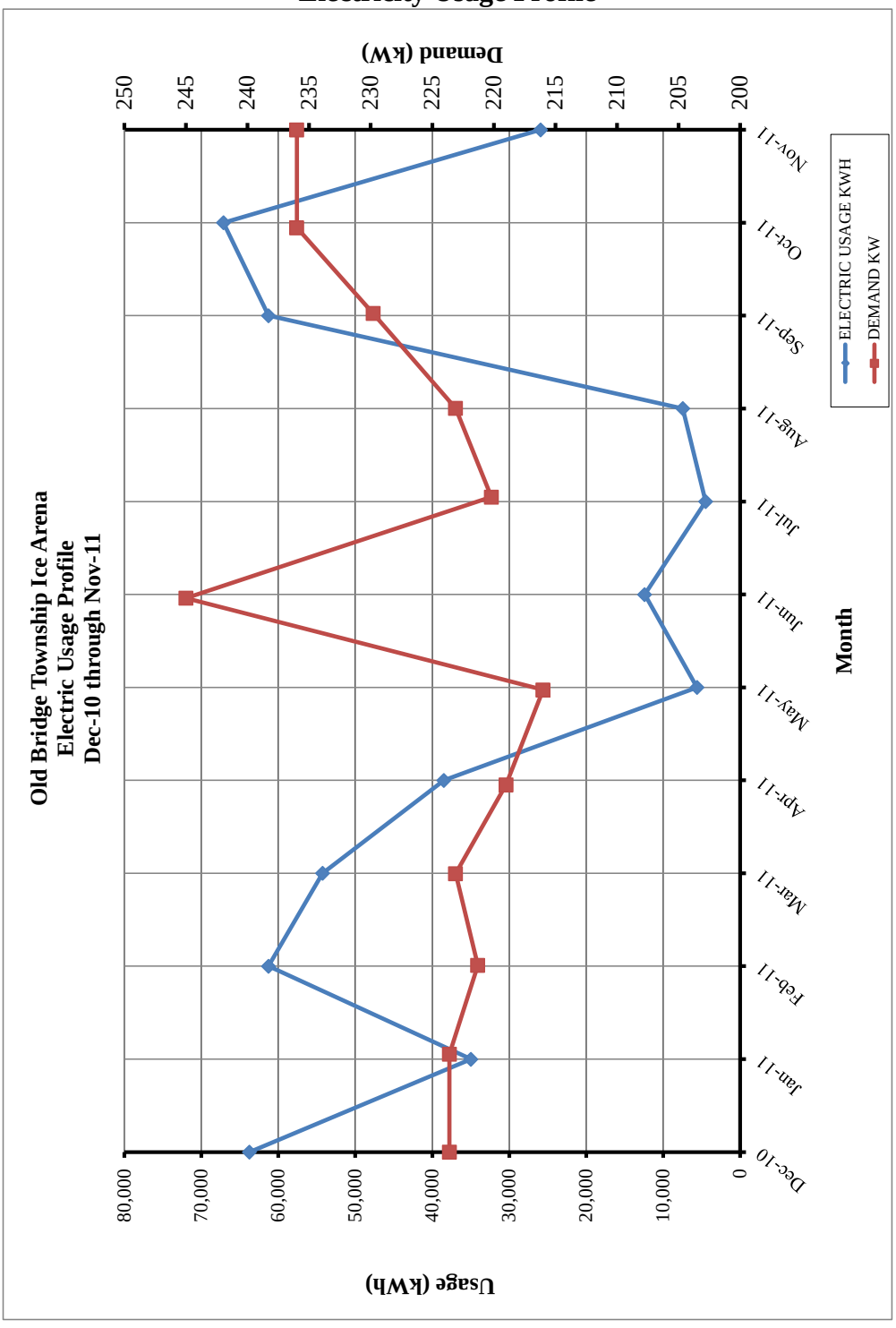
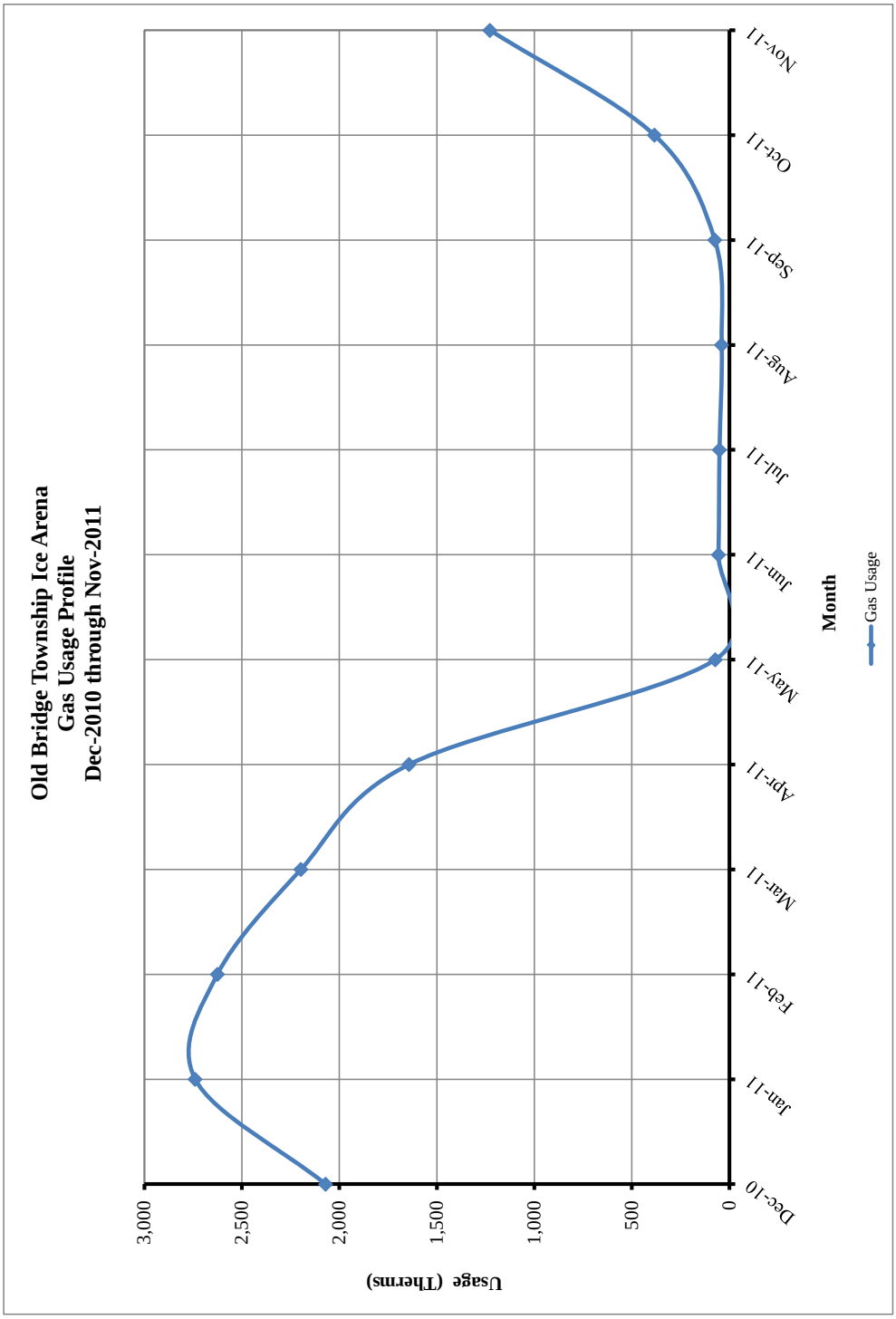


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	PSE&G	
Rate:	LVG	
Meter No:	2750275	
Point of Delivery ID:	PG000010388561284212	
Third Party Utility Provider:	N/A	
TPS Meter No:	N/A	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Dec-10	2,070.60	$2,177.45
Jan-11	2,739.15	$2,902.56
Feb-11	2,625.46	$2,833.79
Mar-11	2,197.00	$2,421.66
Apr-11	1,643.08	$1,387.62
May-11	72.61	$149.98
Jun-11	55.91	$143.29
Jul-11	50.63	$138.82
Aug-11	39.26	$131.13
Sep-11	74.47	$159.46
Oct-11	384.09	$393.37
Nov-11	1,227.30	$1,313.21
TOTALS	**13,179.56**	**$14,152.34**
AVERAGE RATE:	**$1.07**	**$/THERM**

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

The Old Bridge Township Ice Rink is located within the Old Bridge Township Municipal Complex at 1 Old Bridge Plaza, Old Bridge, New Jersey.

The 31,250 SF facility was built in 1982 with no additions. The building is a single story facility comprised of locker rooms, restrooms, concession area and ice rink.

Occupancy Profile

The typical hours of operation for the Facility are Monday through Friday between 12:00 pm and 12:00 am starting in October and ending April 1. There are approximately 4 employees that normally occupy the facility with varying occupancy throughout the day and evening.

Building Envelope

Exterior walls for the Ice Rink are masonry brick faced with a masonry block construction. The windows throughout the building are in good condition and appear to be well maintained. Typical windows are double pane, operable, ¼" coated glass with aluminum frames. The roof is sloped standing seam metal roof.

HVAC Systems

Hot water for heating is supplied via a gas fired cast iron boiler, located in the mechanical room. This unit is a Peerless model rated for 840 MBH input. This boiler serves perimeter heating and unit heaters in the locker rooms. The concession area is heated via ceiling mounted electric unit heaters. Ventilation air for the concessional area is provided via a gas fired make up air unit.

Ice Rink System

Ice for the skating rink is produced by a packaged chiller system, manufactured by Holmsten Ice Rinks, Inc. This system is rated at 135 Tons of refrigeration. The chillers are liquid cooled. There is a remote air cooled condenser. The sub floor heating system is provided by a Laars 400 MBH hot water boiler with two (2) 82 gallon storage tanks. These systems are is original to the building and are in fair condition. CEG recommends a complete engineering assessment of the ice rink system(s) in order to determine whether or not the ice rink equipment/system should be replaced. This assessment would include evaluation of the ice rink slab, integrity/condition of underground piping, leak testing and operating efficiency of the existing chiller system.

Exhaust System

Air is exhausted from the toilet rooms through in-line exhaust fans.

HVAC System Controls

The building HVAC system is controlled via pneumatic controls and local , stand alone electronic controllers.

Domestic Hot Water

Domestic hot water is provided to the locker rooms via two (2) 100 MBH storage tank type hot water heaters. In addition, there is a 75 MBH storage tank hot water heater that serves the concession area restrooms.

Lighting

Refer to the Investment Grade lighting Audit Appendix for a detailed list of the lighting throughout the facility and estimated operating hours per space.

III. 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.

IV. ENERGY CONSERVATION MEASURES

Energy Conservation Measures are developed specifically for this facility. The energy savings and calculations are highly dependent on the information received from the site survey and interviews with operations personnel. The assumptions and calculations should be reviewed by the owner to ensure accurate representation of this facility. The following ECMs were analyzed:

Table 1
ECM Financial Summary

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Lighting Upgrade	$12,892	$2,107	6.1	145.2%
ECM #2	Lighting Controls - Occupancy Sensors	$1,800	$498	3.6	315.0%
ECM #3	Condensing Boilers	$87,724	$2,140	41.0	-39.0%
ECM #4	Domestic Hot Water Heater Replacement	$32,396	$461	70.3	-64.4%
ECM #5	DDC Controls System	$125,000	$6,697	18.7	7.2%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Ice Rink 161.21 kW Array	$973,892	$101,814	9.6	56.8%

Notes: A. Cost takes into consideration applicable NJ Smart StartTM incentives.
B. Savings takes into consideration applicable maintenance savings.

Table 2
ECM Energy Summary

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
ECM #1	Lighting Upgrade	8.2	17,417	-
ECM #2	Lighting Controls - Occupancy Sensors	1.9	4,118	-
ECM #3	Condensing Boilers	-	-	2,000
ECM #4	Domestic Hot Water Heater Replacement	-	-	430
ECM #5	DDC Controls System	-	43,696	1,318
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	Ice Rink 161.21 kW Array	74.2	114,255	-

Table 3
Facility Project Summary

ENERGY SAVINGS IMPROVEMENT PROGRAM - POTENTIAL PROJECT					
ENERGY CONSERVATION MEASURES	**ANNUAL ENERGY SAVINGS ($)**	**PROJECT COST ($)**	**SMART START INCENTIVES**	**CUSTOMER COST**	**SIMPLE PAYBACK**
Lighting Upgrade	$2,107	$15,902	$3,010	$12,892	6.1
Lighting Controls - Occupancy Sensors	$498	$1,800	$0	$1,800	3.6
Condensing Boilers	$2,140	$89,087	$1,363	$87,724	41.0
Domestic Hot Water Heater Replacement	$461	$32,746	$350	$32,396	70.3
DDC Controls System	$6,697	$125,000	$0	$125,000	18.7
Design / Construction Extras (10%)	*$0*	*$13,954*	*$0*	*$13,954*	
Total Project	**$11,903**	**$278,489**	**$4,723**	**$273,766**	**23.0**

Note: ECM's with the strike-through font are not included in the ESIP.

Design / Construction Extras are shown as an additional cost for the facility project summary. This cost is included to estimate the costs associated with construction management fees for a larger combined project.

ECM #1: Lighting Upgrade – General

Description:

The majority of the interior lighting throughout the Old Bridge Township Ice Rink is provided with fluorescent fixtures with older and outdated fixtures with T12 lamps and magnetic ballasts. It is recommended to replace all of the T12 and 700 series T8 fixtures in these areas with higher efficiency fluorescent T8 fixtures with electronic ballasts. In addition, the lighting in the ice rink area is provided by 400W metal halide fixtures. The space would be better served with a more efficient, T5HO lighting system. CEG recommends upgrading the existing lighting to energy efficient, 54 Watt T5HO lamps.

This ECM includes re-lamping of the existing fluorescent fixtures with 800 series, 28W T8 lamps. The ECM also includes retrofit of all older fluorescent fixtures with T8 or T5 fluorescent fixtures with electronic ballasts in the building. The new, energy efficient T8 fixtures will provide adequate lighting and will save on electrical costs due to better performance of the lamp and ballasts.

The ECM also includes replacement of any incandescent lamps with compact fluorescent lamps. Compact fluorescent lamps (CFL's) were designed 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. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures. Where the existing fixture is controlled by a dimmer switch, the CFL bulb must be compatible with a dimmer switch. In some locations the bulb replacement will need to be tested to make sure the larger base of the CFL will fit into the existing fixture. The energy usage of an incandescent compared to a compact fluorescent approximately 3 to 4 times greater. In addition to the energy savings, compact fluorescent fixtures burn-hours are 8 to 15 times longer than incandescent fixtures ranging from 6,000 to 15,000 burn-hours compared to incandescent fixtures ranging from 750 to 1000 burn-hours. However, the maintenance savings due to reduced lamp replacement is offset by the higher cost of the CFL's compared to the incandescent lamps.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the hours of operation, proposed retrofits, costs, savings, and payback periods for each set of fixtures in the each building.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$15,902
NJ Smart Start Equipment Incentive ($):	$3,010
Net Installation Cost ($):	$12,892
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,107
Total Yearly Savings ($/Yr):	$2,107
Estimated ECM Lifetime (Yr):	15
Simple Payback	6.1
Simple Lifetime ROI	145.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$31,605
Internal Rate of Return (IRR)	14%
Net Present Value (NPV)	$12,261.23

ECM #2: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Old Bridge Township Ice Rink are left on unnecessarily. In many cases the lights are left on because of the inconvenience to manually switch lights off when a room is left or on when a room is first occupied. This is common in rooms that are occupied for only short periods and only a few times per day. In some instances lights are left on due to the misconception that it is better to keep the lights on rather than to continuously switch lights on and off. Although increased switching reduces lamp life, the energy savings outweigh the lamp replacement costs. The payback timeframe for when to turn the lights off is approximately two minutes. If the lights are expected to be off for at least a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed. Occupancy sensors detect motion and will switch the lights on when the room is occupied. Occupancy sensors can either be mounted in place of a current wall switch, or on the ceiling to cover large areas.

The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the report:

- Occupancy Sensors for Lighting Control 20% - 28% energy savings.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 20% of the total light energy controlled by occupancy sensors (The majority of the savings is expected to be after school hours when rooms are left with lights on)

This ECM includes installation of ceiling or switch mount sensors for individual offices, classrooms, large bathrooms, and Media Centers. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent. The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by the applicable percent savings for each area that includes lighting controls.

Energy Savings Calculations:

$$\text{Energy Savings} = \left(\%\ \text{Savings} \times \text{Controlled Light Energy}\ \left(\text{kWh/Yr}\right)\right)$$

$$\text{Savings.} = \text{Energy Savings}\left(\text{kWh}\right) \times \text{Ave Elec Cost}\left(\frac{\$}{\text{kWh}}\right)$$

Rebates and Incentives:

From the **NJ Smart Start® Program Incentives Appendix**, the installation of a lighting control device warrants the following incentive:

Smart Start Incentive
= (# Wall mount sensors × $20 per sensor)
+ (# Ceiling mount sensors × $35 per sensor)

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,800
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$1,800
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$498
Total Yearly Savings ($/Yr):	$498
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.6
Simple Lifetime ROI	315.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$7,470
Internal Rate of Return (IRR)	27%
Net Present Value (NPV)	$4,145.09

ECM #3: Condensing Boiler Installation – Ice Rink

Description:

Heating is currently provided to the ice rink via a Peerless 840 MBH cast iron boiler. This boiler, located in the mechanical room, provides heating to the locker room areas and areas around the ice rink. In addition, there is a Laars cast iron boiler that serves the below slab heating system. The purpose of this system is to prevent the sub-surface of the ice rink slab from freezing, thus preventing heaving of the slab. Both of these boilers are in fair condition, however, both operate at an efficiency of 80% or less, which is below today's standards for high efficiency.

New condensing boilers could substantially improve the operating efficiency of the heating systems of the building. Condensing boiler's peak efficiency tops out at 99% depending on return water temperature. Due to the operating conditions of the building, the annual average operating efficiency of the proposed condensing boiler is expected to be 90%. Based on the age and condition of the existing boilers, the estimated operating efficiency of the plant is approximately 70%, which makes the condensing boilers an 20% increase in efficiency. This ECM is based on variable supply water temperature adjusted based on outdoor temperature.

This ECM includes installation of two (2) condensing gas fired boilers in the Ice Rink to replace the two (2) existing boilers. The basis for this ECM is Aerco condensing boiler; model number MLX909H for the space heating, and model number MLX454H for the below slab heating.

Energy Savings Calculations:

Currently, the gas consuming equipment connected to the building gas meter are the boilers, domestic hot water heaters and a single gas fired heating and ventilation unit. Therefore, annual energy consumption of the boilers has to be estimated. In this calculation, it is assumed that the energy consumption of the boilers will be in proportion with the ratio of the total heating capacity of each piece equipment.

Below calculation is performed to estimate annual gas usage of the cast iron boilers:

Total facility heating capacity (Heating equipment output capacity):

(1) Laars boilers (below slab heatin)	= 400 MBH
(1) Peerless boiler (space heating)	= 840 MBH
(3) Domestic hot water heaters	= 274 MBH
(1) Gas fired make-up air unit	= 75 MBH
Total Heating Capacity	**= 1,589 MMBH**

Total facility heating capacity:	1,589 MBH
Total Capacity - Boilers only:	1,240 MBH
Percent usage by boilers:	78.0% of Total

Estimated natural gas usage 78.0% of 13,179 Therms
Estimated natural gas usage by boilers 10,284 Therms

$$\text{Bldg Heat Required} = \text{Heating Nat. Gas (Therm)} \times \text{Heating Eff (\%)} \times \text{Fuel Heat Value } (\frac{\text{BTU}}{\text{Therm}})$$

$$\text{Proposed Heating Gas Usage} = \frac{\text{Bldg. Heat Required (BTU)}}{\text{New Heating Eff (\%)} \times \text{Fuel Heat Value } (\frac{\text{BTU}}{\text{Therm}})}$$

$$\text{Energy Cost} = \text{Heating Gas Usage (Therms)} \times \text{Ave Fuel Cost } (\frac{\$}{\text{Therm}})$$

Energy savings calculations are summarized in the table below:

CONDENSING BOILER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Boilers	New Condensing Boilers	
Existing Nat Gas (Therms)	10,284	0	
Boiler Efficiency (%)	73%	90%	18%
Nat Gas Heat Value (BTU/Therm)	100,000	100,000	
Equivalent Building Heat Usage (MMBTUs)	746	746	
Gas Cost ($/Therm)	1.07	1.07	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therms)	10,284	8,284	2,000
Energy Cost ($)	$11,004	$8,864	$2,140
COMMENTS:			

Existing boiler efficiencies are estimated to be approximately 73% based on age and condition.

From the **NJ Smart Start Appendix**, the installation of new condensing boilers warrants the following incentive: $1.00 per MBH, or **$1,363**.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$89,087
NJ Smart Start Equipment Incentive ($):	$1,363
Net Installation Cost ($):	$87,724
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,140
Total Yearly Savings ($/Yr):	$2,140
Estimated ECM Lifetime (Yr):	25
Simple Payback	41.0
Simple Lifetime ROI	-39.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$53,500
Internal Rate of Return (IRR)	-3%
Net Present Value (NPV)	($50,460.23)

ECM #5: Digital Energy Management System (DDC EMS)

Description:

Currently, the Ice Rink HVAC systems are controlled locally thorough electronic controls via wall thermostats and temperature sensors.

Concord Engineering recommends installing a DDC system throughout the ice to control all of the HVAC systems including the boilers, heaters, exhaust fans and ice rink chiller system.

The system will include new temperature sensors and new local thermostats with limited over-ride capability, a front end computer and main controller. The system will also include central controls for lighting. With the communication between the control devices and the front end computer interface, the facility manager will be able to take advantage of scheduling for occupied and unoccupied periods based on the actual occupancy of each space in the facility. Due to the fact that the buildings may have diverse hours of occupancy, including evening and weekend activities, having supervisory control over all of the equipment makes sense. The DDC system will also aid in the response time to service / maintenance issues when the facility is not under normal maintenance supervision, i.e. after-hours.

The new DDC system has the potential to provide significant savings by controlling the HVAC systems as a whole and provide operating schedules and features such as space averaging, night set-back, temperature override control, etc. The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the referenced report:

- Energy Management and Control System Savings: 5%-15%.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 10% of the electricity and 10% for natural gas in these buildings.

The basis for the DDC system expansion is the Automated Logic Energy Management System or similar.

Energy Savings Calculations:

Energy savings for each utility is calculated with the equation below.

$$\text{Energy Savings (Utility)} = \text{Current Energy Consumption} \times \text{Estimated Savings, \%}$$

Following table summarizes energy savings for this facility via implementation of an Energy Management System:

DDC ENERGY MANAGEMENT SYSYEM CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Controls w/ Local Thermostats	DDC Controls	
Existing Nat Gas Usage (Therms)	13,179	-	
Existing Electricity Usage (kWh)	436,960	-	
Energy Savings, Nat Gas	-	10%	
Energy Savings, Electricity	-	10%	
Gas Cost ($/Therm)	*$1.07*	$1.07	
Electricity Cost ($/kWh)	*$0.121*	$0.121	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Nat Gas Usage (Therms)	13,179	11,861	1,318
Electricity Usage (kWh)	436,960	393,264	43,696
Nat Gas Cost ($)	$14,102	$12,691	$1,410
Electricity Cost ($)	$52,872	$47,585	$5,287
Energy Cost ($)	$66,974	$60,276	$6,697
COMMENTS:			

Demand savings due to implementation of this ECM is minimal.

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately $4.00 per SF in accordance with recent Contractor pricing for systems of this magnitude. Savings from the implementation of this ECM will be from the reduced energy consumption currently used by the HVAC system by proper control of schedule and temperatures via the DDC system.

Cost of complete DDC System = ($4.00/SF x 31,250 SF) = $125,000

Currently, there are no prequalified NJ SmartSmart Incentives for installation of the DDC system.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$125,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$125,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$6,697
Total Yearly Savings ($/Yr):	$6,697
Estimated ECM Lifetime (Yr):	20
Simple Payback	18.7
Simple Lifetime ROI	7.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$133,940
Internal Rate of Return (IRR)	1%
Net Present Value (NPV)	($25,365.55)

REM #1: 161.21 kW Solar System

Description:

The Ice Rink has available roof space that could accommodate a significant amount of solar generation. Based on the available areas a 161.21 kilowatt solar array could be installed, assuming the existing roof structure is capable of supporting an array. The array will produce approximately 200,972 kilowatt-hours annually that will reduce the overall electric usage of the facility by 46%.

Energy Savings Calculations:

See **Renewable / Distributed Energy Measures Calculations Appendix** for detailed financial summary and proposed solar layout areas. Financial results in table below are based on 100% financing of the system over a fifteen year period.

Energy Savings Summary:

REM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$973,892
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$973,892
Maintenance Savings ($/Yr):	$77,496
Energy Savings ($/Yr):	$24,318
Total Yearly Savings ($/Yr):	$101,814
Estimated ECM Lifetime (Yr):	15
Simple Payback	9.6
Simple Lifetime ROI	56.8%
Simple Lifetime Maintenance Savings	$1,162,440
Simple Lifetime Savings	$1,527,210
Internal Rate of Return (IRR)	6%
Net Present Value (NPV)	$241,556.92

V. 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. Turn off computers when not in use. Ensure computers are not running in screen saver mode which saves the monitor screen not energy.

F. Ensure outside air dampers are functioning properly and only open during occupied mode.

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Old Bridge Township - Ice Rink

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY														
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 #1	Lighting Upgrade	$6,361	$9,541	$3,010	$12,892	$2,107	$0	$2,107	15	$31,605	$0	145.2%	6.1	14.08%	$12,261.23
ECM #2	Lighting Controls - Occupancy Sensors	$1,000	$800	$0	$1,800	$498	$0	$498	15	$7,470	$0	315.0%	3.6	1226122.92%	$0.00
ECM #3	Condensing Boilers	$37,430	$51,657	$1,363	$87,724	$2,140	$0	$2,140	25	$53,500	$0	-39.0%	41.0	0.00%	$0.00
ECM #4	Domestic Hot Water Heater Replacement	$17,523	$15,223	$350	$32,396	$461	$0	$461	25	$11,525	$0	-64.4%	70.3	0.00%	$0.00
ECM #5	DDC Controls System	$62,500	$62,500	$0	$125,000	$6,697	$0	$6,697	20	$133,940	$0	7.2%	18.7	0.00%	$0.00
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Ice Rink 161.21 kW Array	$973,892	$0	$0	$973,892	$24,318	$77,496	$101,814	15	$1,527,210	$1,162,440	56.8%	9.6	6.23%	$241,556.92

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* .

APPENDIX B

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 15, 2011:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2007

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 - $92 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 90.1-2007

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%

Ground Source Heat Pumps

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per VFD rated hp
Compressors	$5,250 to $12,500 per drive
Cooling Towers ≥ 10 hp	$60 per VFD rated hp

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons, 0.67 energy factor or better	$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

Prescriptive Lighting

Retro fit of T12 to T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	$10 per fixture (1-4 lamps)
Replacement of T12 with new T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	$25 per fixture (1-4 lamps)
Replacement of incandescent with screw-in PAR 38 or PAR 30 (CFL) bulb	$7 per bulb
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 Including Parking Lot	$25 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $200 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

Prescriptive Lighting - LED

LED New Exit Sign Fixture Existing Facility < 75 kw Existing Facility > 75 kw	 $20 per fixture $10 per fixture
LED Display Case Lighting	$30 per display case
LED Shelf-Mtd. Display & Task Lights	$15 per linear foot
LED Portable Desk Lamp	$20 per fixture
LED Wall-wash Lights	$30 per fixture
LED Recessed Down Lights	$35 per fixture
LED Outdoor Pole/Arm-Mounted Area and Roadway Luminaries	$175 per fixture
LED Outdoor Pole/Arm-Mounted Decorative Luminaries	$175 per fixture
LED Outdoor Wall-Mounted Area Luminaries	$100 per fixture
LED Parking Garage Luminaries	$100 per fixture
LED Track or Mono-Point Directional Lighting Fixtures	$50 per fixture
LED High-Bay and Low-Bay Fixtures for Commercial & Industrial Bldgs.	$150 per fixture
LED High-Bay-Aisle Lighting	$150 per fixture
LED Bollard Fixtures	$50 per fixture
LED Linear Panels (2x2 Troffers only)	$100 per fixture
LED Fuel Pump Canopy	$100 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

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

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2007 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%

APPENDIX C

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Old Bridge Ice Arena

Building ID: 3253736
For 12-month Period Ending: October 31, 2011[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: August 14, 2012

Facility
Old Bridge Ice Arena
1 Old Bridge Plaza
Old Bridge, NJ 08857

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1982
Gross Floor Area (ft²): 31,250

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	1,519,745
Natural Gas (kBtu)[4]	1,315,471
Total Energy (kBtu)	2,835,216

Energy Intensity[4]

Site (kBtu/ft²/yr)	91
Source (kBtu/ft²/yr)	207

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	285

Electric Distribution Utility
Jersey Central Power & Light Co [FirstEnergy Corp]

National Median Comparison

National Median Site EUI	39
National Median Source EUI	100
% Difference from National Median Source EUI	107%
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.

Certifying Professional
N/A

Meets Industry Standards[5] **for Indoor Environmental Conditions:**

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

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Values represent energy intensity, annualized to a 12-month period.
5. 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) or a Registered Architect (RA) 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 or RA 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	Old Bridge Ice Arena	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	1 Old Bridge Plaza, Old Bridge, NJ 08857	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 a hospital, k-12 school, hotel and senior care facility) nor can they be submitted as representing only a portion of a building.		☐
Ice Arena (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	31,250 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	1(Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	80Hours(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	4(Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Jersey Central Power & Light Co [FirstEnergy Corp]

Fuel Type: Electricity

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

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
09/23/2011	10/22/2011	67,120.00
08/23/2011	09/22/2011	61,280.00
07/23/2011	08/22/2011	7,440.00
06/23/2011	07/22/2011	4,480.00
05/23/2011	06/22/2011	12,400.00
04/23/2011	05/22/2011	5,600.00
03/23/2011	04/22/2011	38,480.00
02/23/2011	03/22/2011	54,240.00
01/23/2011	02/22/2011	61,280.00
12/23/2010	01/22/2011	34,960.00
11/23/2010	12/22/2010	63,760.00
Electric Consumption (kWh (thousand Watt-hours))		**411,040.00**
Electric Consumption (kBtu (thousand Btu))		**1,402,468.48**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**1,402,468.48**
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)
09/08/2011	10/07/2011	384.09
08/08/2011	09/07/2011	74.47
07/08/2011	08/07/2011	39.26
06/08/2011	07/07/2011	50.63
05/08/2011	06/07/2011	55.91
04/08/2011	05/07/2011	72.61
03/08/2011	04/07/2011	1,643.08
02/08/2011	03/07/2011	2,197.00
01/08/2011	02/07/2011	2,625.46
12/08/2010	01/07/2011	2,739.15
11/08/2010	12/07/2010	2,070.60

Gas Consumption (therms)	**11,952.26**
Gas Consumption (kBtu (thousand Btu))	**1,195,226.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**1,195,226.00**
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 PE or RA 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
Old Bridge Ice Arena
1 Old Bridge Plaza
Old Bridge, NJ 08857

Facility Owner
N/A

Primary Contact for this Facility
N/A

General Information

Old Bridge Ice Arena	
Gross Floor Area Excluding Parking: (ft^2)	31,250
Year Built	1982
For 12-month Evaluation Period Ending Date:	October 31, 2011

Facility Space Use Summary

Ice Arena	
Space Type	Other - Recreation
Gross Floor Area (ft^2)	31,250
Number of PCs °	1
Weekly operating hours °	80
Workers on Main Shift °	4

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 10/31/2011)	**Baseline** (Ending Date 10/31/2011)	**Rating of 75**	**Target**	**National Median**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site ($kBtu/ft^2$)	91	91	0	N/A	39
Source ($kBtu/ft^2$)	207	207	0	N/A	100
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/$ft^2$/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	285	285	0	N/A	123
$kgCO_2e/ft^2$/year	9	9	0	N/A	4

More than 50% of your building is defined as Recreation. This building is currently ineligible for a rating. Please note the National Median column represents the CBECS national median data for Recreation. This building uses 107% more energy per square foot than the CBECS national median for Recreation.

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

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

Ice Rink

Boilers

Tag	BU-1	BU-2	
Unit Type	Volume Water Heater/Boiler	Cast Iron Gas Boiler	
Qty	1	1	
Location	Ice Rink	Ice Rink	
Area Served	Ice Rink	Ice Rink	
Manufacturer	Laars	Peerless	
Model #	VW-PW0400CN01CBACN	211A-05-W/S-I	
Serial #	E03CF0034	211-12494-0397	
Input Capacity (Btu/Hr)	400,000	840,000	
Rated Output Capacity (Btu/Hr)	324,000	672,000	
Approx. Efficiency %	70.0%	75.0%	
Fuel	Gas	Gas	
Approx Age	15	12	
ASHRAE Service Life	24	24	24
Remaining Life	9	12	24
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Ice Rink

Cooling Tower

Tag	CH-1		
Unit Type	Ice rink chiller		
Qty	1		
Location	Mechanical Room		
Area Served	Ice Rink Ice		
Manufacturer	Holmsten Ice Rinks, Inc		
Model #	Rinkmaseter 135		
Serial #	650		
Refrigerant	R123		
Cooling Capacity (Tons)	135		
Cooling Efficiency (KW/Ton)			
Volts / Phase / Hz	460v / 3Ph / 60 hz		
Fuel	-		
Chilled Water GPM / ΔT	-		
Condenser Water GPM / ΔT	-		
Approx Age	30		
ASHRAE Service Life	20	20	20
Remaining Life	(10)	20	20
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Ice Rink

Cooling Tower

Tag	CT-1		
Unit Type	Air cooled closed loop		
Qty	1		
Location	Outside at Grade		
Area Served	Ice Rink Chiller System		
Manufacturer	IMECO		
Model #	N/A		
Serial #	N/A		
Rated Flow GPM	N/A		
EWT / LWT	N/A		
Motor HP	N/A		
Electrical	460v		
Approx Age	30		
ASHRAE Service Life	20	20	20
Remaining Life	(10)	20	20
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Old Bridge Township Ice Rink

Domestic Water Heaters

Tag	HWH-1/2	HWH-3	
Unit Type	Domestic Hot Water Heater	Domestic Hot Water Heater	
Qty	2	1	
Location	Ice Rink	Ice Rink	
Area Served	Ice Rink	Ice Rink	
Manufacturer	A.O. Smith	A.O. Smith	
Model #	BT 100 230	FSG 75 230	
Serial #	MG97-0668974-230	MD97-0076666-230	
Size (Gallons)	75	75	
Input Capacity (MBH/KW)	100	75	
Recovery (Gal/Hr)	98	76.8	
Efficiency %	80%	80%	
Fuel	Natural Gas	Natural Gas	
Approx Age	18	12	
ASHRAE Service Life	12	12	
Remaining Life	(6)	0	
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

APPENDIX E

Investment Grade Lighting Audit

CEG Job #: 9C12048
Project: Ice Rink
1 Old Bridge Plaza
Old Bridge, NJ
Bldg. Sq. Ft.

Ice Rink

KWH COST: $0.121

Lighting Upgrade - General & Re-Lamping

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	Total Incentive	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
142.31	Lobby/Eating	2200	28	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	156	4.37	9,609.6	$1,162.76	28	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	2.02	4435.2	$536.66	$180.00	$5,040.00	$280.00	2.35	5174.4	$626.10	8.05
142.31	Kitchen	2200	12	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	156	1.87	4,118.4	$498.33	12	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.86	1900.8	$230.00	$180.00	$2,160.00	$120.00	1.01	2217.6	$268.33	8.05
769	Rink	2200	24	1	400w MH, Hi-Bay	465	11.16	24,552.0	$2,970.79	24	6	2x4 54w T5HO 6 Lamp w/Prismatic Lens	354	8.50	18691.2	$2,261.64	$260.00	$6,240.00	$2,400.00	2.66	5860.8	$709.16	8.80
128.34	Electrical Room	1200	6	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Pendant Mnt., No Lens	209	1.25	1,504.8	$182.08	6	4	(2) 8' Lamps to (4) 4' Lamps - 28w T8, Elect Ballast; retrofit	98	0.59	705.6	$85.38	$100.00	$600.00	$60.00	0.67	799.2	$96.70	6.20
128.34	Zamboni Storage	2200	2	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Pendant Mnt., No Lens	209	0.42	919.6	$111.27	2	4	(2) 8' Lamps to (4) 4' Lamps - 28w T8, Elect Ballast; retrofit	98	0.20	431.2	$52.18	$100.00	$200.00	$20.00	0.22	488.4	$59.10	3.38
124.31	Computer Rec.	1200	1	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.08	93.6	$11.33	1	2	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.05	60	$7.26	$100.00	$100.00	$10.00	0.03	33.6	$4.07	24.60
121.14	Tool Rooom	1200	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., No Lens	78	0.16	187.2	$22.65	2	2	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.10	120	$14.52	$100.00	$200.00	$20.00	0.06	67.2	$8.13	24.60
6	Staff	2200	4	1	1x1 Surface Mount, 75w A19	75	0.30	660.0	$79.86	4	1	Relamp - 26w CFL Lamp	26	0.10	228.8	$27.68	$20.00	$80.00	$0.00	0.20	431.2	$52.18	1.53
6	Locker Room	2200	6	1	1x1 Surface Mount, 75w A19	75	0.45	990.0	$119.79	6	1	Relamp - 26w CFL Lamp	26	0.16	343.2	$41.53	$20.00	$120.00	$0.00	0.29	646.8	$78.26	1.53
620	Walkway	2200	4	1	Wall Mnt. 100w A19 Lamp	100	0.40	880.0	$106.48	4	1	(1) 26w CFL Lamp	26	0.10	228.8	$27.68	$20.00	$80.00	$0.00	0.30	651.2	$78.80	1.02
142.31	Restroom (2)	2200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	156	0.31	686.4	$83.05	2	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.14	316.8	$38.33	$180.00	$360.00	$20.00	0.17	369.6	$44.72	8.05
121.34	Electrical/Mechanical Room	1200	3	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Pendant Mnt., No Lens	78	0.23	280.8	$33.98	3	2	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.15	180	$21.78	$100.00	$300.00	$30.00	0.08	100.8	$12.20	24.60
242.21	Restrooms (2)	2200	4	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.43	941.6	$113.93	4	4	Relamp - Sylvania Lamp FO28/841/SS/ECO	98	0.39	862.4	$104.35	$28.00	$112.00	$0.00	0.04	79.2	$9.58	11.69
141.34	Skate Sharpening	2200	1	4	1x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., No Lens	156	0.16	343.2	$41.53	1	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.07	158.4	$19.17	$180.00	$180.00	$10.00	0.08	184.8	$22.36	8.05
141.34	First Aid	2200	1	4	1x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., No Lens	156	0.16	343.2	$41.53	1	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.07	158.4	$19.17	$180.00	$180.00	$10.00	0.08	184.8	$22.36	8.05
142.31	Skate Rental	2200	6	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	156	0.94	2,059.2	$249.16	6	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.43	950.4	$115.00	$180.00	$1,080.00	$60.00	0.50	1108.8	$134.16	8.05
142.31	PRO Lounge	2200	4	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	156	0.62	1,372.8	$166.11	4	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.29	633.6	$76.67	$180.00	$720.00	$40.00	0.34	739.2	$89.44	8.05
142.31	Office	2200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	156	0.31	686.4	$83.05	2	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.14	316.8	$38.33	$180.00	$360.00	$20.00	0.17	369.6	$44.72	8.05
142.31	Party Room-old	2200	6	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	156	0.94	2,059.2	$249.16	6	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.43	950.4	$115.00	$180.00	$1,080.00	$60.00	0.50	1108.8	$134.16	8.05
142.31	Party Room-new	2200	10	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	156	1.56	3,432.0	$415.27	10	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.72	1584	$191.66	$180.00	$1,800.00	$100.00	0.84	1848	$223.61	8.05
142.31	Supplies	2200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	156	0.31	686.4	$83.05	2	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.14	316.8	$38.33	$180.00	$360.00	$20.00	0.17	369.6	$44.72	8.05
142.31	Exercise Rooom	2200	4	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	156	0.62	1,372.8	$166.11	4	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.29	633.6	$76.67	$180.00	$720.00	$40.00	0.34	739.2	$89.44	8.05
142.31	Hall	2200	5	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	156	0.78	1,716.0	$207.64	5	3	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.36	792	$95.83	$180.00	$900.00	$50.00	0.42	924	$111.80	8.05
602		8670	2	2	Incandescent Exit Sign	20	0.04	346.8	$41.96	2	1	LED Exit Sign	2	0.00	34.68	$4.20	$65.00	$130.00	$40.00	0.04	312.12	$37.77	3.44
	Totals		101	64			21.6	46,114	$5,580	101	61			13.4	28,697	$3,472		$15,902	$3,010	8.2	17,417	$2,107	6.12

CEG Job #: 9C12048
Project: Ice Rink
Address: 1 Old Bridge Plaza
Old Bridge, NJ
Building SF:

Ice Rink

KWH COST: $0.121

#REF!

Lighting Controls

EXISTING LIGHTING											PROPOSED LIGHTING CONTROLS									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Existing Fixture **For Reference Only**	Retrofitted 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
142.31	Lobby/Eating	2200	28	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	2.016	4435.2	$536.66	28	0	No Change	72	2.02	0%	4435.2	$536.66	$0.00	$0.00	0.00	0	$0.00	0.00
142.31	Kitchen	2200	12	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.864	1900.8	$230.00	12	0	No Change	72	0.86	0%	1900.8	$230.00	$0.00	$0.00	0.00	0	$0.00	0.00
769	Rink	2200	24	1	400w MH, Hi-Bay	2x4 54w T5HO 6 Lamp w/Prismatic Lens	354	8.496	18691.2	$2,261.64	24	4	Dual Technology Occupancy Sensor - Remote Mnt.	354	6.80	20%	14952.96	$1,809.31	$300.00	$1,200.00	1.70	3738.24	$452.33	2.65
128.34	Electrical Room	1200	6	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Pendant Mnt., No Lens	(2) 8' Lamps to (4) 4' Lamps - 28w T8, Elect Ballast; retrofit	98	0.588	705.6	$85.38	6	0	No Change	98	0.59	0%	705.6	$85.38	$0.00	$0.00	0.00	0	$0.00	0.00
128.34	Zamboni Storage	2200	2	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Pendant Mnt., No Lens	(2) 8' Lamps to (4) 4' Lamps - 28w T8, Elect Ballast; retrofit	98	0.196	431.2	$52.18	2	0	No Change	98	0.20	0%	431.2	$52.18	$0.00	$0.00	0.00	0	$0.00	0.00
124.31	Computer Rec.	1200	1	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.05	60	$7.26	1	0	No Change	50	0.05	0%	60	$7.26	$0.00	$0.00	0.00	0	$0.00	0.00
121.14	Tool Rooom	1200	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., No Lens	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.1	120	$14.52	2	0	No Change	50	0.10	0%	120	$14.52	$0.00	$0.00	0.00	0	$0.00	0.00
6	Staff	2200	4	1	1x1 Surface Mount, 75w A19	Relamp - 26w CFL Lamp	26	0.104	228.8	$27.68	4	0	No Change	26	0.10	0%	228.8	$27.68	$0.00	$0.00	0.00	0	$0.00	0.00
6	Locker Room	2200	6	1	1x1 Surface Mount, 75w A19	Relamp - 26w CFL Lamp	26	0.156	343.2	$41.53	6	0	No Change	26	0.16	0%	343.2	$41.53	$0.00	$0.00	0.00	0	$0.00	0.00
620	Walkway	2200	4	1	Wall Mnt. 100w A19 Lamp	(1) 26w CFL Lamp	26	0.104	228.8	$27.68	4	0	No Change	26	0.10	0%	228.8	$27.68	$0.00	$0.00	0.00	0	$0.00	0.00
142.31	Restroom (2)	2200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.144	316.8	$38.33	2	0	No Change	72	0.14	0%	316.8	$38.33	$0.00	$0.00	0.00	0	$0.00	0.00
121.34	Electrical/Mechanical Room	1200	3	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Pendant Mnt., No Lens	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.15	180	$21.78	3	0	No Change	50	0.15	0%	180	$21.78	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Restrooms (2)	2200	4	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	Relamp - Sylvania Lamp FO28/841/SS/ECO	98	0.392	862.4	$104.35	4	0	No Change	98	0.39	0%	862.4	$104.35	$0.00	$0.00	0.00	0	$0.00	0.00
141.34	Skate Sharpening	2200	1	4	1x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., No Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.072	158.4	$19.17	1	0	No Change	72	0.07	0%	158.4	$19.17	$0.00	$0.00	0.00	0	$0.00	0.00
141.34	First Aid	2200	1	4	1x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., No Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.072	158.4	$19.17	1	0	No Change	72	0.07	0%	158.4	$19.17	$0.00	$0.00	0.00	0	$0.00	0.00
142.31	Skate Rental	2200	6	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.432	950.4	$115.00	6	0	No Change	72	0.43	0%	950.4	$115.00	$0.00	$0.00	0.00	0	$0.00	0.00

Lighting Controls

EXISTING LIGHTING											PROPOSED LIGHTING CONTROLS									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Existing Fixture **For Reference Only**	Retrofitted 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
142.31	PRO Lounge	2200	4	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.288	633.6	$76.67	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	72	0.23	20%	506.88	$61.33	$150.00	$150.00	0.06	126.72	$15.33	9.78
142.31	Office	2200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.144	316.8	$38.33	2	1	Dual Technology Occupancy Sensor - Switch Mnt.	72	0.12	20%	253.44	$30.67	$150.00	$150.00	0.03	63.36	$7.67	19.57
142.31	Party Room-old	2200	6	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.432	950.4	$115.00	6	0	No Change	72	0.43	0%	950.4	$115.00	$0.00	$0.00	0.00	0	$0.00	0.00
142.31	Party Room-new	2200	10	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.72	1584	$191.66	10	0	No Change	72	0.72	0%	1584	$191.66	$0.00	$0.00	0.00	0	$0.00	0.00
142.31	Supplies	2200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.144	316.8	$38.33	2	1	Dual Technology Occupancy Sensor - Switch Mnt.	72	0.12	20%	253.44	$30.67	$150.00	$150.00	0.03	63.36	$7.67	19.57
142.31	Exercise Rooom	2200	4	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.288	633.6	$76.67	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	72	0.23	20%	506.88	$61.33	$150.00	$150.00	0.06	126.72	$15.33	9.78
142.31	Hall	2200	5	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Pendant Mnt., Prismatic Lens	3 Lamp , 28w T8, Elect. Ballast, Specular Reflector; retrofit	72	0.36	792	$95.83	5	0	No Change	72	0.36	0%	792	$95.83	$0.00	$0.00	0.00	0	$0.00	0.00
602		8670	2	2	Incandescent Exit Sign	LED Exit Sign	2	0.004	34.68	$4.20	2	0	No Change	2	0.00	0%	34.68	$4.20	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		101	64				16.3	35,033.1	$4,239	141	8			14.4		30,914.7	$3,740.68		$1,800	1.87	4,118	$498	3.61

APPENDIX F

Project Name: **LGEA Solar PV Project - Old Bridge Township Ice Rink**
Location: **Old Bridge, NJ**
Description: **Photovoltaic System 100% Financing - 15 year**

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$973,892
Annual kWh Production	200,972
Annual Energy Cost Reduction	$24,318
Average Annual SREC Revenue	$77,496

Simple Payback: **9.57** Years

Life Cycle Cost Analysis

Analysis Period (years): 15
Discount Rate: 3%
Average Energy Cost ($/kWh) **$0.121**
Financing Rate: 6.00%
Financing %: 100%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
Average SREC Value ($/kWh) $0.386

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$0	0	0	0	$0	0	0	0	0
1	$0	200,972	$24,318	$0	$110,535	$57,310	$41,309	$36,233	$36,233
2	$0	199,967	$25,047	$0	$109,982	$54,762	$43,857	$36,410	$72,643
3	$0	198,967	$25,799	$0	$99,484	$52,057	$46,562	$26,663	$99,306
4	$0	197,972	$26,573	$0	$89,088	$49,185	$49,434	$17,041	$116,348
5	$0	196,983	$27,370	$2,029	$88,642	$46,136	$52,483	$15,364	$131,711
6	$0	195,998	$28,191	$2,019	$88,199	$42,899	$55,720	$15,752	$147,463
7	$0	195,018	$29,037	$2,009	$78,007	$39,462	$59,157	$6,416	$153,879
8	$0	194,043	$29,908	$1,999	$77,617	$35,814	$62,805	$6,907	$160,786
9	$0	193,072	$30,805	$1,989	$67,575	$31,940	$66,679	($2,227)	$158,559
10	$0	192,107	$31,729	$1,979	$67,237	$27,827	$70,792	($1,631)	$156,928
11	$0	191,147	$32,681	$1,969	$57,344	$23,461	$75,158	($10,563)	$146,364
12	$0	190,191	$33,661	$1,959	$57,057	$18,826	$79,793	($9,859)	$136,505
13	$0	189,240	$34,671	$1,949	$47,310	$13,904	$84,715	($18,587)	$117,918
14	$0	188,294	$35,711	$1,939	$47,073	$8,679	$89,940	($17,774)	$100,144
15	$0	187,352	$36,783	$1,930	$37,470	$3,132	$95,487	($26,296)	$73,848
	Totals:	2,911,322	$452,281	$21,768	$1,122,621	$505,394	$973,892	$73,848	$1,808,637

Net Present Value (NPV) **$82,398**

Location Description	Area (Sq FT)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Total KW_{AC}	Panel Weight (41.9 lbs)	W/SQFT
Old Bridge Township - Recreation Center Roof	16800	SHARP NU-U235F2	686	17.5	12,033	161.21	200,972	130.6	28,743	13.40

.= Proposed PV Layout

Notes:

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

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	161.2 kW
DC to AC Derate Factor:	0.810
AC Rating:	130.6 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	12.1 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ^{2}/day)	AC Energy (kWh)	Energy Value ($)
1	3.36	14061	1701.38
2	4.05	15178	1836.54
3	4.58	18407	2227.25
4	4.84	17998	2177.76
5	5.30	19836	2400.16
6	5.33	18722	2265.36
7	5.27	18906	2287.63
8	5.25	18700	2262.70
9	5.06	18130	2193.73
10	4.46	17075	2066.08
11	3.15	12194	1475.47
12	2.87	11764	1423.44
Year	4.46	200972	24317.61