BERGEN COUNTY
DARLINGTON GOLF CLUBHOUSE

277 CAMPGAW ROAD
MAHWAH, NJ 07430

FACILITY ENERGY REPORT

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I. HISTORIC ENERGY CONSUMPTION/COST

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.

Electric Utility Provider:	Orange and Rockland
Electric Utility Rate Structure:	Not available
Third Party Supplier:	None

Natural Gas Utility Provider:	Public Service Electric & Gas
Utility Rate Structure:	Not available
Third Party Supplier:	None

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 within each facility report 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 billing data was not available for this facility.

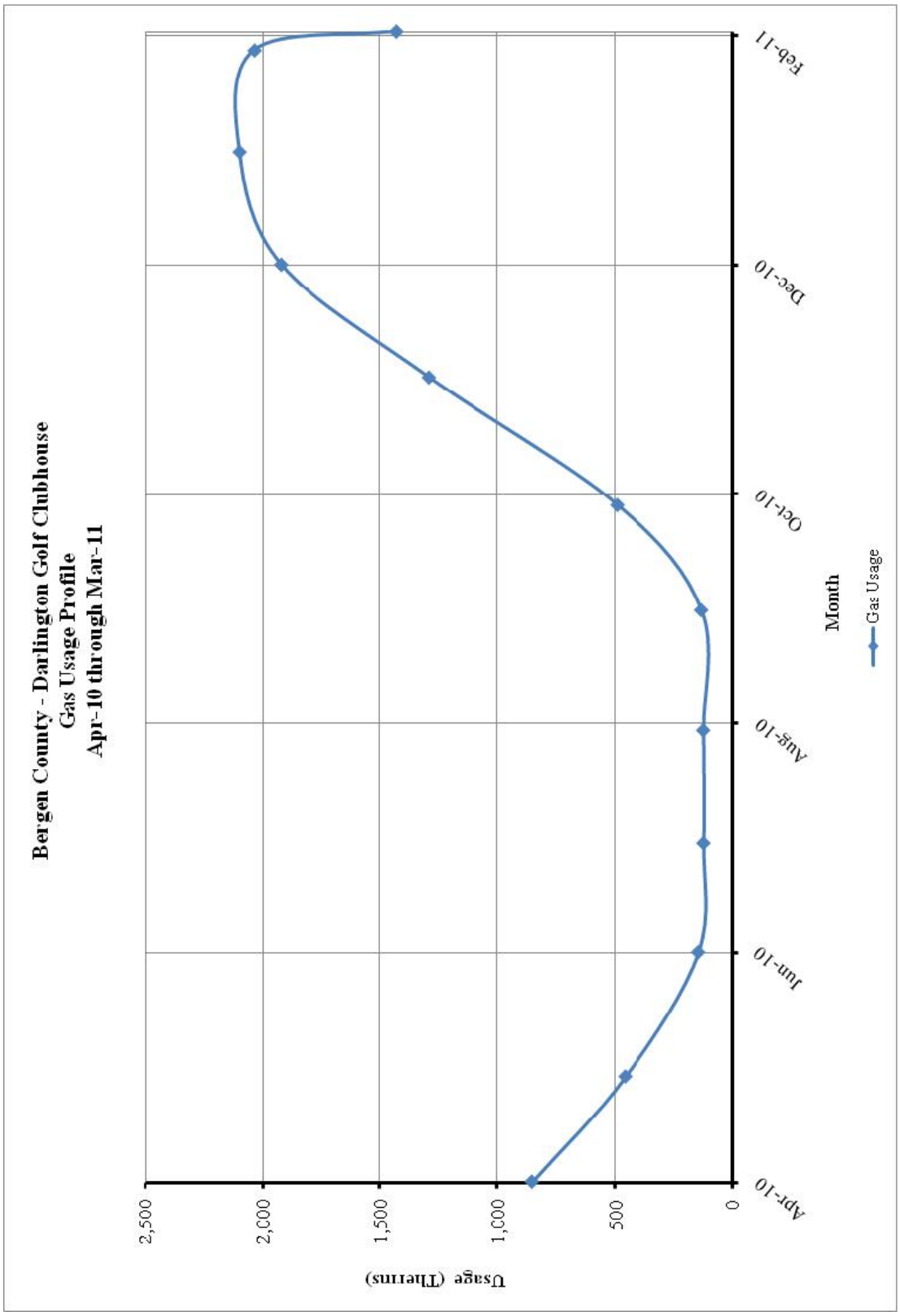
Figure 1
Electricity Usage Profile

Electricity Usage Profile was not available for this facility.

Table 2
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: PSE&G		
Rate: N/A		
Meter No: 3341454, 2048143		
Point of Delivery ID: 65 799 099 00, 65 799 091 02		
Third Party Utility Provider: None		
TPS Meter No: -		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Apr-10	851.00	$824.53
May-10	454.34	$473.71
Jun-10	142.45	$164.68
Jul-10	120.33	$154.05
Aug-10	121.36	$158.88
Sep-10	129.79	$155.64
Oct-10	488.01	$503.62
Nov-10	1,290.99	$1,340.33
Dec-10	1,919.78	$2,178.43
Jan-11	2,096.45	$2,393.01
Feb-11	2,033.11	$2,340.33
Mar-11	1,429.04	$1,575.81
TOTALS	**11,076.64**	**$12,263.02**
AVERAGE RATE:	**$1.11**	**$/THERM**

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

The 8,229 SF Golf Clubhouse is a two story facility comprised of office areas, pro-shop, concession area, bathrooms, custodial rooms, boiler room and an apartment on the second floor of the building. The typical hours of operation for this facility are 7 days per week between 7:00 AM and 7:00 PM. Estimated number of visitors is 500 per day.

Exterior walls are cinder block construction with partly concrete and wood panel siding. The amount of insulation within the exterior walls is unknown. The windows throughout the facility are in fair condition. Typical windows throughout the facility are single pane, ¼" clear glass with aluminum frames.

The facility has pitched roof with asphalt shingle covering. The amount of insulation below the roofing could not be verified. The building was built in 1980 with no additions since the original construction.

HVAC Systems

The main lobby area, concession area and the offices are air conditioned by a split air conditioning system. The system consists of a central air handling unit (AHU) and a split condenser both made by Trane. The Trane condensing unit is approximately 17 years old, which is beyond ASHRAE service life of 15 years for this type of equipment. Conditioned air is distributed to the corresponding spaces through constant volume ductwork to ceiling diffusers. The air handling unit supply fan is driven with a 5 HP standard efficiency electric motor.

In addition to central unit, a separate 3-ton split system made by Weather King provides cooling for the apartment on the second floor of the facility.

Heating for the clubhouse main areas is provided with hot water perimeter baseboard heaters. The bathrooms have ceiling hung unit heaters for supplemental heating. Primary source of heating for this facility is a standard efficiency, gas fired, cast iron hot water boiler made by Weil McLain. The boiler is approximately 2-years old and it is in excellent condition. It has 935 MBh input capacity and 81% thermal efficiency. It was observed that the boiler's exhaust damper actuator is missing. It is recommended to install the damper actuator in order to restore boiler's thermal efficiency. The exhaust damper reduces the stack losses of the boiler. Heating hot water is circulated through the heating zones via three (3) ¾ HP hot water circulators made by Bell & Gossett.

Exhaust System

Air is exhausted from the toilet rooms through the side wall exhauster. The kitchen area is equipped with a ventilation hood. The hood operates only occasionally.

HVAC System Controls

The main air conditioning system is controlled with an old and outdated Honeywell mechanical thermostat located in the hallway near ticketing office. It is recommended to replace the

mechanical thermostat with a digital programmable thermostat to implement set-back at night. Three separate digital thermostat controls the hot water baseboard heater zones. The unit heaters are controlled with manual thermostats. The apartment has a separate thermostat for both heating and air conditioning.

Domestic Hot Water

Domestic hot water for the entire clubhouse is provided by a 100-gallon gas fired hot water heater made by AO Smith. The unit is over 14 years old and in good condition. Typical service life of gas fired hot water heaters is 12 years.

Lighting

Typical lighting throughout building is fluorescent tube lay-in fixtures with a combination of T-8 and T-12 lamps and magnetic ballasts. Mechanical areas, storage rooms and closets are lit with a mixture of incandescent lamps and compact fluorescent lamps. Some of the exit signs are lit with incandescent lamps.

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 3
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 Equipment Upgrade	$6,583	$2,382	2.8	442.8%
ECM #2	Lighting Controls Upgrade	$3,885	$754	5.2	191.2%
ECM #3	New AC Condensing Unit	$31,025	$2,546	12.2	23.1%
ECM #4	Programmable Thermostats for Heat	$300	$903	0.3	5916.9%
ECM #5	Programmable Thermostats for AC	$300	$1,061	0.3	5204.7%
ECM #6	Nema Motor for AHU Fan	$1,459	$86	17.0	-11.6%
ECM #7	Automatic Boiler Flue Damper	$300	$293	1.0	1365.5%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Solar Photovoltaic System	$2,320,470	$157,490	14.7	1.8%

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

Table 4
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 Equipment Upgrade	4.1	14,228	0
ECM #2	Lighting Controls Upgrade	0	4,571	0
ECM #3	New AC Condensing Unit	8.6	15,429	0
ECM #4	Programmable Thermostats for Heat	0	0	813
ECM #5	Programmable Thermostats for AC	0	6,430	0
ECM #6	Nema Motor for AHU Fan	0.1	506	0
ECM #7	Automatic Boiler Flue Damper	0	0	264
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	Solar Photovoltaic System	257.8	314,979	0

Table 5
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 Equipment Upgrade	$2,382	$6,953	$370	$6,583	2.8
Lighting Controls Upgrade	$754	$4,225	$340	$3,885	5.2
New AC Condensing Unit	$2,546	$33,000	$1,975	$31,025	12.2
Programmable Thermostats for Heat	$903	$300	$0	$300	0.3
Programmable Thermostats for AC	$1,061	$300	$0	$300	0.3
Nema Motor for AHU Fan	$86	$1,519	$60	$1,459	17.0
Automatic Boiler Flue Damper	$293	$300	$0	$300	1.0
Design / Construction Extras (15%)	$0	$6,990	$0	*$6,990*	
Total Project	**$8,025**	**$53,587**	**$370**	**$50,842**	**6.3**

Design / Construction Extras is 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 – Interior Spaces

Description:

The majority of the interior lighting throughout Darlington Golf Clubhouse is provided with fluorescent fixtures with older generation, 700 series 32W T8 lamps and electronic ballasts. Although 700 series T8 lamps are considered fairly efficient, further energy savings can be achieved by replacing the existing T8 lamps with new generation, 800 series 28W T8 lamps without compromising light output. CEG recommends, re-lamping all of the fixtures with 28W T8 lamps. In addition, some of the storage areas, locker room and gym areas, offices, auditorium, classrooms, restrooms and kitchen areas still have a variety of older fluorescent fixtures with magnetic ballasts and incandescent lamps. It is recommended to retrofit or replace all of the older fluorescent fixtures and the incandescent lights in these areas with high efficiency fluorescent T8 or T5 fixtures with electronic ballasts or compact fluorescent 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. This ECM also includes maintenance savings through the reduced number of lamps replaced per year. The expected lamp life of a T8 lamp is approximately 30,000 burn-hours, in comparison to the existing T12 lamps which is approximately 20,000 burn-hours. The facility will need approximately 33% less lamps replaced per year for each one for one fixture replaced.

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 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.

Rebates and Incentives:

NJ Smart Start® Program Incentives are calculated using the **Smart Start® Incentive Appendix** as follows:

Retrofit of T-12 fixtures to T-5 or T-8 with electric ballasts	$10 per fixture (1-4 lamp retrofits)

$$\text{Smart Start® Incentive} = (\#\ \text{of fixtures} \times \$10) = 37 \times \$10 = \$370$$

Replacement and Maintenance Savings are calculated as follows:

$$\text{Savings} = (\text{reduction in lamps replaced per year}) \times (\text{repacment \$ per lamp} + \text{Labor \$ per lamp})$$

$$\text{Savings} = 4.95 \times (\$2\ \text{per lamp} + \$5\ \text{per lamp}) = \$35$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,953
NJ Smart Start Equipment Incentive ($):	$370
Net Installation Cost ($):	$6,583
Maintenance Savings ($/Yr):	$35
Energy Savings ($/Yr):	$2,348
Total Yearly Savings ($/Yr):	$2,382
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.8
Simple Lifetime ROI	442.8%
Simple Lifetime Maintenance Savings	$520
Simple Lifetime Savings	$35,735
Internal Rate of Return (IRR)	36%
Net Present Value (NPV)	$21,857.03

ECM #2: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Clubhouse building 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 and daylight 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 libraries. 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:

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

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

Cost and Incentives:

Installation cost per dual-technology sensors (Basis: Sensor switch or equivalent) are as follows:

Dual Technology Occupancy Sensor - Switch Mount	$125 per installation
Dual Technology Occupancy Sensor - Remote Mount	$450 per installation
Dual Tech. Occupancy Sensor w/2 Pole Relay - Remote Mount	$500 per installation
Daylight Sensor (Sensorswitch PP-20 & CM-PC or equal)	$400 per installation

Cost includes material and labor.

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

Occupancy Sensor Fixture Mounted (existing facility only) = $20 per sensor
Occupancy Sensor Remote Mounted (existing facility only) = $35 per sensor

$$\text{Smart Start® Incentive} = (\#\text{ of wall mount} \times \$\,20) + (\#\text{ of ceiling mount} \times \$35)$$
$$\text{Smart Start® Incentive} = (3\text{ wall mount} \times \$\,20) + (8\text{ ceiling mount} \times \$35) = \$340$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,225
NJ Smart Start Equipment Incentive ($):	$340
Net Installation Cost ($):	$3,885
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$754
Total Yearly Savings ($/Yr):	$754
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.2
Simple Lifetime ROI	191.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$11,312
Internal Rate of Return (IRR)	18%
Net Present Value (NPV)	$5,118.18

ECM #3: Main Air Conditioning Unit Upgrade

Description:

Air conditioning for the Darlington Golf Clubhouse is provided with an older Trane split air conditioning system installed in 1994. The unit is in poor condition and in need of replacement. The unit is inefficient compared to modern equipment and can be replaced with new high efficiency units. New air conditioners provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and refrigerants.

This ECM includes one-for-one replacement of the older air conditioning unit with a new higher efficiency system. It is recommended to fully evaluate the capacity needed for all new systems prior to moving forward with this ECM. A summary of the unit replacements for this ECM can be found in the table below:

IMPLEMENTATION SUMMARY					
ECM INPUTS	**SERVICE FOR**	**NUMBER OF UNITS**	**COOLING CAPACITY, BTU/HR**	**TOTAL CAPACITY, TONS**	**REPLACE UNIT WITH**
Main AC Unit	Clubhouse	1	300,000	25.0	Trane Split System RAUJ-25 (R410a)
Total		**1**	**300,000**	**25.0**	

The manufacturer used for the design basis is TRANE. This ECM includes replacement of the outdoor condensing units and associated indoor air handling unit.

Energy Savings Calculations:

Cooling Energy Savings:

Seasonal energy consumption of the air conditioners at the cooling mode is calculated with the equation below:

$$\text{Energy Savings, kWh} = \text{Cooling Capacity,} \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{IEER}_{\text{Old}}} - \frac{1}{\text{IEER}_{\text{New}}} \right) \times \frac{\text{Operation Hours}}{1000 \frac{\text{W}}{\text{kWh}}}$$

$$\text{Demand Savings, kW} = \frac{\text{Energy Savings (kWh)}}{\text{Hours of Cooling}}$$

$$\text{Cooling Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity} \left(\frac{\$}{\text{kWh}} \right)$$

ENERGY SAVINGS CALCULATIONS							
ECM INPUTS	**COOLING CAPACITY, BTU/Hr**	**ANNUAL COOLING HOURS**	**EXISTING UNITS (S)EER**	**SPLIT UNITS (S)EER**	**# OF UNITS**	**ENERGY SAVINGS kWh**	**DEMAND SAVINGS kW**
Main AC Unit	300,000	1,800	10 IEER(Est) (8 EER)	14 IEER (11.9 EER)	1	15,429	8.6
Total					1	15,429	8.6

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start® Program appendix, the replacement of split system AC units and unitary systems with high efficiency AC systems falls under the category "Unitary HVAC Split System" and warrants an incentive based on efficiency (EER/SEER). The program incentives are calculated as follows:

$$\text{SmartStart® Incentive} = (\text{Cooling Tons} \times \$/\text{Ton Incentive})$$

SPLIT SYSTEM AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	**UNIT EFFICIENCY**	**REBATE $/TON**	**PROPOSED CAPACITY TONS**	**TOTAL REBATE $**
≥20 to 30 tons	10.5 EER	79	25.0	$1,975
≥ 11.25 to < 20 tons	11.5 EER	79	0.0	$0
≥ 5.4 to < 11.25 tons	11.5 EER	73	0.0	$0
5.4 tons or less Unitary AC and Split System	≥14 SEER	$92	0.0	$0
TOTAL			**25**	**$1,975**

Summary of cost, savings and payback for this ECM is below.

COST & SAVINGS SUMMARY							
ECM INPUTS	**INSTALLED COST**	**# OF UNITS**	**TOTAL COST**	**REBATES**	**NET COST**	**ENERGY SAVING**	**PAY BACK YEARS**
Main AC Unit	$33,000	1	$33,000	$1,975	$31,025	$2,546	12.2
Total		1	$33,000	$1,975	$31,025	$2,546	12.2

There is no significant maintenance savings due to implementation of this ECM.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$33,000
NJ Smart Start Equipment Incentive ($):	$1,975
Net Installation Cost ($):	$31,025
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,546
Total Yearly Savings ($/Yr):	$2,546
Estimated ECM Lifetime (Yr):	15
Simple Payback	12.2
Simple Lifetime ROI	23.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$38,186
Internal Rate of Return (IRR)	3%
Net Present Value (NPV)	($634.43)

ECM #4: Programmable Thermostats for Hydronic Heat

Description:

The heating for the Darlington Golf Clubhouse is achieved via perimeter baseboard heaters. The system is controlled with a mechanical thermostat. Currently, there is no night setback for the perimeter baseboard heating.

Energy consumption of the perimeter baseboard heating can be reduced by installing programmable thermostats. Programmable thermostats for heating are available to utilize time-of-day schedules for occupied and unoccupied times and set-backs.

This energy conservation measure will install programmable thermostats to control the hot baseboard heating system. The recommended thermostat set points for heating in the offices are as follows:

Occupied Heating = 70° F
Unoccupied Heating = 65° F

Energy Savings Calculations:

Energy savings calculations are derived from the actual natural gas consumption of the building, number of heating degree days at this location and estimated hours of setback during the unoccupied times.

First, total design day heat load of the building is back-calculated using the actual natural gas consumption of the building, HDDs based on 65°F and 24hours per day operation.

$$\text{Total Heat Load}, \frac{\text{BTU}}{\text{hr}} = \frac{\text{Heating Energy Used (Therms)} \times \Delta\text{T} \times \text{Eff} \times \text{V}}{\text{HDD}_{65°\text{F}} \times \text{Hours of Operation}}$$

Then the proposed energy consumption of the building is calculated at set-back conditions using the total heat load of the building, HDDs at 60°F and based on hours of set-back conditions per day.

$$\text{Heating Energy Used (Therms)} = \frac{\text{Heating Capacity}}{\Delta\text{T} \times \text{Eff} \times \text{V}} \left(\text{HDD}_{65°\text{F}} \times \text{Non}_{\text{Setback}}\text{Hrs} + \text{HDD}_{60°F} \times \text{Setback Hrs}\right)$$

Where:

HDD = number of Heating Degree Days as Specified Base Temperature
ΔT= Design temperature difference, 70ºF
Eff = Efficiency of Energy Utilization (Boiler efficiency)
V = Heating value of fuel, BTU/Therm (100,000 Btu/Hr per Therm)

Estimated total cost of heating = Energy Consumption (Therms) x Cost of Natural Gas ($/Therms)

Energy savings calculations are summarized in the table below.

PROGRAMMABLE THERMOSTAT for HYDRONIC HEATING			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Mechanical Thermostat	Programmable Thermostat	
Annual Natural Gas Cons. (Therms)	11,077	-	-
Heating Degree Days (65°F)	4,750	4,750	-
Design Day Temperature Diff. (°F)	70	70	-
Heating Efficiency (Natural Gas Boiler)	80%	80%	-
Design Day Heating Capacity, BTU/Hr	544,133	544,133	-
Heating Degree Days (60°F)	3,704	3,704	-
Hours of Heating Temp. Setback	0	8	8
Elec Cost ($/kWh)	$0.165	$0.165	-
Natural Gas Cost ($/Therm)	$1.110	$1.110	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Cons. (Non-Setback)	11,077	7,385	3,692
Natural Gas Cons. (Setback)	0	2,879	(2,879)
Natural Gas Cons. (Total)	11,077	10,264	813
Electric Energy Cost ($)	$12,295	$11,393	$903
COMMENTS:	HDDs estimated based on Newark,NJ.		

Cost

Installed cost of programmable thermostats is $300/Unit.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$300
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$300
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$903
Total Yearly Savings ($/Yr):	$903
Estimated ECM Lifetime (Yr):	20
Simple Payback	0.3
Simple Lifetime ROI	5916.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$18,051
Internal Rate of Return (IRR)	301%
Net Present Value (NPV)	$13,127.38

ECM #5: Programmable Thermostats for Central A/C System

Description:

The air conditioning for the Darlington Golf Clubhouse is achieved via a 25-ton central split A/C system. The system is controlled with a mechanical thermostat. Currently, there is no night setback for this system.

Energy consumption of the air conditioning system can be reduced by installing a programmable thermostat. Programmable thermostats for air conditioning units are available to utilize time-of-day schedules for occupied and unoccupied times and set-backs.

This energy conservation measure will install programmable thermostats to control the central air conditioning system. The recommended thermostat set points for air conditioning in the facility are as follows:

Occupied Cooling = 74° F
Unoccupied Cooling = 78° F

Energy Savings Calculations:

Energy savings calculations are derived from the annual energy consumption of the unit based on total cooling capacity and seasonal integrated energy efficiency of the system. The calculation uses the number of annual cooling degree days (CDDs) and the estimated hours of setback during the unoccupied period on each day.

First total energy consumption of the unit in occupied and unoccupied modes are calculated using the total cooling capacity and the CDDs.

$$\text{Energy Consp., kWh (Occupied)} = \frac{\text{Cooling Capacity}, \frac{\text{BTU}}{\text{Hr}} \times \text{Operation Hours } (\text{CDDs}_{65°\text{F}})}{\text{IEER} \times 1000 \frac{\text{W}}{\text{kWh}}}$$

$$\text{Energy Consp., kWh (Unoccupied)} = \frac{\text{Cooling Capacity}, \frac{\text{BTU}}{\text{Hr}} \times \text{Operation Hours } (\text{CDDs}_{70°\text{F}})}{\text{IEER} \times 1000 \frac{\text{W}}{\text{kWh}}}$$

Total Annual Energy Consumption of the unit in partly occupied and unoccupied settings are calculated simply by proportioning the hours of day in occupied mode and unoccupied modes using equation below:

$$\text{Total Energy Consp., kWh (Partly Occupied \& } \textit{Unoccupied Modes}\text{)}$$

$$= \frac{\text{Cooling Capacity}, \frac{\text{BTU}}{\text{Hr}}}{\text{IEER} \times 1000 \frac{\text{W}}{\text{kWh}}} \times \left(\frac{(24 - \text{HoursSetback}) \times \text{CDDs}_{65°\text{F}}}{24} - \frac{\text{HrsSetback} \times \text{CDDs}_{70°\text{F}}}{24} \right)$$

Energy savings is the difference between the energy consumption of the unit at always occupied mode and partly occupied mode.

$$\text{Cooling Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity} \left(\frac{\$}{\text{kWh}} \right)$$

Demand savings cannot be achieved in this facility via installing programmable thermostats.

Energy savings calculations are summarized in the table below.

PROGRAMMABLE THERMOSTAT for AIR CONDITIONING			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Mechanical Thermostat	Programmable Thermostat	
Total Cooling Capacity, Tons	25	25	-
Annual Cooling Degree Days, Base 65°F	1,811	1,811	-
Annual Cooling Degree Days, Base 70°F	1,168	1,168	-
Unit Efficiency (Estimated, IEER)	10	10	-
Hours Set-back	0	8	
Elec Cost ($/kWh)	$0.165	$0.165	-
Natural Gas Cost ($/Therm)	$1.110	$1.110	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Cons. (Non Set-back)	54,330	36,220	18,110
Electric Cons. (Set-back)	0	11,680	(11,680)
Electric Cons. (Total)	54,330	47,900	6,430
Electric Energy Cost ($)	$8,964	$7,904	$1,061
COMMENTS:	HDDs estimated based on Newark,NJ.		

Cost

Installed cost of programmable thermostats is $300/Unit.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$300
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$300
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,061
Total Yearly Savings ($/Yr):	$1,061
Estimated ECM Lifetime (Yr):	15
Simple Payback	0.3
Simple Lifetime ROI	5204.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$15,914
Internal Rate of Return (IRR)	354%
Net Present Value (NPV)	$12,365.55

ECM #6: Install NEMA Premium® Efficiency Motors

Description:

The improved efficiency of the NEMA Premium® efficient motors is primarily due to better designs with use of better materials to reduce losses. Surprisingly, the electricity used to power a motor represents 95 % of its total lifetime operating cost. Because many motors operate continuously 24 hours a day, even small increases in efficiency can yield substantial energy and dollar savings.

The electric motors driving the main air handling unit supply fan motor is the candidate for replacing with a premium efficiency motor. The standard efficiency motor runs considerable amount of time over a year.

This energy conservation measure replaces existing electric motors over 5 HP or more with NEMA Premium® efficiency motors. NEMA Premium® is the most efficient motor designation in the marketplace today.

IMPLEMENTATION SUMMARY					
EQMT ID	**FUNCTION**	**MOTOR HP**	**HOURS OF OPERATION**	**EXISTING EFFICIENCY**	**NEMA PREMIUM EFFICIENCY**
AHU	Supply Fan Motor	5	4,380	*87.5%*	90.2%
** Motor efficiency N/A. Estimated based on EPAct of 1992*					

Energy Savings Calculations:

$$\text{Electric usage, kWh} = \frac{\text{HP} \times \text{LF} \times 0.746 \times \text{Hours of Operation}}{\text{Motor Efficiency}}$$

where, HP = Motor Nameplate Horsepower Rating

LF = Load Factor Motor Efficiency = Motor Nameplate Efficiency

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric cost savings} = \text{Electric Usage Savings} \times \text{Electric Rate} \left(\frac{\$}{\text{kWh}}\right)$$

The calculations were carried out and the results are tabulated in the table below:

PREMIUM EFFICIENCY MOTOR CALCULATIONS							
EQMT ID	MOTOR HP	LOAD FACTOR	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY	POWER SAVINGS kW	ENERGY SAVINGS kWH	COST SAVINGS
AHU	5	90%	87.5%	90.2%	0.11	506	$86
TOTAL					**0.1**	**506**	**$86**

Equipment Cost and Incentives

Below is a summary of SmartStart Building® incentives for premium efficiency motors on chilled water pumps:

INCENTIVES	
HORSE POWER	NJ SMART START INCENTIVE
5	$60
7.5	$90
10	$100
15	$115
20	$125
25	$130

The following table outlines the summary of motor replacement costs and incentives:

MOTOR REPLACEMENT SUMMARY						
EQMT ID	MOTOR POWER HP	INSTALLED COST	SMART START INCENTIVE	NET COST	TOTAL SAVINGS	SIMPLE PAYBACK
AHU	5	$1,519	$60	$1,459	$86	17.0
TOTAL	**Totals:**	**$1,519**	**$60**	**$1,459**	**$86**	**17.0**

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,519
NJ Smart Start Equipment Incentive ($):	$60
Net Installation Cost ($):	$1,459
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$86
Total Yearly Savings ($/Yr):	$86
Estimated ECM Lifetime (Yr):	15
Simple Payback	17.0
Simple Lifetime ROI	-11.6%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$1,290
Internal Rate of Return (IRR)	-2%
Net Present Value (NPV)	($432.70)

ECM #7: Automatic Flue Gas Damper

Description:

Heating for this facility is provided with a recently installed WeilMclain cast iron hot water boiler. The boiler is originally equipped with an automatic flue gas damper. However, it was observed that the damper currently does not operate since the damper actuator was missing.

Flue gas damper is a control device located in the downstream of the draft diverter to reduce air flow up the chimney when the boiler cycles off. An automatic boiler flue gas damper saves energy by reducing or eliminating the air flow through the boiler heat exchanger and reduces stack losses. A recent study suggests up to 3% to 4% energy savings by implementing flue gas dampers in hot water heaters. Energy savings by installing a flue gas damper actuator for this boiler is estimated to be 2% of the total energy consumption of the boiler.

Automatic flue gas damper will improve the overall operating efficiency of the heating system of the building. This ECM is based on installation of a stock Weil-Mclain flue gas damper designed to fit the existing boiler in the facility.

Energy Savings Calculations:

Baseline Dom. Hot Water Gas Use: 128.5 Therms (Ave from May - Aug Gas Use)

Existing Heating Natural Gas: 11,076 Therms – (128.5 Therms X 12 Months)
10,562 Therms

$$\text{Bldg Heat Required} = \text{Existing Nat Gas}\,(\text{Therms}) \times \text{Heating Eff.}(\%) \times \text{Fuel HeatValue}\left(\frac{\text{BTU}}{\text{Therm}}\right)$$

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

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

AUTOMATIC FLUE GAS DAMPER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Flue gas damper actuator	Automatic Flue Gas Damper	
Annual Nat. Gas Cons. (Therms)	11,076	-	
May-Aug Gas Use (Therms) for Domestic Hot Water	514	514	
Annual Nat Gas Usage for Heating (Therms)	10,562	-	
Boiler Efficiency (%)	78%	80%	2%
Nat Gas Heat Value (BTU/Therm)	100,000	100,000	
Equivalent Building Heat Usage (MMBTUs)	824	824	
Gas Cost ($/Therm)	1.11	1.11	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therms)	10,562	10,298	264
Energy Cost ($)	$11,724	$11,431	$293
COMMENTS:			

Installed cost of a stock flue gas damper for the boiler is estimated to be $300.

Currently there are no **NJ Smart Start Incentives**, for this application.

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$300
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$300
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$293
Total Yearly Savings ($/Yr):	$293
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.0
Simple Lifetime ROI	1365.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$4,396
Internal Rate of Return (IRR)	98%
Net Present Value (NPV)	$3,198.98

REM #1: 258 kW Ground Mounted Solar Array

Description:

The Intermediate Care Center has approximately 18,300 square-foot of available parking lot space that can accommodate a substantial parking lot canopy mounted solar array with a 258 kW electricity generation capacity.

The array will produce approximately 314,979 kilowatt-hours annually that will dramatically reduce the overall electric usage of the facility (Actual total electricity consumption of this facility was not available during this audit).

Energy Savings Calculations:

See **Renewable / Distributed Energy Measures Calculations Appendix** for detailed financial summary and proposed solar layout areas.

Energy Savings Summary:

REM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,320,470
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$2,320,470
Maintenance Savings ($/Yr):	$110,243
Energy Savings ($/Yr):	$47,247
Total Yearly Savings ($/Yr):	$157,490
Estimated ECM Lifetime (Yr):	15
Simple Payback	14.7
Simple Lifetime ROI	1.8%
Simple Lifetime Maintenance Savings	$1,653,640
Simple Lifetime Savings	$2,362,343
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	($440,370.57)

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.

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Bergen County - Darlington Golf Clubhouse

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	Lighting Equipment Upgrade	$2,781	$4,172	$370	$6,583	$2,348	$35	$2,382	15	$35,735	$520	442.8%	2.8	35.82%	$21,857.03
ECM #2	Lighting Controls Upgrade	$1,690	$2,535	$340	$3,885	$754	$0	$754	15	$11,312	$0	191.2%	5.2	17.74%	$5,118.18
ECM #3	New AC Condensing Unit	$18,000	$15,000	$1,975	$31,025	$2,546	$0	$2,546	15	$38,186	$0	23.1%	12.2	2.72%	($634.43)
ECM #4	Programmable Thermostats for Heat	$300	$0	$0	$300	$903	$0	$903	20	$18,051	$0	5916.9%	0.3	300.84%	$13,127.38
ECM #5	Programmable Thermostats for AC	$300	$0	$0	$300	$1,061	$0	$1,061	15	$15,914	$0	5204.7%	0.3	353.65%	$12,365.55
ECM #6	Nema Motor for AHU Fan	$1,519	$0	$60	$1,459	$86	$0	$86	15	$1,290	$0	-11.6%	17.0	-1.50%	($432.70)
ECM #7	Automatic Boiler Flue Damper	$300	$0	$0	$300	$293	$0	$293	15	$4,396	$0	1365.5%	1.0	97.70%	$3,198.98
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Solar Photovoltaic System	$2,320,470	$0	$0	$2,320,470	$47,247	$110,243	$157,490	15	$2,362,343	$1,653,640	1.8%	14.7	0.22%	($440,370.57)

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

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 (1-2 lamps) $30 per fixture (3-4 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	$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

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 90.1-2004 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%

STATEMENT OF ENERGY PERFORMANCE

Bergen County - Darlington Golf Clubhouse

Not able to generate report due to type of the facility

MAJOR EQUIPMENT LIST

Concord Engineering Group

Bergen County - Darlington Golf Clubhouse

Boilers

Tag	Boiler-1		
Unit Type	Sectional cast iron hot water boiler		
Qty	1		
Location	Boiler room		
Area Served	The facility AHUs and baseboard		
Manufacturer	Weil Mclain		
Model #	780		
Serial #	-		
Input Capacity (MBH)	935		
Rated Output Capacity (MBH)	753		
Approx. Efficiency %	81%		
Fuel	Natural Gas		
Burner	Powerflame Burner 600-937 MBH		
Approx Age	2		
ASHRAE Service Life	30		
Remaining Life	28		
Comments			

MAJOR EQUIPMENT LIST

Concord Engineering Group

Bergen County - Darlington Golf Clubhouse

Pumps

Tag	Pumps		
Unit Type	Pipe mounted Hot Water Circulators		
Qty	3		
Location	Boiler room		
Area Served	Heating hot water loop		
Manufacturer	BG		
Model #	-		
Serial #	-		
Horse Power	3/4		
Flow	-		
Motor Info	-		
Electrical Power	-		
RPM	-		
Motor Efficiency %	-		
Approx Age	2		
ASHRAE Service Life	20		
Remaining Life	18		
Comments			

MAJOR EQUIPMENT LIST

Concord Engineering Group

Bergen County - Darlington Golf Clubhouse

Domestic Water Heaters

Tag	HWH-1		
Unit Type	100 Gallon hot water heater tank		
Qty	1		
Location	Boiler room		
Area Served	Faucets, kitchen, showers		
Manufacturer	AO Smith		
Model #	BTC 400 970		
Serial #	MJ97-0680866-970		
Size (Gallons)	100		
Input Capacity (MBH/KW)	399 MBH		
Recovery (Gal/Hr)	362		
Efficiency %	80%		
Fuel	Natural Gas		
Approx Age	14		
ASHRAE Service Life	12		
Remaining Life	(2)		
Comments			

MAJOR EQUIPMENT LIST

Concord Engineering Group

Bergen County - Darlington Golf Clubhouse

Air Handling Units

Tag	AHU	AHU	
Unit Type	AHU w/ Hot Water and DX coils	Residential	
Qty	1	1	
Location	Boiler room	Apartment	
Area Served	Lobby and consession area	Apartment	
Manufacturer	TRANE	-	
Model & Serial #	Climatemaster L-14 / K5J297228	-	
Fan HP	5 HP (Est)	-	
Cooling Type	DX	DX	
Cooling Capacity (Tons)	25	3	
Cooling Efficiency (SEER/EER)	9 SEER (Est)	10 SEER	
Heating Type	Hot water	None	
Heating Input (MBH)	-	-	
Efficiency	-	-	
Approx Age	20	6	
ASHRAE Service Life	15	15	
Remaining Life	(5)	9	
Comments			

MAJOR EQUIPMENT LIST

Concord Engineering Group

Bergen County - Darlington Golf Clubhouse

Split Condensing Units

Tag	CU	CU	
Unit Type	Split Condensing Unit	Split Condensing Unit	
Qty	1	1	
Location	Ground	Ground	
Area Served	Main Clubhouse Areas	Residence	
Manufacturer	TRANE	Wather King	
Condensing Unit Model / Serial #	RAUA-2506-MO	10AJB36A01	
Cooling Capacity (Tons)	25	3	
Cooling Efficiency (SEER/EER)	9 SEER (Est)	10 SEER	
Approx Age	20	6	
ASHRAE Service Life	15	15	
Remaining Life	(5)	9	
Comments			

MAJOR EQUIPMENT LIST

Concord Engineering Group

Bergen County - Darlington Golf Clubhouse

Unit Heaters

Tag	UH		
Unit Type	Hot Water Unit Heater		
Qty	3		
Location	Bathrooms		
Area Served	Bathrooms		
Manufacturer	Trane		
Model & Serial #	60S		
Fan HP	Fractional		
Heating Type	Hot Water		
Heating Input (MBH)	60 MBH (Est)		
Efficiency	-		
Approx Age	20		
ASHRAE Service Life	20		
Remaining Life	0		
Comments			

Investment Grade Lighting Audit

CEG Job #: 9C10085

Project: Bergen County - Darlington Golf Clubhouse
279 Campgaw Road
Mahwah, NJ 07430

Bldg. Sq. Ft. 8,154

Bergen County - Darlington Golf Clubhouse

KWH COST: $0.165
(Estimated)

ECM #1: Lighting Upgrade - General

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
31.2	Exterior Lights	3500	4	2	Recessed Down Light, 90w R40 Lamp	180	0.72	2,520.0	$415.80	4	2	26w CFL Lamp	52	0.21	728	$120.12	$20.00	$80.00	0.51	1792	$295.68	0.27
237.21	Table Area	3500	9	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.83	2,898.0	$478.17	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
565	Table Area	3500	5	2	Recessed down Light with (2) 13w CFL bi-pin	26	0.13	455.0	$75.08	5	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
237.21	Cooking Area	2000	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.55	1,104.0	$182.16	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
237.21	Back corridor	3500	4	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.37	1,288.0	$212.52	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Men's Room	3500	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	602.0	$99.33	2	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.14	504	$83.16	$21.00	$42.00	0.03	98	$16.17	2.60
211.41		3500	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Vanity Light	32	0.03	112.0	$18.48	1	1	Relamp - Sylvania Lamp FO28/841/SS/ECO	25	0.03	87.5	$14.44	$7.00	$7.00	0.01	24.5	$4.04	1.73
565		3500	1	2	Recessed down Light with (2) 13w CFL bi-pin	26	0.03	91.0	$15.02	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Ladies Room	3500	2	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.12	434.0	$71.61	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	350	$57.75	$14.00	$28.00	0.02	84	$13.86	2.02
211.41		3500	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Vanity Light	32	0.03	112.0	$18.48	1	1	Relamp - Sylvania Lamp FO28/841/SS/ECO	25	0.03	87.5	$14.44	$7.00	$7.00	0.01	24.5	$4.04	1.73
237.21	Lobby to padio	3500	4	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.37	1,288.0	$212.52	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
127.21	Seating Area	3500	16	2	2x2, 2 Lamp, 34w T12 U-Tube, Mag. Ballast, Recessed Mnt., Prismatic Lens	72	1.15	4,032.0	$665.28	16	2	2x2, 2 Lamp, 14w T5, Indirect; Fixture	31	0.50	1736	$286.44	$215.00	$3,440.00	0.66	2296	$378.84	9.08
232.21	Workshop	3500	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	602.0	$99.33	2	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.14	504	$83.16	$21.00	$42.00	0.03	98	$16.17	2.60
232.21	Office	3500	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	602.0	$99.33	2	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.14	504	$83.16	$21.00	$42.00	0.03	98	$16.17	2.60
622.1	Seating Area	3500	18	1	Flood, (1) 90w PAR Lamp	90	1.62	5,670.0	$935.55	18	1	(1) 26w CFL PAR Lamp	26	0.47	1638	$270.27	$20.00	$360.00	1.15	4032	$665.28	0.54
232.21	Reception	3500	3	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.26	903.0	$149.00	3	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.22	756	$124.74	$21.00	$63.00	0.04	147	$24.26	2.60
127.21	Reception	3500	2	2	2x2, 2 Lamp, 34w T12 U-Tube, Mag. Ballast, Recessed Mnt., Prismatic Lens	72	0.14	504.0	$83.16	2	2	2x2, 2 Lamp, 14w T5, Indirect; Fixture	31	0.06	217	$35.81	$215.00	$430.00	0.08	287	$47.36	9.08

Investment Grade Lighting Audit

ECM #1: Lighting Upgrade - General

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
232.21	Ticketing	3500	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	602.0	$99.33	2	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.14	504	$83.16	$21.00	$42.00	0.03	98	$16.17	2.60
127.21	Ticketing	3500	2	2	2x2, 2 Lamp, 34w T12 U-Tube, Mag. Ballast, Recessed Mnt., Prismatic Lens	72	0.14	504.0	$83.16	2	2	2x2, 2 Lamp, 14w T5, Indirect; Fixture	31	0.06	217	$35.81	$215.00	$430.00	0.08	287	$47.36	9.08
128.13	Ticketing	3500	3	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Surface Mnt., No Lens	209	0.63	2,194.5	$362.09	3	4	(2) 8' Lamps to (4) 4' Lamps - FO28, T8, Elect Ballast; retrofit	98	0.29	1029	$169.79	$100.00	$300.00	0.33	1165.5	$192.31	1.56
142.21	Ticketing	3500	4	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.62	2,184.0	$360.36	4	3	3 Lamp , FO28, T8, Elect. Ballast, Specular Reflector; retrofit	72	0.29	1008	$166.32	$100.00	$400.00	0.34	1176	$194.04	2.06
121.34	Ticketing	3500	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Pendant Mnt., No Lens	78	0.08	273.0	$45.05	1	2	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.05	175	$28.88	$80.00	$80.00	0.03	98	$16.17	4.95
142.21	Manager	2000	3	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.47	936.0	$154.44	3	3	3 Lamp , FO28, T8, Elect. Ballast, Specular Reflector; retrofit	72	0.22	432	$71.28	$100.00	$300.00	0.25	504	$83.16	3.61
142.21	Walter's Office	2000	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.31	624.0	$102.96	2	3	3 Lamp , FO28, T8, Elect. Ballast, Specular Reflector; retrofit	72	0.14	288	$47.52	$100.00	$200.00	0.17	336	$55.44	3.61
128.11	St room	2000	2	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	209	0.42	836.0	$137.94	2	4	(2) 8' Lamps to (4) 4' Lamps - FO28, T8, Elect Ballast; retrofit	98	0.20	392	$64.68	$100.00	$200.00	0.22	444	$73.26	2.73
602	Corridors	8760	4	2	Incandescent Exit Sign	20	0.08	700.8	$115.63	4	1	LED Exit Sign	2	0.01	70.08	$11.56	$65.00	$260.00	0.07	630.72	$104.07	2.50
121.11	Stairwell	8760	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.16	1,366.6	$225.48	2	2	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	49	0.10	858.48	$141.65	$100.00	$200.00	0.06	508.08	$83.83	2.39
	Totals		107	66				33,438	$5,517	107	50			3.5	12,086	$1,994		$6,953	4.1	14,228	$2,348	2.96

CEG Job #:
Project: **Bergen County - Darlington Golf Clubhouse**
Address: **279 Campgaw Road**
Mahwah, NJ 07430
Building SF: **8,154**

Bergen County - Darlington Golf Clubhouse

KWH COST: **$0.165**
(Estimated)

ECM #2: 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
31.2	Exterior Lights	3500	4	2	Recessed Down Light, 90w R40 Lamp	180	0.72	2520	$415.80	4		No Change	180	0.72	0%	2520	$415.80	$0	$0.00	0	0	$0.00	0.00
237.21	Table Area	3500	9	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.83	2898	$478.17	9	1	Dual Tech. Occupancy Sensor w/2 Pole Powerpack Remote Mnt.	92	0.83	20%	2318.4	$382.54	$500.00	$500.00	0	579.6	$95.63	5.23
565	Table Area	3500	5	2	Recessed down Light with (2) 13w CFL bi-pin	26	0.13	455	$75.08	5		No Change	26	0.13	0%	455	$75.08	$0	$0.00	0	0	$0.00	0.00
237.21	Cooking Area	2000	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.55	1104	$182.16	6		No Change	92	0.55	0%	1104	$182.16	$0	$0.00	0	0	$0.00	0.00
237.21	Back corridor	3500	4	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.37	1288	$212.52	4	1	Dual Technology Occupancy Sensor - Remote Mnt.	92	0.37	20%	1030.4	$170.02	$450.00	$450.00	0	257.6	$42.50	10.59
232.21	Men's Room	3500	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	602	$99.33	2		No Change	86	0.17	0%	602	$99.33	$0	$0.00	0	0	$0.00	0.00
211.41		3500	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Vanity Light	32	0.03	112	$18.48	1		No Change	32	0.03	0%	112	$18.48	$0	$0.00	0	0	$0.00	0.00
565		3500	1	2	Recessed down Light with (2) 13w CFL bi-pin	26	0.03	91	$15.02	1		No Change	26	0.03	0%	91	$15.02	$0	$0.00	0	0	$0.00	0.00
221.11	Ladies Room	3500	2	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.12	434	$71.61	2		No Change	62	0.12	0%	434	$71.61	$0	$0.00	0	0	$0.00	0.00
211.41		3500	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Vanity Light	32	0.03	112	$18.48	1		No Change	32	0.03	0%	112	$18.48	$0	$0.00	0	0	$0.00	0.00
237.21	Lobby to padio	3500	4	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.37	1288	$212.52	4	1	Dual Technology Occupancy Sensor - Remote Mnt.	92	0.37	20%	1030.4	$170.02	$450.00	$450.00	0	257.6	$42.50	10.59
127.21	Seating Area	3500	16	2	2x2, 2 Lamp, 34w T12 U-Tube, Mag. Ballast, Recessed Mnt., Prismatic Lens	72	1.15	4032	$665.28	16	1	Dual Tech. Occupancy Sensor w/2 Pole Powerpack Remote Mnt.	72	1.15	20%	3225.6	$532.22	$500.00	$500.00	0	806.4	$133.06	3.76
232.21	Workshop	3500	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	602	$99.33	2		No Change	86	0.17	0%	602	$99.33	$0	$0.00	0	0	$0.00	0.00
232.21	Office	3500	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	602	$99.33	2		No Change	86	0.17	0%	602	$99.33	$0	$0.00	0	0	$0.00	0.00
622.1	Seating Area	3500	18	1	Flood, (1) 90w PAR Lamp	90	1.62	5670	$935.55	18	1	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	90	1.62	20%	4536	$748.44	$500.00	$500.00	0	1134	$187.11	2.67

ECM #2: 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
232.21	Reception	3500	3	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.26	903	$149.00	3	1	Dual Technology Occupancy Sensor - Remote Mnt.	86	0.26	20%	722.4	$119.20	$450.00	$450.00	0	180.6	$29.80	15.10
127.21	Reception	3500	2	2	2x2, 2 Lamp, 34w T12 U-Tube, Mag. Ballast, Recessed Mnt., Prismatic Lens	72	0.14	504	$83.16	2		No Change	72	0.14	0%	504	$83.16	$0	$0.00	0	0	$0.00	0.00
232.21	Ticketing	3500	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	602	$99.33	2		No Change	86	0.17	0%	602	$99.33	$0	$0.00	0	0	$0.00	0.00
127.21	Ticketing	3500	2	2	2x2, 2 Lamp, 34w T12 U-Tube, Mag. Ballast, Recessed Mnt., Prismatic Lens	72	0.14	504	$83.16	2		No Change	72	0.14	0%	504	$83.16	$0	$0.00	0	0	$0.00	0.00
128.13	Ticketing	3500	3	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Surface Mnt., No Lens	209	0.63	2194.5	$362.09	3	1	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	209	0.63	20%	1755.6	$289.67	$500.00	$500.00	0	438.9	$72.42	6.90
142.21	Ticketing	3500	4	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.62	2184	$360.36	4	1	Dual Tech. Occupancy Sensor w/2 Pole Powerpack Remote Mnt.	156	0.62	20%	1747.2	$288.29	$500.00	$500.00	0	436.8	$72.07	6.94
121.34	Ticketing	3500	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Pendant Mnt., No Lens	78	0.08	273	$45.05	1		No Change	78	0.08	0%	273	$45.05	$0	$0.00	0	0	$0.00	0.00
142.21	Manager	2000	3	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.47	936	$154.44	3	1	Dual Technology Occupancy Sensor - Switch Mnt.	156	0.47	20%	748.8	$123.55	$125.00	$125.00	0	187.2	$30.89	4.05
142.21	Walter's Office	2000	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.31	624	$102.96	2	1	Dual Technology Occupancy Sensor - Switch Mnt.	156	0.31	20%	499.2	$82.37	$125.00	$125.00	0	124.8	$20.59	6.07
128.11	St room	2000	2	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	209	0.42	836	$137.94	2	1	Dual Technology Occupancy Sensor - Switch Mnt.	209	0.42	20%	668.8	$110.35	$125.00	$125.00	0	167.2	$27.59	4.53
602	Corridors	8760	4	2	Incandescent Exit Sign	20	0.08	700.8	$115.63	4		No Change	20	0.08	0%	700.8	$115.63	$0	$0.00	0	0	$0.00	0.00
121.11	Stairwell	8760	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.16	1366.56	$225.48	2		No Change	78	0.16	0%	1366.56	$225.48	$0	$0.00	0	0	$0.00	0.00
	Totals		107	66			9.9	33,437.9	$5,517	107	11			9.9		28,867.2	$4,763.08		$4,225	0	4,571	$754	5.60

Project Name: LGEA Solar PV Project - Darlington Golf Clubhouse
Location: Mahwah, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

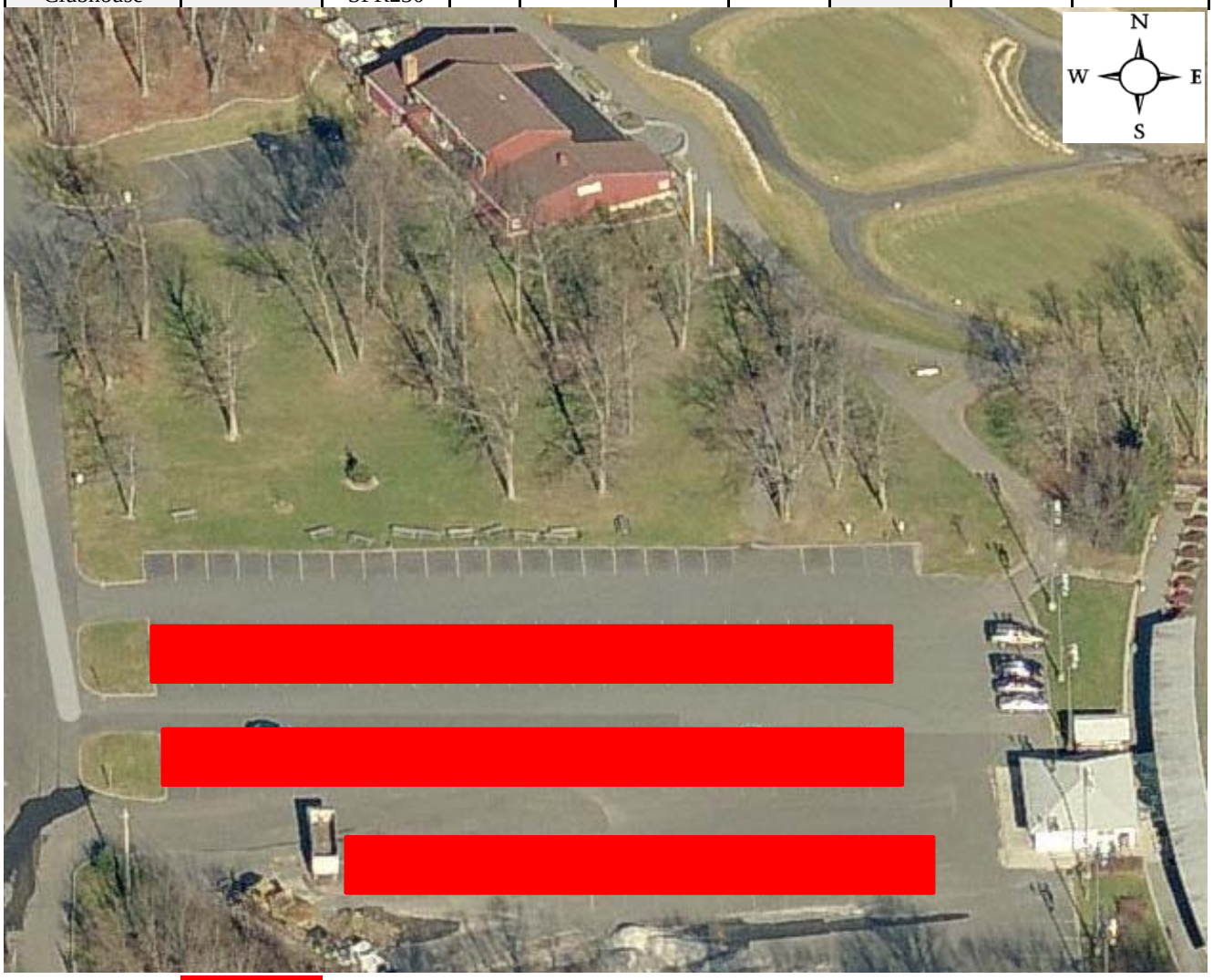
	Photovoltaic System - Direct Purchase
Total Construction Cost	$2,320,470
Annual kWh Production	314,979
Annual Energy Cost Reduction	$47,247
Annual SREC Revenue	$110,243
First Cost Premium	**$2,320,470**
Simple Payback:	**14.73** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.150**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$2,320,470	0	0	0	$0	(2,320,470)	0
1	$0	314,979	$47,247	$0	$110,243	$157,490	($2,162,981)
2	$0	313,404	$48,664	$0	$109,691	$158,356	($2,004,625)
3	$0	311,837	$50,124	$0	$109,143	$159,267	($1,845,358)
4	$0	310,278	$51,628	$0	$108,597	$160,225	($1,685,132)
5	$0	308,727	$53,177	$3,180	$108,054	$158,051	($1,527,081)
6	$0	307,183	$54,772	$3,164	$107,514	$159,122	($1,367,959)
7	$0	305,647	$56,415	$3,148	$106,976	$160,243	($1,207,716)
8	$0	304,119	$58,108	$3,132	$106,442	$161,417	($1,046,299)
9	$0	302,598	$59,851	$3,117	$105,909	$162,643	($883,655)
10	$0	301,085	$61,646	$3,101	$105,380	$163,925	($719,730)
11	$0	299,580	$63,496	$3,086	$104,853	$165,263	($554,467)
12	$0	298,082	$65,401	$3,070	$104,329	$166,659	($387,808)
13	$0	296,591	$67,363	$3,055	$103,807	$168,115	($219,694)
14	$0	295,108	$69,384	$3,040	$103,288	$169,632	($50,062)
15	$0	293,633	$71,465	$3,024	$102,772	$171,212	$121,151
16	$0	292,165	$73,609	$3,009	$102,258	$172,857	$294,008
17	$0	290,704	$75,817	$2,994	$101,746	$174,569	$468,577
18	$0	289,250	$78,092	$2,979	$101,238	$176,350	$644,928
19	$0	287,804	$80,435	$2,964	$100,731	$178,202	$823,129
20	$0	286,365	$82,848	$2,950	$100,228	$180,126	$1,003,255
21	$1	284,933	$85,333	$2,935	$99,727	$182,125	$1,185,380
22	$2	283,509	$87,893	$2,920	$99,228	$184,201	$1,369,581
23	$3	282,091	$90,530	$2,906	$98,732	$186,356	$1,555,937
24	$4	280,681	$93,246	$2,891	$98,238	$188,593	$1,744,530
25	$5	279,277	$96,043	$2,877	$97,747	$190,914	$1,935,444
	Totals:	7,419,630	$1,722,585	$63,542	$2,596,871	$4,255,914	($4,516,646)
				Net Present Value (NPV)		**$1,935,469**	
				Internal Rate of Return (IRR)		**5.1%**	

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
Darlington Golf Clubhouse	18,300	Sunpower SPR230	1121	14.7	16,483	257.83	314,979	36,993	15.64



.= Proposed PV Layout

Notes:

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

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:	257.8 kW
DC to AC Derate Factor:	0.810
AC Rating:	208.8 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	11.2 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	2.58	16748	1875.78
2	3.33	19776	2214.91
3	4.31	27620	3093.44
4	5.20	31461	3523.63
5	5.85	35931	4024.27
6	6.14	34974	3917.09
7	6.06	35330	3956.96
8	5.54	32468	3636.42
9	4.85	27917	3126.70
10	3.76	22796	2553.15
11	2.65	15972	1788.86
12	2.23	13987	1566.54
Year	4.38	314979	35277.65

Output Hourly Performance Data

About the Hourly Performance Data

Output Results as Text

Saving Text from a Browser

Run PVWATTS v.1 for another US location or an International location
Run PVWATTS v.2 (US only)

Please send questions and comments regarding PVWATTS to Webmaster

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