CAMDEN COUNTY COLLEGE
LINCOLN HALL
ENERGY ASSESSMENT

for

NEW JERSEY
BOARD OF PUBLIC UTILITIES

CHA PROJECT NO. 24364

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TABLE OF CONTENTS

APPENDICES

REPORT DISCLAIMER

This audit was conducted in accordance with the standards developed by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) for a Level II audit. Cost and savings calculations for a given measure were estimated to within ±20%, and are based on data obtained from the owner, data obtained during site observations, professional experience, historical data, and standard engineering practice. Cost data does not include soft costs such as engineering fees, legal fees, project management fees, financing, etc.

A thorough walkthrough of the facility was performed, which included gathering nameplate information and operating parameters for all accessible equipment and lighting systems. Unless otherwise stated, model, efficiency, and capacity information included in this report were collected directly from equipment nameplates and /or from documentation provided by the owner during the site visit. Typical operation and scheduling information was obtained from interviewing facility staff and spot measurements taken in the field.

1.0 EXECUTIVE SUMMARY

The Camden County College recently engaged CHA to perform an energy audit in connection with the New Jersey Board of Public Utilities' Local Government Energy Audit Program. This report details the results of the energy audit conducted for:

Building Name	Address	Square Feet	Construction Date
Camden County College Criminal Justice Building	200 College Drive Building 12 Blackwood, New Jersey	41,500	Original: 1954 Addition: 1994

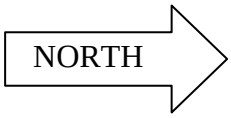
The Energy Conservation Measures (ECMs) identified in this report will allow for a more efficient use of energy and if pursued have the opportunity to qualify for the New Jersey SmartStart Buildings Program. Potential annual savings of $15,600 for the recommended ECMs may be realized with a payback of 2.6 years. A summary of the costs, savings, and paybacks for the recommended ECMs follows:

Summary of Energy Conservation Measures							
Energy Conservation Measure		Approx. Costs ($)	Approx. Savings ($/year)	Payback (Years) w/o Incentive	Potential Incentive ($)*	Payback (Years) w/ Incentive	Recommended For Implementation
ECM-1	HVAC Condensing Boilers Addition	125,800	700	>20	3,000	>20	
2	Replace Domestic Water Heater (DWH)	7,800	400	18.6	200	18.0	
3	HVAC Cooling Tower Replacement	76,000	3,200	>20	6,700	>20	
4	HVAC Water Source Heat Pumps Replacement	950,900	1,100	>20	13,000	>20	
5	HVAC Air Handling Equipment Replacement	70,700	2,300	>20	1,600	>20	
6	HVAC Demand Control Ventilation	5,000	900	5.6	0	5.6	X
7	Install Vending Miser	200 (per unit)	200 (average)	1.0	0	1.0	X
8	Replace Rooftop Exhaust Fans	7,000	400	17.5	0	17.5	
9	Replace Domestic Hot Water Pumps	300 (per unit)	200 (per unit)	1.5	0	1.5	X
10	Building Automation System Upgrade / Re-Commission	20,800	1,900	10.9	0	10.9	X
11	Replace Windows	284,600	1,700	>20	0	>20	
12	Lighting Replacement Upgrades	9,800	8,100	1.2	6,100	0.5	X
13	Install Lighting Controls (Occupancy Sensors)	6,600	5,800	1.1	800	1.0	X
14	Lighting Replacements with Lighting Controls (Occupancy Sensors)	15,200	12,400	1.2	6,900	0.7	X

2.0 INTRODUCTION AND BACKGROUND

New Jersey's Clean Energy Program, funded by the New Jersey Board of Public Utilities, supports energy efficiency and sustainability for Municipal and Local Government Energy Audits. Through the support of a utility trust fund, New Jersey is able to assist state and local authorities in reducing energy consumption while increasing comfort.

Lincoln Hall located on the Camden County College campus in Blackwood, NJ, is a 41,500 square foot mainly single story block structure with brick veneer. The building contains theaters, theater workshop, dressing/prop/costume storage areas, dance studio, ceramics/pottery studios, sculpture studio, drawing/painting studios, music room, a photography lab, developing room, classrooms, administrative offices and other support areas. The main theater, music room, photography lab, developing studios, smaller theater and art/sculpture areas are taller structures than the single story of the building; the stage area is a high bay is the tallest portion of the building. HVAC units are located on the roof, boilers are in a mechanical room and a cooling tower serving water source heat pumps is located on the roof. The building was constructed in 1954, and later expanded in 1994. Occupancy includes approximately XXX students and XX faculty members. The building operates Monday through Friday from 8:00 am to approximately 8:00 pm. There is also some reduced occupancy on weekends, and occupancy levels are reduced in summer months between semesters for each school year.



3.0 EXISTING CONDITIONS

3.1 Building - General

Originally built in 1954, Lincoln Hall is a 41,500 square foot mainly single story brick structure, containing a 700 seat main theater, a 100 seat small theater, a theater workshop, dressing/prop/costume storage areas, dance studio, ceramics/pottery studios, sculpture studio, drawing/painting studios, music room, a photography lab, developing room, classrooms, administrative offices and other support areas. Exterior entrances are glass doors in metal frame that open into various lobbies and areas of the building.

Lincoln Hall has approximately XXX students and XX faculty and staff, and appears to be fully utilized during our field inspection. The building can be assumed to be fully occupied until 8:00 pm during the week, and by approximately one quarter of the occupants during the weekend. The hours of operation are:

- Monday thru Friday 8:00 am to 6:00 pm.
- Saturday, Sunday 8:00 pm to 4:00 pm.

The building is constructed of steel framing with masonry walls and brick veneer with an air space between. Insulation is incorporated into wall assemblies from the 1994 expansion for an improved envelope, but it is nominal. The majority of the interior walls are painted block or concrete walls; 3-5/8" metal studs filled with fiberglass insulation finished with gypsum board are used renovated or reconfigured areas. The building has a flat roof system comprised of a structural steel framing with a metal deck having rigid foam board insulation. The western half of the building rooftop has a light-colored EPDM roof membrane system. The eastern half of the building has a light-colored asphalt roll roofing system. The smaller theater and art/sculpture areas rooftop is a structural steel A-frame with a metal deck having rigid foam insulation, with a light-colored asphalt roll roofing system. Windows are used in exterior walls; the higher building sections and the western half of the one story areas of the building have minimal glazing (<15% on walls where used), and are double pane set in metal frames with tint. The one story area in the eastern half of the building has substantial windows (~75%), and the windows are single pane. The building has exposed walls facing the north, east, south and west directions; the single story areas have a single story height of 15'; the main theater, music room, photography lab, developing studios, smaller theater and art/sculpture areas have a high bay height of 20'; and the stage area has a height of 35'. All spaces are considered first floor areas that have concrete slab-on-grade floors. Portions of the building have areas that are partially below grade to increase ceiling height inside the space.

3.2 Utility Usage

Utilities include electricity, natural gas, and potable water. Electricity is delivered and supplied by Atlantic City Electric. Natural gas is delivered and supplied by South Jersey Gas. Potable water is provided by the municipally owned water department at a charge. See Appendix A for a detailed utility analysis.

The campus has one main electric meter. There was no installed sub-metering for this building from the main meter, therefore the following usage and costs rates were determined from square footage of the building. From June 2011 through April 2012, the electric usage for the building was 404,524 kWh at a cost of $54,016. Review of electricity bills during this period showed that the electricity was charged at the following rates: supply unit consumption cost of $0.119 per kWh; demand unit cost of $5.94 per kW;

and blended unit cost of $0.131 per kWh. It was estimated that the peak demand per month is approximately 143 kW from June 2011 through April 2012.

The facility has one natural gas meter. From July 2011 through May 2012, gas-fired equipment consumed 9,561 therms of natural gas. Based on the annual cost of $6,161, the price for natural gas was $0.80 per therm.

The delivery component of the electric and natural gas bills will always be the responsibility of the utility that connects the facility to the power grid or gas line; however, the supply can be purchased from a third party; as is currently the case with electricity and natural gas. The electricity or natural gas commodity supply entity will require submission of one to three years of past energy bills. Contract terms can vary among suppliers. According to the U.S. Energy Information Administration, the average commercial unit costs of electricity and natural gas in New Jersey during the same periods as those noted above was $0.141 per kWh and $0.959 per therm. The electrical supply rate charged by Hess for the 12 month period from June 2011 through April 2012 resulted in lower cost to the college than having ACE both supply (see table below). When compared to the average state values, it is recommended that the present natural gas be maintained and the present electricity supply rate charge be monitored and checked monthly.

Main Electric Meter Supply Costs – ACE vs. Hess

Month	ACE Supply Costs (For Comparison)	Hess Supply Costs (Actual)
June-11	$56,524	$0.00
July-11	$59,840	$65,404.53
August-11	$56,583	$61,844.82
September-11	$71,502	$64,413.68
October-11	$54,932	$49,486.97
November-11	$57,110	$51,448.28
December-11	$52,264	$47,082.95
January-12	$50,542	$45,800.14
February-12	$58,915	$53,387.07
March-12	$51,755	$46,899.02
April-12	$53,147	$48,160.52
Total	**$623,112.69**	**$533,927.98**
Extra Savings of using Hess for Electric Supply	$89,184.71	

A list of approved electrical and natural gas energy commodity suppliers can be found in Appendix A.

3.3 HVAC Systems

The systems and equipment described below serve the Lincoln Hall. Specifics on the mechanical equipment can be found within the equipment inventory located in Appendix B.

3.3.1 Natural Draft Cooling Tower with Shell and Tube Heat Exchanger

The building was originally cooled and heated by water source heat pumps, with a boiler hot water system as backup; an IMECO closed loop cooling tower is located on the building rooftop. The cooling tower was installed in 1994, and provides tempered building loop water. The cooling tower operates as long as it is possible to provide heating and cooling with the water source heat pump equipment; when it becomes too cold, the hot water boilers are started and the building water loop is used for hot water. The cooling tower condition is poor. The cooling tower water is piped the building loop water pumping system. Two 25 HP pumps operate in lead-lag and circulate water to the building water source heat pumps. The pumps are constant volume with standard efficiency motors.

3.3.2 Heating Hot Water Systems

When the water source heat pumps are not able to provide adequate heating, hot water is supplied by six Weil McLain cast iron sectional, gas-fired boilers with factory gas burners and controls. The boilers were installed in 1991, and are located in a mechanical room. The hot water system operates from October until April, and the boilers are shut down during the summer. The boilers are piped to the building loop water pumping system with two 25 HP pumps that operate in lead-lag. The pumps are constant volume with standard efficiency motors; the building loop water system is shared with the cooling tower water to/from WSHPs. Hot water is provided to unit ventilators located in exterior rooms and spaces for heating when WSHP system cannot provide sufficient heating. Building loop water system piping and valves appear to be insulated.

3.3.3 Package DX Cooling and Heating Rooftop Unit

One 1991 packaged DX cooling; natural gas heating RTU is located on the rooftop of the building (RTU-1). The RTU is mounted on an extended curb, with outside air intake and relief air dampers, with an air mixing box. Supply and return ductwork is routed down through the roof curbs supply and return duct systems in the ceilings of the areas/spaces being served. The RTU serves the main theater.

3.3.3 Water Source Heat Pumps

The building was originally heated and cooled by a WSHP system installed in 1991. The closed loop cooling tower serving the WSHPs is located on building rooftop.

XXX water-to-air WSHPs have loop water provided by the two 25 HP pumps listed in sections 3.3.1 and 3.3.2. The WSHPs are located in ceilings above the areas they serve, and some are cabinet-type equipment inside the spaces. The heat pumps have water from the closed loop cooling tower connected on one side, and ductwork to the spaces being served connected on the other side. These heat pumps serve the entire building.

3.3.4 Unit Ventilators and Unit Ventilators

Rooms and spaces with exterior wall exposures are ventilated and heated by XXX vertical floor mounted cabinet UVs. Outside air is drawn through low sidewall louvers, and hot water coils piped to the boilers provides winter heating; WSHPs described above provide cooling during the summer.

3.3.7 Exhaust Systems

Constant volume exhaust fans serve laboratories, larger classrooms and spaces. In classrooms, dedicated exhaust fans are connected directly to lab fume hoods, typically controlled by a hood mounted switch. Exhaust fans are also used for restrooms and custodial closets throughout the building.

3.4 Control Systems

The building is controlled by McQuay/Snyder General electronic controls, except for two units that have CM3 DDC controls; there is no central BAS interface. The system consists of original, outdated 1993 electronic field devices and components which have become hard to replace and maintain.

Previous occupants added supplemental cooling to small rooms, and disabled the controls on the WSHPs in the area. Each split system has a wall mounted thermostat; setpoints in the building are 68°F heating and 74°F cooling during occupied times, and 55°F heating and 85°F cooling during unoccupied times. However, thermostats can be adjusted by occupants to override the central control system.

The occupants (staff) have the ability to adjust the space temperatures to suit their comfort which results in many areas being over cooled (and most likely over heated). The inconsistent occupancy schedules of the building does not allow for a normal unoccupied temperature set back of the buildings which results in increased energy usage.

3.5 Lighting/Electrical Systems

The facility has reballasted and relamped the majority of original fixtures; the building primarily consists of fixtures with T-8 32 watt bulbs and electronic ballast. However, the building still contains T-12 lights with magnetic ballasts in ancillary and storage spaces. Compact fluorescent (CFL) and older incandescent bulbs are also used in select areas and storage closets. The student lounge and cafeteria seating areas have 200 watt metal halide lights and lighting quality is poor due to the ceiling height. The primary source of control for the lights is switches manually turned off at the end of the day.

The exterior lighting consists of 200 and 400 watt metal halide fixtures, 200 watt high pressure sodium fixtures, and60 watt incandescent lamps. These fixtures are all wall mounted on the exterior building walls.

3.6 Plumbing Systems

3.6.1 Domestic Hot Water System

The boiler room contains one 140 gallon A.O. Smith standard efficiency, natural gas hot water heater installed in 2001; this serves the entire Lincoln Hall building. Hot water is provided to certain art/shop studios, toilets, janitor's closets, and the majority of hot water piping appears to be insulated. Water demand is primarily for the cafeteria kitchen. Domestic hot water temperature is maintained at 130°F, and chemical disinfection soap is provided in the restrooms.

3.6.2 Plumbing Fixtures

The building's lavatories, water closets, and urinals are original, and require upgrades. These should be replaced thru attrition over the years with lavatories that are 2.5 GPM with push type faucets, water closets that are 1.6 GPF, and urinals that are 1.0 GPF.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 HVAC Condensing Boiler Addition

Lincoln Hall is heated with hot water supplied by six Weil McLain cast iron sectional gas-fired boilers from 1991. The boilers are non-condensing and have an estimated efficiency of 82%.

Due to the relatively low efficiency of the existing boilers, an evaluation was performed for adding one high efficiency condensing boiler to operate as the primary boiler during the shoulder months (October-November and March-April) with the existing two boilers operating as secondary. The majority of the savings will be achieved during these months when the lower return water temperature enables the condensing boiler to achieve the highest efficiencies.

The boiler fuel consumption was calculated from the natural gas used annually for the shoulder months per utility bills and boiler efficiency. This was then compared to the efficiency of a new condensing boiler at the improved operating efficiency. The difference in fuel usage was the savings.

Natural gas-fired boilers have an expected life of 25 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 22,500 therms and $18,000.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-1 HVAC Condensing Boilers Addition

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
125,800	0	0	900	700	0	700	(0.9)	3,000	>20	>20

* Incentive shown is per the New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is not recommended.

4.2 ECM-2 Replace Domestic Water Heater

Lincoln Hall has one A.O. Smith standard efficiency tank type natural gas water heater that provides hot water to the building. During periods of little or no domestic hot water use, the unit must still heat the water within its storage tank. Energy required maintaining the 140 gallons of hot water temperature setpoint during times of zero demand is known as standby losses; replacing this unit with a higher efficiency natural gas unit was evaluated.

According to the U.S. Department of Energy, 2.5% of stored capacity is lost every hour during HW heater standby. This value was applied to the total volume of the existing DHW heater storage tank to determine the annual standby losses. Proposed efficiency was based on a typical tankless type, high efficiency, condensing hot water heater with a storage tank to increase recovery capacity. The new water heater will require gas and water piping modifications, venting, and electrical connections.

Domestic hot water heaters have an expected life of 12 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 6,240 therms and $5,000.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-2 Replace Domestic Water Heater (DWH)

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric kWh	Electric kW	Nat Gas Therms	Total $						
$					$	$		$	Years	Years
7,800	0	0	520	400	0	400	(0.4)	240	19.5	18.9

* Incentive shown is per the New Jersey SmartStart Program. See section 5.0 for other incentive opportunities.

This measure is not recommended.

4.3 ECM-3 HVAC Cooling Tower Replacement

An existing IMECO (1991) closed loop cooling tower provide building loop water to the water source heat pumps serving the building. Replacement of the cooling tower which is in poor condition with a higher efficiency unit with VFDs on the tower fans and condenser water pumps was assessed.

The assumption of this calculation is that the operating hours and capacities of the 1991 cooling tower stays the same. The energy savings result from operating a higher efficiency cooling tower with tower fan speed control, and condenser water pump flow control. The existing fan motors operate at a constant speed even though the building load does not require all of the cooling tower's capacity to maintain building loop water temperatures. A modern tower also has more efficient fill designs that result in a better approach temperature difference and performance. By replacing the cooling tower, adding VFDs and inverter duty high efficiency motors, and reducing the flow (by slowing the motors down), significant electrical energy can be saved. Cooling tower condenser water temperature can be used to control cooling tower fan speed and condenser water pump flow.

Cooling towers have an expected life of 20 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 492,000 kWh and $64,000.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-3 HVAC Cooling Tower Replacement

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	120 kWh	Electric kW	Nat Gas Therms	Total $						
$					$	$		$	Years	Years
76,000	24,600	0	0	3,200	0	3,200	(0.1)	6,700	>20	>20

* Incentive shown is per the New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is not recommended. However, the existing units should be replaced with units such as those assessed in this ECM thru attrition when they fail.

4.4 ECM-4 HVAC Water Source Heat Pumps Replacement

Existing Snyder General (1991) WSHPs provide heating and cooling to the entire building. Replacement of the 1991 WSHPs with higher efficiency units was assessed.

The assumption of this calculation is that the operating hours and capacities of the 1991 WSHP equipment stay the same. The energy savings result from operating higher efficiency units.

WSHP units have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 123,000 kWh and $16,200.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-4 **HVAC Water Source Heat Pumps Replacement**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
950,900	8,200	0	0	1,100	0	1,100	(1.0)	13,000	>20	>20

* Incentive shown is per the New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

Due to the unfavorable payback, this measure is not recommended. GSHP equipment should be replaced with higher efficiency units by attrition in the future.

4.5 ECM-5 HVAC Air Handling Equipment Replacement

One packaged DX cooling, natural gas heating AHU from 1991 provides the serves the main theater of the building (RTU-1). Replacing these units with modern AAON units with supply fan variable speed drives and digital scroll compressors was evaluated.

The assumption of this calculation is that the operating hours, number of units, and capacities stay the same. The energy savings is the result of upgraded efficiency.

DX rooftop units have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 262,500 kWh and $17,800.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-5 HVAC Air Handling Equipment Replacement

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
70,700	17,500	0	0	2,300	0	2,300	-0.5	1,600	>20	>20

* Incentive shown is per the New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is not recommended. However, the existing units should be replaced with units such as those assessed in this ECM thru attrition when they fail.

4.6 ECM-6 HVAC Demand Control Ventilation

A rooftop air handling unit serves the main theater (RTU-1). It is assumed the unit provides the originally specified ventilation air flow volumes. Reducing outside air during occupied time periods will reduce heating and cooling energy used during the occupied period. This can be accomplished using carbon dioxide sensors to monitor the air quality. The quantity of ventilation will be based on maintaining an acceptable carbon dioxide (CO_2) level in the space as an indicator of indoor air quality. A limit of 1000 PPM of CO_2 is recommended in ASHRAE Standard 62-1982, Ventilation for Acceptable Indoor Air Quality. Sensors will be installed to measure the building air CO_2 concentration, and the control sequence of operation programmed into the BAS. During unoccupied periods the outside air dampers should be closed.

For RTU-1, the savings from this ECM can either pay back the cost of only adding demand control ventilation, or it can be implemented in conjunction with ECM-5 and ECM-6 which address replacing the unit, or addition of premium efficiency motors and variable speed drives, respectively.

Equipment supply and outside airflows were obtained from existing design drawings where possible, or from vendors per serial/model numbers found in the field. For the analysis, estimated savings for demand control ventilation are based on reducing the outdoor air volume from 30% to 10. The energy savings are the differences in thermal usage and motor horsepower electricity reduction.

Temperature controls have an expected life of 18 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 50,000 kWh, 14,000 therms and $17,800.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-6 HVAC Demand Control Ventilation

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
5,000	2,500	0	700	900	0	900	2.6	0	5.6	5.6

* Incentive shown is per the New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.7 ECM-7 Install Vending Miser

Vending machines are usually leased by building owners who are also required to pay for the electricity to run the machines. Snack machines typically draw 200 watts for lighting and electrical systems while beverage machines can draw around 400 watts to also maintain the cooling systems. Older vending machines may draw even more power. When the machines operate all year round, this can add up to some significant energy usage.

Occupancy sensors can be installed in-line with vending machines that allow the machines to operate with little to no power while a space is unoccupied. Snack machines will completely power down while beverage machines will only have to cycle a few minutes every couple hours to keep the drinks cold. Beverage machines that contain perishable items such as milk are not recommended for occupancy sensor installation.

The exact number of vending machines within the Lincoln Hall building was unknown; therefore savings were calculated on a per unit basis.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-7 Install Vending Miser

Vending Type	Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
		Electric kWh	Electric kW	Nat Gas Therms	Total $						
	$					$	$		$	Years	Years
Beverage	200	1,900	0	0	250	0	250	-	0	0.8	0.8
Snack	200	960	0	0	130	0	130	-	0	1.6	1.6
Dual	200	1,400	0	0	190	0	190	-	0	1.1	1.1

* No applicable incentive as per New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.8 ECM-8 Rooftop Exhaust Fan Replacement

Older rooftop exhaust fans run on less efficient motors and do not have backdraft dampers installed. Backdraft dampers prevent infiltration of outdoor air into the building and help protect the building envelope. According to ASHRAE standard 90.1, low leakage dampers should be less than 3 CFM/sqft. It was estimated that the existing rooftop units allow 2% infiltration per CFM of exhaust air. The existing units have a total airflow rate of 6,275 CFM which will result in 126 CFM of infiltration.

The savings for implementing this measure will therefore be a combination of decreased energy usage for a high efficiency motors and cooling and heating savings from

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-8 Rooftop Exhaust Fan Replacement

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
7,000	2,360	0	100	400	0	400	(0.2)	0	17.5	17.5

* No applicable incentive as per New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is not recommended.

4.9 ECM-9 Replace Domestic Hot Water Pumps

Maintenance personnel at the Lincoln Hall Building indicated that domestic hot water pumps were beyond their expected life and were no longer operating at ideal flow rates. Typically water pumps do not need to be upgraded as often as pump motors. This measure aims to address this complaint through the installation of higher output cartridge type pumps. It was assumed that the existing domestic hot water pump were 60% efficient B&G Series 100 1/6 HP motors. This measure proposes an equivalently efficient motor at a decreased HP such as a Taco 007 Series 1/25 HP cartridge motor.

The exact number of water pumps in the Lincoln Hall building was unknown; therefore this calculation was performed on a per unit basis.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-9 Replace Domestic Hot Water Pumps

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
300	1,190	0	0	200	0	200	8.2	0	1.6	1.6

* No applicable incentive as per New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.10 ECM-10 HVAC Building Automation System Upgrade/Re-commissioning

- The existing mixed electronic controls and CM3 controls (for two units) are old, hard to maintain, is difficult to obtain parts, are not as user friendly as more modern standalone DDC controls and are not as functional as systems using current technology. It is recommended the stand alone controls be upgraded and full system re-commissioning executed as a future facility improvement item. The re-commissioning should include DDC controllers/field devices tuning, as well as

HVAC system dampers and valves that are not equipment components. This could be coordinated with a complete systems testing and balancing that must occur prior to system re-commissioning efforts.

This would allow more accurate control of HVAC systems and minimize local thermostat adjustment by occupants. HVAC systems will be tuned up during this process, and significant savings could be obtained by making the following controls improvements:

- Re-commission all existing controls and verify that the input/ output data is actually controlling the valves, dampers, sensors, etc. within the HVAC systems and spaces. This should be done in concert with air and water flow testing and balancing.
- Institute a set building occupancy schedule for devices that are programmable and set occupied/ unoccupied temperatures. After hours use of the buildings that require heating/cooling should be restricted to certain areas only. Limit ventilation to these same schedules (No outdoor air and no exhaust, except for special chemical/fume applications)
- Institute set occupied space temperatures of 68°F - 72°F for heating and 74°F - 76°F for cooling and prohibit staff adjustment of the thermostats. This will require some education of the staff members on the actual cost of the building energy consumption.
- Institute a set time of the year when heating is turned on and when cooling is turned on through the control system. Economizer cooling should be used for shoulder weather whenever possible.
- Limit re-heat as much as possible. Institute discharge air reset, energy heat recovery and other strategies to reduce re-heat.

Additional benefits of this system are that it can provide useful trending information such as daily, monthly, and seasonal energy usage, and also provide alarm messages via the internet indicating that a piece of equipment needs repair or maintenance. The BAS should also allow the facility to monitor the energy consuming equipment in the building remotely in real-time, track the facility energy performance, and remotely adjust set points and schedules to optimize facility operation. Full color graphics and logical programming functions should also be provided.

The annual electrical and natural gas consumption is taken from the utility bills. Per the U.S. Energy Information Administration, the percent of a building's cooling and heating is 26% and 82%, respectively. Utilizing these numbers, the annual electrical and natural gas usage was found; based on project experience, retro-commissioning produces a 10% energy savings.

Commissioning can have an expected life of 10 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 97,100 kWh, 7,300 therms and $19,000. To continue to gain this annual saving, proper maintenance of equipment is required.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-10 HVAC Building Automation System Upgrade / Re-commissioning

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years

20,800	9,710	0	730	1,900	0	1,900	(0.1)	0	10.9	10.9

* No applicable incentive as per New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.11 ECM-11 Replace Windows

The buildings existing windows are from the original construction of the building in 1954. There are approximately 76 original windows in the school. The windows are single pane, aluminum frame units, over time the window seals can deteriorate and start to leak unconditioned air in or conditioned air our causing unnecessary energy consumption. The windows could be replaced with energy efficient double pane units with a higher thermal resistance to prevent air infiltration and heat transfer through the glazing.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below;

ECM-11 Replace Windows

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
284,600	1,280	0	1,860	1,700	0	1,700	(0.8)	0	>20	>20

* No applicable incentive as per New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is not recommended.

4.12 ECM-12 Lighting Replacement Upgrades

The building utilizes 4 foot 40W T-12 fluorescent bulbs with magnetic ballasts; U-tube T-12s are also used in some fixtures, and some 4 foot 32W T-8 fixtures have also been installed. Recessed can lights and surface mounted standard bulb fixtures use biaxial compact fluorescent lights (CFLs). There are also some incandescent bulbs/fixtures currently being used as well. A comprehensive fixture survey was conducted of the entire building. Each switch and circuit was identified, and the number of fixtures, locations, and existing wattage established (Appendix C).

The existing exterior lighting system for this building consists of two 400 watt and three 200 watt metal halide wall pack fixtures, thirteen 200 watt high pressure sodium pole fixtures. Various spaces in the building contain forty one 250 watt metal halide fixtures. The exterior fixtures are utilized for building lighting during nighttime hours and are in operation from sun down until sun up. The interior fixtures are utilized during occupied hours. Alternative LED lighting solutions are available to replace these fixtures that will reduce the total wattage to 241 watts per fixture. It is suggested to replace the existing metal halide wall pack fixtures on a one for one basis with LED. The reduction in per fixture wattage will result in a reduced total exterior lighting connected wattage, therefore resulting in electrical energy savings. In addition to electrical energy savings, LED lights have a longer useful lifetime than the existing lighting fixtures, and will provide significant maintenance savings. However, maintenance savings were not calculated or included in the payback analysis below due to unknown labor rates and knowledge of existing required maintenance time.

Energy savings for this measure were calculated by applying the existing and proposed fixture wattages to estimated times of operation. The difference between energy requirements resulted in a total annual savings of 53,500 kWh with an electrical demand reduction of about 25 kW. Supporting calculations, including assumptions for lighting hours and annual energy usage for each fixture, are provided in Appendix C.

Lighting has an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 802,500 kWh and $122,200.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized as follows:

ECM-12 Lighting Replacement Upgrades

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
9,800	53,500	25	0	8,100	0	8,100	11.5	6,100	1.2	0.5

* Incentive shown is per the New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is not recommended in lieu of ECM-14.

4.13 ECM-13 Lighting Controls Installation

The current lighting is controlled by manual switches. Lights are generally turned on in the morning and shut off at night by the staff. During occupied times, there are rooms that are not occupied, however the lights remain on. Adding occupancy controls to the individual rooms will automatically control the lights based on occupancy. The occupancy sensor can be wall mounted near the switch or placed at the ceiling for larger room coverage. All occupancy sensors are equipped with a manual override feature. These sensors are generally not recommended in public toilet rooms.

Lighting controls have an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 657,000kWh and $86,400.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-13 Lighting Controls Installation (Occupancy Sensors)

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
6,600	43,800	0	0	5,800	0	5,800	12.1	800	1.1	1.0

* Incentive shown is per the New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is not recommended in lieu of ECM-14.

4.14 ECM-14 Lighting Replacements with Lighting Controls

Due to interactive effects, the energy and cost savings for occupancy sensors and lighting upgrades are not cumulative. This measure is a combination of ECM-8 and ECM-9 to reflect actual expected energy and demand reduction.

The lighting retrofits and controls have an expected lifetime of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 1,336,500 kWh and $185,500.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized as follows:

ECM-14 Lighting Replacements with Lighting Controls (Occupancy Sensors)

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
15,200	89,100	30	0	12,400	0	12,400	11.2	6,900	1.2	0.7

* Incentive shown is per the New Jersey Smart Start Program. See section 5.0 for other incentive opportunities.

This measure is recommended.

5.0 PROJECT INCENTIVES

5.1 Incentives Overview

5.1.1 New Jersey Pay For Performance Program

The facility will be eligible for incentives from the New Jersey Office of Clean Energy. The most significant incentives are available from the New Jersey Pay for Performance (P4P) Program. The P4P program is designed for qualified energy conservation projects applied to facilities whose demand in any of the preceding 12 months exceeds 100 kW. This average minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations, however. Facilities that meet this criterion must also achieve a minimum performance target of 15% energy reduction by using the EPA Portfolio Manager benchmarking tool before and after implementation of the measure(s). If the participant is a municipal electric company customer, and a customer of a regulated gas New Jersey Utility, only gas measures will be eligible under the Program. Available incentives are as follows:

Incentive #1: Energy Reduction Plan – This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP).

- Incentive Amount: $0.10/SF
- Minimum incentive: $5,000
- Maximum Incentive: $50,000 or 50% of Facility annual energy cost

The standard incentive pays $0.10 per square foot, up to a maximum of $50,000, not to exceed 50% of facility annual energy cost, paid after approval of application. For building audits funded by the New Jersey Board of Public Utilities, which receive an initial 75% incentive toward performance of the energy audit, facilities are only eligible for an additional $0.05 per square foot, up to a maximum of $25,000, rather than the standard incentive noted above.

Incentive #2: Installation of Recommended Measures – This incentive is based on projected energy savings as determined in Incentive #1 (Minimum 15% savings must be achieved), and is paid upon successful installation of recommended measures.

Electric

- Base incentive based on 15% savings: $0.09/ per projected kWh saved.
- For each % over 15% add: $0.005 per projected kWh saved.
- Maximum incentive: $0.11/ kWh per projected kWh saved

Gas

- Base incentive based on 15% savings: $0.90/ per projected Therm saved.
- For each % over 15% add: $0.05 per projected Therm saved.
- Maximum incentive: $1.25 per projected Therm saved

Incentive cap: 25% of total project cost

Incentive #3: Post-Construction Benchmarking Report – This incentive is paid after acceptance of a report proving energy savings over one year utilizing the Environmental Protection Agency (EPA) Portfolio Manager benchmarking tool.

Electric

- Base incentive based on 15% savings: $0.09/ per projected kWh saved.
- For each % over 15% add: $0.005 per projected kWh saved.
- Maximum incentive: $0.11/ kWh per projected kWh saved

Gas

- Base incentive based on 15% savings: $0.90/ per projected Therm saved.
- For each % over 15% add: $0.05 per projected Therm saved.
- Maximum incentive: $1.25 per projected Therm saved

If eligible, incentives #2 and #3 can be combined to yield additive savings.

Without existing sub meters in place, exact utility consumption for this building was unknown. Therefore, further analysis will need to take place before P4P incentives can be justified.

See Appendix D for calculations.

5.1.2 New Jersey Smart Start Program

For this program, specific incentives for energy conservation measures are calculated on an individual basis utilizing the 2011 New Jersey Smart Start incentive program. This program provides incentives dependent upon mechanical and electrical equipment. If applicable, incentives from this program are reflected in the ECM summaries and attached appendices.

If the complex qualifies and enters into the New Jersey Pay for Performance Program, all energy savings will be included in the total site energy reduction, and savings will be applied towards the Pay for Performance incentive. A project is not applicable for both New Jersey incentive programs.

5.1.3 Direct Install Program

The Direct Install Program targets small and medium sized facilities where the peak electrical demand does not exceed 150 kW in any of the previous 12 months. Buildings must be located in New Jersey and served by one of the state's public, regulated electric or natural gas utility companies. On a case-by-case basis, the program manager may accept a project for a customer that is within 10% of the 150 kW peak demand threshold.

Direct Install is funded through New Jersey's Clean Energy Program and is designed to provide capital for building energy upgrade projects to fast track implementation. The program will pay up to 70% of the costs for lighting, HVAC, motors, natural gas, refrigeration, and other equipment upgrades with higher efficiency alternatives. If a building is eligible for this funding, the Direct Install Program can significantly reduce the implementation cost of energy conservation projects.

The program pays 70% of each project cost up to $75,000 per electrical utility account; total funding for each year is capped at $250,000 per customer. Installations must be completed by a Direct Install participating contractor, a list of which can be found on the New Jersey Clean Energy Website at http://www.njcleanenergy.com. Contractors will coordinate with the applicant to arrange installation of recommended measures identified in a previous energy assessment, such as this document.

The facility is not eligible to receive funding from the Direct Install Program due to the monthly demand exceeding 150kW.

5.1.4 Energy Savings Improvement Plans (ESIP)

The Energy Savings Improvement Program (ESIP) allows government agencies to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. Under the recently enacted Chapter 4 of the Laws of 2009 (the law), the ESIP provides all

government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources.

ESIP allows local units to use “energy savings obligations” to pay for the capital costs of energy improvements to their facilities. This can be done over a maximum term of 15 years. Energy savings obligations are not considered “new general obligation debt” of a local unit and do not count against debt limits or require voter approval. They may be issued as refunding bonds or leases. Savings generated from the installation of energy conservation measures pay the principal of and interest on the bonds; for that reason, the debt service created by the ESOs is not paid from the debt service fund, but is paid from the general fund.

For local governments interested in pursuing an ESIP, the first step is to perform an energy audit. Pursuing a Local Government Energy Audit through New Jersey's Clean Energy Program is a valuable first step to the ESIP approach. The “Local Finance Notice” outlines how local governments can develop and implement an ESIP for their facilities (see Appendix E). The ESIP can be prepared internally if the entity has qualified staff. If not, the ESIP must be implemented by an independent contractor and not by the energy savings company producing the Energy Reduction Plan.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Local units should carefully consider all alternatives to develop an approach that best meets their needs.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Solar

6.1.1 Photovoltaic Rooftop Solar Power Generation

The facility was evaluated for the potential to install rooftop photovoltaic (PV) solar panels for power generation. Present technology incorporates the use of solar cell arrays that produce direct current (DC) electricity. This DC current is converted to alternating current (AC) with the use of an electrical device known as an inverter. The building's roof has sufficient room to install a large solar cell array. All rooftop areas have been replaced, and are in good condition. It is recommended to install a permanent PV array at this time.

The PVWATTS solar power generation model was utilized to calculate PV power generation. The closest city available in the model is Newark, New Jersey and a fixed tilt array type was utilized to calculate energy production. The PVWATT solar power generation model is provided in Appendix P.

Federal tax credits are also available for renewable energy projects up to 30% of installation cost. Since the facility is a non-profit organization, federal taxes are paid and this project is eligible for this incentive.

Installation of (PV) arrays in the state New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. One SREC credit is equivalent to 1000 kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. The average SREC value per credit is estimated to be about $95/ SREC per year based on current market data, and this number was utilized in the cash flow for this report.

The available roof area justifies the use of 234 kW PV solar array. The system costs for PV installations were derived from contractor budgetary pricing in the state of New Jersey for estimates of total cost of system installation. It should be noted that the cost of installation is currently about $4.00 per watt or $4,000 per kW of installed system. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

The implementation cost and savings related to this ECM are presented in Appendix E and summarized as follows:

Photovoltaic (PV) Rooftop Solar Power Generation – 234 kW System

Budgetary Cost	Annual Utility Savings				Total Savings	Federal Tax Credit *	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)
	Electricity		Natural Gas	Total					
$	kW	kWh	Therms	$	$	$	$	Years	Years
$936,000	0.0	280,954	0	36,800	36,800	0	26,691	>25	14.7

* 30% federal tax credit

** Solar Renewable Energy Certificate Program (SREC) for 2012 is $95/1000kwh

This measure is not recommended due long payback period.

6.1.2 Solar Thermal Hot Water Plant

Active solar thermal systems use solar collectors to gather the sun's energy to heat water, another fluid, or air. An absorber in the collector converts the sun's energy into heat. The heat is then transferred by circulating water, antifreeze, or sometimes air to another location for immediate use or storage for later utilization. Applications for active solar thermal energy include providing hot water, heating swimming pools, space heating, and preheating air in residential and commercial buildings.

A standard solar hot water system is typically composed of solar collectors, heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually placed on the roof of the building, oriented south, and tilted around the site's latitude, to maximize the amount of radiation collected on a yearly basis.

Several options exist for using active solar thermal systems for space heating. The most common method involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system). The most practical system would transfer the heat from the panels to thermal storage tanks and transfer solar produced thermal energy to use for domestic hot water production. DHW is presently produced by gas-fired water heaters and, therefore, this measure would offer natural gas utility savings.

The implementation cost and savings related to this ECM are presented in Appendix F and summarized as follows:

Solar Thermal Hot Water Plant

Budgetary Cost	Annual Utility Savings				Total Savings	Federal Tax Credit *	Payback (without incentive)	Payback (with incentives)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$	$	$	Years	Years
$15,000	0.0	4,400	0	$580	$580	4,500	>25	18.1

* 30% federal tax credit

This is not recommended since the facility is not occupied year-round and domestic hot water demand is not excessive.

6.2 Demand Response Curtailment

Presently, electricity is delivered by South Jersey Energy Company, which receives the electricity from regional power grid RFC. South Jersey Energy Company is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia including the State of New Jersey.

Utility Curtailment is an agreement with the utility provider's regional transmission organization and an approved Curtailment Service Provider (CSP) to shed electrical load by either turning major equipment off or energizing all or part of a facility utilizing an emergency generator; therefore, reducing the electrical demand on the utility grid. This program is to benefit the utility company during high demand periods and utility provider offers incentives to the CSP to participate in this program. Enrolling in the

program will require program participants to drop electrical load or turn on emergency generators during high electrical demand conditions or during emergencies. Part of the program also will require that program participants reduce their required load or run emergency generators with notice to test the system.

A pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. From June 2011 through April 2012, Lincoln Hall had a maximum electricity demand of 141 kW.

This measure is not recommended because the facility is not operating year round, and the building does not have back up/emergency generator power.

7.0 EPA PORTFOLIO MANAGER

The EPA Portfolio Manager benchmarking tool was used to assess the building's energy performance. Portfolio Manager provides a Site and Source Energy Use Intensity (EUI), as well as an Energy Star performance rating for qualifying building types. The EUIs are provided in kBtu/ft^2/year, and the performance rating represents how energy efficient a building is on a scale of 1 to 100, with 100 being the most efficient. In order for a building to receive and Energy Star label, the energy benchmark rating must be at least 75. As energy use decreases from implementation of the proposed ECMs, the Energy Star rating will increase.

The Site EUI is the amount of heat and electricity consumed by a building as reflected in utility bills. Site energy may be delivered to a facility in the form of primary energy, which is raw fuel burned to create heat or electricity (such as natural gas or oil), or as secondary energy, which is the product created from a raw fuel (such as electricity or district steam). Site EUI is a measure of a building's annual energy utilization per square foot. Site EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types.

$$\textbf{\textit{Site Energy Intensity}} = \frac{(\textit{Electric Usage in kBtu + Natural Gas in kBtu})}{\textit{Building Square Footage}}$$

To provide an equitable comparison for different buildings with varying proportions of primary and secondary energy consumption, the Portfolio Manager uses the convention of Source EUIs. The source energy also accounts for all losses incurred in production, storage, transmission, and delivery of energy to the site; which provides an equivalent measure for various types of buildings with different energy sources.

$$\textbf{\textit{Source Energy Intensity}} = \frac{(\textit{Electric Usage in kBtu X Site/Source Ratio + Natural Gas in kBtu X Site/Source Ratio})}{\textit{Building Square Footage}}$$

The EPA Score, Site EUI, and Source EUI for the Community Center Building are as follows:

Energy Intensity	Camden County College Lincoln Building	National Average
EPA Score	N/A	N/A
Site (kBtu/sf/year)	40	104
Source (kBtu/sf/year)	77	244

Lincoln Hall does not qualify for performance benchmarking in Portfolio Manager because the program does not currently include this building type. However it is expected to begin benchmarking these buildings in the near future. It is suggested that the client check for updates in the future to see if any of their buildings qualify for an Energy Star label. For the building to qualify for the Energy Star label the EPA score is required to be above 75. There are several energy conservation measures recommended in this report, that if implemented will further reduce the energy use intensity and increase the EPA score of the facility.

The Portfolio Manager account can be accessed by entering the username and password shown below at the login screen of the Portfolio Manager website (https://www.energystar.gov/istar/pmpam/).

A full EPA Energy Star Portfolio Manager Report is located in Appendix G.

The user name ("[redacted]") and password ("[redacted]") for the building's EPA Portfolio Manager Account have been provided to Ed Carney, Director of Public Safety for the Camden County College.

8.0 CONCLUSIONS & RECOMMENDATIONS

Summary of Energy Conservation Measures							
Energy Conservation Measure		**Approx. Costs ($)**	**Approx. Savings ($/year)**	**Payback (Years) w/o Incentive**	**Potential Incentive ($)***	**Payback (Years) w/ Incentive**	**Recommended For Implementation**
ECM-6	HVAC Demand Control Ventilation	5,000	900	5.6	0	5.6	X
7	Install Vending Miser	200 (per unit)	190 (average)	1.1	0	1.1	X
9	Replace Domestic Hot Water Pumps	328 (per unit)	200 (per unit)	1.6	0	1.6	X
10	Building Automation System Upgrade / Re-Commission	20,800	1,900	10.9	0	10.9	X
14	Lighting Replacements with Lighting Controls (Occupancy Sensors)	15,200	12,400	1.2	6,900	0.7	X

APPENDIX A

Utility Usage Analysis, Energy Suppliers List

Main Electricity Meter Electricity Consumption (Excluding Central Power Plant)	4,626,006	kWh
Central Power Plant Electricity Consumption (Cooling Season)	1,161,896	
Main Electric Meter Demand	1,632.96	kW
Main Electric Meter Cost	$ 760,716	

Building Name	sq. ft	% of Total Area	Main or Dedicated Meter	Electric Cost ($)	~Electric Consumption (kWh)	~Electric Demand (kW)	Blended Rate ($/kWh)	Consumption Rate ($/kWh)	Demand Rate ($/kW)	Gas Meter Number	Gas Cost ($)	Gas Consumption Therm	Gas Rate $/Therm
Child Care	4,649	-	D	$ 1,806	14,235	1	$ 0.127	$ 0.121	$ 8.60	310674	$ 901.78	1,442.38	$ 0.80
CIM	63,869	-	D	$ 165,543	1,443,300	360	$ 0.115	$ 0.100	$ 6.01	497191	$ 16,056.35	19,436.98	$ 0.80
Community Center	56,612	11.9%	M	$ 73,678	551,776	195	$ 0.131	$ 0.119	$ 5.94	431186	$ 2,687.79	3,240.64	$ 0.80
Connector Building	31,748	6.7%	M	$ 41,319	309,436	109	$ 0.131	$ 0.119	$ 5.94		$ 2,180.98	2,729.25	$ 0.80
Criminal Justice Center	13,702	2.9%	M	$ 17,833	133,548	47	$ 0.131	$ 0.119	$ 5.94	180372	$ 941.28	1,177.91	$ 0.80
Helene Fuld	36,000	7.6%	M	$ 46,853	350,879	124	$ 0.131	$ 0.119	$ 5.94	341687	$ 2,473.08	3,094.78	$ 0.80
Jefferson Hall	9,495	2.0%	M	$ 12,357	92,544	33	$ 0.131	$ 0.119	$ 5.94	4393670	$ 2,752.49	3,868.58	$ 0.80
Laser Building	9,991	2.1%	M	$ 13,003	97,379	34	$ 0.131	$ 0.119	$ 5.94	199278	$ 686.35	858.89	$ 0.80
Lincoln Hall	41,504	8.7%	M	$ 54,016	404,524	143	$ 0.131	$ 0.119	$ 5.94	514828	$ 6,161.23	9,560.71	$ 0.80
Madison Hall	50,508	10.6%	M	$ 65,734	492,283	174	$ 0.131	$ 0.119	$ 5.94	453525	$ 3,469.73	4,341.98	$ 0.80
Papiano Gym	40,000	8.4%	M	$ 52,058	389,865	138	$ 0.131	$ 0.119	$ 5.94	180448	$ 21,522.08	58,276.13	$ 0.80
Taft Hall	42,387	8.9%	M	$ 207,875	994,078	146	$ 0.131	$ 0.119	$ 5.94	461792	$ 4,738.76	14,034.42	$ 0.80
Truman Hall	32,990	7.0%	M	$ 195,646	902,489	114	$ 0.131	$ 0.119	$ 5.94	411069	$ 17,416.69	47,343.31	$ 0.80
Wolverton Library	49,284	10.4%	*M*	$ 64,141	*480,353*	*170*	$ 0.131	$ 0.119	$ 5.94	430957	$ 6,752.35	9,307.28	$ 0.80
Wilson Hall East	*20,571*	*4.3%*	*M*	$ 26,772	*200,498*	*71*	$ 0.131	$ 0.119	$ 5.94				
Wilson Hall Center	*8,292*	*1.7%*	*M*	$ 10,792	*80,819*	*29*	$ 0.131	$ 0.119	$ 5.94				
Wilson Hall West	*16,857*	*3.6%*	*M*	$ 21,939	*164,299*	*58*	$ 0.131	$ 0.119	$ 5.94				
Roosevelt Hall	*14,685*	*3.1%*	*M*	$ 19,112	*143,129*	*51*	$ 0.131	$ 0.119	$ 5.94				
Central Power Plant	*6,200*	-	*M*	*$ 152,710*	*1,161,896*	-	$ 0.131	$ 0.119	$ 5.94				
Total sq. ft (Main Meter)	474,626	100.0%		$ 772,223	5,802,136	1,633.96	$ 0.131	$ 0.119	$ 6.09		$ 88,741	178,713.23	$ 0.80

Electric Heat

Electric
Delivery Atlantic City Electric
Supplier Hess

Gas
Delivery South Jersey Gas
Supplier Woodruff Energy

Notes
1. Values calculated based on square footage of each building related to the total square footage of all buildings on the main electric meter
2. Values calculated based on the average btu/sq. foot of each building
3. *Italics represent buildings that were not included in the scope of this project but use electricity off the main meter*

Electric Usage Comparison

Building	Lighting (kWh)	Total From Matrix
Child Care	23,577	14,235
CIM Building	N/A	N/A
Community Center	149,864	551,776
Connector Building	39,736	309,436
Criminal Justice	33,600	133,548
Helene Fuld	109,842	350,879
Jefferson Hall	52,614	92,544
Laser Building	34,977	97,379
Lincoln Hall	179,383	404,524
Madison Hall	119,776	492,283
Papiano Gym	73,095	389,865
Taft Hall	120,182	994,078
Truman Hall	103,919	902,489
Wolverton Library	*134,640*	480,353

Gas Breakdown Estimates Based on Max Annual Therm Usage

	sq. ft	Btu/sq ft	Est. Btu/sq ft	Est. Therms	Est. Cost
Child Care	4,649	10,056			
CIM	63,869	10,226			
Community Center	56,612	741			
Connector Building	31,748		8,597	2,729.25	$ 2,180.98
Criminal Justice Center	13,702		8,597	1,177.91	$ 941.28
Helene Fuld	36,000		8,597	3,094.78	$ 2,473.08
Jefferson Hall	9,495	9,911			
Laser Building	9,991		8,597	858.89	$ 686.35
Lincoln Hall	41,504	6,572			
Madison Hall	50,508		8,597	4,341.98	$ 3,469.73
Papiano Gym	40,000	15,426			
Taft Hall	42,387	4,942			
Truman Hall	32,990	15,426			
Wolverton Library	49,284	4,069			
	avg btu/sq ft	8,597			

Main Boiler Plant Electricity Usage (Cooling Season)

Electric Rate $ 0.131 $/kWh

Cooling Equipment Runtime		Comments
6	Months/Year	
30	Days (avg)/Month	
24	hrs/day	
0.25	Runtime multiplier	Estimated run hours as 1/4 of total hours between May-October
1,500	hrs	

Chiller		Comments
412	Tons	
1.5	COP (kW/Ton)	Based off an estimated 8 EER
618	kW	
927,000	kWh	
$ 121,838	Cost/year	

Chilled Water Pumps		Comments
3	# of Pumps	
50	HP	
112	kW	Calculated using 1 kW = 0.7457 HP
167,783	kWh	
$ 22,052	Cost/year	

Cooling Towers		Comments
4	# of Motors	
15	HP of Motors	
45	kW	
67,113	kWh	
$ 8,821	Cost/yr	

Notes

1. Calculated Values

Cooling System

Annual Electric Usage	Annual Cost
1,161,896 kWh	$ 152,710

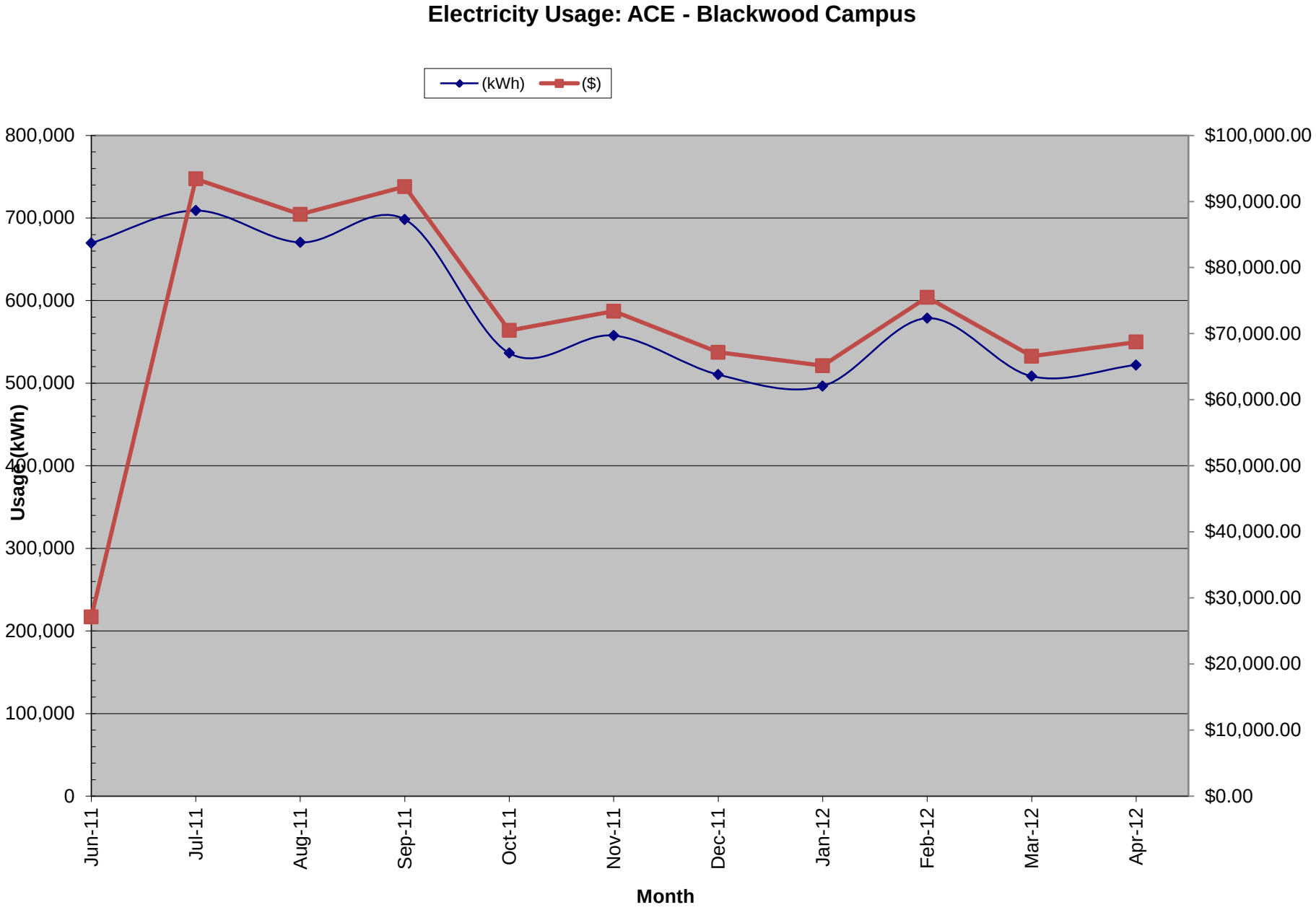
Building Name	~Electrical Consumption	Cost
Building		$ -
Taft Hall	580,947.75	$ 76,355
Truman Hall	580,947.75	$ 76,355

Camden County Community College
302 College Drive, Blackwood, NJ 08012

Electric Service
Delivery - ACE
Supplier - Hess

For Service at: **Blackwood Campus**
Account No.: 050767599934
Meter No.: 83431473

			Charges			Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Delivery ($)	Supply ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
June-11	669,721	1,560.96	$27,133.38	$ 27,133.38		$ 0.041	$ 0.027	$ 5.61
July-11	709,000	1,632.96	$93,414.28	$28,009.75	$65,404.53	$ 0.132	$ 0.119	$ 5.36
August-11	670,412	1,539.36	$88,047.34	$26,202.52	$61,844.82	$ 0.131	$ 0.120	$ 5.08
September-11	698,259	1,500.48	$92,240.86	$27,827.18	$64,413.68	$ 0.132	$ 0.120	$ 5.79
October-11	536,450	1,429.92	$70,486.53	$20,999.56	$49,486.97	$ 0.131	$ 0.118	$ 5.08
November-11	557,711	1,306.36	$73,398.01	$21,949.73	$51,448.28	$ 0.132	$ 0.118	$ 5.79
December-11	510,390	1,306.36	$67,167.13	$20,084.18	$47,082.95	$ 0.132	$ 0.118	$ 5.26
January-12	496,484	1,306.36	$65,141.43	$19,341.29	$45,800.14	$ 0.131	$ 0.118	$ 5.08
February-12	578,728	1,306.36	$75,496.79	$22,109.72	$53,387.07	$ 0.130	$ 0.118	$ 5.61
March-12	508,396	1,306.36	$66,585.12	$19,686.10	$46,899.02	$ 0.131	$ 0.118	$ 5.08
April-12	522,071	1,306.36	$68,738.63	$20,578.11	$48,160.52	$ 0.132	$ 0.119	$ 5.08
Total (All)	**5,787,901**	**1,632.96**	**$760,716.12**	**$226,788.14**	**$533,927.98**	**$ 0.131**	**$ 0.119**	**$ 5.94**


Electricity Usage: ACE - Blackwood Campus
(kWh)
($)
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Usage(kWh)
$100,000.00
$90,000.00
$80,000.00
$70,000.00
$60,000.00
$50,000.00
$40,000.00
$30,000.00
$20,000.00
$10,000.00
$0.00
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
Month

Main Natural Gas Meter

		Cost ($)				129292 (Monkey House)				Usage (Therms) Meter Number **180448 (Papiano Gym)**				249260 (Roosevelt House)			
Month	**Total**	Delivery	Supply	Total Therms	Therm	Cost	% Tot	$/Therm		Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm
Jul-11	$ 3,604.91	$ 3,604.91		5,306.26	12.46	$ 8.46	0.23%	$	0.68	23.87	$ 16.22	0.45%	$ 0.68	43.6	$ 29.62	0.82%	$ 0.68
Aug-11	$ -			-		$ -	0.00%	#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
Sep-11	$ 3,402.14	$ 3,402.14		5,089.27		$ -	0.00%	#DIV/0!		21.86	$ 14.61	0.43%	$ 0.67	37.48	$ 25.06	0.74%	$ 0.71
Oct-11	$ 3,577.46	$ 3,577.46		4,611.32		$ -	0.00%	#DIV/0!		37.19	$ 28.85	0.81%	$ 0.78	49.58	$ 38.46	1.08%	$ 0.78
Nov-11	$ 9,843.06	$ 9,843.06		9,117.98		$ -	0.00%	#DIV/0!		29.84	$ 32.21	0.33%	$ 1.08	166.7	$ 179.96	1.83%	$ 0.40
Dec-11	$ 21,671.14	$ 21,671.14		23,331.55		$ -	0.00%	#DIV/0!		29.84	$ 27.72	0.13%	$ 0.93	938.45	$ 871.66	4.02%	$ 0.15
Jan-12	$ 32,847.20	$ 32,847.20		36,482.23		$ -	0.00%	#DIV/0!		35.81	$ 32.24	0.10%	$ 0.90	1322.74	$ 1,190.94	3.63%	$ 0.10
Feb-12	$ 15,880.61	$ 15,880.61		42,477.14		$ -	0.00%	#DIV/0!		34.06	$ 12.73	0.08%	$ 0.37	1607.86	$ 601.12	3.79%	$ 0.08
Mar-12	$ 13,557.55	$ 13,557.55		35,389.55		$ -	0.00%	#DIV/0!		42.35	$ 16.22	0.12%	$ 0.38	1318.11	$ 504.96	3.72%	$ 0.10
Apr-12	$ 38,795.86	$ 13,397.93	$ 25,397.93	36,285.87		$ -	0.00%	#DIV/0!		42.23	$ 45.15	0.12%	$ 1.07	834.3	$ 892.01	2.30%	$ 0.10
May-12	$ 20,089.02	$ 7,674.46	$ 12,414.56	17,736.60		$ -	0.00%	#DIV/0!		26.78	$ 30.33	0.15%	$ 1.13	545.9	$ 618.30	3.08%	$ 0.20
Total	$ 163,269	$ 125,456	$ 37,812	215,827.77	12.46					323.83	256.29			6,864.72			
Average											30.33						
											30.331854						
											$ 30.33						

Master Meter List

Unknown	Known	Used	Needed
362093	129292 (Monkey House)	**310674 (Child Care)**	Connector Building
470558	249260 (Roosevelt House)	**497191 (CIM)**	Criminal Justice Center (180372)
497759	268114 (Print Shop)	**431186 (Community Center)**	Helene Fuld (341687)
516533	307090 (Animal Barn)	**4393670 (Jefferson Hall)**	Laser Building (199278)
543578	450781 (Main Boiler Room)	**514828 (Lincoln Hall)**	Madison Hall (453525)
		180448 (Papiano Gym)	
		461792 (Taft Hall)	
		555971 (Taft Hall)	
		411069 (Truman Hall)	
		430957 (Wolverton)	

Building Meters and Totals

Building Name	Gas Meter	Therms	$/Therm	Secondary Meter #	Therms
Child Care	310674	1,442.38	$ 0.80		
CIM	497191	19,436.98	$ 0.80		
Community Cente	431186	3,240.64	$ 0.80		
Connector Building			$ 0.80		
Criminal Justice C	180372		$ 0.80		
Helene Fuld	341687		$ 0.80		
Jefferson Hall	4393670	3,868.58	$ 0.80		
Laser Building	199278		$ 0.80		
Lincoln Hall	514828	9,560.71	$ 0.80		
Madison Hall	453525		$ 0.80		
Papiano Gym	180448	29,299.98	$ 0.80		
Taft Hall	461792	7,040.50	$ 0.80	555971	6,993.92
Truman Hall	411069	23,702.06	$ 0.80		
Wolverton Library	430957	9,307.28	$ 0.80		

Main Boiler House

Therms	Cost
52,617.40	$ 38,630.26

	sq ft	% total	Therms	Cost
Papiano Gym	40,000	54.8%	28,835.40	$ 21,170.16
Truman Hall	32,990	45.2%	23,782.00	$ 17,460.09

Main Boiler House Gas Usage

	Main Boiler House		Papiano Gym				Truman Hall			
Month	MBH Therms	MBH Cost	Therms	Cost	DHW	HHW	Therms	Cost	DHW	HHW
Jul-11	311	$ 211.56	311.40	$ 211.56	311.40	-	-	$ -		
Aug-11	-	$ -	-				-	$ -		
Sep-11	-	$ -	-	$ -			-	$ -		
Oct-11	-	$ -	-	$ -			-	$ -		
Nov-11	3,087	$ 3,332.48	1,691.74	$ 1,826.27	1,168.43	523.30	1,395.26	$ 1,506.22	627.87	767.39
Dec-11	6,277	$ 5,830.20	3,439.87	$ 3,195.07	1,168.43	2,271.43	2,837.03	$ 2,635.13	627.87	2,209.16
Jan-12	9,207	$ 8,289.63	5,045.62	$ 4,542.89	1,168.43	3,877.19	4,161.38	$ 3,746.74	627.87	3,533.51
Feb-12	11,042	$ 4,128.34	6,051.46	$ 2,262.41	1,168.43	4,883.03	4,990.94	$ 1,865.93	627.87	4,363.07
Mar-12	11,260	$ 4,313.53	6,170.54	$ 2,363.90	1,168.43	5,002.11	5,089.16	$ 1,949.63	627.87	4,461.29
Apr-12	6,695	$ 7,158.11	3,669.00	$ 3,922.79	1,168.43	2,500.56	3,026.00	$ 3,235.32	627.87	2,398.14
May-12	4,738	$ 5,366.40	2,596.52	$ 2,940.90	1,168.43	1,428.09	2,141.48	$ 2,425.51	627.87	1,513.61
Total	52,617	$ 38,630	$ 28,976	$ 21,266	$ 8,490	$ 20,486	$ 23,641	$ 17,364	$ 4,395	$ 19,246

Usage (Therms)
Meter Number

	268114 (Print Shop)				307090 (Animal Barn)				**310674 (Child Care)**				362093				**411069 (Truman Hall)**				**430957 (Wolverton)**			
	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm
	0	$ -	0.00%	#DIV/0!	36.33	$ 24.68	0.68%	$ 0.68	0	$ -	0.00%	#DIV/0!	26.99	$ 18.34	0.51%	$ 0.68	5.19	$ 3.53	0.10%	$ 0.68	104.84	$ 71.23	1.98%	$ 0.68
		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
	0	$ -	0.00%	#DIV/0!	10.41	$ 6.96	0.20%	$ 0.67	0	$ -	0.00%	#DIV/0!	5.21	$ 3.48	0.10%	$ 0.67	1.04	$ 0.70	0.02%	$ 0.67	14.57	$ 9.74	0.29%	$ 0.67
	0	$ -	0.00%	#DIV/0!	46.49	$ 36.07	1.01%	$ 0.78	3.1	$ 2.40	0.07%	$ 0.78	0	$ -	0.00%	#DIV/0!	4.13	$ 3.20	0.09%	$ 0.78	23.76	$ 18.43	0.52%	$ 0.78
	1.03	$ 1.11	0.01%	$ 1.08	12.35	$ 13.33	0.14%	$ 1.08	0	$ -	0.00%	#DIV/0!	374.56	$ 404.35	4.11%	$ 1.08	7.2	$ 7.77	0.08%	$ 1.08	55.57	$ 59.99	0.61%	$ 1.08
	23.67	$ 21.99	0.10%	$ 0.93		$ -	0.00%	#DIV/0!	73.06	$ 67.86	0.31%	$ 0.93	912.72	$ 847.77	3.91%	$ 0.93	8.23	$ 7.64	0.04%	$ 0.93	1041.35	$ 967.24	4.46%	$ 0.93
	57.29	$ 51.58	0.16%	$ 0.90		$ -	0.00%	#DIV/0!	236.31	$ 212.76	0.65%	$ 0.90	1499.72	$ 1,350.29	4.11%	$ 0.90	4.09	$ 3.68	0.01%	$ 0.90	1954.95	$ 1,760.16	5.36%	$ 0.90
	107.33	$ 40.13	0.25%	$ 0.37		$ -	0.00%	#DIV/0!	467.5	$ 174.78	1.10%	$ 0.37	1732.73	$ 647.80	4.08%	$ 0.37	4.13	$ 1.54	0.01%	$ 0.37	2005.18	$ 749.66	4.72%	$ 0.37
	98.14	$ 37.60	0.28%	$ 0.38		$ -	0.00%	#DIV/0!	394.61	$ 151.17	1.12%	$ 0.38	1418.31	$ 543.35	4.01%	$ 0.38	7.23	$ 2.77	0.02%	$ 0.38	1929.64	$ 739.23	5.45%	$ 0.38
	48.41	$ 51.76	0.13%	$ 1.07		$ -	0.00%	#DIV/0!	165.83	$ 177.30	0.46%	$ 1.07	1038.24	$ 1,110.06	2.86%	$ 1.07	12.36	$ 13.21	0.03%	$ 1.07	1411.1	$ 1,508.71	3.89%	$ 1.07
	14.42	$ 16.33	0.08%	$ 1.13		$ -	0.00%	#DIV/0!	101.97	$ 115.49	0.57%	$ 1.13	610.79	$ 691.80	3.44%	$ 1.13	7.21	$ 8.17	0.04%	$ 1.13	766.32	$ 867.96	4.32%	$ 1.13
Total	350.29				105.58				1,442.38	901.78			7,619.27				60.81	52.22			9,307.28	$ 6,752.35		

Usage (Therms)
Meter Number

	431186 (Community Center)				**450781 (Main Boiler Room)**				**461792 (Taft Hall)**				470558				**497191 (CIM)**				497759			
	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm
	162.97	$ 110.72	3.07%	$ 0.68	311.4	$ 211.56	5.87%	$ 0.68	8.3	$ 5.64	0.16%	$ 0.68	20.76	$ 14.10	0.39%	$ 0.68	1.04	$ 0.71	0.02%	$ 0.68	3684.9	$ 2,503.41	69.44%	$ 0.68
		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
	224.86	$ 150.32	4.42%	$ 0.67	0	$ -	0.00%	#DIV/0!	7.29	$ 4.87	0.14%	$ 0.67	0	$ -	0.00%	#DIV/0!	195.52	$ 130.70	3.84%	$ 0.67	4528.35	$ 3,027.17	88.98%	$ 0.67
	363.62	$ 282.10	7.89%	$ 0.78	0	$ -	0.00%	#DIV/0!	30.99	$ 24.04	0.67%	$ 0.78	0	$ -	0.00%	#DIV/0!	169.41	$ 131.43	3.67%	$ 0.78	3842.76	$ 2,981.21	83.33%	$ 0.78
	382.79	$ 413.23	4.20%	$ 1.08	3087	$ 3,332.48	33.86%	$ 1.08	0	$ -	0.00%	#DIV/0!	0	$ -	0.00%	#DIV/0!	307.67	$ 332.14	3.37%	$ 1.08	4362.96	$ 4,709.91	47.85%	$ 1.08
	353.98	$ 328.79	1.52%	$ 0.93	6276.9	$ 5,830.20	26.90%	$ 0.93		$ -	0.00%	#DIV/0!	2315.25	$ 2,150.48	9.92%	$ 0.93	2215.44	$ 2,057.78	9.50%	$ 0.93	6698.79	$ 6,222.06	28.71%	$ 0.93
	333.5	$ 300.27	0.91%	$ 0.90	9207	$ 8,289.63	25.24%	$ 0.90		$ -	0.00%	#DIV/0!	3017.85	$ 2,717.16	8.27%	$ 0.90	3227.57	$ 2,905.98	8.85%	$ 0.90	9278.61	$ 8,354.10	25.43%	$ 0.90
	216.72	$ 81.02	0.51%	$ 0.37	11042.4	$ 4,128.34	26.00%	$ 0.37		$ -	0.00%	#DIV/0!	3653.28	$ 1,365.82	8.60%	$ 0.37	4468.56	$ 1,670.63	10.52%	$ 0.37	9731.76	$ 3,638.34	22.91%	$ 0.37
	419.4	$ 160.67	1.19%	$ 0.38	11259.7	$ 4,313.53	31.82%	$ 0.38		$ -	0.00%	#DIV/0!	0	$ -	0.00%	#DIV/0!	1046.43	$ 400.88	2.96%	$ 0.38	10619.24	$ 4,068.17	30.01%	$ 0.38
	408.91	$ 437.20	1.13%	$ 1.07	6695	$ 7,158.11	18.45%	$ 1.07		$ -	0.00%	#DIV/0!	5489.9	$ 5,869.65	15.13%	$ 1.07	6531.23	$ 6,983.01	18.00%	$ 1.07	9383.3	$ 10,032.37	25.86%	$ 1.07
	373.89	$ 423.48	2.11%	$ 1.13	4738	$ 5,366.40	26.71%	$ 1.13		$ -	0.00%	#DIV/0!	1246.3	$ 1,411.60	7.03%	$ 1.13	1274.11	$ 1,443.10	7.18%	$ 1.13	5737.1	$ 6,498.02	32.35%	$ 1.13
Total	3,240.64	$ 2,687.79			52,617.40	$ 38,630.26			46.58	$ 34.55			15,743.34				19,436.98	$ 16,056.35			67,867.77			

Usage (Therms)
Meter Number

	514828 (Lincoln Hall)				516533				543578				**4393670 (Jefferson)**				**555971 (Taft Hall)**			
	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm	Therm	Cost	% Tot	$/Therm
	807.56	$ 548.63	15.22%	$ 0.68	56.05	$ 38.08	1.06%	$ 0.68	0	$ -	0.00%	#DIV/0!	0	$ -	0.00%	#DIV/0!		$ -	0.00%	#DIV/0!
		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
	0	$ -	0.00%	#DIV/0!	42.68	$ 28.53	0.84%	$ 0.67	0	$ -	0.00%	#DIV/0!	0	$ -	0.00%	#DIV/0!		$ -	0.00%	#DIV/0!
	0	$ -	0.00%	#DIV/0!	40.29	$ 31.26	0.87%	$ 0.78	0	$ -	0.00%	#DIV/0!	0	$ -	0.00%	#DIV/0!		$ -	0.00%	#DIV/0!
	101.87	$ 109.97	1.12%	$ 1.08	89.52	$ 96.64	0.98%	$ 1.08	115.25	$ 124.41	1.26%	$ 1.08	23.67	$ 25.55	0.26%	$ 1.08		$ -	0.00%	#DIV/0!
	636.95	$ 591.62	2.73%	$ 0.93	315.9	$ 293.42	1.35%	$ 0.93	803.65	$ 746.46	3.44%	$ 0.93	419.83	$ 389.95	1.80%	$ 0.93	267.54	$ 248.50	1.15%	$ 0.93
	1443.45	$ 1,299.63	3.96%	$ 0.90	1547.8	$ 1,393.58	4.24%	$ 0.90	1511.99	$ 1,361.34	4.14%	$ 0.90	596.41	$ 536.98	1.63%	$ 0.90	1207.14	$ 1,086.86	3.31%	$ 0.90
	2727.58	$ 1,019.74	6.42%	$ 0.37	0	$ -	0.00%	#DIV/0!	1714.15	$ 640.86	4.04%	$ 0.37	868.94	$ 324.86	2.05%	$ 0.37	2094.96	$ 783.23	4.93%	$ 0.37
	2256.07	$ 864.29	6.37%	$ 0.38	676.62	$ 259.21	1.91%	$ 0.38	1351.16	$ 517.62	3.82%	$ 0.38	941.06	$ 360.52	2.66%	$ 0.38	1611.48	$ 617.35	4.55%	$ 0.38
	1109.31	$ 1,186.04	3.06%	$ 1.07	326.51	$ 349.10	0.90%	$ 1.07	833.27	$ 890.91	2.30%	$ 1.07	616.97	$ 659.65	1.70%	$ 1.07	1339	$ 1,431.62	3.69%	$ 1.07
	477.92	$ 541.31	2.69%	$ 1.13	169.95	$ 192.49	0.96%	$ 1.13	770.44	$ 872.62	4.34%	$ 1.13	401.7	$ 454.98	2.26%	$ 1.13	473.8	$ 536.64	2.67%	$ 1.13
Total	9,560.71	$ 6,161.23			3,265.32				7,099.91				3,868.58	$ 2,752.49			6,993.92	$ 4,704.20		

APPENDIX B

Equipment Inventory

New Jersey BPU Energy Audit Program
CHA #24364
Camden County College
Lincoln Hall
Original Construction Date: 1954
Renovation/Addtion Date: 1994

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size/Efficiency	Location	Areas/Equipment Served	Date Installed	Remaining Useful Life (years)	Other Info.
CT-1	1	IMECO	EFC-C-223-3	2573-1RH	Closed Loop Cooling Tower / Electric	421 GPM, 10°F Water ΔT at 78°F WB / 2,105 MBH (175 tons) 20 HP fan motor 1.5 HP Spray water pump 6.0 kW electric basin heater	Rooftop	Lincoln Hall / Condenser Cooling Water	1991	-1	Poor Condition
B-1 B-2 B-3 B-4 B-5 B-6	6	Weil-McLain	HE-II-6	CP-2452799 CP-2434777 CP-2434806 CP-2434778 CP-2434805 CP-2434804	HVAC Heating Hot Water System / Natural Gas	167 MBH Input / 137 MBH Output / 82% Efficiency	Boiler Room Lower Level	Lincoln Hall	1991	14	Fair Condition
HWP-1	1	TACO	FM3013126B2K102L0	113160001	HVAC Heating Hot Water System / Electric	25 HP / 1750 RPM / Standard Efficiency 86%	Boiler Room	Lincoln Hall / Primary Hot Water Sytem	1993	1	Good Condition
HWP-2	1	TACO	FM3013126B2K102L0	113160011	HVAC Heating Hot Water System / Electric	25 HP / 1750 RPM / Standard Efficiency 86%	Boiler Room	Lincoln Hall / Primary Hot Water Sytem	1993	1	Good Condition
DHW-1	1	AO Smith	BJP-140-199	SJ93-5030793	Domestic Hot Water Heating / Natural Gas	199 MBH Input / 140 GAL	Boiler Room Lower Level	Lincoln Hall	1991	-9	Fair Condition
RTU-1	1	McQuay	CUR251EFLC	5YG83831-01	HVAC / DX Cooling, Natural Gas Heating	10,000 CFM / CLG: 300 MBH HTG: 320 MBH / 10 HP SF	Rooftop Above Area Being Served	Theater	1991	-6	Good Condition
HP-1 Water Source Heat Pump	1	Snyder General	HWH030CCFS	74G08900 00	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-2 Water Source Heat Pump	1	Snyder General	HWH030CCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-3 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-4 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition

New Jersey BPU Energy Audit Program
CHA #24364
Camden County College
Lincoln Hall
Original Construction Date: 1954
Renovation/Addtion Date: 1994

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size/Efficiency	Location	Areas/Equipment Served	Date Installed	Remaining Useful Life (years)	Other Info.
HP-5 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-6 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-7 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-8 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-9 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-10 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-11 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-12 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-13 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition

New Jersey BPU Energy Audit Program
CHA #24364
Camden County College
Lincoln Hall
Original Construction Date: 1954
Renovation/Addtion Date: 1994

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size/Efficiency	Location	Areas/Equipment Served	Date Installed	Remaining Useful Life (years)	Other Info.
HP-14 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-15 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-16 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-17 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-18 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-19 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
HP-20 Water Source Heat Pump	1	Snyder General	HWHxxxCCFS	xxx	HVAC / WSHP Electric Cooling & Heating, Vertical Cabinet	- CFM / CLG: - MBH @ - EER HTG: - MBH @ - COP	Floor Mounted Cabinet In Area Served	xxx	1991	-6	Good Condition
UV-1 thru UV-xxx	xx	Snyder General	EABAENRSAR	NOT AVAILABLE	HVAC / Hot Water Heating	Fractional HP fan motors	Vertical unit ventilator floor mounted cabinet	Exterior Zones	1991	-1	Good Condition

Energy Audit of Camden County College (Lincoln Hall)

CHA Project No. 24364

Existing Lighting

Cost of Electricity: **$0.150** **$/kWh**

$6.00 **$/kW**

		EXISTING CONDITIONS									
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Retrofit Control**	**Annual kWh**	
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	Retrofit control device	(kW/space) * (Annual Hours)	Notes
209A	West Cooridor	8	**2' 2-LAMP T-8 (32W)**	FU2ILL	32	0.26	SW	2500	None	640	
234	Lobby A	7	**SP 100 W I 2**	i100/2	200	1.40	SW	2500	None	3,500	
234	Lobby B	33	**SP 100 W I 2**	i100/2	200	6.60	SW	2500	None	16,500	
129A	Lobby B	3	**SP 72 I**	I72/1	75	0.23	SW	2125	C-OCC	478	
35A	Men's Room	2	**4' 3-LAMP T-8 (32W)**	F43ILL	32	0.06	SW	2125	C-OCC	136	
41A	Men's Room	1	**4' 1-LAMP T-8 (32W)**	F41ILL	32	0.03	SW	2125	C-OCC	68	
35A	Women's Room	2	**4' 3-LAMP T-8 (32W)**	F43ILL	32	0.06	SW	2500	None	160	
41A	Women's Room	1	**4' 1-LAMP T-8 (32W)**	F41ILL	32	0.03	SW	2125	OCC	68	
35A	L - 023	4	**4' 3-LAMP T-8 (32W)**	F43ILL	32	0.13	SW	2125	OCC	272	
35A	L - 022	4	**4' 3-LAMP T-8 (32W)**	F43ILL	32	0.13	SW	2125	OCC	272	
35A	Gallery - 024	14	**4' 3-LAMP T-8 (32W)**	F43ILL	32	0.45	SW	2250	C-OCC	1,008	
129A	Gallery - 024	43	**SP 72 I**	I72/1	75	3.23	SW	2250	C-OCC	7,256	
35A	Gallery - 025	12	**4' 3-LAMP T-8 (32W)**	F43ILL	32	0.38	SW	2125	OCC	816	
129A	Gallery - 025	45	**SP 72 I**	I72/1	75	3.38	SW	2125	OCC	7,172	
234	Storage Closet	1	**SP 100 W I 2**	i100/2	200	0.20	SW	2125	OCC	425	
226	Theater Lobby	10	**70 W MH Wall Pack**	MH70/1	95	0.95	SW	2000	OCC	1,900	
175A	Theater Men's Bathroom	1	**4' 2-LAMP T-8 (32W)**	F42ILL	32	0.03	SW	2125	OCC	68	
175A	Theater Women's Bathroom	1	**4' 2-LAMP T-8 (32W)**	F42ILL	32	0.03	SW	2125	OCC	68	
227	Closet	1	**W60CF1**	F81EL	60	0.06	SW	2125	OCC	128	
234	Entrance Theater	1	**SP 100 W I 2**	i100/2	200	0.20	SW	2125	OCC	425	
175A	Theater	8	**4' 2-LAMP T-8 (32W)**	F42ILL	32	0.26	SW	2125	OCC	544	
Y	Theater	42	**I 100**	I100/1	100	4.20	SW	2125	OCC	8,925	
227	Theater	1	**W60CF1**	F81EL	60	0.06	SW	2125	OCC	128	
227	Stairway	1	**W60CF1**	F81EL	60	0.06	SW	2125	OCC	128	
23	Theater Exit Signs	9	**X 5 W CF 2**	ECF5/2	20	0.18	SW	2500	None	450	
71	Projector Room	4	**I 60**	I60/1	60	0.24	SW	2125	OCC	510	
234	Theater	3	**SP 100 W I 2**	i100/2	200	0.60	SW	2125	OCC	1,275	
162A	Stage	9	**4' 4-LAMP T-12**	F44EL	120	1.08	SW	500	None	540	
35A	Kitchen	3	**4' 3-LAMP T-8 (32W)**	F43ILL	32	0.10	SW	2125	OCC	204	
180	L - 021	6	**T 32 R F 4 (ELE)**	F44ILL	112	0.67	SW	2500	None	1,680	
180	L - 021E (Photo Studio)	9	**T 32 R F 4 (ELE)**	F44ILL	112	1.01	SW	2500	None	2,520	
180	L - 021D	2	**T 32 R F 4 (ELE)**	F44ILL	112	0.22	SW	2500	None	560	
180	L - 021A	2	**T 32 R F 4 (ELE)**	F44ILL	112	0.22	SW	2125	OCC	476	
180	L - 021A	6	**T 32 R F 4 (ELE)**	F44ILL	112	0.67	SW	1063	None	714	
169	L - 016 Music Room	17	**SP 250 MH ROOF**	MH250/1	295	5.02	SW	2125	OCC	10,657	
209A	Corridor Outside of Music Room	9	**2' 2-LAMP T-8 (32W)**	FU2ILL	32	0.29	SW	1063	None	306	
169	L - 020	12	**SP 250 MH ROOF**	MH250/1	295	3.54	SW	1063	None	3,761	
162A	L - 017	11	**4' 4-LAMP T-12**	F44EL	120	1.32	SW	2125	OCC	2,805	
162A	L - 019	8	**4' 4-LAMP T-12**	F44EL	120	0.96	SW	500	None	480	
162A	L - 018	8	**4' 4-LAMP T-12**	F44EL	120	0.96	SW	500	None	480	
169	L - 009, L - 010, L - 011	12	**SP 250 MH ROOF**	MH250/1	295	3.54	SW	500	None	1,770	
204	L - 010	1	**S 96 P F 2 (MAG) 8'**	F82EHE	207	0.21	SW	2125	OCC	440	
169	L - 008 Little Theater	8	**SP 250 MH ROOF**	MH250/1	295	2.36	SW	1063	None	2,508	
11A	L - 008 Closet	2	**4' 2-LAMP T-12**	F42EL	60	0.12	SW	2125	OCC	255	
11A	Women's Bathroom	4	**4' 2-LAMP T-12**	F42EL	60	0.24	SW	1063	None	255	

Energy Audit of Camden County College (Lincoln Hall)

CHA Project No. 24364

Existing Lighting

Cost of Electricity: **$0.150** **$/kWh**

$6.00 **$/kW**

		EXISTING CONDITIONS									
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Retrofit Control**	**Annual kWh**	
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	Retrofit control device	(kW/space) * (Annual Hours)	Notes
71	Closet	1	**I 60**	I60/1	60	0.06	SW	2250	None	135	
71	Closet	1	**I 60**	I60/1	60	0.06	SW	2250	None	135	
11A	All Purpose Bathroom	1	**4' 2-LAMP T-12**	F42EL	60	0.06	SW	500	None	30	
209A	Vestibule	1	**2' 2-LAMP T-8 (32W)**	FU2ILL	32	0.03	SW	520	None	17	
35A	L- 007	4	**4' 3-LAMP T-8 (32W)**	F43ILL	32	0.13	SW	520	C-OCC	67	
11A	L - 012	4	**4' 2-LAMP T-12**	F42EL	60	0.24	SW	520	None	125	
204	L - 012	1	**S 96 P F 2 (MAG) 8'**	F82EHE	207	0.21	SW	500	None	104	
11A	Kiln Room #2	4	**4' 2-LAMP T-12**	F42EL	60	0.24	SW	4380	None	1,051	
11A	Kiln Room #1	2	**4' 2-LAMP T-12**	F42EL	60	0.12	SW	4380	None	526	
162A	Ceramic Studio	22	**4' 4-LAMP T-12**	F44EL	120	2.64	SW	8760	None	23,126	
204	Glaze Room	3	**S 96 P F 2 (MAG) 8'**	F82EHE	207	0.62	SW	8760	None	5,440	
227	Dance Room	6	**W60CF1**	F81EL	60	0.36	SW	2125	OCC	765	
61A	Dance Cooridor	6	**4' 3-LAMP T-12**	F43EL	115	0.69	SW	2125	OCC	1,466	
111A	Dance Cooridor	12	**4' 1-LAMP T-12**	F41EL	32	0.38	SW	500	None	192	
11A	Men's Bathroom	4	**4' 2-LAMP T-12**	F42EL	60	0.24	SW	500	None	120	
61A	L - 005	4	**4' 3-LAMP T-12**	F43EL	115	0.46	SW	8760	None	4,030	
209A	L - 005	1	**2' 2-LAMP T-8 (32W)**	FU2ILL	32	0.03	SW	500	None	16	
61A	L - 004A	3	**4' 3-LAMP T-12**	F43EL	115	0.35	SW	3285	OCC	1,133	
71	L - 004A BR	1	**I 60**	I60/1	60	0.06	SW	3285	OCC	197	
11A	Display Case	3	**4' 2-LAMP T-12**	F42EL	60	0.18	SW	8760	None	1,577	
162A	L - 004	4	**4' 4-LAMP T-12**	F44EL	120	0.48	SW	8760	None	4,205	
61A	L - 013	6	**4' 3-LAMP T-12**	F43EL	115	0.69	SW	500	None	345	
61A	L - 013 Costume Storage	6	**4' 3-LAMP T-12**	F43EL	115	0.69	SW	2125	OCC	1,466	
162A	Men's Bathroom	1	**4' 4-LAMP T-12**	F44EL	120	0.12	SW	500	None	60	
162A	Women's Bathroom	1	**4' 4-LAMP T-12**	F44EL	120	0.12	SW	2000	OCC	240	
11A	L - 003	8	**4' 2-LAMP T-12**	F42EL	60	0.48	SW	2000	None	960	
11A	Mechanical Room	7	**4' 2-LAMP T-12**	F42EL	60	0.42	SW	500	None	210	
71	Mechanical Room	1	**I 60**	I60/1	60	0.06	SW	8760	OCC	526	
209A	Ext Boiler Room	4	**2' 2-LAMP T-8 (32W)**	FU2ILL	32	0.13	SW	500	None	64	
209A	L - 002	1	**2' 2-LAMP T-8 (32W)**	FU2ILL	32	0.03	SW	500	None	16	
61A	L - 002A	2	**4' 3-LAMP T-12**	F43EL	115	0.23	SW	8760	OCC	2,015	
61A	L - 002B	2	**4' 3-LAMP T-12**	F43EL	115	0.23	SW	2000	None	460	
61A	L - 002C	2	**4' 3-LAMP T-12**	F43EL	115	0.23	SW	8760	None	2,015	
61A	L - 002D	2	**4' 3-LAMP T-12**	F43EL	115	0.23	SW	2000	OCC	460	
209A	Cooridor	9	**2' 2-LAMP T-8 (32W)**	FU2ILL	32	0.29	SW	4380	OCC	1,261	
204	L - 001	28	**S 96 P F 2 (MAG) 8'**	F82EHE	207	5.80	SW	4380	C-OCC	25,386	
204	Cooridor	2	**S 96 P F 2 (MAG) 8'**	F82EHE	207	0.41	SW	4380	OCC	1,813	
61A	Electrical Supply Room	3	**4' 3-LAMP T-12**	F43EL	115	0.35	SW	520	C-OCC	179	
209A	Cooridor	12	**2' 2-LAMP T-8 (32W)**	FU2ILL	32	0.38	SW	520	OCC	200	
61A	L - 015.5 Storage	2	**4' 3-LAMP T-12**	F43EL	115	0.23	SW	2500	None	575	
61A	L - 015	4	**4' 3-LAMP T-12**	F43EL	115	0.46	SW	2125	OCC	978	
61A	L - 014	4	**4' 3-LAMP T-12**	F43EL	115	0.46	SW	2125	OCC	978	
146	Exterior Lighting	2	**High Bay MH 400**	MH400/1	458	0.92	SW	1125	None	1,031	
141A	Exterior Lighting	13	**HPS 200**	HPS200/1	250	3.25	SW	2500	None	8,125	
9A	Exterior Lighting	3	**High Bay MH 200 35 Feet High**	MH200/1	232	0.70	SW	2250	C-OCC	1,566	

Energy Audit of Camden County College (Lincoln Hall)

CHA Project No. 24364

Existing Lighting

Cost of Electricity: **$0.150** **$/kWh**

$6.00 **$/kW**

		EXISTING CONDITIONS									
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Retrofit Control**	**Annual kWh**	
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	Retrofit control device	(kW/space) * (Annual Hours)	Notes
71	Exterior Lighting	2	**I 60**	I60/1	60	0.12	SW	2250	C-OCC	270	
	Total	**606**				**70.62**				**179,383**	

APPENDIX C

ECM Calculations

Summary of Energy Conservation Measures							
Energy Conservation Measure		**Approx. Costs ($)**	**Approx. Savings ($/year)**	**Payback (Years) w/o Incentive**	**Potential Incentive ($)***	**Payback (Years) w/ Incentive**	**Recommended For Implementation**
ECM-1	HVAC Condensing Boilers Addition	125,800	700	179.7	3,000	175.4	
ECM-2	Replace Domestic Water Heater (DWH)	7,800	420	18.6	240	18.0	
ECM-3	HVAC Cooling Tower Replacement	76,000	3,200	23.8	6,650	21.7	
ECM-4	HVAC Water Source Heat Pumps Replacement	950,900	1,080	880.5	13,000	868.4	
ECM-5	HVAC Air Handling Equipment Replacement	70,700	2,300	30.7	1,625	30.0	
ECM-6	HVAC Demand Control Ventilation	5,000	900	5.6	0	5.6	X
ECM-7	Install Vending Misers	600	600	1.0	0	1.0	X
ECM-8	Replace/Upgrade Rooftop Exhaust Fans	7,000	400	17.5	0	17.5	
ECM-9	Replace Domestic Hot Water Pumps	328	200	1.6	0	1.6	X
ECM-10	Upgrade / Re-commission Building Automation System	20,800	1,900	10.9	0	10.9	
ECM-11	Replace Windows	284,600	1,700	167.4	0	167.4	
ECM-12	Lighting Replacement Upgrades	9,800	8,100	1.2	6,067	0.5	X
ECM-13	Lighting Controls Installation (Occupancy Sensors)	6,600	5,800	1.1	805	1.0	X
ECM-14	Lighting Replacements with Lighting Controls (Occupancy Sensors)	15,200	12,400	1.2	6,872	0.7	X

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM Summary Sheet

ECM-1 HVAC Condensing Boilers Addition

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric kWh	Electric kW	Nat Gas Therms	Total						
$				$	$	$		$	Years	Years
125,800	0	0	900	700	0	700	(0.9)	3,000	>20	>20

ECM-2 Replace Domestic Water Heater (DWH)

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric kWh	Electric kW	Nat Gas Therms	Total						
$				$	$	$		$	Years	Years
7,800	0	0	520	400	0	400	(0.4)	240	19.5	18.9

ECM-3 HVAC Cooling Tower Replacement

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	120 kWh	Electric kW	Nat Gas Therms	Total						
$				$	$	$		$	Years	Years
76,000	24,600	0	0	3,200	0	3,200	-0.1	6,650	>20	>20

ECM-4 HVAC Water Source Heat Pumps Replacement

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric kWh	Electric kW	Nat Gas Therms	Total						
$				$	$	$		$	Years	Years
950,900	8,200	0	0	1,100	0	1,100	(1.0)	13,000	>20	>20

ECM-5 HVAC Air Handling Equipment Replacement

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric kWh	Electric kW	Nat Gas Therms	Total						
$				$	$	$		$	Years	Years
70,700	17,500	0	0	2,300	0	2,300	-0.5	1,625	>20	>20

ECM-6 HVAC Demand Control Ventilation

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric kWh	Electric kW	Nat Gas Therms	Total						
$				$	$	$		$	Years	Years
5,000	2,500	0	700	900	0	900	2.6	0	5.6	5.6

ECM-7 Install Vending Misers

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						

$	kWh	kW	Therms	$	$	$		$	Years	Years
5,000	4,340	0	0	600	0	600	13.2	0	8.3	8.3

ECM-8 **Replace/Upgrade Rooftop Exhaust Fans**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
7,000	2,360	0	100	400	0	400	(0.2)	0	17.5	17.5

ECM-9 **Replace Domestic Hot Water Pumps**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
328	1,190	0	0	200	0	200	8.2	0	1.6	1.6

ECM-10 **Upgrade / Re-commission Building Automation System**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
20,800	9,710	0	730	1,900	0	1,900	(0.1)	0	10.9	10.9

ECM-11 **Replace Windows**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
284,600	1,280	0	1,860	1,700	0	1,700	(0.8)	0	>20	>20

ECM-12 **Lighting Replacement Upgrades**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
9,800	53,500	25	0	8,100	0	8,100	11.5	6,067	1.2	0.5

ECM-13 **Lighting Controls Installation (Occupancy Sensors)**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
6,600	43,800	0	0	5,800	0	5,800	12.1	805	1.1	1.0

ECM-14 **Lighting Replacements with Lighting Controls (Occupancy Sensors)**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
15,200	89,100	30	0	12,400	0	12,400	11.2	6,872	1.2	0.7

Camden County College Blackwood Campus- NJBPU
CHA Project #24364

Utility Costs		Yearly Usage	MTCDE	Building Area	Annual Utility Cost	
$ 0.131	$/kWh blended		0.00042021	41,500	Electric	Natural Gas
$ 0.119	$/kWh consumpt	404,524	0.00042021		$54,016	$6,161
$ 5.94	$/kW	143	0			
$ 0.80	$/Therm	9,561	0.00533471			
$ -	$/kgals	-	0			

Lincoln Hall

	Item	Savings						Cost	Simple Payback	MTCDE	Life Expectancy	NJ Smart Start Incentives	Direct Install Eligible (Y/N)*	Direct Install Incentives**	Max Incentives	Payback w/ Incentives***	Simple Projected Lifetime Savings						ROI
		kW	kWh	therms	cooling kWh	kgal/yr	$										kW	kWh	therms	cooling	kgal/yr	$	
ECM-1	HVAC Condensing Boilers Addition	0.0	0	900	0	0	$ 700	$ 125,800	179.7	4.8	25	$ 3,000	Y	$ 75,000	$ 3,000	175.4	0	0	22,500	0	0	$ 18,000	(0.9)
ECM-2	Replace Domestic Water Heater (DWH)	0.0	0	520	0	0	$ 420	$ 7,800	18.6	2.8	12	$ 240	Y	$ 5,500	$ 240	18.0	0	0	6,240	0	0	$ 5,000	(0.4)
ECM-3	HVAC Cooling Tower Replacement	0.0	24,600	0	0	0	$ 3,200	$ 76,000	23.8	10.3	20	$ 6,650	Y	$ 53,200	$ 6,650	21.7	0	492,000	0	0	0	$ 64,700	(0.1)
ECM-4	HVAC Water Source Heat Pumps Replacement	0.0	8,200	0	0	0	$ 1,080	$ 950,900	880.5	3.4	15	$ 13,000	Y	$ 75,000	$ 13,000	868.4	0	123,000	0	0	0	$ 16,200	(1.0)
ECM-5	HVAC Air Handling Equipment Replacement	0.0	17,500	0	0	0	$ 2,300	$ 70,700	30.7	7.4	15	$ 1,625		$ -	$ 1,625	30.0	0	262,500	0	0	0	$ 34,500	(0.5)
ECM-6	HVAC Demand Control Ventilation	0.0	2,500	700	0	0	$ 900	$ 5,000	5.6	4.8	20			$ -	$ -	5.6	0	50,000	14,008	0	0	$ 17,800	2.6
ECM-7	Install Vending Misers	0.0	4,336	0	0	0	$ 600	$ 600	1.0	1.8	15			$ -	$ -	1.0	0	65,043	0	0	0	$ 8,500	13.2
ECM-8	Replace/Upgrade Rooftop Exhaust Fans	0.0	2,357	105	0	0	$ 400	$ 7,000	17.5	1.6	15			$ -	$ -	17.5	0	35,351	1,574	0	0	$ 5,900	(0.2)
ECM-9	Replace Domestic Hot Water Pumps	0.1	1,190	0	0	0	$ 200	$ 328	1.6	0.5	20			$ -	$ -	1.6	3	23,807	0	0	0	$ 3,000	8.2
ECM-10	Upgrade / Re-commission Building Automation System	0.0	9,709	727	0	0	$ 1,900	$ 20,800	10.9	8.0	10			$ -	$ -	10.9	0	97,086	7,266	0	0	$ 18,600	(0.1)
ECM-11	Replace Windows	0.0	1,278	1,858	0	0	$ 1,700	$ 284,600	167.4	10.4	30			$ -	$ -	167.4	0	38,332	55,745	0	0	$ 49,600	(0.8)
ECM-12	Lighting Replacement Upgrades	25.2	53,500	0	0	0	$ 8,100	$9,800	1.2	22.5	15	$ 6,067		$ -	$ 6,067	0.5	378	802,500	0	0	0	$ 122,200	11.5
ECM-13	Lighting Controls Installation (Occupancy Sensors)	0.0	43,800	0	0	0	$ 5,800	$6,600	1.1	18.4	15	$ 805		$ -	$ 805	1.0	0	657,000	0	0	0	$ 86,400	12.1
ECM-14	Lighting Replacements with Lighting Controls (Occupancy Sensors)	25.2	89,100	0	0	0	$ 12,400	$15,200	1.2	37.4	15	$ 6,872	Y	$ 10,600	$ 6,872	0.7	378	1,336,500	0	0	0	$ 185,500	11.2
	Total (Does Not Include ECM-8 & ECM-9)	**25.3**	**160,769.6**	**4,810.1**	**0.0**	**0.0**	**25,800.0**	**1,564,727.5**	60.6		18	$ 31,387		$ 219,300	$ 31,387	59.4	**380.9**	**2,523,619**	**107,333**	**0**	**0**	**$ 427,300**	(0.7)
	Total Measures with Positive ROI	**25.2**	**91,600.0**	**700.4**	**0.0**	**0.0**	**13,300.0**	**20,200.0**	1.5		16.6666667	$ 6,872		$ 10,600	$ 6,872	1.0	**380.9**	**1,475,350**	**14,008**	**0**	**0**	**$ 214,800**	9.6
	% of Existing	**18%**	**40%**	**50%**	**0%**	**#DIV/0!**																	

**Direct Install Incentives program provides70% of each project cost up to $75,000 per electrical utility account; total funding for each year is capped at $250,00

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-1: HVAC Condensing Boiler Added

ECM Description Summary

One (1) high efficiency condensing boiler will be added to operate as the primary boiler during the milder winter months (October-November and March-April) with the existing boilers operating as secondary boilers. Boiler installation location/space to be determined since there is not enough room in the existing boiler room. Space may have to be provided in existing building or constructed if boiler cannot fit in exsiting mechanical space.

Existing Fuel Nat.Gas
Proposed Fuel Nat.Gas

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	$ 0.80	/ Therm	
Proposed Fuel Cost	$ 0.80	/ Therm	
Baseline Fuel Use	6,693	Therms	Based on historical utility data.
Existing Boiler Plant Efficiency	80%		Estimated or Measured
Baseline Boiler Load	535,455	Mbtu/yr	Baseline Fuel Use x Existing Efficiency x 100 Mbtu/Therms
Baseline Fuel Cost	$ 5,349		
Proposed Boiler Plant Efficiency	92%		New Condensing Boiler Efficiency
Proposed Fuel Use	5,820	Therms	Baseline Boiler Load / Proposed Efficiency / 100 Mbtu/Therms
Proposed Fuel Cost	$ 4,651		
Annual Utility Savings	900	Therms	
Annual Savings	$ 700		
Boiler Addition Project Cost	$ 125,800		
Simple Payback	180	Years	

*Note to engineer: Link savings back to summary sheet in appropriate column.

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-1: HVAC Condensing Boiler Added - Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
3,000 MBH NG Condensing Boiler	1	EA	$ 45,000	$ 2,000		$ 49,500	$ 2,700	$ -	$ 52,200	
Flue Installation	25	LF	$ 75.0	$ 15.00		$ 2,063	$ 506	$ -	$ 2,569	
Reprogram DDC system	1	EA	$ 100.0	$ 350.00		$ 110	$ 473	$ -	$ 583	
Miscellaneous Electrical	1	LS	$ 500	$ 250		$ 550	$ 338	$ -	$ 888	
Miscellaneous HW Piping	1	LS	$ 2,000	$ 1,000		$ 2,200	$ 1,350	$ -	$ 3,550	
Boiler room/space construction	1	LS	$ 20,000	$ 10,000		$ 22,000	$ 13,500	$ -	$ 35,500	
						$ -	$ -	$ -	$ -	

$ 95,289	Subtotal
$ 9,529	10% Contingency
$ 20,964	20% Contractor O&P
$ -	0% Engineering
$ 125,800	**Total**

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-2: Replace Gas-Fired DHW Heater w/ Condensing Gas-Fired DHW Heater

ECM Summary

During periods of little or no domestic hot water use, domestic hot water heaters must still heat the water within their storage tank. Energy required maintaining the hot water temperature setpoint during times of zero demand is known as standby losses. According to the U.S. Department of Energy, 2.5% of stored capacity is lost every hour during HW heater standby. This value was applied to the total volume of the existing DHW heater storage tank to determine the annual standby losses. Proposed efficiency was based on a tankless-type, high efficiency condensing hot water heater with an auxiliary storage tank for increased hot water recovery capacity.

Item	Value	Units	Formula/Comments
Avg. Monthly Utility Demand by Water Heater	**2,868**	Therms/yr	From utility bill for usage in month of May when DHW is primary NG usage
Total Annual Utility Demand by Water Heater	286,752	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	80%		Per manufacturer nameplate
Total Annual Hot Water Demand (w/ standby losses)	229,402	MBTU/yr	
Existing Tank Size	140	Gallons	Per manufacturer nameplate
Hot Water Piping System Capacity	10	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	130	˚F	Per building personnel
Room Temperature	70	˚F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	1.9	MBH	
Annual Standby Hot Water Load	16,425	MBTU/yr	
New Tank Size	100	Gallons	Based on Rinnai tankless water heater with (1) 100 gal storage tank
Hot Water Piping System Capacity	10	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	130	˚F	
Room Temperature	70	˚F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	1.4	MBH	
Annual Standby Hot Water Load	12,045	MBTU/yr	
Total Annual Hot Water Demand	225,022	MBTU/yr	
Proposed Avg. Hot water heater efficiency	96%		Based on Rinnai Instantaneous Water heater
Proposed Fuel Use	2,344	Therms	
Utility Cost	$0.80	$/Therm	
Existing Operating Cost of DHW	$2,291	$/yr	
Proposed Operating Cost of DHW	$1,873	$/yr	
Simple Payback	**19**		

Savings Summary:

Utility	Energy Savings Therms	Cost Savings
Therms/yr	**520**	**$418**

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-2: Replace Electric & Gas-Fired DHW Heaters w/ Condensing Gas-Fired DHW Heater - Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Gas DHW Heater Removal	1	EA	$ -	$ 50		$ -	$ 68	$ -	$ 100	
High Efficiency Gas-Fired tankless DHW Heater	1	EA	$ 1,200	$ 1,000		$ 1,320	$ 1,350	$ -	$ 2,700	
100 gallon storage tank	1	EA	$ 400	$ 200		$ 440	$ 270	$ -	$ 700	
Miscellaneous Electrical	1	EA	$ 50	$ 100		$ 55	$ 135	$ -	$ 200	
Venting Kit	1	EA	$ 450	$ 650		$ 495	$ 878	$ -	$ 1,400	
Miscellaneous Piping and Valves	1	LS	$ 300			$ 330	$ -	$ -	$ 300	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 5,400	Subtotal
$ 1,080	20% Contingency
$ 1,296	20% Contractor O&P
$ -	0% Engineering
$ 7,800	**Total**

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

EQUIPMENT SERVED	AREA SERVED	FAN MOTOR HP
CT-1	Cooling Tower CT-1	20.0
Total Combined Motor Horsepower:		*20.0* *HP*

ECM-3: Replace Cooling Tower

Utility Costs

Blended Electric Rate $0.131

ECM Description Summary

Older Cooling towers supply constant volume air regardless of outside temperature. Modern cooling towers incorporate Variable Frequency Drives (VFD's) to reduce the air flow by slowing the motors down when less cooling capacity is needed, significant electrical energy can be saved. The fan motors will also be replaced with a premium efficiency motor. System static pressure will be permitted to float with fan speed, and pressure will not be controlled or monitored. Control strategy is to program the EMCS system to permit the CT fan to ramp speed linearly between 100% and 50% as OAT varies between the design cooling load and building balance point.

UNIT	HP	Existing Motor Eff (Note 1)	New Motor Eff (Note 1)	Existing Motor kW	New Motor kW		Building Balance Point
CT-1	20.0	88.3%	93.0%	13.52	12.83		55.0
				13.5	12.83	**VFD Eff. (CC)**	98.5%

OAT - DB Avg Temp F	Bin Hours	Occupied Hours in Bin	CT Hours in Bin	Existing Fan Kw	Existing Fan kWh	Fan Load %	Proposed Fan kW	Speed efficiency %	Proposed Fan kWh	Savings Fan kWh
(A)	(B)	(C)	(D)	(F)	(F)	(E)	(G)	(H)	(I)	(J)
102.5	0	0	0	13.5	0	100%	13.03	99.0%	0	0
97.5	3	1	1	13.5	12	100%	13.03	99.0%	12	0
92.5	34	10	10	13.5	137	94%	11.20	100.0%	113	23
87.5	131	39	39	13.5	527	88%	9.53	100.0%	372	156
82.5	500	149	149	13.5	2,012	82%	8.02	100.0%	1193	818
77.5	620	185	185	13.5	2,494	76%	6.66	98.7%	1246	1,248
72.5	664	198	198	13.5	2,671	71%	5.45	96.4%	1118	1,553
67.5	854	254	254	13.5	3,436	65%	4.39	93.2%	1196	2,240
62.5	927	276	276	13.5	3,729	59%	3.46	89.2%	1070	2,660
57.5	600	179	179	13.5	2,414	53%	2.66	84.3%	563	1,851
52.5	610	182	182	13.5	2,454	50%	2.30	81.5%	513	1,941
47.5	611	182	182	13.5	2,458	50%	2.30	81.5%	514	1,944
42.5	656	195	195	13.5	2,639	50%	2.30	81.5%	552	2,087
37.5	1,023	304	304	13.5	4,116	50%	2.30	81.5%	861	3,255
32.5	734	218	218	13.5	2,953	50%	2.30	81.5%	617	2,335
27.5	334	99	99	13.5	1,344	50%	2.30	81.5%	281	1,063
22.5	252	75	75	13.5	1,014	50%	2.30	81.5%	212	802
17.5	125	37	37	13.5	503	50%	2.30	81.5%	105	398
12.5	47	14	14	13.5	189	50%	2.30	81.5%	40	150
7.5	22	7	7	13.5	89	50%	2.30	81.5%	19	70
2.5	13	4	4	13.5	52	50%	2.30	81.5%	11	41
-2.5	0	0	0	13.5	0	50%	2.30	81.5%	0	0
-7.5	0	0	0	13.5	0	50%	2.30	81.5%	0	0
TOTALS		**2,607**	**2,607**	**311**	**35,242**				**10,607**	**24,635**

Notes:
1) Existing motor power based on operation with existing motor efficiency, operating at 80% load factor when at full load. Formula: Motor HP x 0.746 x 0.8 / Exist. Motor Eff., New motor power is based on same formula using the new motor efficiency.
2) Weather data from NOAA for Newark, NJ International Airport.
3) Occupied & AHU Bin Hours are based upon current Owner reported occuped schedule.
4) The required VFD motor power draw is based on a 3.0 power relationship to load, since system static pressure will not be controlled.

Annual Utility Savings	24,600	kWh
Annual Savings	$ 3,200	
Install Variable Speed Drives	#REF!	
- Air Handling Fan Cost		
Simple Payback	#REF!	Years

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-3 Cooling Tower Replacement Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Existing (1) cooling tower demolition	1	EA	$ 350	$ 1,550		$ 385	$ 2,093	$ -	$ 2,500	
(1) Cooling tower, rooftop mounted with VSD fans	1	EA	$ 16,800	$ 2,075		$ 18,480	$ 2,801	$ -	$ 21,300	2012 RS Means, $96 per ton for 175 ton cooling tower
- Condenser water pumps and piping	175	tons	$ 99	$ 33		$ 18,961	$ 7,796	$ -	$ 26,800	2012 RS Means, $
- Condenser water chemical feed system	1	EA	$ 350	$ 275		$ 385	$ 371	$ -	$ 800	
- Reprogram DDC system for (1) cooling tower	1	EA	$ 150	$ 2,000		$ 165	$ 2,700	$ -	$ 2,900	
Electrical - misc.	1	LS	$ 500	$ 2,000		$ 550	$ 2,700	$ -	$ 3,300	
						$ -	$ -	$ -	$ -	

$ 57,600	Subtotal
$ 5,760	10% Contingency
$ 12,672	20% Contractor O&P
$ -	0% Engineering
$ 76,000	**Total**

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

EQUIPMENT	AREA SERVED	DX COOLING CAPACITY (MBH)	DX HEATING CAPACITY (MBH)	QTY.	COOLING TOTAL MBH
HP-1,2,3,4,5	Block A1996 Areas, Art Room 11A, Home Ec Room 3A, and Resource Room 12A	40.0	30.0	5	200.0
HP-6A,6B,6C,42	Rooms 7A,7B,7C and 2001 Block C Areas	48.0	42.0	4	192.0
HP-7A,7B,8A,8B	Media Center 2B, Science Room 1S	54.0	50.0	4	216.0
HP-9	Computer Lab L1 & Media Center Area L2	63.0	52.0	1	63.0
HP-10,36	1996 Board Offices and 2001 Block C Areas	63.0	52.0	2	126.0
HP-11A,11B,11C,11D	1973 Areas AHUs and Terminal Equipment	219.3	200.6	4	877.2
HP-10A,10B,10C, 10D,10E,10F,10G	2001 Block C Areas and Main Offices	10.0	7.5	7	70.0
HP-16A,16B,16C, 16D,16E,16F,16G	2001 Block C Areas	16.7	12.8	7	116.9
HP-19A,19B,19C,19D	2001 Block C Areas and Main Offices	19.2	15.1	4	76.8
HP-24	OA to Block C Areas	27.0	18.0	1	27.0
HP-30A,30B,30C, 30D,30E,30F	2001 Block C Areas	31.2	21.6	7	218.4
		591	*502*		*2,183* *MBH*

ECM-4: HVAC Water Source Heat Pumps Replacement

ECM Description Summary

By replacing older water source heat pump equipment with units which have high efficiency fan motors and higher SEER/EER compressors, significant electrical energy can be saved. Control schemes can be incorporated that were not possible with the older equiopment as well. It is recommended these units be replaced by more modern water source heat pumps.

ASSUMPTIONS			Comments
Electric Cost	$0.131	/ kWh	
Average run hours per Week	66	Hours	
Space Balance Point	55	F	
Space Temperature Setpoint	74	deg F	Setpoint.
Cooling BTU/Hr Rating of existing DX equipment	591,400	Btu / Hr	Total BTU/hr of DX cooling equipment to be replaced.
Heating BTU/Hr Rating of existing DX equipment	501,600	Btu / Hr	Total BTU/hr of DX cooling equipment to be replaced.
Average EER (cooling)	11.7		Units are 10 years old, EER of 12.0, COP of 3.0 when new.
Average COP (heating)	3.1		Units are 10 years old, EER of 12.0, COP of 3.0 when new.
Existing Annual Electric Usage	44,695	kWh	

Item	Value	Units	Comments
Proposed Average EER	14.4		New ductless mini-splits (per manufacturer)
Proposed Average COP	3.8		New ductless mini-splits (per manufacturer)
Proposed Annual Electric Usage	36,461	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Electrical Usage Savings	**8,230**	**kWh**
Annual Cost Savings	**$1,082**	
Total Project Cost	$950,900	
Simple Payback	879	years

OAT - DB Bin Temp F	Annual Hours	Cooling Hrs at Temp Above balance point	Assumed % of time of operation	Assumed hrs of Operation
102.5	0	0	100%	0
97.5	3	1	89%	1
92.5	34	13	79%	11
87.5	131	51	68%	35
82.5	500	196	58%	114
77.5	620	244	47%	115
72.5	664	0	0%	0
67.5	854	0	0%	0
62.5	927	0	0%	0
57.5	600	0	0%	0
52.5	610	0	0%	0
47.5	611	0	0%	0
42.5	656	0	0%	0
37.5	1,023	0	0%	0
32.5	734	0	0%	0
27.5	334	0	0%	0
22.5	252	0	0%	0
17.5	125	0	0%	0
12.5	47	0	0%	0
7.5	22	0	0%	0
2.5	13	0	0%	0
-2.5	0	0	0%	0
-7.5	0	0	0%	0

Total	8,760	506	55%	276

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-4: HVAC Water Source Heat Pumps Replacement - Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Existing (53) GSHPs demolition	46	EA	$ 100	$ 1,000		$ 5,060	$ 62,100	$ -	$ 67,200	
(7) GSHPs, 1.0 ton with cooling and heating	7	EA	$ 1,690	$ 400		$ 13,013	$ 3,780	$ -	$ 16,800	
- Valves & Piping to GSHP CHW & HW coils	7	EA	$ 250	$ 300		$ 1,925	$ 2,835	$ -	$ 4,800	
- Reprogram DDC system for (1) GSHP	7	EA	$ 75	$ 200		$ 578	$ 1,890	$ -	$ 2,500	
(7) GSHPs, 1.5 tons with cooling and heating	7	EA	$ 1,960	$ 445		$ 15,092	$ 4,205	$ -	$ 19,300	
- Valves & Piping to GSHP CHW & HW coils	7	EA	$ 250	$ 300		$ 1,925	$ 2,835	$ -	$ 4,800	
- Reprogram DDC system for (1) GSHP	7	EA	$ 75	$ 200		$ 578	$ 1,890	$ -	$ 2,500	
(4) GSHPs, 2.0 tons with cooling and heating	4	EA	$ 2,140	$ 470		$ 9,416	$ 2,538	$ -	$ 12,000	
- Valves & Piping to GSHP CHW & HW coils	4	EA	$ 250	$ 300		$ 1,100	$ 1,620	$ -	$ 2,700	
- Reprogram DDC system for (1) GSHP	4	EA	$ 75	$ 200		$ 330	$ 1,080	$ -	$ 1,400	
(1) GSHP, 2.5 tons with cooling and heating	1	EA	$ 2,340	$ 500		$ 2,574	$ 675	$ -	$ 3,200	
- Valves & Piping to GSHP CHW & HW coils	1	EA	$ 250	$ 300		$ 275	$ 405	$ -	$ 700	
- Reprogram DDC system for (1) GSHP	1	EA	$ 75	$ 200		$ 83	$ 270	$ -	$ 400	
(7) GSHPs, 3.0 tons with cooling and heating	7	EA	$ 2,400	$ 575		$ 18,480	$ 5,434	$ -	$ 23,900	
- Valves 120	7	EA	$ 250	$ 300		$ 1,925	$ 2,835	$ -	$ 4,800	
- Reprogram DDC system for (1) GSHP	7	EA	$ 75	$ 200		$ 578	$ 1,890	$ -	$ 2,500	
(1) GSHP, 3.5 tons with cooling and heating	1	EA	$ 2,590	$ 615		$ 2,849	$ 830	$ -	$ 3,700	
- Valves & Piping to GSHP CHW & HW coils	1	EA	$ 250	$ 300		$ 275	$ 405	$ -	$ 700	
- Reprogram DDC system for (1) GSHP	1	EA	$ 75	$ 200		$ 83	$ 270	$ -	$ 400	
(4) GSHPs, 4.0 tons with cooling and heating	4	EA	$ 2,850	$ 670		$ 12,540	$ 3,618	$ -	$ 16,200	
- Valves & Piping to GSHP CHW & HW coils	4	EA	$ 300	$ 400		$ 1,320	$ 2,160	$ -	$ 3,500	
- Reprogram DDC system for (1) GSHP	4	EA	$ 75	$ 200		$ 330	$ 1,080	$ -	$ 1,400	
(7) GSHPs, 5.0 tons with cooling and heating	7	EA	$ 3,270	$ 890		$ 25,179	$ 8,411	$ -	$ 33,600	
- Valves & Piping to GSHP CHW & HW coils	7	EA	$ 300	$ 400		$ 2,310	$ 3,780	$ -	$ 6,100	
- Reprogram DDC system for (1) GSHP	7	EA	$ 75	$ 200		$ 578	$ 1,890	$ -	$ 2,500	
(4) GSHPs, 6.0 tons with cooling and heating	4	EA	$ 3,100	$ 1,200		$ 13,640	$ 6,480	$ -	$ 20,100	
- Valves & Piping to GSHP CHW & HW coils	4	EA	$ 300	$ 400		$ 1,320	$ 2,160	$ -	$ 3,500	
- Reprogram DDC system for (1) GSHP	4	EA	$ 75	$ 200		$ 330	$ 1,080	$ -	$ 1,400	
(4) GSHPs, 20.0 tons with cooling and heating	4	EA	$ 16,700	$ 3,100		$ 73,480	$ 16,740	$ -	$ 90,200	
- Valves & Piping to GSHP CHW & HW coils	4	EA	$ 400	$ 500		$ 1,760	$ 2,700	$ -	$ 4,500	
- Reprogram DDC system for (1) GSHP	4	EA	$ 75	$ 300		$ 330	$ 1,620	$ -	$ 2,000	
Electrical - misc.	46	LS	$ 1,000	$ 5,000		$ 50,600	$ 310,500	$ -	$ 361,100	
						$ -	$ -	$ -	$ -	

$ 720,400	Subtotal
$ 72,040	10% Contingency
$ 158,488	20% Contractor O&P
$ -	0% Engineering
$ 950,900	**Total**

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

EQUIPMENT	AREA SERVED	COOLING CAPACITY (MBH)
RTU-1	Main Theater	300

Total Electric DX Cooling: *300* *MBH*

ECM-5: HVAC Air Handling Equipment Replacment

ECM Summary
Replace old DX rooftop air handling units with more efficient fDX rooftop units having fariable speed fans and compressors.

ASSUMPTIONS			Comments
Electric Cost	$0.131	/ kWh	
Average run hours per Week	66	Hours	
Space Balance Point	55	F	
Space Temperature Setpoint	74	deg F	Setpoint.
BTU/Hr Rating of existing DX equipment	300,000	Btu / Hr	Total BTU/hr of DX cooling equipment to be replaced.
Average EER	8.0		Units are 13 years old, EERs were 10 when new
Existing Annual Electric Usage	10,347	kWh	

Item	Value	Units	Comments
Proposed EER	14.4		New ductless mini-splits (per manufacturer)
Proposed Annual Electric Usage	5,748	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Electrical Usage Savings	4,600	kWh
Annual Cost Savings	$600	
Total Project Cost	$70,700	
Simple Payback	118	years

OAT - DB Bin Temp F	Annual Hours	Cooling Hrs at Temp Above balance point	Assumed % of time of operation	Assumed hrs of Operation
102.5	0	0	100%	0
97.5	3	1	89%	1
92.5	34	13	79%	11
87.5	131	51	68%	35
82.5	500	196	58%	114
77.5	620	244	47%	115
72.5	664	0	0%	0
67.5	854	0	0%	0
62.5	927	0	0%	0
57.5	600	0	0%	0
52.5	610	0	0%	0
47.5	611	0	0%	0
42.5	656	0	0%	0
37.5	1,023	0	0%	0
32.5	734	0	0%	0
27.5	334	0	0%	0
22.5	252	0	0%	0
17.5	125	0	0%	0
12.5	47	0	0%	0
7.5	22	0	0%	0
2.5	13	0	0%	0
-2.5	0	0	0%	0

Total	8,760	506	55%	276

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-6B: Install Variable Speed Drives - AHU Fans

EQUIPMENT SERVED	AREA SERVED	FAN MOTOR HP
RTU-1	Main Theater	10.0

Total Combined Motor Horsepower: *10.0* *HP*

Utility Costs

Blended Electric Rate $0.131

ECM Description Summary

Air handling units with constant volume supply fan motors serve spaces with intermittent large occupancy loads. By adding Variable Frequency Drives (VFD's) to reducing the air flow by slowing the motors down, significant electrical energy can be saved. The fan motors will also be replaced with a premium efficiency motor. System static pressure will be permitted to float with fan speed, and pressure will not be controlled or monitored. Control strategy is to program the EMCS system to permit the AHU fan to ramp speed linearly between 100% and 50% as OAT varies between the design heating load and building balance point.

UNIT	HP	Existing Motor Eff (Note 1)	New Motor Eff (Note 1)	Existing Motor kW	New Motor kW		Building Balance Point
RTU-1	10.0	86.1%	91.7%	6.93	6.51		55.0
				6.9	6.51	**VFD Eff. (CC)**	98.5%

OAT - DB Avg Temp F	Bin Hours	Occupied Hours in Bin	AHU Hours in Bin	Existing Fan Kw	Existing Fan kWh	Fan Load %	Proposed Fan kW	Speed efficiency %	Proposed Fan kWh	Savings Fan kWh
(A)	(B)	(C)	(D)	(F)	(F)	(E)	(G)	(H)	(I)	(J)
102.5	0	0	0	6.9	0	50%	1.17	81.5%	0	0
97.5	3	1	1	6.9	6	50%	1.17	81.5%	1	5
92.5	34	10	10	6.9	70	50%	1.17	81.5%	15	56
87.5	131	39	39	6.9	270	50%	1.17	81.5%	56	214
82.5	500	149	149	6.9	1,031	50%	1.17	81.5%	213	818
77.5	620	185	185	6.9	1,279	50%	1.17	81.5%	264	1,015
72.5	664	198	198	6.9	1,370	50%	1.17	81.5%	283	1,087
67.5	854	254	254	6.9	1,762	50%	1.17	81.5%	364	1,397
62.5	927	276	276	6.9	1,912	50%	1.17	81.5%	395	1,517
57.5	600	179	179	6.9	1,238	50%	1.17	81.5%	256	982
52.5	610	182	182	6.9	1,258	52%	1.31	83.7%	283	975
47.5	611	182	182	6.9	1,260	57%	1.61	87.6%	334	927
42.5	656	195	195	6.9	1,353	61%	1.95	91.1%	418	935
37.5	1,023	304	304	6.9	2,110	66%	2.33	94.0%	755	1,355
32.5	734	218	218	6.9	1,514	70%	2.75	96.3%	624	890
27.5	334	99	99	6.9	689	75%	3.22	98.2%	326	363
22.5	252	75	75	6.9	520	80%	3.73	99.5%	281	239
17.5	125	37	37	6.9	258	84%	4.28	100.0%	159	98
12.5	47	14	14	6.9	97	89%	4.89	100.0%	68	29
7.5	22	7	7	6.9	45	93%	5.54	100.0%	36	9
2.5	13	4	4	6.9	27	98%	6.24	99.6%	24	3
-2.5	0	0	0	6.9	0	100%	6.61	99.0%	0	0
-7.5	0	0	0	6.9	0	100%	6.61	99.0%	0	0
TOTALS		**2,607**	**2,607**	**159**	**18,071**				**5,157**	**12,914**

Notes:

1) Existing motor power based on operation with existing motor efficiency, operating at 80% load factor when at full load. Formula: Motor HP x 0.746 x 0.8 / Exist. Motor Eff., New motor power is based on same formula using the new motor efficiency.
2) Weather data from NOAA for Newark, NJ International Airport.
3) Occupied & AHU Bin Hours are based upon current Owner reported occuped schedule.
4) The required VFD motor power draw is based on a 3.0 power relationship to load, since system static pressure will not be controlled.

Annual Utility Savings	12,900	kWh
Annual Savings	$ 1,700	
Install Variable Speed Drives	$ 70,700	
- Air Handling Fan Cost		
Simple Payback	42	Years

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-5: HVAC Air Handling Equipment Replacment - Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Existing (1) RTU demolition	1	EA	$ 100	$ 1,500		$ 110	$ 2,025	$ -	$ 2,135	
(1) RTU, 25.0 tons with DX cooling and NG heating	1	EA	$ 30,700	$ 8,200		$ 33,770	$ 11,070	$ -	$ 44,840	
- Reprogram DDC system for (1) RTU	1	EA	$ 75	$ 300		$ 83	$ 405	$ -	$ 488	
10 HP VFD	1	ea	$ 1,625	$ 585		$ 1,788	$ 790	$ -	$ 2,577	
10 HP Motors	1	ea	$ 660	$ 100		$ 726	$ 135	$ -	$ 861	
Reprogram DDC system	1	ea	$ 100	$ 1,000		$ 110	$ 1,350	$ -	$ 1,460	
Electrical - misc.	1	ea	$ 150	$ 150		$ 165	$ 203	$ -	$ 368	
Duct pressure sensor/transmitter	1	ea	$ 500	$ 200		$ 550	$ 270	$ -	$ 820	
						$ -	$ -	$ -	$ -	

$ 53,548	Subtotal
$ 5,355	10% Contingency
$ 11,781	20% Contractor O&P
$ -	0% Engineering
$ 70,700	**Total**

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-6A: Install Variable Speed Drives - HW Pump

Variable Inputs

Blended Electric Rate	$0.13
Heating System "On" Point	55
VFD Efficiency	98.5%

ECM Description Summary

Larger motors that operate pumps unnecessarily consume electrical energy. The hot water system pumps operate at a constant speed even though the building load does not require all of the flow to maintain temperatures. By adding speed controllers to the motors, called Variable Frequency Drives (VFD's), and reducing the flow (by slowing the motors down), significant electrical energy can be saved. Pressure actuated controllers are used to measure the water pressure in the hto water system and as valves close, the system pressure increases and in turn the pump speed is reduced.

PUMP SCHEDULE

Pump ID	Qty	HP	Total HP	Existing Motor Motor Eff.	New Motor Motor Eff.	Exist. Motor kW Note 1	New Motor kW Note 2
P-1, P-2	1	25.0	25.0	92.4%	93.6%	16.15	15.94
					Total:	16.15	15.94

SAVINGS ANALYSIS

OAT - DB Avg Temp F	OAT - WB Avg 120	Annual Hours in Bin	Heating Hours Bin	Pump Load %	Existing Pump kWh	Proposed Pump kW	Speed efficiency %	Proposed Pump kWh	Proposed Savings kWh
(A) See Note 3	(B) See Note 3	(C) See Note 3	(D) =IF(A>TP,0,C)	(E) =0.5+0.5* (50-A)/(50-10)) See Note 4	(F) =D*AA	(G) =BB*E^2.5/CC See Note 5	(H)	(I) =D*G	(J) =F-H
97.5	75	3	0	0%	0	0.0	0.0%	0	0
92.5	74	34	0	0%	0	0.0	0.0%	0	0
87.5	72	131	0	0%	0	0.0	0.0%	0	0
82.5	69	500	0	0%	0	0.0	0.0%	0	0
77.5	67	620	0	0%	0	0.0	0.0%	0	0
72.5	64	664	0	0%	0	0.0	0.0%	0	0
67.5	62	854	0	0%	0	0.0	0.0%	0	0
62.5	58	927	0	0%	0	0.0	0.0%	0	0
57.5	53	600	0	0%	0	0.0	0.0%	0	0
52.5	47	610	610	53%	9,850	3.3	84.1%	2,374	7,475
47.5	43	611	611	58%	9,866	4.2	88.8%	2,893	6,973
42.5	38	656	656	64%	10,593	5.3	92.7%	3,735	6,858
37.5	34	1,023	1,023	69%	16,519	6.5	95.9%	6,941	9,578
32.5	30	734	734	75%	11,852	7.9	98.2%	5,893	5,959
27.5	25	334	334	81%	5,393	9.4	99.8%	3,156	2,237
22.5	20	252	252	86%	4,069	11.1	100.0%	2,806	1,263
17.5	16	125	125	92%	2,018	13.0	100.0%	1,627	391
12.5	11	47	47	97%	759	15.1	99.7%	711	48
7.5	6	22	22	100%	355	16.2	99.0%	360	-4
2.5	2	13	13	100%	210	16.2	99.0%	212	-3
-2.5	-3	0	0	0%	0	0.0	0.0%	0	0
-7.5	-8	0	0	0%	0	0.0	0.0%	0	0
		8,760	4,427		71,484			30,708	40,776

Notes:

1) Existing motor power based on operation with existing motor efficiency, operating at 80% load factor when at full load. Formula: Motor HP x 0.746 x 0.8 / Exist. Motor Eff., New motor power is based on same formula using the new motor efficiency.
2) New motor power is the same as existing motor power adjusted for the new efficiency, if a new motor is proposed.
3) Weather data from NOAA for Newark, New Jersey.
4) The pump load is estimated at 100% at X deg. OAT and 50% at X deg. OAT and varies linearly in between.
5) The required VFD motor draw is based on a 2.5 power relationship to load.

Annual Utility Savings	40,800	kWh
Annual Savings	$ 5,400	
Install Variable Speed Drives	$ 17,500	
- HW Pump Cost		
Simple Payback	3	Years

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-6A: Install Variable Speed Drives - HW Pump - Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
25 HP VFD	1	ea	$ 2,850	$ 1,175		$ 3,135	$ 1,586	$ -	$ 4,721	
25 HP Motors	1	ea	$ 1,350	$ 160		$ 1,485	$ 216	$ -	$ 1,701	
Reprogram DDC system	1	ea	$ 100	$ 350		$ 110	$ 473	$ -	$ 583	
Electrical - misc.	1	ls	$ 200	$ 150		$ 220	$ 203	$ -	$ 423	
2-way or 3-way control valve(s) for system sequence	1	ea	$ 1,000	$ 2,000		$ 1,100	$ 2,700	$ -	$ 3,800	
Pipe pressure sensor/transmitter	1	ea	$ 850	$ 500		$ 935	$ 675	$ -	$ 1,610	
Misc. piping modification	1	ea	$ 200	$ 150		$ 220	$ 203	$ -	$ 423	
						$ -	$ -	$ -	$ -	

$ 13,260	Subtotal
$ 1,326	10% Contingency
$ 2,917	20% Contractor O&P
$ -	0% Engineering
$ 17,500	**Total**

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

	Total CFM	O.A. CFM	O.A. %	
Org. scheduled CFM	10,000	2,000	30%	
Derated CFM	10,000	1,000	10%	
SA Enthalpy	26.4	BTU/lbma		
SA Set point, Winter	68.0	°F		
SA Set point, Summer	74.0	°F		
Heating "On" Point	55.0	°F		
Cooling System Eff.	1.5	kW/Ton		(Includes ancillary equipment)
Heating System Eff.	80%			(Includes distribution losses)

ECM-M8A: Install Demand Control Ventilation

Description:
Outside air can be significantly reduced for most of the time that the building is occupied.
Savings will result from the avoided heating and cooling of excessive outside air.

Method:
The outdoor air introduced into the spaces is currently constant based on design occupancy conditions.
This ECM proposes the installation of CO2 sensors in the space to allow for reduced outdoor air flows when conditions allow.
An average reduction of 50% is assumed possible with the implementation of DCV
The DCV system will automatically adjust the outdoor air damper position through the EMS to reduce outdoor air flows based on indoor CO2 levels.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
			Existing					Proposed Demand Ventilation					Savings	
Avg. DB Bin Temp °F	OA Enthalpy Btu/lb	Occupied Bin HOURS	OA CFM	Cooling Load MBH	Heating Load MBH	Cooling kWh	Heating therms	Derated O.A. CFM	Cooling Load MBH	Heating Load MBH	Cooling kWh	Heating therms	Cooling kWh	Heating therms
102.5	49.1	-	2,000	204	0	0	-	1,000	102	0	0	-	0	-
97.5	42.5	1	2,000	145	0	21	-	1,000	72	0	11	-	11	-
92.5	39.5	13	2,000	118	0	197	-	1,000	59	0	98	-	98	-
87.5	36.6	51	2,000	92	0	591	-	1,000	46	0	295	-	295	-
82.5	34	196	2,000	68	0	1,679	-	1,000	34	0	840	-	840	-
77.5	31.6	244	2,000	47	0	1,425	-	1,000	23	0	712	-	712	-
72.5	29.2	261	2,000	25	0	822	-	1,000	13	0	411	-	411	-
67.5	27	336	2,000	5	0	226	-	1,000	3	0	113	-	113	-
62.5	24.5	364	2,000	0	0	0	-	1,000	0	0	0	-	0	-
57.5	21.4	236	2,000	0	0	0	-	1,000	0	0	0	-	0	-
52.5	18.7	240	2,000	0	33	0	100	1,000	0	17	0	50	0	50
47.5	16.2	240	2,000	0	44	0	133	1,000	0	22	0	66	0	66
42.5	14.4	258	2,000	0	55	0	177	1,000	0	28	0	89	0	89
37.5	12.6	402	2,000	0	66	0	331	1,000	0	33	0	165	0	165
32.5	10.7	288	2,000	0	77	0	276	1,000	0	38	0	138	0	138
27.5	8.6	131	2,000	0	87	0	143	1,000	0	44	0	72	0	72
22.5	6.8	99	2,000	0	98	0	122	1,000	0	49	0	61	0	61
17.5	5.5	49	2,000	0	109	0	67	1,000	0	55	0	33	0	33
12.5	4.1	18	2,000	0	120	0	28	1,000	0	60	0	14	0	14
7.5	2.6	9	2,000	0	131	0	14	1,000	0	65	0	7	0	7
2.5	1	5	2,000	0	141	0	9	1,000	0	71	0	5	0	5
-2.5	0	-	2,000	0	152	0	-	1,000	0	76	0	-	0	-
-7.5	-1.5	-	2,000	0	163	0	-	1,000	0	82	0	-	0	-
Total		**3,441**		**705**		**4,961**	**1,401**		**352**		**2,481**	**700**	**2,481**	**700**

ANNUAL SAVINGS		
Annual Natural Gas	**700**	**Therms**
Annual Electrical Usag	**2,481**	**kWh**
Annual Cost Savings	$886	
Total Project Cost	$5,000	
Simple Payback	5.6	years

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-7: HVAC Demand Control Ventilation - Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
CO2 sensor	1	ea	$ 500	$ 150	$ -	$ 550	$ 203	$ -	$ 800	
Replace damper actuators	3	ea	$ 250	$ 50	$ -	$ 825	$ 203	$ -	$ 1,000	
Reprogram DDC system	1	ea	$ 150	$ 350	$ -	$ 165	$ 473	$ -	$ 600	
Miscellaneous electrical/wiring	1	ls	$ 300	$ 750	$ -	$ 330	$ 1,013	$ -	$ 1,300	

$	3,700	Subtotal
$	740	10% Contingency
$	555	20% Contractor O&P
$	-	0% Engineering
$	**5,000**	**Total**

ECM-8 Install Vending Machine Controls

Ex. Cold Beverage Vending Machine Electric usage		3,504	kWh[1,4,7]
Ex. Snack Vending Machine Electric usage		1,752	kWh[2,5,7]
Ex. Dual Vending Machine Electric Usage		2,628	kWh[3,6,7]
Total Vending Machine Electric Usage		7,884	kWh
Proposed Vending Machine Electric usage		3,548	kWh[8]
Vending Machine Controls Usage Savings		**4,336**	**kWh**
Total cost savings	**$**	**570**	
Estimated Total Project Cost	**$**	**600**	[9]
Simple Payback		**1.05**	**years**

Assumptions

1	1	Number of cold beverage vending machines
2	1	Number of snack vending machines
3	1	Number of dual snack/beverage vending machines
4	400	Average wattage, typical of cold beverage machines based on prior project experience
5	200	Average wattage, typical of snack machines based on prior project experience
6	300	Average wattage, typical of dual snack/beverage machines based on prior project experience
7	8760	Hours per year vending machine plugged in
8	55%	Typical savings for cold vending machines based on historical data for runtime savings
9	$200	Estimated installed cost per vending machine

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-9a: Install Modern Roof Top Exhaust Fans with Premium Efficiency Motors

Demand Cost $/kW-month	Energy Cost $/kWh
$ 5.94	$ 0.12

Multipliers		
Material	Labor	Equipment
1.00	1.00	1.00

Savings Analysis **Cost Estimates**

								New												Unit Costs			Subtotal Costs				
			Existing	Load	Existing	Existing	New	Load	New	New	Demand	Demand	Annual	kWh	$ kWh	Total $	Estimated	Payback									
#	Description	Location	HP	Factor	Efficiency$_a$	kW	HP$_b$	Factor	Efficiency$_a$	kW	Savings	Savings $	Hours	Savings	Savings	Savings	Cost	Years	Materials	Labor	Equipment	Materials	Labor	Equipment	Total Cost	Remarks
1	EF-1	Women's Toilet Room	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1.211	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
2	EF-2	Men's Toilet Room	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1.211	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
3	EF-3	Men's Toilet Room	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1.211	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
4	EF-4	Toilet Room	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1.211	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
5	EF-5	Dressing Room	0.06	0.75	70%	0.0	0	0.75	77%	0.0	0.005	$ 0.327	8,760	40	$ 5	$ 5	$ 500	98.2	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
6	EF-6	Not Used	N/A	N/A	70%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
7	EF-7	Not Used	N/A	N/A	70%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
8	EF-8	Men's Toilet Room	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
9	EF-9	Women's Toilet Room	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
10	EF-10	Not Used	N/A	N/A	70%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
11	EF-11	Kitchen	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
12	EF-12	Janitor's Closet	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
13	EF-13	Men's Toilet Room	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
14	EF-14	Women's Toilet Room	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
15	EF-15	Projection Room	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
16	EF-16	Nurse's Toilet Room	0.17	0.75	70%	0.1	0	0.75	80%	0.1	0.017	$ 1	8,760	149	$ 18	$ 19	$ 500	26.5	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
17	EF-17	Kiln	0.33	0.75	70%	0.3	0	0.75	82%	0.2	0.039	$ 3	8,760	345	$ 41	$ 44	$ 500	11.4	$ 400	$ 100	$ -	$ 400	$ 100	$ -	$ 500	
		Total	**2.393333**			**1.9**	**2.393**			**1.7**	**0.25**	**$ 18**		**2,171**	**$ 258**	**$ 275**	**$ 7,000**										

Notes

a Existing and new efficiencies should be entered if known. If not known, use provided curve fit based on "DOE Survey Installed Average" and NEMA Premium values, respectively.

b Same as existing HP unless resized to better match load

Note: pricing is for energy calculations only -do not use for procurement

ECM-9b: Rooftop Exhaust Replacement (Infiltration Savings)

Assume: Existing rooftop exhaust fans do not emply backdraft dampers to prevent outdoor air from seeping into the building

Proposed: Newer rooftop exhaust systems use back draft dampers to protect the building envelope and prevent outdoor air infiltration.

Perimeter of Exhaust Fans	64	LF	Cooling System Efficiency	1.2	kW/ton	Heating System Efficiency	82%	
Area of Exhaust Fans	19	SF	Ex Occupied Clng Temp.	74	*F	Heating On Temp.	60	*F
Existing Infiltration Factor	**6.7**	**cfm/SF**	Ex Unoccupied Clng Temp.	78	*F	Ex Occupied Htg Temp.	68	*F
Proposed Infiltration Factor	**3.0**	**cfm/SF**	Cooling Occ Enthalpy Setpoint	27.5	Btu/lb	Ex Unoccupied Htg Temp.	60	*F
			Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb	Electricity	$ 0.131	$/kWh
						Natural Gas	$ 0.80	$/therm

					EXISTING LOADS		PROPOSED LOADS		COOLING ENERGY		HEATING ENERGY	
					Occupied	Unoccupied	Occupied	Unoccupied				
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Exhaust Infiltration BTUH	Exhaust Infiltration BTUH	Exhaust Infiltration BTUH	Exhaust Infiltration BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy Therms	Proposed Heating Energy Therms
A		B	C	D	E	F	G	H	I	J	K	L
102.5	50.1	0	0	0	-12,763	-12,763	-5,652	-5,652	0	0	0	0
97.5	42.5	3	1	2	-8,471	-8,471	-3,751	-3,751	3	1	0	0
92.5	39.5	34	13	21	-6,777	-6,777	-3,001	-3,001	23	10	0	0
87.5	36.6	131	51	80	-5,139	-5,139	-2,276	-2,276	67	30	0	0
82.5	34.0	500	196	304	-3,671	-3,671	-1,626	-1,626	184	81	0	0
77.5	31.6	620	244	376	-2,315	0	-1,025	0	56	25	0	0
72.5	29.2	664	261	403	0	0	0	0	0	0	0	0
67.5	27.0	854	336	519	0	0	0	0	0	0	0	0
62.5	24.5	927	364	563	0	0	0	0	0	0	0	0
57.5	21.4	600	236	364	1,423	339	630	150	0	0	6	2
52.5	18.7	610	240	370	2,101	1,017	930	450	0	0	11	5
47.5	16.2	611	240	371	2,779	1,694	1,230	750	0	0	16	7
42.5	14.4	656	258	398	3,456	2,372	1,530	1,050	0	0	22	10
37.5	12.6	1,023	402	621	4,134	3,050	1,831	1,350	0	0	43	19
32.5	10.7	734	288	446	4,812	3,727	2,131	1,651	0	0	37	16
27.5	8.6	334	131	203	5,489	4,405	2,431	1,951	0	0	20	9
22.5	6.8	252	99	153	6,167	5,083	2,731	2,251	0	0	17	7
17.5	5.5	125	49	76	6,845	5,760	3,031	2,551	0	0	9	4
12.5	4.1	47	18	29	7,522	6,438	3,331	2,851	0	0	4	2
7.5	2.6	22	9	13	8,200	7,116	3,631	3,151	0	0	2	1
2.5	1.0	13	5	8	8,878	7,794	3,931	3,451	0	0	1	1
0.0	0.0	0	0	0	9,217	8,132	4,081	3,601	0	0	0	0
TOTALS		**8,760**	**3,441**	**5,319**					333	147	**188**	**83**

Existing Exhaust Infiltration	**126**	**cfm**	
Proposed Exhaust Infiltration	**56**	**cfm**	

Savings	**105**	**Therms**	**$ 84**
	185	**kWh**	**$ 24**
			$ 108

Window ID	Location	Quantity	Width (ft)	Height (ft)	Linear Feet (LF)	Area (SF)	Airflow (CFM)	Infiltration Rate (CFM/SF)	Infiltration (CFM)
EF-1	Women's Toilet Room	1	1.125	1.125	4.5	1.3	600.0	9.48	12.0
EF-2	Men's Toilet Room	1	1.125	1.125	4.5	1.3	600.0	9.48	12.0
EF-3	Men's Toilet Room	1	1.125	1.125	4.5	1.3	190.0	3.00	3.8
EF-4	Toilet Room	1	1.125	1.125	4.5	1.3	190.0	3.00	3.8
EF-5	Dressing Room	1	1.125	1.125	4.5	1.3	400.0	6.32	8.0
EF-6	Not Used	0	1.125	1.125	0.0	0.0	0.0	0.00	0.0
EF-7	Not Used	0	1.125	1.125	0.0	0.0	0.0	0.00	0.0
EF-8	Men's Toilet Room	1	1.125	1.125	4.5	1.3	360.0	5.69	7.2
EF-9	Women's Toilet Room	1	1.125	1.125	4.5	1.3	360.0	5.69	7.2
EF-10	Not Used	0	1.125	1.125	0.0	0.0	0.0	0.00	0.0
EF-11	Kitchen	1	1.125	1.125	4.5	1.3	520.0	8.22	10.4
EF-12	Janitor's Closet	1	1.125	1.125	4.5	1.3	520.0	8.22	10.4
EF-13	Men's Toilet Room	1	1.125	1.125	4.5	1.3	190.0	3.00	3.8
EF-14	Women's Toilet Room	1	1.125	1.125	4.5	1.3	190.0	3.00	3.8
EF-15	Projection Room	1	1.292	1.292	5.2	1.7	665.0	7.97	13.3
EF-16	Nurse's Toilet Room	1	1.125	1.125	4.5	1.3	190.0	3.00	3.8
EF-17	Kiln	1	1.292	1.292	5.2	1.7	1300.0	15.58	26.0
Total		**14**	**19.5**	**19.5**	**64.3**	**18.5**	**6,275.0**	**6.66**	**125.5**

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-9: DHW Pumps

Demand Cost
$/kW-month
$ 5.94

Energy Cost
$/kWh
$ 0.13

Multipliers		
Material	Labor	Equipment
1.10	1.35	1.10

Savings Analysis

Cost Estimates

										New																				
			Existing	Load	Existing	Existing	Existing	Existing	New	Load	New	New	New	Demand	Demand	Annual	kW	kWh	$ kWh	Total $	Estimated	Payback	Unit Costs			Subtotal Costs				
#	Description	Location	HP	Factor	Hours	Efficiency$_a$	kW	kWh	HP$_b$	Factor	Efficiency$_a$	kW	kWh	Savings	Savings $	Hours	Savings	Savings	Savings	Savings	Cost	Years	Materials	Labor	Equipment	Materials	Labor	Equipment	Total Cost	Remarks
1			0.17	0.8	8760	0.600	0.2	1451.6	0.04	0.8	0.600	0.04	261.29	0.126	$ 9	6,570	0.13	1,190	$ 156	$ 165	$ 328	2.0	$ 175	$ 100	$ -	$ 193	$ 135	$ -	$ 328	

Notes

a Existing and new efficiencies should be entered if known. If not known, use provided curve fit based on "DOE Survey Installed Average" and NEMA Premium values, respectively.

b Same as existing HP unless resized to better match load

Assumptions:

a Existing pump is Bell & Gosset 100 series 1/6 HP pump w/ 60% efficiency

b Proposed pump is Taco 007 series cartridge circulator 1/25 HP at the same efficiency

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-10: Re-commission Facility BAS and Integrate Existing HVAC Equipment

ECM Description Summary

41,500 Sq Footage

EXISTING CONDITIONS		
Existing Facility Total Electric usage	404,524	kWh
Existing Facility Total Gas usage	9,561	Therms
Existing Facility Cooling Electric usage	97,086	kWh[1]
Existing Facility Heating Natural Gas usage	7,266	Therms[2]
PROPOSED CONDITIONS		
Proposed Facility Cooling Electric Usage	87,377	kWh
Proposed Facility Natural Gas Usage	6,540	Therms
SAVINGS		
Retro-Commissioning Electric Savings	9,709	**kWh**
Retro-Commissioning Natural Gas Savings	727	**Therms**
Total cost savings	$ 1,857	
Estimated Total Project Cost	$ 20,800	[4]
Simple Payback	11.2	**years**

Assumptions

1 24% of facility total electricity dedicated to Cooling; Source: E source, data from U.S. Energy Information Administration
2 76% of facility total natural gas dedicated to Heating; Source: E source, data from U.S. Energy Information Administration
3 10% Typical Savings associated with Retro-Commissioning of controls based on previous project experience
4 Based on $0.50 / Sq Ft recommissioning cost

Note: pricing is for energy calculations only -do not use for procurement

ECM-11: Window Replacement

Existing: Windows are not energy efficiency single paned windows
Proposed: Install energy efficient vinyl windows

Linear Feet of window Edge	1,600.0	LF	Cooling System Efficiency	1.2	kW/ton	Heating System Efficiency	82%	
Area of window glass	1,960.0	SF	Ex Occupied Clng Temp.	74	*F	Heating On Temp.	60	*F
Existing Infiltration Factor	**0.25**	**cfm/LF**	Ex Unoccupied Clng Temp.	78	*F	Ex Occupied Htg Temp.	68	*F
Proposed Infiltration Factor	**0.10**	**cfm/LF**	Cooling Occ Enthalpy Setpoint	27.5	Btu/lb	Ex Unoccupied Htg Temp.	60	*F
Existing U Value	**1.00**	**Btuh/SF/°F**	Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb	Electricity	$ 0.131	$/kWh
Proposed U Value	**0.45**	**Btuh/SF/°F**				Natural Gas	$ 0.80	$/therm

					EXISTING LOADS		PROPOSED LOADS		COOLING ENERGY		HEATING ENERGY	
					Occupied	Unoccupied	Occupied	Unoccupied				
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Window Infiltration & Heat Load BTUH	Window Infiltration & Heat Load BTUH	Window Infiltration & Heat Load BTUH	Window Infiltration & Heat Load BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy Therms	Proposed Heating Energy Therms
A		B	C	D	E	F	G	H	I	J	K	L
102.5	49.1	0.0	0	0	-94,740	-86,900	-40,689	-37,161	0	0	0	0
97.5	42.5	3.0	1	2	-73,060	-65,220	-31,527	-27,999	20	9	0	0
92.5	39.5	34.0	13	21	-57,860	-50,020	-24,957	-21,429	181	78	0	0
87.5	36.6	131.0	51	80	-42,840	-35,000	-18,459	-14,931	499	214	0	0
82.5	34	500.0	196	304	-28,360	-20,520	-12,177	-8,649	1180	502	0	0
77.5	31.6	620.0	244	376	-14,240	0	-6,039	0	347	147	0	0
72.5	29.2	664.0	261	403	0	0	0	0	0	0	0	0
67.5	27	854.0	336	519	0	0	0	0	0	0	0	0
62.5	24.5	927.0	364	563	0	0	0	0	0	0	0	0
57.5	21.4	600.0	236	364	25,116	5,980	11,075	2,637	0	0	99	44
52.5	18.7	610.0	240	370	37,076	17,940	16,349	7,911	0	0	189	84
47.5	16.2	611.0	240	371	49,036	29,900	21,623	13,185	0	0	279	123
42.5	14.4	656.0	258	398	60,996	41,860	26,897	18,459	0	0	395	174
37.5	12.6	1,023.0	402	621	72,956	53,820	32,171	23,733	0	0	765	337
32.5	10.7	734.0	288	446	84,916	65,780	37,445	29,007	0	0	656	289
27.5	8.6	334.0	131	203	96,876	77,740	42,719	34,281	0	0	347	153
22.5	6.8	252.0	99	153	108,836	89,700	47,993	39,555	0	0	299	132
17.5	5.5	125.0	49	76	120,796	101,660	53,267	44,829	0	0	166	73
12.5	4.1	47.0	18	29	132,756	113,620	58,541	50,103	0	0	69	31
7.5	2.6	22.0	9	13	144,716	125,580	63,815	55,377	0	0	36	16
2.5	1	13.0	5	8	156,676	137,540	69,089	60,651	0	0	23	10
-2.5	0	0.0	0	0	168,636	149,500	74,363	65,925	0	0	0	0
TOTALS		**8,760**	**3,441**	**5,319**					2227	949	**3,324**	**1,466**

Existing Window Infiltration	**400**	**cfm**
Existing Window Heat Transfer	**1,960**	**Btuh/°F**
Proposed Window Infiltration	**160**	**cfm**
Proposed Window Heat Transfer	**882**	**Btuh/°F**

Savings			
	1,858	**Therms**	**$ 1,485**
	1,278	**kWh**	**$ 168**
			$ 1,653

Window ID	Facing Direction	Quantity	Width (ft)	Height (ft)	Linear Feet (LF)	Area (SF)	Infiltration Rate (CFM/LF)	U Value (Btuh/SF/°F)	Infiltration (CFM)	Heat Transfer (Btuh/°F)
1	N/A	52	4	7	1144.0	1456.0	0.25	1.00	286.0	1456.0
2	N/A	24	3.5	6	456.0	504.0	0.25	1.00	114.0	504.0
Total		**76**	**7.5**	**13**	**1,600.0**	**1,960.0**	**0.25**	**1.00**	**400.0**	**1,960.0**

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

ECM-11: Window Replacement Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
4' x 7' x 4.5" Energy Efficient Vinyl Window	1456	SF	$ 100		$ -	$ 160,160	$ -	$ -	$ 160,160	
3.5' x 6' x 4.5" Energy Efficient Vinyl Window	504	SF	$ 100.0		$ -	$ 55,440	$ -	$ -	$ 55,440	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 215,600	Subtotal
$ 21,560	10% Contingency
$ 47,432	20% Contractor O&P
$ -	0% Engineering
$ 284,600	**Total**

ECM-8 Lighting Replacement Upgrades

Budgetary	Annual Utility Savings				Estimated	Total	New Jersey	Payback	Payback
Cost					Maintenance	Savings	Incentive	(without incentive)	(with incentive)
					Savings				
$	kW	kWh	therms	$	$	$	$	Years	Years
$15,747	**25.2**	**53,500**	**0**	**$9,800**	**0**	**$9,800**	**$6,067**	**1.6**	**1.0**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

ECM-9 Lighting Controls Installation (Occupancy Sensors)

Budgetary	Annual Utility Savings				Estimated	Total	New Jersey	Payback	Payback
Cost					Maintenance	Savings	Incentive	(without incentive)	(with incentive)
					Savings				
$	kW	kWh	therms	$	$	$	$	Years	Years
$6,014	**0.0**	**43,800**	**0**	**$6,600**	**0**	**$6,600**	**$805**	**0.9**	**0.8**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

ECM-10 Lighting Replacements with Lighting Controls (Occupancy Sensors)

Budgetary	Annual Utility Savings				Estimated	Total	New Jersey	Payback	Payback
Cost					Maintenance	Savings	Incentive	(without incentive)	(with incentive)
					Savings				
$	kW	kWh	therms	$	$	$	$	Years	Years
$21,761	**25.2**	**89,100**	**0**	**$15,200**	**0**	**$15,200**	**$6,872**	**1.4**	**1.0**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

Energy Audit of Camden County College (Lincoln Hall)

CHA Project No. 24364

ECM-8 Lighting Replacement Upgrades

Cost of Electricity: **$0.150 $/kWh**

$6.00 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Annual Hours**	**Annual kWh**	**Annual kWh Saved**	**Annual kW Saved**	**Annual $ Saved**	**Retrofit Cost**	**NJ Smart Start Lighting Incentive**	**Simple Payback With Out Incentive**	**Simple Payback**
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
209A	West Cooridor	8	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	SW	2500	640	8	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.5	SW	2,500	1,180	(540)	(0.2)	$ (96.55)	$ -			
234	Lobby A	7	SP 100 W I 2	i100/2	200	1.4	SW	2500	3,500	7	WP 42 1	CF42/2-L	100	0.7	SW	2,500	1,750	1,750	0.7	$ 312.90	$ 141.75	$175	0.5	-0.1
234	Lobby B	33	SP 100 W I 2	i100/2	200	6.6	SW	2500	16,500	33	WP 42 1	CF42/2-L	100	3.3	SW	2,500	8,250	8,250	3.3	$ 1,475.10	$ 668.25		0.5	0.5
129A	Lobby B	3	SP 72 I	I72/1	75	0.2	SW	2125	478	3	SP 72 I	I72/1	72	0.2	SW	2,125	459	19	0.0	$ 3.52	$ -		0.0	0.0
35A	Men's Room	2	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	136	2	4' 3-LAMP T-8 (32W)	F43ILL	89	0.2	SW	2,125	378	(242)	(0.1)	$ (44.55)	$ -			
41A	Men's Room	1	4' 1-LAMP T-8 (32W)	F41ILL	32	0.0	SW	2125	68	1	4' 1-LAMP T-8 (32W)	F41ILL	31	0.0	SW	2,125	66	2	0.0	$ 0.39	$ -	$25	0.0	-64.0
35A	Women's Room	2	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2500	160	2	4' 3-LAMP T-8 (32W)	F43ILL	89	0.2	SW	2,500	445	(285)	(0.1)	$ (50.96)	$ -	$50		
41A	Women's Room	1	4' 1-LAMP T-8 (32W)	F41ILL	32	0.0	SW	2125	68	1	4' 1-LAMP T-8 (32W)	F41ILL	31	0.0	SW	2,125	66	2	0.0	$ 0.39	$ -		0.0	0.0
35A	L - 023	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	272	4	4' 3-LAMP T-8 (32W)	F43ILL	89	0.4	SW	2,125	757	(485)	(0.2)	$ (89.09)	$ -	$100		
35A	L - 022	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	272	4	4' 3-LAMP T-8 (32W)	F43ILL	89	0.4	SW	2,125	757	(485)	(0.2)	$ (89.09)	$ -			
35A	Gallery - 024	14	4' 3-LAMP T-8 (32W)	F43ILL	32	0.4	SW	2250	1,008	14	4' 3-LAMP T-8 (32W)	F43ILL	89	1.2	SW	2,250	2,804	(1,796)	(0.8)	$ (326.78)	$ -			
129A	Gallery - 024	43	SP 72 I	I72/1	75	3.2	SW	2250	7,256	43	SP 72 I	I72/1	72	3.1	SW	2,250	6,966	290	0.1	$ 52.83	$ -		0.0	0.0
35A	Gallery - 025	12	4' 3-LAMP T-8 (32W)	F43ILL	32	0.4	SW	2125	816	12	4' 3-LAMP T-8 (32W)	F43ILL	89	1.1	SW	2,125	2,270	(1,454)	(0.7)	$ (267.27)	$ -			
129A	Gallery - 025	45	SP 72 I	I72/1	75	3.4	SW	2125	7,172	45	SP 72 I	I72/1	72	3.2	SW	2,125	6,885	287	0.1	$ 52.75	$ -		0.0	0.0
234	Storage Closet	1	SP 100 W I 2	i100/2	200	0.2	SW	2125	425	1	WP 42 1	CF42/2-L	100	0.1	SW	2,125	213	213	0.1	$ 39.08	$ 20.25		0.5	0.5
226	Theater Lobby	10	70 W MH Wall Pack	MH70/1	95	1.0	SW	2000	1,900	10	FXLED18	FXLED18/1	18	0.2	SW	2,000	360	1,540	0.8	$ 286.44	$ -		0.0	0.0
175A	Theater Men's Bathroom	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	SW	2125	68	1	4' 2-LAMP T-8	F42ILL	59	0.1	SW	2,125	125	(57)	(0.0)	$ (10.55)	$ -			
175A	Theater Women's Bathroom	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	SW	2125	68	1	4' 2-LAMP T-8	F42ILL	59	0.1	SW	2,125	125	(57)	(0.0)	$ (10.55)	$ -			
227	Closet	1	W60CF1	F81EL	60	0.1	SW	2125	128	1	CF42W	CF42/1-L	48	0.0	SW	2,125	102	26	0.0	$ 4.69	$ 202.50		43.2	43.2
234	Entrance Theater	1	SP 100 W I 2	i100/2	200	0.2	SW	2125	425	1	WP 42 1	CF42/2-L	100	0.1	SW	2,125	213	213	0.1	$ 39.08	$ 20.25		0.5	0.5
175A	Theater	8	4' 2-LAMP T-8 (32W)	F42ILL	32	0.3	SW	2125	544	8	4' 2-LAMP T-8	F42ILL	59	0.5	SW	2,125	1,003	(459)	(0.2)	$ (84.40)	$ -			
Y	Theater	42	I 100	I100/1	100	4.2	SW	2125	8,925	42	CF 26	CFQ26/1-L	27	1.1	SW	2,125	2,410	6,515	3.1	$ 1,198.04	$ 1,701.00	$1,050	1.4	0.5
227	Theater	1	W60CF1	F81EL	60	0.1	SW	2125	128	1	CF42W	CF42/1-L	48	0.0	SW	2,125	102	26	0.0	$ 4.69	$ 202.50		43.2	43.2
227	Stairway	1	W60CF1	F81EL	60	0.1	SW	2125	128	1	CF42W	CF42/1-L	48	0.0	SW	2,125	102	26	0.0	$ 4.69	$ 202.50		43.2	43.2
23	Theater Exit Signs	9	X 5 W CF 2	ECF5/2	20	0.2	SW	2500	450	9	LED1.5W	ELED1.5/1	1.5	0.0	SW	2,500	34	416	0.2	$ 74.43	$ 1,154.25		15.5	15.5
71	Projector Room	4	I 60	I60/1	60	0.2	SW	2125	510	4	CF 26	CFQ26/1-L	27	0.1	SW	2,125	230	281	0.1	$ 51.58	$ 162.00		3.1	3.1
234	Theater	3	SP 100 W I 2	i100/2	200	0.6	SW	2125	1,275	3	WP 42 1	CF42/2-L	100	0.3	SW	2,125	638	638	0.3	$ 117.23	$ 60.75		0.5	0.5
162A	Stage	9	4' 4-LAMP T-12	F44EL	120	1.1	SW	500	540	9	F28T8	F44SSILL-R	86	0.8	SW	500	387	153	0.3	$ 44.98	$ -	$225	0.0	-5.0
35A	Kitchen	3	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	204	3	4' 3-LAMP T-8 (32W)	F43ILL	89	0.3	SW	2,125	567	(363)	(0.2)	$ (66.82)	$ -			
180	L - 021	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2500	1,680	6	T 28 C F 4	F43SSILL	72	0.4	SW	2,500	1,080	600	0.2	$ 107.28	$ 688.50		6.4	6.4
180	L - 021E (Photo Studio)	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2500	2,520	9	T 28 C F 4	F43SSILL	72	0.6	SW	2,500	1,620	900	0.4	$ 160.92	$ 1,032.75	$225	6.4	5.0
180	L - 021D	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2500	560	2	T 28 C F 4	F43SSILL	72	0.1	SW	2,500	360	200	0.1	$ 35.76	$ 229.50	$50	6.4	5.0
180	L - 021A	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2125	476	2	T 28 C F 4	F43SSILL	72	0.1	SW	2,125	306	170	0.1	$ 31.26	$ 229.50		7.3	7.3
180	L - 021A	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	1062.5	714	6	T 28 C F 4	F43SSILL	72	0.4	SW	1,063	459	255	0.2	$ 55.53	$ 688.50		12.4	12.4
169	L - 016 Music Room	17	SP 250 MH ROOF	MH250/1	295	5.0	SW	2125	10,657	17	FXLED78	FXLED78/1	78	1.3	SW	2,125	2,818	7,839	3.7	$ 1,441.48	$ 2,180.25		1.5	1.5
209A	Corridor Outside of Music Room	9	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	SW	1062.5	306	9	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.5	SW	1,063	564	(258)	(0.2)	$ (56.22)	$ -			
169	L - 020	12	SP 250 MH ROOF	MH250/1	295	3.5	SW	1062.5	3,761	12	FXLED78	FXLED78/1	78	0.9	SW	1,063	995	2,767	2.6	$ 602.50	$ 1,539.00		2.6	2.6
162A	L - 017	11	4' 4-LAMP T-12	F44EL	120	1.3	SW	2125	2,805	11	F28T8	F44SSILL-R	86	0.9	SW	2,125	2,010	795	0.4	$ 146.14	$ -		0.0	0.0
162A	L - 019	8	4' 4-LAMP T-12	F44EL	120	1.0	SW	500	480	8	F28T8	F44SSILL-R	86	0.7	SW	500	344	136	0.3	$ 39.98	$ -		0.0	0.0
162A	L - 018	8	4' 4-LAMP T-12	F44EL	120	1.0	SW	500	480	8	F28T8	F44SSILL-R	86	0.7	SW	500	344	136	0.3	$ 39.98	$ -		0.0	0.0
169	L - 009, L - 010, L - 011	12	SP 250 MH ROOF	MH250/1	295	3.5	SW	500	1,770	12	FXLED78	FXLED78/1	78	0.9	SW	500	468	1,302	2.6	$ 382.79	$ 1,539.00		4.0	4.0
204	L - 010	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2125	440	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2,125	440	-	0.0	$ -	$ -			
169	L - 008 Little Theater	8	SP 250 MH ROOF	MH250/1	295	2.4	SW	1062.5	2,508	8	FXLED78	FXLED78/1	78	0.6	SW	1,063	663	1,845	1.7	$ 401.67	$ 1,026.00		2.6	2.6
11A	L - 008 Closet	2	4' 2-LAMP T-12	F42EL	60	0.1	SW	2125	255	2	F32T8	F42ILL-R	52	0.1	SW	2,125	221	34	0.0	$ 6.25	$ -		0.0	0.0
11A	Women's Bathroom	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	1062.5	255	4	F32T8	F42ILL-R	52	0.2	SW	1,063	221	34	0.0	$ 7.40	$ -	$28	0.0	-3.8
71	Closet	1	I 60	I60/1	60	0.1	SW	2250	135	1	CF 26	CFQ26/1-L	27	0.0	SW	2,250	61	74	0.0	$ 13.51	$ 40.50		3.0	3.0
71	Closet	1	I 60	I60/1	60	0.1	SW	2250	135	1	CF 26	CFQ26/1-L	27	0.0	SW	2,250	61	74	0.0	$ 13.51	$ 40.50		3.0	3.0
11A	All Purpose Bathroom	1	4' 2-LAMP T-12	F42EL	60	0.1	SW	500	30	1	F32T8	F42ILL-R	52	0.1	SW	500	26	4	0.0	$ 1.18	$ -		0.0	0.0
209A	Vestibule	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	SW	520	17	1	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.1	SW	520	31	(14)	(0.0)	$ (4.05)	$ -			
35A	L- 007	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	520	67	4	4' 3-LAMP T-8 (32W)	F43ILL	89	0.4	SW	520	185	(119)	(0.2)	$ (34.20)	$ -			
11A	L - 012	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	520	125	4	F32T8	F42ILL-R	52	0.2	SW	520	108	17	0.0	$ 4.80	$ -	$100	0.0	-20.8
204	L - 012	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	500	104	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	500	104	-	0.0	$ -	$ -			
11A	Kiln Room #2	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	4380	1,051	4	F32T8	F42ILL-R	52	0.2	SW	4,380	911	140	0.0	$ 23.33	$ -		0.0	0.0
11A	Kiln Room #1	2	4' 2-LAMP T-12	F42EL	60	0.1	SW	4380	526	2	F32T8	F42ILL-R	52	0.1	SW	4,380	456	70	0.0	$ 11.66	$ -		0.0	0.0
162A	Ceramic Studio	22	4' 4-LAMP T-12	F44EL	120	2.6	SW	8760	23,126	22	F28T8	F44SSILL-R	86	1.9	SW	8,760	16,574	6,552	0.7	$ 1,036.73	$ -		0.0	0.0
204	Glaze Room	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	SW	8760	5,440	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	SW	8,760	5,440	-	0.0	$ -	$ -			
227	Dance Room	6	W60CF1	F81EL	60	0.4	SW	2125	765	6	CF42W	CF42/1-L	48	0.3	SW	2,125	612	153	0.1	$ 28.13	$ 1,215.00	$150	43.2	37.9
61A	Dance Cooridor	6	4' 3-LAMP T-12	F43EL	115	0.7	SW	2125	1,466	6	F28T8	F43SSILL-R	66	0.4	SW	2,125	842	625	0.3	$ 114.88	$ -	$150	0.0	-1.3
111A	Dance Cooridor	12	4' 1-LAMP T-12	F41EL	32	0.4	SW	500	192	12	F28T8	F41SSILL-R	23	0.3	SW	500	138	54	0.1	$ 15.88	$ -	$300	0.0	-18.9
11A	Men's Bathroom	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	500	120	4	F32T8	F42ILL-R	52	0.2	SW	500	104	16	0.0	$ 4.70	$ -	$100	0.0	-21.3
61A	L - 005	4	4' 3-LAMP T-12	F43EL	115	0.5	SW	8760	4,030	4	F28T8	F43SSILL-R	66	0.3	SW	8,760	2,313	1,717	0.2	$ 271.66	$ -	$100	0.0	-0.4
209A	L - 005	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	SW	500	16	1	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.1	SW	500	30	(14)	(0.0)	$ (3.97)	$ -	$25		
61A	L - 004A	3	4' 3-LAMP T-12	F43EL	115	0.3	SW	3285	1,133	3	F28T8	F43SSILL-R	66	0.2	SW	3,285	650	483	0.1	$ 83.02	$ -	$75	0.0	-0.9
71	L - 004A BR	1	I 60	I60/1	60	0.1	SW	3285	197	1	CF 26	CFQ26/1-L	27	0.0	SW	3,285	89	108	0.0	$ 18.64	$ 40.50	$25	2.2	0.8
11A	Display Case	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	8760	1,577	3	F32T8	F42ILL-R	52	0.2	SW	8,760	1,367	210	0.0	$ 33.26	$ -	$75	0.0	-2.3
162A	L - 004	4	4' 4-LAMP T-12	F44EL	120	0.5	SW	8760	4,205	4	F28T8	F44SSILL-R	86	0.3	SW	8,760	3,013	1,191	0.1	$ 188.50	$ -		0.0	0.0
61A	L - 013	6	4' 3-LAMP T-12	F43EL	115	0.7	SW	500	345	6	F28T8	F43SSILL-R	66	0.4	SW	500	198	147	0.3	$ 43.22	$ -	$150	0.0	-3.5
61A	L - 013 Costume Storage	6	4' 3-LAMP T-12	F43EL	115	0.7	SW	2125	1,466	6	F28T8	F43SSILL-R	66	0.4	SW	2,125	842	625	0.3	$ 114.88	$ -	$150	0.0	-1.3
162A	Men's Bathroom	1	4' 4-LAMP T-12	F44EL	120	0.1	SW	500	60	1	F28T8	F44SSILL-R	86	0.1	SW	500	43	17	0.0	$ 5.00	$ -	$25	0.0	-5.0
162A	Women's Bathroom	1	4' 4-LAMP T-12	F44EL	120	0.1	SW	2000	240	1	F28T8	F44SSILL-R	86	0.1	SW	2,000	172	68	0.0	$ 12.65	$ -	$25	0.0	-2.0
11A	L - 003	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	2000	960	8	F32T8	F42ILL-R	52	0.4	SW	2,000	832	128	0.1	$ 23.81	$ -	$200	0.0	-8.4
11A	Mechanical Room	7	4' 2-LAMP T-12	F42EL	60	0.4	SW	500	210	7	F32T8	F42ILL-R	52	0.4	SW	500	182	28	0.1	$ 8.23	$ -	$175	0.0	-21.3
71	Mechanical Room	1	I 60	I60/1	60	0.1	SW	8760	526	1	CF 26	CFQ26/1-L	27	0.0	SW	8,760	237	289	0.0	$ 45.74	$ 40.50	$25	0.9	0.3
209A	Ext Boiler Room	4	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.1	SW	500	64	4	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.2	SW	500	118	(54)	(0.1)	$ (15.88)	$ -	$100		
209A	L - 002	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	SW	500	16	1	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.1	SW	500	30	(14)	(0.0)	$ (3.97)	$ -	$25		
61A	L - 002A	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	8760	2,015	2	F28T8	F43SSILL-R	66	0.1	SW	8,760	1,156	858	0.1	$ 135.83	$ -	$50	0.0	-0.4
61A	L - 002B	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	2000	460	2	F28T8	F43SSILL-R	66	0.1	SW	2,000	264	196	0.1	$ 36.46	$ -	$50	0.0	-1.4
61A	L - 002C	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	8760	2,015	2	F28T8	F43SSILL-R	66	0.1	SW	8,760	1,156	858	0.1	$ 135.83	$ -	$50	0.0	-0.4
61A	L - 002D	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	2000	460	2	F28T8	F43SSILL-R	66	0.1	SW	2,000	264	196	0.1	$ 36.46	$ -	$50	0.0	-1.4
209A	Cooridor	9	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	SW	4380	1,261	9	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.5	SW	4,380	2,326	(1,064)	(0.2)	$ (177.15)	$ -	$225		
204	L - 001	28	S 96 P F 2 (MAG) 8'	F82EHE	207	5.8	SW	4380	25,386	28	S 96 P F 2 (MAG) 8'	F82EHE	207	5.8	SW	4,380	25,386	-	0.0	$ -	$ -	$700		
204	Cooridor	2	S 96 P F 2 (MAG) 8'	F82EHE	207	0.4	SW	4380	1,813	2	S 96 P F 2 (MAG) 8'	F82EHE	207	0.4	SW	4,380	1,813	-	0.0	$ -	$ -	$50		
61A	Electrical Supply Room	3	4' 3-LAMP T-12	F43EL	115	0.3	SW	520	179	3	F28T8	F43SSILL-R	66	0.2	SW	520	103	76	0.1	$ 22.05	$ -	$75	0.0	-3.4
209A	Cooridor	12	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.4	SW	520	200	12	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.7	SW	520	368	(168)	(0.3)	$ (48.60)	$ -	$300		
61A	L - 015.5 Storage	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	2500	575	2	F28T8	F43SSILL-R	66	0.1	SW	2,500	330	245	0.1	$ 43.81	$ -		0.0	0.0
61A	L - 015	4	4' 3-LAMP T-12	F43EL	115	0.5	SW	2125	978	4	F28T8	F43SSILL-R	66	0.3	SW	2,125	561	417	0.2	$ 76.59	$ -	$100	0.0	-1.3
61A	L - 014	4	4' 3-LAMP T-12	F43EL	115	0.5	SW	2125	978	4	F28T8	F43SSILL-R	66	0.3	SW	2,125	561	417	0.2	$ 76.59	$ -	$100	0.0	-1.3
146	Exterior Lighting	2	High Bay MH 400	MH400/1	458	0.9	SW	1125	1,031	2	P 54 C F 4	FC20	20	0.0	SW	1,125	45	986	0.9	$ 210.90	$ 600.00	$14	2.8	2.8
141A	Exterior Lighting	13	HPS 200	HPS200/1	250	3.3	SW	2500	8,125	13	FXLED78	FXLED78/1	78	1.0	SW	2,500	2,535	5,590	2.2	$ 999.49	$ -	$325	0.0	-0.3
9A	Exterior Lighting	3	High Bay MH 200 35 Feet High	MH200/1	232	0.7	SW	2250	1,566	3	FXLED78	FXLED78/1	78	0.2	SW	2,250	527	1,040	0.5	$ 189.19	$ -	$75	0.0	-0.4
71	Exterior Lighting	2	I 60	I60/1	60	0.1	SW	2250	270	2	CF 26	CFQ26/1-L	27	0.1	SW	2,250	122	149	0.1	$ 27.03	$ 81.00		3.0	3.0

Energy Audit of Camden County College (Lincoln Hall)

CHA Project No. 24364

ECM-8 Lighting Replacement Upgrades

Cost of Electricity: **$0.150 $/kWh**

$6.00 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Annual Hours**	**Annual kWh**	**Annual kWh Saved**	**Annual kW Saved**	**Annual $ Saved**	**Retrofit Cost**	**NJ Smart Start Lighting Incentive**	**Simple Payback With Out Incentive**	**Simple Payback**
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
	Total	**606**				**70.6**			**179,383**	**606**			**6,512**	**45.4**			**125,835**	**53,548**	**25.2**	**$9,848**	**$15,747**	**$6,067**		
																	Demand Savings			**25.2**	**$1,816**			
																	kWh Savings			**53,500**	**$8,025**			
																	Total savings				**$9,800**		**1.6**	**1.0**

Energy Audit of Camden County College (Lincoln Hall)

CHA Project No. 24364

ECM-9 Lighting Controls Installation (Occupancy Sensors)

Cost of Electricity: **$0.150 $/kWh**

$6.00 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Annual Hours**	**Annual kWh**	**Annual kWh Saved**	**Annual kW Saved**	**Annual $ Saved**	**Retrofit Cost**	**NJ Smart Start Lighting Incentive**	**Simple Payback With Out Incentive**	**Simple Payback**
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
209A	West Cooridor	8	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	SW	2500	640.0	8	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	None	2500	640.0	0.0	0.0	$0.00	$0.00	$0.00		
234	Lobby A	7	SP 100 W I 2	i100/2	200	1.4	SW	2500	3,500.0	7	SP 100 W I 2	i100/2	200	1.4	None	2500	3,500.0	0.0	0.0	$0.00	$0.00	$0.00		
234	Lobby B	33	SP 100 W I 2	i100/2	200	6.6	SW	2500	16,500.0	33	SP 100 W I 2	i100/2	200	6.6	None	2500	16,500.0	0.0	0.0	$0.00	$0.00	$0.00		
129A	Lobby B	3	SP 72 I	I72/1	75	0.2	SW	2125	478.1	3	SP 72 I	I72/1	75	0.2	C-OCC	1200	270.0	208.1	0.0	$31.22				
35A	Men's Room	2	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	136.0	2	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	C-OCC	1200	76.8	59.2	0.0	$8.88	$202.50	$35.00	4.5	3.8
41A	Men's Room	1	4' 1-LAMP T-8 (32W)	F41ILL	32	0.0	SW	2125	68.0	1	4' 1-LAMP T-8 (32W)	F41ILL	32	0.0	C-OCC	1200	38.4	29.6	0.0	$4.44				
35A	Women's Room	2	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2500	160.0	2	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	None	2500	160.0	0.0	0.0	$0.00	$0.00	$0.00		
41A	Women's Room	1	4' 1-LAMP T-8 (32W)	F41ILL	32	0.0	SW	2125	68.0	1	4' 1-LAMP T-8 (32W)	F41ILL	32	0.0	OCC	1200	38.4	29.6	0.0	$4.44	$118.75	$20.00	26.7	22.2
35A	L - 023	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	272.0	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	OCC	1200	153.6	118.4	0.0	$17.76	$118.75	$20.00	6.7	5.6
35A	L - 022	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	272.0	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	OCC	1200	153.6	118.4	0.0	$17.76	$118.75	$20.00	6.7	5.6
35A	Gallery - 024	14	4' 3-LAMP T-8 (32W)	F43ILL	32	0.4	SW	2250	1,008.0	14	4' 3-LAMP T-8 (32W)	F43ILL	32	0.4	C-OCC	1000	448.0	560.0	0.0	$84.00	$202.50	$35.00	2.4	2.0
129A	Gallery - 024	43	SP 72 I	I72/1	75	3.2	SW	2250	7,256.3	43	SP 72 I	I72/1	75	3.2	C-OCC	1000	3,225.0	4,031.3	0.0	$604.69	$202.50	$35.00	0.3	0.3
35A	Gallery - 025	12	4' 3-LAMP T-8 (32W)	F43ILL	32	0.4	SW	2125	816.0	12	4' 3-LAMP T-8 (32W)	F43ILL	32	0.4	OCC	1200	460.8	355.2	0.0	$53.28	$118.75	$20.00	2.2	1.9
129A	Gallery - 025	45	SP 72 I	I72/1	75	3.4	SW	2125	7,171.9	45	SP 72 I	I72/1	75	3.4	OCC	1200	4,050.0	3,121.9	0.0	$468.28	$118.75	$20.00	0.3	0.2
234	Storage Closet	1	SP 100 W I 2	i100/2	200	0.2	SW	2125	425.0	1	SP 100 W I 2	i100/2	200	0.2	OCC	1200	240.0	185.0	0.0	$27.75	$118.75	$20.00	4.3	3.6
226	Theater Lobby	10	70 W MH Wall Pack	MH70/1	95	1.0	SW	2000	1,900.0	10	70 W MH Wall Pack	MH70/1	95	1.0	OCC	1000	950.0	950.0	0.0	$142.50	$118.75	$0.00	0.8	0.8
175A	Theater Men's Bathroom	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	SW	2125	68.0	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	OCC	1200	38.4	29.6	0.0	$4.44	$118.75	$20.00	26.7	22.2
175A	Theater Women's Bathroom	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	SW	2125	68.0	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	OCC	1200	38.4	29.6	0.0	$4.44	$118.75	$20.00	26.7	22.2
227	Closet	1	W60CF1	F81EL	60	0.1	SW	2125	127.5	1	W60CF1	F81EL	60	0.1	OCC	1200	72.0	55.5	0.0	$8.33	$118.75	$20.00	14.3	11.9
234	Entrance Theater	1	SP 100 W I 2	i100/2	200	0.2	SW	2125	425.0	1	SP 100 W I 2	i100/2	200	0.2	OCC	1200	240.0	185.0	0.0	$27.75	$118.75	$20.00	4.3	3.6
175A	Theater	8	4' 2-LAMP T-8 (32W)	F42ILL	32	0.3	SW	2125	544.0	8	4' 2-LAMP T-8 (32W)	F42ILL	32	0.3	OCC	1200	307.2	236.8	0.0	$35.52	$118.75	$20.00	0.2	0.2
Y	Theater	42	I 100	I100/1	100	4.2	SW	2125	8,925.0	42	I 100	I100/1	100	4.2	OCC	1200	5,040.0	3,885.0	0.0	$582.75				
227	Theater	1	W60CF1	F81EL	60	0.1	SW	2125	127.5	1	W60CF1	F81EL	60	0.1	OCC	1200	72.0	55.5	0.0	$8.33	$118.75	$20.00	14.3	11.9
227	Stairway	1	W60CF1	F81EL	60	0.1	SW	2125	127.5	1	W60CF1	F81EL	60	0.1	OCC	1200	72.0	55.5	0.0	$8.33	$118.75	$20.00	14.3	11.9
23	Theater Exit Signs	9	X 5 W CF 2	ECF5/2	20	0.2	SW	2500	450.0	9	X 5 W CF 2	ECF5/2	20	0.2	None	2500	450.0	0.0	0.0	$0.00	$0.00	$0.00		
71	Projector Room	4	I 60	I60/1	60	0.2	SW	2125	510.0	4	I 60	I60/1	60	0.2	OCC	1200	288.0	222.0	0.0	$33.30	$118.75	$20.00	3.6	3.0
234	Theater	3	SP 100 W I 2	i100/2	200	0.6	SW	2125	1,275.0	3	SP 100 W I 2	i100/2	200	0.6	OCC	1000	600.0	675.0	0.0	$101.25	$118.75	$20.00	1.2	1.0
162A	Stage	9	4' 4-LAMP T-12	F44EL	120	1.1	SW	500	540.0	9	4' 4-LAMP T-12	F44EL	120	1.1	None	500	540.0	0.0	0.0	$0.00	$0.00	$0.00		
35A	Kitchen	3	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	204.0	3	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	OCC	1200	115.2	88.8	0.0	$13.32	$118.75	$20.00	8.9	7.4
180	L - 021	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2500	1,680.0	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	None	2500	1,680.0	0.0	0.0	$0.00	$0.00	$0.00		
180	L - 021E (Photo Studio)	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2500	2,520.0	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	None	2500	2,520.0	0.0	0.0	$0.00	$0.00	$0.00		
180	L - 021D	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2500	560.0	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	None	2500	560.0	0.0	0.0	$0.00	$0.00	$0.00		
180	L - 021A	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2125	476.0	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1200	268.8	207.2	0.0	$31.08	$118.75	$0.00	3.8	3.8
180	L - 021A	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	1062.5	714.0	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	None	1062.5	714.0	0.0	0.0	$0.00	$0.00	$0.00		
169	L - 016 Music Room	17	SP 250 MH ROOF	MH250/1	295	5.0	SW	2125	10,656.9	17	SP 250 MH ROOF	MH250/1	295	5.0	OCC	1200	6,018.0	4,638.9	0.0	$695.83	$118.75	$20.00	0.2	0.1
209A	Corridor Outside of Music Room	9	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	SW	1062.5	306.0	9	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	None	1062.5	306.0	0.0	0.0	$0.00	$0.00	$0.00		
169	L - 020	12	SP 250 MH ROOF	MH250/1	295	3.5	SW	1062.5	3,761.3	12	SP 250 MH ROOF	MH250/1	295	3.5	None	1062.5	3,761.3	0.0	0.0	$0.00	$0.00	$0.00		
162A	L - 017	11	4' 4-LAMP T-12	F44EL	120	1.3	SW	2125	2,805.0	11	4' 4-LAMP T-12	F44EL	120	1.3	OCC	1200	1,584.0	1,221.0	0.0	$183.15	$118.75	$20.00	0.6	0.5
162A	L - 019	8	4' 4-LAMP T-12	F44EL	120	1.0	SW	500	480.0	8	4' 4-LAMP T-12	F44EL	120	1.0	None	500	480.0	0.0	0.0	$0.00	$0.00	$0.00		
162A	L - 018	8	4' 4-LAMP T-12	F44EL	120	1.0	SW	500	480.0	8	4' 4-LAMP T-12	F44EL	120	1.0	None	500	480.0	0.0	0.0	$0.00	$0.00	$0.00		
169	L - 009, L - 010, L - 011	12	SP 250 MH ROOF	MH250/1	295	3.5	SW	500	1,770.0	12	SP 250 MH ROOF	MH250/1	295	3.5	None	500	1,770.0	0.0	0.0	$0.00	$0.00	$0.00		
204	L - 010	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2125	439.9	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	OCC	1200	248.4	191.5	0.0	$28.72	$118.75	$20.00	4.1	3.4
169	L - 008 Little Theater	8	SP 250 MH ROOF	MH250/1	295	2.4	SW	1062.5	2,507.5	8	SP 250 MH ROOF	MH250/1	295	2.4	None	1062.5	2,507.5	0.0	0.0	$0.00	$0.00	$0.00		
11A	L - 008 Closet	2	4' 2-LAMP T-12	F42EL	60	0.1	SW	2125	255.0	2	4' 2-LAMP T-12	F42EL	60	0.1	OCC	1200	144.0	111.0	0.0	$16.65	$118.75	$0.00	7.1	7.1
11A	Women's Bathroom	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	1062.5	255.0	4	4' 2-LAMP T-12	F42EL	60	0.2	None	1062.5	255.0	0.0	0.0	$0.00	$0.00	$0.00		
71	Closet	1	I 60	I60/1	60	0.1	SW	2250	135.0	1	I 60	I60/1	60	0.1	None	2250	135.0	0.0	0.0	$0.00	$0.00	$0.00		
71	Closet	1	I 60	I60/1	60	0.1	SW	2250	135.0	1	I 60	I60/1	60	0.1	None	2250	135.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	All Purpose Bathroom	1	4' 2-LAMP T-12	F42EL	60	0.1	SW	500	30.0	1	4' 2-LAMP T-12	F42EL	60	0.1	None	500	30.0	0.0	0.0	$0.00	$0.00	$0.00		
209A	Vestibule	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	SW	520	16.6	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	None	520	16.6	0.0	0.0	$0.00	$0.00	$0.00		
35A	L- 007	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	520	66.6	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	C-OCC	390	49.9	16.6	0.0	$2.50	$202.50	$35.00	81.1	67.1
11A	L - 012	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	520	124.8	4	4' 2-LAMP T-12	F42EL	60	0.2	None	520	124.8	0.0	0.0	$0.00	$0.00	$0.00		
204	L - 012	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	500	103.5	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	None	500	103.5	0.0	0.0	$0.00	$0.00	$0.00		
11A	Kiln Room #2	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	4380	1,051.2	4	4' 2-LAMP T-12	F42EL	60	0.2	None	4380	1,051.2	0.0	0.0	$0.00	$0.00	$0.00		
11A	Kiln Room #1	2	4' 2-LAMP T-12	F42EL	60	0.1	SW	4380	525.6	2	4' 2-LAMP T-12	F42EL	60	0.1	None	4380	525.6	0.0	0.0	$0.00	$0.00	$0.00		
162A	Ceramic Studio	22	4' 4-LAMP T-12	F44EL	120	2.6	SW	8760	23,126.4	22	4' 4-LAMP T-12	F44EL	120	2.6	None	8760	23,126.4	0.0	0.0	$0.00	$0.00	$0.00		
204	Glaze Room	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	SW	8760	5,440.0	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	None	8760	5,440.0	0.0	0.0	$0.00	$0.00	$0.00		
227	Dance Room	6	W60CF1	F81EL	60	0.4	SW	2125	765.0	6	W60CF1	F81EL	60	0.4	OCC	1200	432.0	333.0	0.0	$49.95	$118.75	$20.00	0.8	0.7
61A	Dance Cooridor	6	4' 3-LAMP T-12	F43EL	115	0.7	SW	2125	1,466.3	6	4' 3-LAMP T-12	F43EL	115	0.7	OCC	1200	828.0	638.3	0.0	$95.74				
111A	Dance Cooridor	12	4' 1-LAMP T-12	F41EL	32	0.4	SW	500	192.0	12	4' 1-LAMP T-12	F41EL	32	0.4	None	500	192.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Men's Bathroom	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	500	120.0	4	4' 2-LAMP T-12	F42EL	60	0.2	None	500	120.0	0.0	0.0	$0.00	$0.00	$0.00		
61A	L - 005	4	4' 3-LAMP T-12	F43EL	115	0.5	SW	8760	4,029.6	4	4' 3-LAMP T-12	F43EL	115	0.5	None	8760	4,029.6	0.0	0.0	$0.00	$0.00	$0.00		
209A	L - 005	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	SW	500	16.0	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	None	500	16.0	0.0	0.0	$0.00	$0.00	$0.00		
61A	L - 004A	3	4' 3-LAMP T-12	F43EL	115	0.3	SW	3285	1,133.3	3	4' 3-LAMP T-12	F43EL	115	0.3	OCC	1825	629.6	503.7	0.0	$75.56	$118.75	$20.00	1.6	1.3
71	L - 004A BR	1	I 60	I60/1	60	0.1	SW	3285	197.1	1	I 60	I60/1	60	0.1	OCC	1825	109.5	87.6	0.0	$13.14	$118.75	$20.00	9.0	7.5
11A	Display Case	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	8760	1,576.8	3	4' 2-LAMP T-12	F42EL	60	0.2	None	8760	1,576.8	0.0	0.0	$0.00	$0.00	$0.00		
162A	L - 004	4	4' 4-LAMP T-12	F44EL	120	0.5	SW	8760	4,204.8	4	4' 4-LAMP T-12	F44EL	120	0.5	None	8760	4,204.8	0.0	0.0	$0.00	$0.00	$0.00		
61A	L - 013	6	4' 3-LAMP T-12	F43EL	115	0.7	SW	500	345.0	6	4' 3-LAMP T-12	F43EL	115	0.7	None	500	345.0	0.0	0.0	$0.00	$0.00	$0.00		
61A	L - 013 Costume Storage	6	4' 3-LAMP T-12	F43EL	115	0.7	SW	2125	1,466.3	6	4' 3-LAMP T-12	F43EL	115	0.7	OCC	1000	690.0	776.3	0.0	$116.44	$118.75	$0.00	1.0	1.0
162A	Men's Bathroom	1	4' 4-LAMP T-12	F44EL	120	0.1	SW	500	60.0	1	4' 4-LAMP T-12	F44EL	120	0.1	None	500	60.0	0.0	0.0	$0.00	$0.00	$0.00		
162A	Women's Bathroom	1	4' 4-LAMP T-12	F44EL	120	0.1	SW	2000	240.0	1	4' 4-LAMP T-12	F44EL	120	0.1	OCC	1000	120.0	120.0	0.0	$18.00	$118.75	$0.00	6.6	6.6
11A	L - 003	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	2000	960.0	8	4' 2-LAMP T-12	F42EL	60	0.5	None	2000	960.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Mechanical Room	7	4' 2-LAMP T-12	F42EL	60	0.4	SW	500	210.0	7	4' 2-LAMP T-12	F42EL	60	0.4	None	500	210.0	0.0	0.0	$0.00	$0.00	$0.00		
71	Mechanical Room	1	I 60	I60/1	60	0.1	SW	8760	525.6	1	I 60	I60/1	60	0.1	OCC	2000	120.0	405.6	0.0	$60.84	$118.75	$20.00	2.0	1.6
209A	Ext Boiler Room	4	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.1	SW	500	64.0	4	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.1	None	500	64.0	0.0	0.0	$0.00	$0.00	$0.00		
209A	L - 002	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	SW	500	16.0	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	None	500	16.0	0.0	0.0	$0.00	$0.00	$0.00		
61A	L - 002A	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	8760	2,014.8	2	4' 3-LAMP T-12	F43EL	115	0.2	OCC	2000	460.0	1,554.8	0.0	$233.22	$118.75	$0.00	0.5	0.5
61A	L - 002B	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	2000	460.0	2	4' 3-LAMP T-12	F43EL	115	0.2	None	2000	460.0	0.0	0.0	$0.00	$0.00	$0.00		
61A	L - 002C	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	8760	2,014.8	2	4' 3-LAMP T-12	F43EL	115	0.2	None	8760	2,014.8	0.0	0.0	$0.00	$0.00	$0.00		
61A	L - 002D	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	2000	460.0	2	4' 3-LAMP T-12	F43EL	115	0.2	OCC	1000	230.0	230.0	0.0	$34.50	$118.75	$20.00	3.4	2.9
209A	Cooridor	9	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	SW	4380	1,261.4	9	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	OCC	2000	576.0	685.4	0.0	$102.82	$118.75	$20.00	1.2	1.0
204	L - 001	28	S 96 P F 2 (MAG) 8'	F82EHE	207	5.8	SW	4380	25,386.5	28	S 96 P F 2 (MAG) 8'	F82EHE	207	5.8	C-OCC	2000	11,592.0	13,794.5	0.0	$2,069.17	$202.50	$35.00	0.1	0.1
204	Cooridor	2	S 96 P F 2 (MAG) 8'	F82EHE	207	0.4	SW	4380	1,813.3	2	S 96 P F 2 (MAG) 8'	F82EHE	207	0.4	OCC	2000	828.0	985.3	0.0	$147.80	$118.75	$20.00	0.8	0.7
61A	Electrical Supply Room	3	4' 3-LAMP T-12	F43EL	115	0.3	SW	520	179.4	3	4' 3-LAMP T-12	F43EL	115	0.3	C-OCC	390	134.6	44.9	0.0	$6.73	$202.50	$35.00	30.1	24.9
209A	Cooridor	12	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.4	SW	520	199.7	12	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.4	OCC	390	149.8	49.9	0.0	$7.49	$118.75	$20.00	15.9	13.2
61A	L - 015.5 Storage	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	2500	575.0	2	4' 3-LAMP T-12	F43EL	115	0.2	None	2500	575.0	0.0	0.0	$0.00	$0.00	$0.00		
61A	L - 015	4	4' 3-LAMP T-12	F43EL	115	0.5	SW	2125	977.5	4	4' 3-LAMP T-12	F43EL	115	0.5	OCC	1200	552.0	425.5	0.0	$63.83	$118.75	$20.00	1.9	1.5
61A	L - 014	4	4' 3-LAMP T-12	F43EL	115	0.5	SW	2125	977.5	4	4' 3-LAMP T-12	F43EL	115	0.5	OCC	1200	552.0	425.5	0.0	$63.83	$118.75	$0.00	1.9	1.9
146	Exterior Lighting	2	High Bay MH 400	MH400/1	458	0.9	SW	1125	1,030.5	2	High Bay MH 400	MH400/1	458	0.9	None	1125	1,030.5	0.0	0.0	$0.00	$0.00	$0.00		
141A	Exterior Lighting	13	HPS 200	HPS200/1	250	3.3	SW	2500	8,125.0	13	HPS 200	HPS200/1	250	3.3	None	2500	8,125.0	0.0	0.0	$0.00	$0.00	$0.00		

Energy Audit of Camden County College (Lincoln Hall)

CHA Project No. 24364

ECM-9 Lighting Controls Installation (Occupancy Sensors)

Cost of Electricity: **$0.150 $/kWh**

$6.00 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Annual Hours**	**Annual kWh**	**Annual kWh Saved**	**Annual kW Saved**	**Annual $ Saved**	**Retrofit Cost**	**NJ Smart Start Lighting Incentive**	**Simple Payback With Out Incentive**	**Simple Payback**
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
9A	Exterior Lighting	3	High Bay MH 200 35 Feet High	MH200/1	232	0.7	SW	2250	1,566.0	3	High Bay MH 200 35 Feet High	MH200/1	232	0.7	C-OCC	1000	696.0	870.0	0.0	$130.50	$202.50	$35.00	1.3	1.1
71	Exterior Lighting	2	I 60	I60/1	60	0.1	SW	2250	270.0	2	I 60	I60/1	60	0.1	C-OCC	1000	120.0	150.0	0.0	$22.50				
	Total	**606**				**70.6**			**179,383**	**606**				**71**			**135,632**	**43,800**	**0**	**6,563**	**$6,014**	**805**		
																	Demand Savings			**0.0**	**$0**			
																	kWh Savings			**43,800**	**$6,570**			
																	Total Savings				**$6,600**		**0.9**	**0.8**

Energy Audit of Camden County College (Lincoln Hall)

CHA Project No. 24364

ECM-10 Lighting Replacements with Lighting Controls (Occupancy Sensors)

Cost of Electricity: **$0.150 $/kWh**

$6.00 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number//Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
209A	West Cooridor	8	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	SW	2500	640	8	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.5	None	2,500	1,180	(540)	(0.2)	$ (96.55)	$ -	$ -		
234	Lobby A	7	SP 100 W I 2	i100/2	200	1.4	SW	2500	3,500	7	WP 42 1	CF42/2-L	100	0.7	None	2,500	1,750	1,750	0.7	$ 312.90	$ 141.75	$ 175	0.5	-0.1
234	Lobby B	33	SP 100 W I 2	i100/2	200	6.6	SW	2500	16,500	33	WP 42 1	CF42/2-L	100	3.3	None	2,500	8,250	8,250	3.3	$ 1,475.10	$ 668.25	$ -	0.5	0.5
129A	Lobby B	3	SP 72 I	I72/1	75	0.2	SW	2125	478	3	SP 72 I	I72/1	72	0.2	C-OCC	1,200	259	219	0.0	$ 33.49	$ 202.50	$ 35	6.0	5.0
35A	Men's Room	2	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	136	2	4' 3-LAMP T-8 (32W)	F43ILL	89	0.2	C-OCC	1,200	214	(78)	(0.1)	$ (19.85)	$ -	$ -		
41A	Men's Room	1	4' 1-LAMP T-8 (32W)	F41ILL	32	0.0	SW	2125	68	1	4' 1-LAMP T-8 (32W)	F41ILL	31	0.0	C-OCC	1,200	37	31	0.0	$ 4.69	$ -	$ 25	0.0	-5.3
35A	Women's Room	2	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2500	160	2	4' 3-LAMP T-8 (32W)	F43ILL	89	0.2	None	2,500	445	(285)	(0.1)	$ (50.96)	$ -	$ 50		
41A	Women's Room	1	4' 1-LAMP T-8 (32W)	F41ILL	32	0.0	SW	2125	68	1	4' 1-LAMP T-8 (32W)	F41ILL	31	0.0	OCC	1,200	37	31	0.0	$ 4.69	$ 118.75	$ 20	25.3	21.0
35A	L - 023	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	272	4	4' 3-LAMP T-8 (32W)	F43ILL	89	0.4	OCC	1,200	427	(155)	(0.2)	$ (39.70)	$ 118.75	$ 120		
35A	L - 022	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	272	4	4' 3-LAMP T-8 (32W)	F43ILL	89	0.4	OCC	1,200	427	(155)	(0.2)	$ (39.70)	$ 118.75	$ 20		
35A	Gallery - 024	14	4' 3-LAMP T-8 (32W)	F43ILL	32	0.4	SW	2250	1,008	14	4' 3-LAMP T-8 (32W)	F43ILL	89	1.2	C-OCC	1,000	1,246	(238)	(0.8)	$ (93.16)	$ 202.50	$ 35		
129A	Gallery - 024	43	SP 72 I	I72/1	75	3.2	SW	2250	7,256	43	SP 72 I	I72/1	72	3.1	C-OCC	1,000	3,096	4,160	0.1	$ 633.33	$ 202.50	$ 35	0.3	0.3
35A	Gallery - 025	12	4' 3-LAMP T-8 (32W)	F43ILL	32	0.4	SW	2125	816	12	4' 3-LAMP T-8 (32W)	F43ILL	89	1.1	OCC	1,200	1,282	(466)	(0.7)	$ (119.09)	$ 118.75	$ 20		
129A	Gallery - 025	45	SP 72 I	I72/1	75	3.4	SW	2125	7,172	45	SP 72 I	I72/1	72	3.2	OCC	1,200	3,888	3,284	0.1	$ 502.30	$ 118.75	$ 20	0.2	0.2
234	Storage Closet	1	SP 100 W I 2	i100/2	200	0.2	SW	2125	425	1	WP 42 1	CF42/2-L	100	0.1	OCC	1,200	120	305	0.1	$ 52.95	$ 139.00	$ 20	2.6	2.2
226	Theater Lobby	10	70 W MH Wall Pack	MH70/1	95	1.0	SW	2000	1,900	10	FXLED18	FXLED18/1	18	0.2	OCC	1,000	180	1,720	0.8	$ 313.44	$ 118.75	$ -	0.4	0.4
175A	Theater Men's Bathroom	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	SW	2125	68	1	4' 2-LAMP T-8	F42ILL	59	0.1	OCC	1,200	71	(3)	(0.0)	$ (2.36)	$ 118.75	$ 20		
175A	Theater Women's Bathroom	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	SW	2125	68	1	4' 2-LAMP T-8	F42ILL	59	0.1	OCC	1,200	71	(3)	(0.0)	$ (2.36)	$ 118.75	$ 20		
227	Closet	1	W60CF1	F81EL	60	0.1	SW	2125	128	1	CF42W	CF42/1-L	48	0.0	OCC	1,200	58	70	0.0	$ 11.35	$ 321.25	$ 20	28.3	26.5
234	Entrance Theater	1	SP 100 W I 2	i100/2	200	0.2	SW	2125	425	1	WP 42 1	CF42/2-L	100	0.1	OCC	1,200	120	305	0.1	$ 52.95	$ 139.00	$ 20	2.6	2.2
175A	Theater	8	4' 2-LAMP T-8 (32W)	F42ILL	32	0.3	SW	2125	544	8	4' 2-LAMP T-8	F42ILL	59	0.5	OCC	1,200	566	(22)	(0.2)	$ (18.91)	$ 118.75	$ 20		
Y	Theater	42	I 100	I100/1	100	4.2	SW	2125	8,925	42	CF 26	CFQ26/1-L	27	1.1	OCC	1,200	1,361	7,564	3.1	$ 1,355.38	$ 1,819.75	$ 1,050	1.3	0.6
227	Theater	1	W60CF1	F81EL	60	0.1	SW	2125	128	1	CF42W	CF42/1-L	48	0.0	OCC	1,200	58	70	0.0	$ 11.35	$ 321.25	$ 20	28.3	26.5
227	Stairway	1	W60CF1	F81EL	60	0.1	SW	2125	128	1	CF42W	CF42/1-L	48	0.0	OCC	1,200	58	70	0.0	$ 11.35	$ 321.25	$ 20	28.3	26.5
23	Theater Exit Signs	9	X 5 W CF 2	ECF5/2	20	0.2	SW	2500	450	9	LED1.5W	ELED1.5/1	1.5	0.0	None	2,500	34	416	0.2	$ 74.43	$ 1,154.25	$ -	15.5	15.5
71	Projector Room	4	I 60	I60/1	60	0.2	SW	2125	510	4	CF 26	CFQ26/1-L	27	0.1	OCC	1,200	130	380	0.1	$ 66.56	$ 280.75	$ 20	4.2	3.9
234	Theater	3	SP 100 W I 2	i100/2	200	0.6	SW	2125	1,275	3	WP 42 1	CF42/2-L	100	0.3	OCC	1,000	300	975	0.3	$ 167.85	$ 179.50	$ 20	1.1	1.0
162A	Stage	9	4' 4-LAMP T-12	F44EL	120	1.1	SW	500	540	9	F28T8	F44SSILL-R	86	0.8	None	500	387	153	0.3	$ 44.98	$ -	$ 225	0.0	-5.0
35A	Kitchen	3	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	2125	204	3	4' 3-LAMP T-8 (32W)	F43ILL	89	0.3	OCC	1,200	320	(116)	(0.2)	$ (29.77)	$ 118.75	$ 20		
180	L - 021	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2500	1,680	6	T 28 C F 4	F43SSILL	72	0.4	None	2,500	1,080	600	0.2	$ 107.28	$ 688.50	$ -	6.4	6.4
180	L - 021E (Photo Studio)	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2500	2,520	9	T 28 C F 4	F43SSILL	72	0.6	None	2,500	1,620	900	0.4	$ 160.92	$ 1,032.75	$ 225	6.4	5.0
180	L - 021D	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2500	560	2	T 28 C F 4	F43SSILL	72	0.1	None	2,500	360	200	0.1	$ 35.76	$ 229.50	$ 50	6.4	5.0
180	L - 021A	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2125	476	2	T 28 C F 4	F43SSILL	72	0.1	OCC	1,200	173	303	0.1	$ 51.24	$ 348.25	$ -	6.8	6.8
180	L - 021A	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	1062.5	714	6	T 28 C F 4	F43SSILL	72	0.4	None	1,063	459	255	0.2	$ 55.53	$ 688.50	$ -	12.4	12.4
169	L - 016 Music Room	17	SP 250 MH ROOF	MH250/1	295	5.0	SW	2125	10,657	17	FXLED78	FXLED78/1	78	1.3	OCC	1,200	1,591	9,066	3.7	$ 1,625.46	$ 2,299.00	$ 20	1.4	1.4
209A	Corridor Outside of Music Room	9	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	SW	1062.5	306	9	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.5	None	1,063	564	(258)	(0.2)	$ (56.22)	$ -	$ -		
169	L - 020	12	SP 250 MH ROOF	MH250/1	295	3.5	SW	1062.5	3,761	12	FXLED78	FXLED78/1	78	0.9	None	1,063	995	2,767	2.6	$ 602.50	$ 1,539.00	$ -	2.6	2.6
162A	L - 017	11	4' 4-LAMP T-12	F44EL	120	1.3	SW	2125	2,805	11	F28T8	F44SSILL-R	86	0.9	OCC	1,200	1,135	1,670	0.4	$ 277.40	$ 118.75	$ 20	0.4	0.4
162A	L - 019	8	4' 4-LAMP T-12	F44EL	120	1.0	SW	500	480	8	F28T8	F44SSILL-R	86	0.7	None	500	344	136	0.3	$ 39.98	$ -	$ -	0.0	0.0
162A	L - 018	8	4' 4-LAMP T-12	F44EL	120	1.0	SW	500	480	8	F28T8	F44SSILL-R	86	0.7	None	500	344	136	0.3	$ 39.98	$ -	$ -	0.0	0.0
169	L - 009, L - 010, L - 011	12	SP 250 MH ROOF	MH250/1	295	3.5	SW	500	1,770	12	FXLED78	FXLED78/1	78	0.9	None	500	468	1,302	2.6	$ 382.79	$ 1,539.00	$ -	4.0	4.0
204	L - 010	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2125	440	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	OCC	1,200	248	191	0.0	$ 28.72	$ 118.75	$ 20	4.1	3.4
169	L - 008 Little Theater	8	SP 250 MH ROOF	MH250/1	295	2.4	SW	1062.5	2,508	8	FXLED78	FXLED78/1	78	0.6	None	1,063	663	1,845	1.7	$ 401.67	$ 1,026.00	$ -	2.6	2.6
11A	L - 008 Closet	2	4' 2-LAMP T-12	F42EL	60	0.1	SW	2125	255	2	F32T8	F42ILL-R	52	0.1	OCC	1,200	125	130	0.0	$ 20.68	$ 118.75	$ -	5.7	5.7
11A	Women's Bathroom	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	1062.5	255	4	F32T8	F42ILL-R	52	0.2	None	1,063	221	34	0.0	$ 7.40	$ -	$ 28	0.0	-3.8
71	Closet	1	I 60	I60/1	60	0.1	SW	2250	135	1	CF 26	CFQ26/1-L	27	0.0	None	2,250	61	74	0.0	$ 13.51	$ 40.50	$ -	3.0	3.0
71	Closet	1	I 60	I60/1	60	0.1	SW	2250	135	1	CF 26	CFQ26/1-L	27	0.0	None	2,250	61	74	0.0	$ 13.51	$ 40.50	$ -	3.0	3.0
11A	All Purpose Bathroom	1	4' 2-LAMP T-12	F42EL	60	0.1	SW	500	30	1	F32T8	F42ILL-R	52	0.1	None	500	26	4	0.0	$ 1.18	$ -	$ -	0.0	0.0
209A	Vestibule	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	SW	520	17	1	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.1	None	520	31	(14)	(0.0)	$ (4.05)	$ -	$ -		
35A	L - 007	4	4' 3-LAMP T-8 (32W)	F43ILL	32	0.1	SW	520	67	4	4' 3-LAMP T-8 (32W)	F43ILL	89	0.4	C-OCC	390	139	(72)	(0.2)	$ (27.26)	$ 202.50	$ 35		
11A	L - 012	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	520	125	4	F32T8	F42ILL-R	52	0.2	None	520	108	17	0.0	$ 4.80	$ -	$ 100	0.0	-20.8
204	L - 012	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	500	104	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	None	500	104	-	0.0	$ -	$ -	$ -		
11A	Kiln Room #2	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	4380	1,051	4	F32T8	F42ILL-R	52	0.2	None	4,380	911	140	0.0	$ 23.33	$ -	$ -	0.0	0.0
11A	Kiln Room #1	2	4' 2-LAMP T-12	F42EL	60	0.1	SW	4380	526	2	F32T8	F42ILL-R	52	0.1	None	4,380	456	70	0.0	$ 11.66	$ -	$ -	0.0	0.0
162A	Ceramic Studio	22	4' 4-LAMP T-12	F44EL	120	2.6	SW	8760	23,126	22	F28T8	F44SSILL-R	86	1.9	None	8,760	16,574	6,552	0.7	$ 1,036.73	$ -	$ -	0.0	0.0
204	Glaze Room	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	SW	8760	5,440	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	None	8,760	5,440	-	0.0	$ -	$ -	$ -		
227	Dance Room	6	W60CF1	F81EL	60	0.4	SW	2125	765	6	CF42W	CF42/1-L	48	0.3	OCC	1,200	346	419	0.1	$ 68.09	$ 1,333.75	$ 170	19.6	17.1
61A	Dance Cooridor	6	4' 3-LAMP T-12	F43EL	115	0.7	SW	2125	1,466	6	F28T8	F43SSILL-R	66	0.4	OCC	1,200	475	991	0.3	$ 169.83	$ 118.75	$ 150	0.7	-0.2
111A	Dance Cooridor	12	4' 1-LAMP T-12	F41EL	32	0.4	SW	500	192	12	F28T8	F41SSILL-R	23	0.3	None	500	138	54	0.1	$ 15.88	$ -	$ 300	0.0	-18.9
11A	Men's Bathroom	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	500	120	4	F32T8	F42ILL-R	52	0.2	None	500	104	16	0.0	$ 4.70	$ -	$ 100	0.0	-21.3
61A	L - 005	4	4' 3-LAMP T-12	F43EL	115	0.5	SW	8760	4,030	4	F28T8	F43SSILL-R	66	0.3	None	8,760	2,313	1,717	0.2	$ 271.66	$ -	$ 100	0.0	-0.4
209A	L - 005	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	SW	500	16	1	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.1	None	500	30	(14)	(0.0)	$ (3.97)	$ -	$ 25		
61A	L - 004A	3	4' 3-LAMP T-12	F43EL	115	0.3	SW	3285	1,133	3	F28T8	F43SSILL-R	66	0.2	OCC	1,825	361	772	0.1	$ 126.38	$ 118.75	$ 95	0.9	0.2
71	L - 004A BR	1	I 60	I60/1	60	0.1	SW	3285	197	1	CF 26	CFQ26/1-L	27	0.0	OCC	1,825	49	148	0.0	$ 24.55	$ 159.25	$ 45	6.5	4.7
11A	Display Case	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	8760	1,577	3	F32T8	F42ILL-R	52	0.2	None	8,760	1,367	210	0.0	$ 33.26	$ -	$ 75	0.0	-2.3
162A	L - 004	4	4' 4-LAMP T-12	F44EL	120	0.5	SW	8760	4,205	4	F28T8	F44SSILL-R	86	0.3	None	8,760	3,013	1,191	0.1	$ 188.50	$ -	$ -	0.0	0.0
61A	L - 013	6	4' 3-LAMP T-12	F43EL	115	0.7	SW	500	345	6	F28T8	F43SSILL-R	66	0.4	None	500	198	147	0.3	$ 43.22	$ -	$ 150	0.0	-3.5
61A	L - 013 Costume Storage	6	4' 3-LAMP T-12	F43EL	115	0.7	SW	2125	1,466	6	F28T8	F43SSILL-R	66	0.4	OCC	1,000	396	1,070	0.3	$ 181.71	$ 118.75	$ 150	0.7	-0.2
162A	Men's Bathroom	1	4' 4-LAMP T-12	F44EL	120	0.1	SW	500	60	1	F28T8	F44SSILL-R	86	0.1	None	500	43	17	0.0	$ 5.00	$ -	$ 25	0.0	-5.0
162A	Women's Bathroom	1	4' 4-LAMP T-12	F44EL	120	0.1	SW	2000	240	1	F28T8	F44SSILL-R	86	0.1	OCC	1,000	86	154	0.0	$ 25.55	$ 118.75	$ 25	4.6	3.7
11A	L - 003	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	2000	960	8	F32T8	F42ILL-R	52	0.4	None	2,000	832	128	0.1	$ 23.81	$ -	$ 200	0.0	-8.4
11A	Mechanical Room	7	4' 2-LAMP T-12	F42EL	60	0.4	SW	500	210	7	F32T8	F42ILL-R	52	0.4	None	500	182	28	0.1	$ 8.23	$ -	$ 175	0.0	-21.3
71	Mechanical Room	1	I 60	I60/1	60	0.1	SW	8760	526	1	CF 26	CFQ26/1-L	27	0.0	OCC	2,000	54	472	0.0	$ 73.12	$ 159.25	$ 45	2.2	1.6
209A	Ext Boiler Room	4	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.1	SW	500	64	4	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.2	None	500	118	(54)	(0.1)	$ (15.88)	$ -	$ 100		
209A	L - 002	1	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.0	SW	500	16	1	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.1	None	500	30	(14)	(0.0)	$ (3.97)	$ -	$ 25		
61A	L - 002A	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	8760	2,015	2	F28T8	F43SSILL-R	66	0.1	OCC	2,000	264	1,751	0.1	$ 269.68	$ 118.75	$ 50	0.4	0.3
61A	L - 002B	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	2000	460	2	F28T8	F43SSILL-R	66	0.1	None	2,000	264	196	0.1	$ 36.46	$ -	$ 50	0.0	-1.4
61A	L - 002C	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	8760	2,015	2	F28T8	F43SSILL-R	66	0.1	None	8,760	1,156	858	0.1	$ 135.83	$ -	$ 50	0.0	-0.4
61A	L - 002D	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	2000	460	2	F28T8	F43SSILL-R	66	0.1	OCC	1,000	132	328	0.1	$ 56.26	$ 118.75	$ 70	2.1	0.9
209A	Cooridor	9	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.3	SW	4380	1,261	9	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.5	OCC	2,000	1,062	199	(0.2)	$ 12.42	$ 118.75	$ 245	9.6	-10.2
204	L - 001	28	S 96 P F 2 (MAG) 8'	F82EHE	207	5.8	SW	4380	25,386	28	S 96 P F 2 (MAG) 8'	F82EHE	207	5.8	C-OCC	2,000	11,592	13,794	0.0	$ 2,069.17	$ 202.50	$ 735	0.1	-0.3
204	Cooridor	2	S 96 P F 2 (MAG) 8'	F82EHE	207	0.4	SW	4380	1,813	2	S 96 P F 2 (MAG) 8'	F82EHE	207	0.4	OCC	2,000	828	985	0.0	$ 147.80	$ 118.75	$ 70	0.8	0.3
61A	Electrical Supply Room	3	4' 3-LAMP T-12	F43EL	115	0.3	SW	520	179	3	F28T8	F43SSILL-R	66	0.2	C-OCC	390	77	102	0.1	$ 25.91	$ 202.50	$ 110	7.8	3.6
209A	Cooridor	12	2' 2-LAMP T-8 (32W)	FU2ILL	32	0.4	SW	520	200	12	2' 2-LAMP T-8 (32W)	FU2ILL	59	0.7	OCC	390	276	(76)	(0.3)	$ (34.79)	$ 118.75	$ 320		
61A	L - 015.5 Storage	2	4' 3-LAMP T-12	F43EL	115	0.2	SW	2500	575	2	F28T8	F43SSILL-R	66	0.1	None	2,500	330	245	0.1	$ 43.81	$ -	$ -	0.0	0.0
61A	L - 015	4	4' 3-LAMP T-12	F43EL	115	0.5	SW	2125	978	4	F28T8	F43SSILL-R	66	0.3	OCC	1,200	317	661	0.2	$ 113.22	$ 118.75	$ 120	1.0	0.0
61A	L - 014	4	4' 3-LAMP T-12	F43EL	115	0.5	SW	2125	978	4	F28T8	F43SSILL-R	66	0.3	OCC	1,200	317	661	0.2	$ 113.22	$ 118.75	$ 100	1.0	0.2
146	Exterior Lighting	2	High Bay MH 400	MH400/1	458	0.9	SW	1125	1,031	2	P 54 C F 4	FC20	20	0.0	None	1,125	45	986	0.9	$ 210.90	$ 600.00	$ 14	2.8	2.8
141A	Exterior Lighting	13	HPS 200	HPS200/1	250	3.3	SW	2500	8,125	13	FXLED78	FXLED78/1	78	1.0	None	2,500	2,535	5,590	2.2	$ 999.49	$ -	$ 325	0.0	-0.3
9A	Exterior Lighting	3	High Bay MH 200 35 Feet High	MH200/1	232	0.7	SW	2250	1,566	3	FXLED78	FXLED78/1	78	0.2	C-OCC	1,000	234	1,332	0.5	$ 233.06	$ 202.50	$ 110	0.9	0.4
71	Exterior Lighting	2	I 60	I60/1	60	0.1	SW	2250	270	2	CF 26	CFQ26/1-L	27	0.1	C-OCC	1,000	54	216	0.1	$ 37.15	$ 283.50	$ -	7.6	7.6

Energy Audit of Camden County College (Lincoln Hall)

CHA Project No. 24364

ECM-10 Lighting Replacements with Lighting Controls (Occupancy Sensors)

Cost of Electricity: **$0.150 $/kWh**

$6.00 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Annual Hours**	**Annual kWh**	**Annual kWh Saved**	**Annual kW Saved**	**Annual $ Saved**	**Retrofit Cost**	**NJ Smart Start Lighting Incentive**	**Simple Payback With Out Incentive**	**Simple Payback**
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
	Total	**606**				**70.6**			**179,383**	**606**				**45.4**			**90,287**		**25.2**	**15,180**	**21,761**	**6,872**		
																	Demand Savings			**25.2**	**$1,816**			
																	kWh Savings			**89,100**	**$13,365**			
																	Total Savings				**$15,200**		**1.4**	**1.0**

APPENDIX D

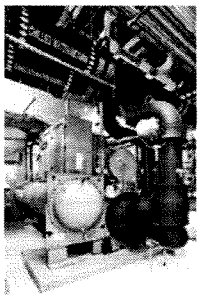
New Jersey Pay For Performance Incentive Program

Pay for Performance - Existing Buildings

Download program applications and incentive forms.

The Greater the Savings, the Greater Your Incentives

Take a comprehensive, whole-building approach to saving energy in your existing facilities and earn incentives that are directly linked to your savings. Pay for Performance relies on a network of program partners who provide technical services under direct contract to you. Acting as your energy expert, your partner will develop an energy reduction plan for each project with a whole-building technical component of a traditional energy audit, a financial plan for funding the energy efficient measures and a construction schedule for installation.



Eligibility

Existing commercial, industrial and institutional buildings with a peak demand over 100 kW for any of the preceding twelve months are eligible to participate including hotels and casinos, large office buildings, multi-family buildings, supermarkets, manufacturing facilities, schools, shopping malls and restaurants. Buildings that fall into the following five customer classes are not required to meet the 100 kW demand in order to participate in the program: hospitals, public colleges and universities, 501(c)(3) non-profits, affordable multifamily housing, and local governmental entities. Your energy reduction plan must define a comprehensive package of measures capable of reducing the existing energy consumption of your building by 15% or more.

Exceptions to the 15% threshold requirement may be made for certain industrial, manufacturing, water treatment and datacenter building types whose annual energy consumption is heavily weighted on process loads. Details are available in the high energy intensity section of the FAQ page.

ENERGY STAR Portfolio Manager

Pay for Performance takes advantage of the ENERGY STAR Program with Portfolio Manager, EPA's interactive tool that allows facility managers to track and evaluate energy and water consumption across all of their buildings. The tool provides the opportunity to load in the characteristics and energy usage of your buildings and determine an energy performance benchmark score. You can then assess energy management goals over time, identify strategic opportunities for savings, and receive EPA recognition for superior energy performance.

This rating system assesses building performance by tracking and scoring energy use in your facilities and comparing it to similar buildings. That can be a big help in locating opportunities for cost-justified energy efficiency upgrades. And, based on our findings, you may be invited to participate in the Building Performance with ENERGY STAR initiative and receive special recognition as an industry leader in energy efficiency.

Incentives

Pay for Performance incentives are awarded upon the satisfactory completion of three program milestones:

Incentive #1 - Submittal of complete energy reduction plan prepared by an approved program partner - Contingent on moving forward, incentives will be between $5,000 and $50,000 based on approximately $.10 per square foot, not to exceed 50% of the facility's annual energy expense.

Incentive #2 - Installation of recommended measures - Incentives are based on the projected level of electricity and natural gas savings resulting from the installation of comprehensive energy-efficiency measures.

Incentive #3 - Completion of Post-Construction Benchmarking Report - A completed report verifying energy reductions based on one year of post-implementation results. Incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum performance threshold of 15% savings has been achieved.

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A detailed Incentive Structure document is available on the applications and forms page.

Energy Efficiency Revolving Loan Fund (EE RLF)

New Jersey-based commercial, institutional or industrial entities (including 501(c)(3) organizations) that have received an approved energy reduction plan under Pay for Performance may be eligible for supplemental financing through the EE RLF. The financing, in the form of low-interest loans, can be used to support up to 80% of total eligible project costs, not to exceed $2.5 million or 100% of total eligible project costs from all public state funding sources. Visit the NJ EDA website for details.

Steps to Participation

Click here for a step-by-step description of the program.

New Jersey's Clean Energy PROGRAM
Your Power to Save
njcleanenergy.com

New Jersey SmartStart BUILDINGS®

BPU

2012 PAY FOR PERFORMANCE PROGRAM
Existing Buildings Incentive Structure

Incentive #1: Energy Reduction Plan

Incentive Amount: ..... $0.10 per sq ft
Minimum Incentive: $5,000
Maximum Incentive:: ..... $50,000 or 50% of facility annual energy cost (whichever is less)

This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP) and is paid upon ERP approval. Incentive is contingent on implementation of recommended measures outlined in the ERP.

Incentive #2: Installation of Recommended Measures

Minimum Performance Target: 15%

Electric Incentives

Base Incentive based on 15% savings: ..... $0.09 per projected kWh saved
For each % over 15% add: ..... $0.005 per projected kWh saved
Maximum Incentive: ..... $0.11 per projected kWh saved

Gas Incentives

Base Incentive based on 15% savings: ..... $0.90 per projected Therm saved
For each % over 15% add: ..... $0.05 per projected Therm saved
Maximum Incentive: ..... $1.25 per projected Therm saved

Incentive Cap: ..... 25% of total project cost

This incentive is based on projected energy savings outlined in the ERP. Incentive is paid upon successful installation of recommended measures.

Incentive #3: Post-Construction Benchmarking Report

Minimum Performance Target: 15%

Electric Incentives

Base Incentive based on 15% savings: ..... $0.09 per actual kWh saved
For each % over 15% add: ..... $0.005 per actual kWh saved
Maximum Incentive: ..... $0.11 per actual kWh saved

Gas Incentives

Base Incentive based on 15% savings: ..... $0.90 per actual Therm saved
For each % over 15% add: ..... $0.05 per actual Therm saved
Maximum Incentive: ..... $1.25 per actual Therm saved

Incentive Cap: ..... 25% of total project cost

This incentive will be released upon submittal of a Post-Construction Benchmarking Report that verifies that the level of savings actually achieved by the installed measures meets or exceeds the minimum performance threshold. To validate the savings and achievement of the Energy Target, the EPA Portfolio Manager shall be used. Savings should be rounded to the nearest percent. Total value of Incentive #2 and Incentive #3 may not exceed 50% of the total project cost. Incentives will be limited to $1 million per gas and electric account per building; maximum of $2 million per project. See Participation Agreement for details.

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Lincoln Hall

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 2012.
Building must have a minimum average electric demand of 100 kW. This minimum is waived for buildings owned by local governements or non-profit organizations.
Values used in this calculation are for measures with a positive return on investment (ROI) only.

Total Building Area (Square Feet)	41,500
Is this audit funded by NJ BPU (Y/N)	Yes

Board of Public Utilites (BPU)

Incentive #1		
Audit is funded by NJ BPU	$0.10	$/sqft

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$54,016	$6,161
Existing Usage (from utility)	404,524	9,561
Proposed Savings	91,600	700
Existing Total MMBtus	2,337	
Proposed Savings MMBtus	383	
% Energy Reduction	**16.4%**	
Proposed Annual Savings	$13,300	

	Min (Savings = 15%)		Increase (Savings > 15%)		Max Incentive		Achieved Incentive	
	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm
Incentive #2	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.10	$0.97
Incentive #3	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.10	$0.97

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$4,150
Incentive #2	$8,874	$679	$9,553
Incentive #3	$8,874	$679	$9,553
Total All Incentives	**$17,749**	**$1,357**	**$23,256**

Total Project Cost	$20,200

		Allowable Incentive
% Incentives #1 of Utility Cost*	6.9%	$4,150
% Incentives #2 of Project Cost**	47.3%	$6,060
% Incentives #3 of Project Cost**	47.3%	$6,060
Total Eligible Incentives***	**$16,270**	
Project Cost w/ Incentives	$3,930	

Project Payback (years)	
w/o Incentives	w/ Incentives
1.5	0.3

* Maximum allowable incentive is 50% of annual utility cost if not funded by NJ BPU, and %25 if it is.

** Maximum allowable amount of Incentive #2 is 25% of total project cost.

Maximum allowable amount of Incentive #3 is 25% of total project cost.

*** Maximum allowable amount of Incentive #1 is $50,000 if not funded by NJ BPU, and $25,000 if it is.

Maximum allowable amount of Incentive #2 & #3 is $1 million per gas account and $1 million per electric account; maximum 2 million per project

APPENDIX E

Energy Savings Improvement Plan (ESIP)

COMMERCIAL, INDUSTRIAL AND LOCAL GOVERNMENT

- PROGRAMS
  - NJ SMARTSTART BUILDINGS
  - PAY FOR PERFORMANCE
  - COMBINED HEAT & POWER AND FUEL CELLS
  - LOCAL GOVERNMENT ENERGY AUDIT
  - LARGE ENERGY USERS PILOT
  - ENERGY SAVINGS IMPROVEMENT PLAN
  - DIRECT INSTALL
  - ENERGY BENCHMARKING
  - T-12 SCHOOLS LIGHTING INITIATIVE
  - OIL, PROPANE & MUNICIPAL ELECTRIC CUSTOMERS
  - EDA PROGRAMS
  - TEACH
  - ARRA
- TECHNOLOGIES
- TOOLS AND RESOURCES
- PROGRAM UPDATES
- CONTACT US

Home » Commercial & Industrial » Programs

Energy Savings Improvement Plan

A new State law allows government agencies to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. Under the recently enacted Chapter 4 of the Laws of 2009 (the law), the "Energy Savings Improvement Program" (ESIP), provides all government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources.

This Local Finance Notice outlines how local governments can develop and implement an ESIP for their facilities. Below are two sample RFPs:

- Local Government
- School Districts (K-12)

The Board also adopted protocols to measure energy savings.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Local units should carefully consider all alternatives to develop an approach that best meets their needs. Local units considering an ESIP should carefully review the Local Finance Notice, the law, and consult with qualified professionals to determine how they should approach the task.

FIRST STEP – ENERGY AUDIT

For local governments interested in pursuing an ESIP, the first step is to perform an energy audit. As explained in the Local Finance Notice, this may be done internally if an agency has qualified staff to conduct the audit. If not, the audit must be implemented by an independent contractor and not by the energy savings company producing the Energy Reduction Plan.

Pursuing a Local Government Energy Audit through New Jersey's Clean Energy Program is a valuable first step to the ESIP approach - and it's free. **Incentives provide 100% of the cost of the audit.**

ENERGY REDUCTION PLANS

If you have an ESIP plan you would like to submit to the Board of Public Utilities, please email it to ESIP@bpu.state.nj.us. Please limit the file size to 3MB (or break it into smaller files).

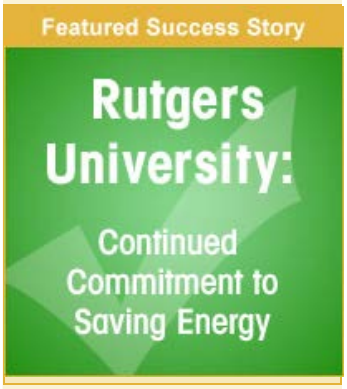
- Frankford Township School District
- Northern Hunterdon-Voorhees Regional High School
- Manalapan Township ***(180 MB** - Right Click, Save As)*

Program Updates

- Board Order - Standby Charges for Distributed Generation Customers
- T-12 Schools Lighting Replacement Initiative - Funding Allocation Reached

Other updates posted.

Featured Success Story



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APPENDIX F

Solar Photovoltaic Analysis

Camden County college
Lincoln Hall

Cost of Electricity	$0.131	/kWh
Electricity Usage	400,600	kWh/yr
System Unit Cost	$4,000	/kW

Photovoltaic (PV) Solar Power Generation - Screening Assessment

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	Federal Tax Credit	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$680,000	**170.0**	**217,223**	**0**	**$28,456**	**0**	**$28,456**	**$0**	**$17,378**	**23.9**	**14.8**

** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $80 /1000kwh

Area Output*
3,411 m2
36,710 ft2

Perimeter Output*
336 m
1,102 ft

Available Roof Space for PV:
(Area Output - 10 ft x Perimeter) x 85%
21,836 ft2

Approximate System Size: Is the roof flat? (Yes/No) Yes

8	watt/ft2	
174,692	DC watts	
170	kW	Enter into PV Watts

PV Watts Inputs*

Array Tilt Angle	20	Enter into PV Watts (always 20 if flat, if pitched - enter estimated roof angle)
Array Azimuth	180	Enter into PV Watts (default)
Zip Code	08012	Enter into PV Watts
DC/AC Derate Factor	0.83	Enter info PV Watts

PV Watts Output
217,223 annual kWh calculated in PV Watts program

% Offset Calc

Usage	400,600	(from utilities)
PV Generation	217,223	(generated using PV Watts)
% offset	54%	

* http://www.freemaptools.com/area-calculator.htm
**http://www.flettexchange.com

AC Energy & Cost Savings

Cautions for Interpreting the Results

Lincoln Hall (Camden County College)

Station Identification

Cell ID:	0267373
State:	New Jersey
Latitude:	39.8 ° N
Longitude:	74.8 ° W

PV System Specifications

DC Rating:	170.0 kW
DC to AC Derate Factor:	0.830
AC Rating:	141.1 kW
Array Type:	Fixed Tilt
Array Tilt:	20.0 °
Array Azimuth:	180.0 °

Energy Specifications

Cost of Electricity:	13.1 ¢/kWh

Results

Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	2.71	11913	1560.60
2	3.50	14025	1837.28
3	4.81	20552	2692.31
4	5.27	21251	2783.88
5	5.81	23589	3090.16
6	6.13	23323	3055.31
7	5.76	22436	2939.12
8	5.63	21844	2861.56
9	5.03	19311	2529.74
10	4.04	16627	2178.14
11	2.90	11854	1552.87
12	2.46	10496	1374.98
Year	4.51	217223	28456.21

Output Hourly Performance Data

(Gridded data is monthly, hourly output not available.)

Output Results as Text

Saving Text from a Browser

Run PVWATTS v.2 for another location

Run PVWATTS v.1

Please send questions and comments to Webmaster
Disclaimer and copyright notice.

RReDC home page (http://rredc.nrel.gov)

Camden County college
Lincoln Hall

Cost of Electricity	$0.131	/kWh
Electricity Usage	400,600	kWh/yr
System Unit Cost	$4,000	/kW

Photovoltaic (PV) Solar Power Generation - Screening Assessment

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	Federal Tax Credit	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$80,000	**20.0**	**25,938**	**0**	**$3,398**	**0**	**$3,398**	**$0**	**$2,075**	**23.5**	**14.6**

** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $80 /1000kwh

Area Output*

676 m2
7,276 ft2

Perimeter Output*

76 m
249 ft

Available Roof Space for PV:
(Area Output - 10 ft x Perimeter) x 50%
2,395 ft2

Approximate System Size: Is the roof flat? (Yes/No) No

11.5 watt/ft2
27,540 DC watts
20 kW Enter into PV Watts

PV Watts Inputs*

Array Tilt Angle	40	Enter into PV Watts (always 20 if flat, if pitched - enter estimated roof angle)
Array Azimuth	180	Enter into PV Watts (default)
Zip Code	08012	Enter into PV Watts
DC/AC Derate Factor	0.83	Enter info PV Watts

PV Watts Output

25,938 annual kWh calculated in PV Watts program

% Offset Calc

Usage	400,600	(from utilities)
PV Generation	25,938	(generated using PV Watts)
% offset	6%	

* http://www.freemaptools.com/area-calculator.htm
**http://www.flettexchange.com

AC Energy & Cost Savings

Cautions for Interpreting the Results

Lincoln Hall - Pitched Roof (Camden County College)

Station Identification

Cell ID:	0267373
State:	New Jersey
Latitude:	39.8 ° N
Longitude:	74.8 ° W

PV System Specifications

DC Rating:	20.0 kW
DC to AC Derate Factor:	0.830
AC Rating:	16.6 kW
Array Type:	Fixed Tilt
Array Tilt:	40.0 °
Array Azimuth:	180.0 °

Energy Specifications

Cost of Electricity:	13.1 ¢/kWh

Results

Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.22	1689	221.26
2	3.92	1854	242.87
3	5.03	2527	331.04
4	5.15	2429	318.20
5	5.39	2538	332.48
6	5.52	2440	319.64
7	5.27	2388	312.83
8	5.39	2441	319.77
9	5.17	2327	304.84
10	4.47	2165	283.62
11	3.37	1638	214.58
12	2.96	1502	196.76
Year	4.57	25938	3397.88

Output Hourly Performance Data

(Gridded data is monthly, hourly output not available.)

Output Results as Text

Saving Text from a Browser

Run PVWATTS v.2 for another location

Run PVWATTS v.1

Please send questions and comments to Webmaster

Disclaimer and copyright notice.

RReDC home page (http://rredc.nrel.gov)

APPENDIX G

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Lincoln Hall

Building ID: 3251856
For 12-month Period Ending: April 30, 2012[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: November 08, 2012

Facility
Lincoln Hall
College Drive
Blackwood, NJ 08012

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1954
Gross Floor Area (ft²): 41,504

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	629,146
Natural Gas (kBtu)[4]	1,037,445
Total Energy (kBtu)	1,666,591

Energy Intensity[4]

Site (kBtu/ft²/yr)	40
Source (kBtu/ft²/yr)	77

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	144

Electric Distribution Utility
Atlantic City Electric Co [Pepco Holdings Inc]

National Median Comparison

National Median Site EUI	104
National Median Source EUI	244
% Difference from National Median Source EUI	-68%
Building Type	College/University (Campus-Level)

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.

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, Licensed Professional facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

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	Lincoln Hall	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	College/University (Campus-Level)	Is this an accurate description of the space in question?		☐
Location	College Drive, Blackwood, NJ 08012	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.		☐
Building (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	41,504 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	N/A(Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	N/A(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	N/A(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: Atlantic City Electric Co [Pepco Holdings Inc]

Fuel Type: Electricity

Meter: 83431473 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
03/26/2012	04/25/2012	13,783.19
02/26/2012	03/25/2012	13,422.16
01/26/2012	02/25/2012	15,279.00
12/26/2011	01/25/2012	13,107.67
11/26/2011	12/25/2011	13,474.80
10/26/2011	11/25/2011	14,724.13
09/26/2011	10/25/2011	14,162.81
08/26/2011	09/25/2011	18,434.73
07/26/2011	08/25/2011	17,699.55
06/26/2011	07/25/2011	18,718.31
05/26/2011	06/25/2011	16,681.30
83431473 Consumption (kWh (thousand Watt-hours))		**169,487.65**
83431473 Consumption (kBtu (thousand Btu))		**578,291.86**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**578,291.86**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: 514828 (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
03/24/2012	04/23/2012	477.92
02/24/2012	03/23/2012	1,109.31
01/24/2012	02/23/2012	2,256.07
12/24/2011	01/23/2012	2,727.58
11/24/2011	12/23/2011	1,443.45
10/24/2011	11/23/2011	636.95
09/24/2011	10/23/2011	101.87
08/24/2011	09/23/2011	0.00
07/24/2011	08/23/2011	0.00
06/24/2011	07/23/2011	0.00
05/24/2011	06/23/2011	807.56

514828 Consumption (therms)	**9,560.71**
514828 Consumption (kBtu (thousand Btu))	**956,071.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**956,071.00**
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
Lincoln Hall
College Drive
Blackwood, NJ 08012

Facility Owner
N/A

Primary Contact for this Facility
N/A

General Information

Lincoln Hall	
Gross Floor Area Excluding Parking: (ft^2)	41,504
Year Built	1954
For 12-month Evaluation Period Ending Date:	April 30, 2012

Facility Space Use Summary

Building	
Space Type	Other - College/University (Campus-Level)
Gross Floor Area (ft^2)	41,504
Number of PCs °	N/A
Weekly operating hours °	N/A
Workers on Main Shift °	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 04/30/2012)	**Baseline** (Ending Date 04/30/2012)	**Rating of 75**	**Target**	**National Median**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	40	40	0	N/A	104
Source (kBtu/ft²)	77	77	0	N/A	244
Energy Cost					
$/year	$ 27,208.65	$ 27,208.65	N/A	N/A	$ 70,478.20
$/ft²/year	$ 0.66	$ 0.66	N/A	N/A	$ 1.71
Greenhouse Gas Emissions					
$MtCO_2e$/year	144	144	0	N/A	373
$kgCO_2e/ft^2$/year	3	3	0	N/A	8

More than 50% of your building is defined as College/University (Campus-Level). This building is currently ineligible for a rating. Please note the National Median column represents the CBECS national median data for College/University (Campus-Level). This building uses 68% less energy per square foot than the CBECS national median for College/University (Campus-Level).

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