CAMDEN COUNTY COLLEGE
PAPIANO GYM
ENERGY ASSESSMENT

for

NEW JERSEY
BOARD OF PUBLIC UTILITIES

CHA PROJECT NO. 24364

November 2012

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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 Papiano Gym	200 College Drive Building 7 Blackwood, New Jersey	40,000	Original: 1974

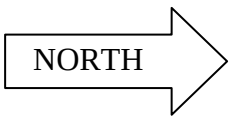
The Energy Conservation Measures (ECMs) identified in this report will allow for a more efficient use of energy and if pursued have the opportunity to qualify for the New Jersey SmartStart Buildings Program. Potential annual savings of $16,700 for the recommended ECMs may be realized with a payback of 7.3 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	186,800	4,800	>20	4,000	>20	
2	Replace Domestic Hot Water Storage Tank and Heat Exchanger	73,700	3,800	19.4	240	19.3	
3	HVAC Install Variable Speed Drive, High Efficiency Motor	22,400	3,800	5.9	4,000	4.8	X
4	HVAC Demand Control Ventilation	15,000	700	>20	0	>20	
5	Building Automation System Upgrade / Re-Commission	20,000	4,800	4.2	0	4.2	X
6	Install Vending Miser	200 (per unit)	200 (average)	1.0	0	1.0	X
7	Replace Rooftop Exhaust Fans	6,300	1,100	5.7	0	5.7	X
8	Replace Domestic Hot Water Pumps	300 (per unit)	200 (per unit)	1.6	0	1.6	X
9	Replace Windows	36,600	200	>20	0	>20	
10	Lighting Replacement Upgrades	69,700	4,800	14.5	1,400	14.2	X
11	Install Lighting Controls (Occupancy Sensors)	3,500	3,600	1.0	520	0.8	X
12	Lighting Replacements with Lighting Controls (Occupancy Sensors)	73,200	6,600	11.1	1,900	10.8	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.

The Papiano Gym building located on the Camden County College campus in Blackwood, NJ, is a 40,000 square foot mainly single story steel and masonry structure with brick veneer. The building contains a basketball court/gym, fitness center, weight room, swimming pool, shower/locker rooms, a handball court, a racquet ball court, a training room, classrooms, equipment storage, athletic department offices and other support areas. The pool and associated locker rooms are currently abandoned and not being used; therefore, this area will not be included in the assessment. The basketball court/gym and swimming pool areas are taller high bay areas than the remainder of the single story structure. A HVAC air handling unit is located in a mechanical room; hot water utility for HVAC equipment is piped from the central plant building boilers. The building was constructed in 1974, and has had no major renovations. 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 1974, the Papiano Gym building is a 40,000 square foot mainly single story brick structure, containing basketball court/gym, fitness center, weight room, swimming pool, shower/locker rooms, a handball court, a racquet ball court, a training room, classrooms, equipment storage, athletic department offices and other support areas. The pool area, related locker rooms and related equipment are currently abandoned and not being used; therefore, equipment in this area will not be included in the assessment. Two main entrances are glass doors in metal frame that open into a long lobby on the east and west sides of the building; additional exterior doors are on the south face of the building.

The Papiano Gym building 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 a brick veneer. Insulation is minimal and not very effective. The majority of the interior walls are painted block or concrete walls. The building has a flat roof system comprised of a structural steel framing with a metal deck having rigid foam board insulation. The rooftop has a light-colored asphalt roll roof system. Windows are minmal (<25% on walls where used), and only occur on the west façade of the building; they are double pane set in metal frames with tint. The building has exposed walls facing the north, east, south and west directions; the mainly single story building has a height of 16'; the basketball court/gym and pool areas have a height of 20' (see photo above). All spaces are first floor areas that have concrete slab-on-grade floors.

3.2 Utility Usage

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

The facility receives electricity from the main electric meter, which does not currently utilize any sub-metering. Electricity usage was determined as a percentage of total square footage of all the buildings contained on the meter. From June 2011 through April 2012, the electric usage for the building was approximately 389,865 kWh at a cost of about $52,058. 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. From June 2011 through April 2012, the library had an estimated electricity demand of 138 kW

The facility receives natural gas from the main natural gas meter. Usage was determined as a percentage of the total square footage of all the buildings included on the meter. From July 2011 through May 2012, gas-fired equipment consumed about 58,276 therms of natural gas. Based on the annual cost of $21,522

the blended price for natural gas was $0.80 per therm. Natural gas consumption was highest in winter months for heating.

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 less cost to the library than having Atlantic City Electric for both supply and delivery (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 Meter Electric Supply Costs – Hess vs Atlantic City Electric

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 Papiano Gym. Specifics on the mechanical equipment can be found within the equipment inventory located in Appendix B.

3.3.1 Heating Hot Water System

The Central Power Plant hot water system operates year round to provide heating hot water for HVAC systems and domestic hot water systems in the Papiano Gym, Truman Hall and Taft Hall. The boilers are piped to a primary loop pumping system with three 15 HP pumps that operate in lead-lag also located in the Central Power Plant mechanical room; one ¾ HP pump in Papiano Gym itself circulates the hot water within the building. All pumps are constant volume with standard efficiency motors, and hot water is provided to air handling units, fan coil units, duct mounted hot water coils, hot water cabinet unit heaters and domestic hot water in the Papiano Gym. AHU and terminal equipment piping use 3-way control valves for capacity control. Hot water system piping and valves appear to be insulated. The overall condition of the hot water system equipment in the Central Power Plant was mostly fair. During our field inspection, one of the three boilers was operational just to provide domestic hot water for the connected buildings; this is highly inefficient. The three buildings utilizing Central Power Plant hot water system should be de-coupled in the same way other campus buildings have been previously.

3.3.3 Package Cooling and Heating Air Handling Units

Five 1973 hot water heating AHUs are located in two separate mechanical rooms. Each AHU contains a hot water heating coil, return, relief/exhaust, and outside air; the units are ducted to the supply and return duct systems above the ceiling. Three heating and ventilation only air handling units serve the gym/basketball courts, related offices, lockers and support spaces (AHU-1, AHU-2, AHU-3). Although there are no savings to be realized from replacing these units, it is recommended they be replaced through attrition with modern units having supply fan variable speed drives.

The natatorium portion of the gym has been abandoned and is no longer in use; therefore, the HVAC equipment serving this area is not included in the ECM assessments in this report.

Six fan coil units serve the office areas and two classrooms in the building.

3.3.4 Fan Coil Units with Hot Water Heating

The offices area and the two classrooms in the building are heated by approximately six horizontal ceiling mounted, ducted fan coil units (FCUs). Outside air duct is connected to the return duct of each FCU for ventilation and hot water coils provide heating. Fan coil units are controlled by individual wall mounted thermostats in each space.

3.3.5 DX Cooling Split System Units

Two split system DX cooling air conditioners with indoor air handlers were installed recently to serve the athletic equipment room. The condensing units are located outside on grade near the area/space being served.

3.3.6 Duct Mounted Hot Water Heating Coils

Lobbies, corridors and some spaces are heated by duct mounted hot water heating coils (HC), and controlled by wall mounted thermostats. Other HVAC equipment (AHUs) provides ventilation and outside air for these spaces.

3.3.7 Hot Water Unit Heaters

Two lobby areas are heated by recessed ceiling mounted cabinet electric unit heater controlled by space a thermostat.

Two corridors on the south side of the Gym/Basketball courts are heated by ceiling mounted hot water cabinet unit heaters controlled by space thermostats. The building electrical equipment room and mechanical rooms are heated by wall mounted hot water unit heaters with fans, controlled by space thermostats.

3.3.8 Exhaust Systems

The gyms, racquet ball courts, lockers, storage rooms, mechanical rooms and other spaces have dedicated exhaust fans. Exhaust fans are used for ventilation, and are typically located on the roof.

Exhaust system fans operate stand alone, and generally operate during building occupancy.

3.4 Control Systems

The building HVAC equipment is controlled by standalone pneumatic controls; there is no central BAS interface. The system consists of original, outdated 1974 pneumatic field devices and components which have become hard to replace and maintain.

Previous occupants added supplemental cooling to small rooms. 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 uses 40 watt T-12 fixtures, 60 watt incandescent fixtures, 32 watt T-8 fixtures, and metal halide high bay fixtures are used in the gym. The primary means of control for the lights are switches that are manually operated by the staff.

The exterior lighting consists of 100 watt high pressure sodium fixtures and 400 watt metal halide fixtures that are wall mounted on the exterior walls of the building.

3.6 Plumbing Systems

3.6.1 Domestic Hot Water System

The gym mechanical room contains one 2000 gallon B&G domestic hot water storage tank with a heat exchanger which is connected to the Central Power Plant hot water system; this serves the entire Papiano Gym. Hot water is provided to lavatories, showers,and mop sinks. The majority of hot water piping appears to be insulated. Hot water demand is mainly for the locker room showers. Domestic hot water temperature is maintained at 130°F, and chemical disinfection soap is provided at the toilet rooms.
During the summer, one of the three main boilers in the Central Power Plant remains operational generating 180°F hot water to make the required 130°F domestic hot water for the gym. It was observed that summer usage of the gym and locker rooms is very light.

3.6.2 Plumbing Fixtures

The building's lavatories, water closets, and urinals are original, and require upgrades. These should be replaced during the next renovation with lavatories having 0.5 GPM low flow faucets, 1.6 GPF water closets and .75 GPF urinals.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 HVAC Condensing Boiler Addition

The building is heated with hot water supplied by the Central Power Plant building cast iron gas fired boilers from 1985. The boilers are non-condensing and have an estimated combustion efficiency of 75%. Due to the remote location of the Central Power Plant, and old underground, poorly insulated piping, it can be assumed that an additional 10% of system losses will occur.

Due to the low efficiency of the existing boilers and piping system, an evaluation was performed for adding high efficiency condensing boilers to provide the heating hot water for the building year-round, and to decouple the Gym from the Central Power Plant. The savings will be achieved during the entire year by operating more efficient equipment and eliminating system losses inherent in piping hot water under ground in old distribution piping.

In addition to providing hot water heating, the new condensing boilers could be used to provide domestic hot water year round, thereby eliminating the large storage tank.

The boiler fuel consumption was calculated from the natural gas used annually for the entire year 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 150,000 therms and $119,900.

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 kWh	Electric kW	Nat Gas Therms	Total $						
$					$	$		$	Years	Years
186,800	0	0	6,000	4,800	0	4,800	(0.4)	4,000	>20	>20

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

This measure is recommended.

4.2 ECM-2 Domestic Hot Water Storage Tank and Heat Exchanger with Condensing boilers

The building has one 2,000 gallon domestic hot water storage tank using hot water from the Central Power Plant. One boiler needs to remain operational even during the summer to generate domestic hot water for the Gym. During periods of little or no domestic hot water use, the storage tank must still heat the water within their storage tank, and the older in-efficient boiler must remain operational. Energy required maintaining the 2,000 gallons of hot water temperature setpoint during times of zero demand is known as standby losses; replacing this storage tank to with higher efficiency natural gas units and decoupling the building from the Central Power Plant 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 a reduced 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 57,000 therms and $45,500.

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

ECM-2 Replace Domestic Hot Water Storage Tank and Heat Exchanger with Condensing Boilers

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
73,700	0	0	4,750	3,800	0	3,800	(0.4)	240	19.4	19.3

* 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 Install Variable Speed Drives, High Efficiency Motors

The hot water system is served by one 5.0 HP pump (P-6). The pump is constant volume pump with a standard efficiency motor.

Two heating and ventilation AHUs having constant volume supply fans serve the main gym/basketball court (AHU-1,2 15 HP supply fan), and the pool (AHU-3, 7.5 HP supply fan). AHU-3 has been abandoned in place and is no longer used; therefore, it is not part of this ECM assessment.

Larger motors that operate pumps and fans continuously consume significant electrical energy. The hot water system pumps and AHUs serving these spaces operate at a constant speed (water and air flows) even though the building load does not require all the flow to maintain temperatures. By adding VFDs and inverter duty high efficiency motors, and reducing the flow (by slowing the motors down), significant electrical energy can be saved. Pressure actuated controllers are used to measure the water differential pressure in the hydronic systems and as valves close, the system pressure increases and pump speed is reduced. Space temperature sensors will be used to control the air flow of the fans based on space temperatures as the current ducted distribution systems are not variable volume systems.

For AHU-1,2 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-3 which addresses the addition of premium efficiency motors and variable speed drives.

The assumption of this calculation is that the operating hours, motor horsepower, and capacity stay the same. The energy savings are realized from operating higher efficiency motors and reducing power draw with the variable speed drives.

Motors and variable speed drives have an expected life of 20 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 572,000 kWh and $75,200.

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

ECM-3 HVAC Install Speed Frequency Drives, High Efficiency Motors

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
22,400	28,600	0	0	3,800	0	3,800	2.4	4,000	5.9	4.8

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

This measure is recommended.

4.4 ECM-4, HVAC Demand Control Ventilation

A packaged air handling unit serves the gym/basketball courts (AHU-1). It is assumed the unit provided the original specified outdoor air volume. 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 sensor to monitor 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 62-2010, 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 AHU-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-3 and ECM-4 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 from 30% to 10% . The energy savings are the differences in thermal energy and motor horse power electricity usage.

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 100,800 kWh and $13,200.

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

ECM-4 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
15,000	5,600	0	0	700	0	700	(0.1)	0	>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.

4.5 ECM-5 HVAC Building Automation System Upgrade/Re-commissioning

The existing mixed pneumatic and electronic control 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 replacement and 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:

- Replace 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 74,000 kWh, 2,000 therms and $11,300. 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-5 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
20,000	9,360	0	4,430	4,800	0	4,800	(1.0)	0	4.2	4.2

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

This measure is recommended.

4.6 ECM-6 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 Papiano Gym 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-6 Install Vending Miser

Vending Type	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
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.

4.7 ECM-7 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 9,680 CFM which will result in 194 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-7 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
6,300	1,860	0	70	300	0	300	(0.1)	0	>20	>20

* 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 Replace Domestic Hot Water Pumps

Maintenance personnel at the Papiano Gym 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 CIM 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-8 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	1.5	1.5

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

This measure is recommended.

4.9 ECM-9 Replace Windows

The buildings existing windows are from the original construction of the building in 1974. There are approximately 12 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-9 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
36,600	170	0	250	200	0	200	(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.

4.10 ECM-10 Lighting Replacement Upgrades

The building utilizes 4 foot 40W T-12 fluorescent bulbs with magnetic ballasts. The high bay fixtures have 400 watt metal halide lamps. 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 six 400 watt metal halide wall pack fixtures, and seven 200 watt high pressure sodium pole fixtures. The exterior fixtures are utilized for building lighting during nighttime hours and are in operation from sun down until sun up. Alternative LED lighting solutions are available to replace these fixtures that will reduce the total wattage to 78 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 30,300 kWh with an electrical demand reduction of about 17 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 454,500 kWh and $72,500.

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

ECM-10 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
69,700	30,300	17	0	4,800	0	4,800	0.0	1,400	14.5	14.2

* 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-12.

4.11 ECM-11 Lighting Controls Installation

The current lighting is controlled by manual switches. Lights are generally controlled by manual switches controlled 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 408,000 kWh and $53,600.

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

ECM-11 Lighting Controls Installation (Occupancy Sensors)

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
3,500	27,200	0	0	3,600	0	3,600	14.3	520	1.0	0.8

* 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-12.

4.12 ECM-12 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-5 and ECM-6 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 682,500 kWh and $99,600.

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

ECM-12 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 kWh	Electric kW	Nat Gas Therms	Total $						
$					$	$		$	Years	Years
73,200	45,500	20	0	6,600	0	6,600	0.4	1,900	11.1	10.8

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

This measure is recommended.

4.13 System Improvement Opportunities

The following items can be implemented by the owner to provide additional energy savings:

- It is recommended that vending misers be added to all college owned vending machines. It is also recommended the school requests vendor owned machines be upgraded or removed if they are not high efficiency equipment.

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 150 kW.

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 F.

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 207 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. 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 F and summarized as follows:

Photovoltaic (PV) Rooftop Solar Power Generation – 207 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
$828,000	0.0	248,536	0	32,600	32,600	0	29,800	>25	13.3

* 30% federal tax credit
** Solar Renewable Energy Certificate Program (SREC) for 2012 is $120/1000kwh

This measure is not recommended due to long payback time 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, the gym had an estimated electricity demand of 140 kW.

This measure is not recommended because 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 Papiano Gym	National Average
EPA Score	N/A	50
Site (kBtu/sf/year)	63	39
Source (kBtu/sf/year)	208	100

The Papiano Gym 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.
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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-3	HVAC Install Variable Speed Drive, High Efficiency Motor	22,400	3,800	5.9	4,000	4.8	X
5	Building Automation System Upgrade / Re-Commission	20,000	4,800	4.2	0	4.2	X
6	Install Vending Miser	200 (per unit)	200 (average)	1.0	0	1.0	X
7	Replace Rooftop Exhaust Fans	6,300	1,100	5.7	0	5.7	X
8	Replace Domestic Hot Water Pumps	300 (per unit)	200 (per unit)	1.6	0	1.6	X
12	Lighting Replacements with Lighting Controls (Occupancy Sensors)	73,200	6,600	11.1	1,900	10.8	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

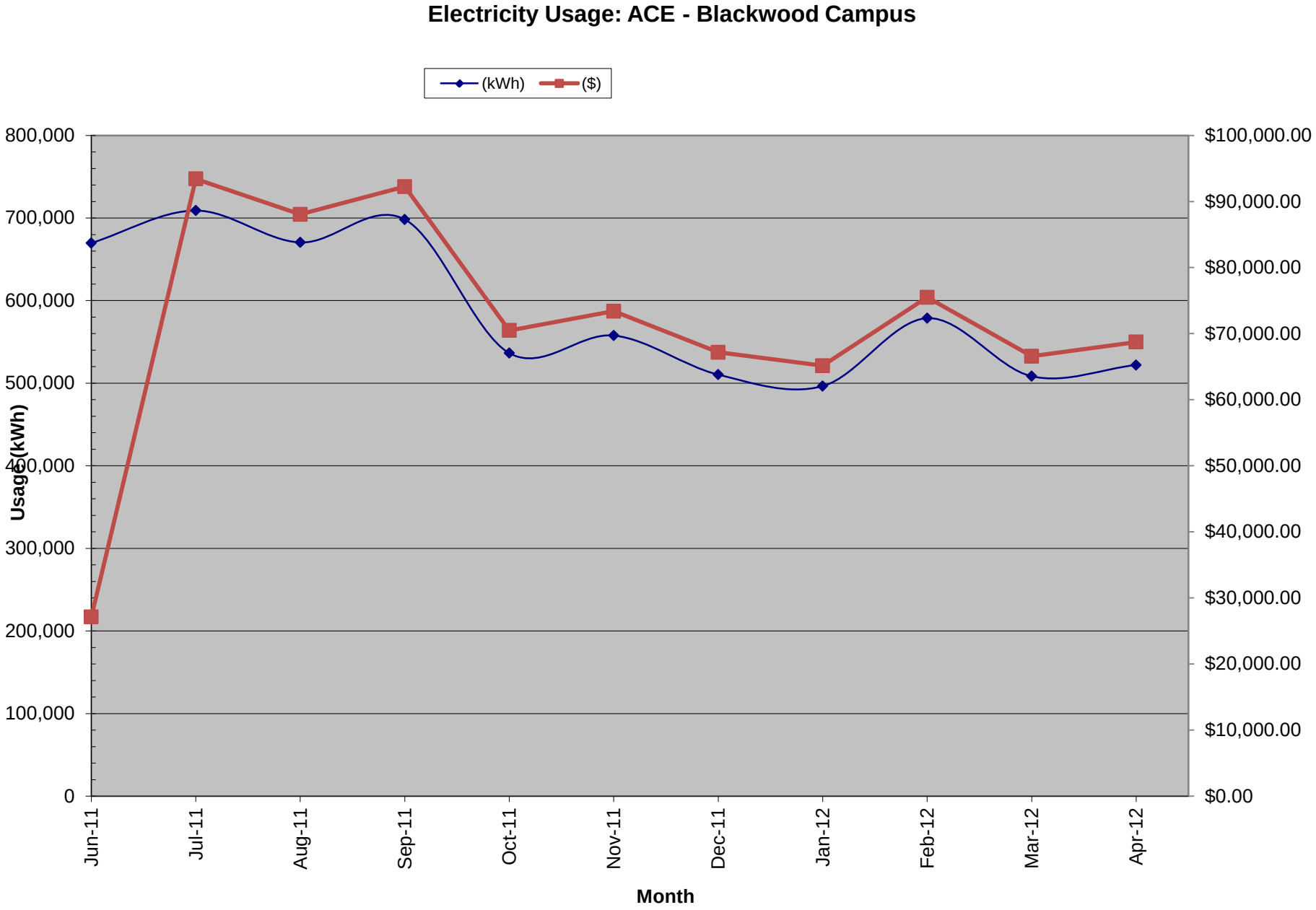
Building Name	~Electrical Consumption	Cost
Building		$ -
Taft Hall	580,947.75	$ 76,355
Truman Hall	580,947.75	$ 76,355

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
Papiano Gym
Original Construction Date: 1974
Renovation/Addtion Date:

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.
P-1 P-2 P-3 P-4 P-5	5	B&G	P-1: Series 60 2"AA P-2: Series 60 2"AA P-3: Series 75 P-4: Series 60 2"AA P-5: Series 50	NOT AVAILABLE	AHUs HW Coil Circulators / Electric	Fractional HP to 2 HP Max. / 1750 HP / Standard Efficiency	At AHU Hot Water Coil	Papiano Gym / At AHU Hot Water Coil	1973	-24	Original Equipment, Fair Condition
P-6, Hot Water Pump	1	Pacific Pumping Co.	1270-5	NOT AVAILABLE	HVAC Heating Hot Water Circulator / Electric	5 HP / 1750 RPM / Standard Efficiency	Mechanical Mezzanine	Papiano Gym / Heating Hot Water Loop	1973	-24	Original Equipment, Fair Condition
P-7, Chilled Water Pump	1	B&G	Series 60 2"AA	NOT AVAILABLE	HVAC Cooling Chilled Water Circulator / Electric	3/4 HP / 1750 RPM / Standard Efficiency	Mechanical Mezzanine	Papiano Gym / Cooling Chilled Water Loop	1973	-24	Original Equipment, Fair Condition
DHWT	1	Patterson Keller	225910	NOT AVAILABLE	DHW Hot Water Heating / Heat Exchanger	2000 gal / 140 °F	Mechanical Mezzanine	Papiano Gym / Potable Domestic Water	1973	-19	Shell & Tube HX from Main Plant HW
P-8	1	Pacific Pumping Co.	11-12705-632201	FJM20606	DHW Building Circulation Pump / Electric	5 HP / 3515 RPM / Standard Efficiency 89.5%	Mechanical Mezzanine	Papiano Gym / Domestic Hot Water Cirulator to Building	1973	-4	Original Equipment, Fair Condition
DHW HX	1	B&G	WG-07-40	NOT AVAILABLE	Domestic Hot Water Heat Exchanger / Plant Hot Water	35 GPM / EWT: 40°F, LWT: 140°F / 1750 MBH	Mechanical Mezzanine	Papiano Gym / Domestic Hot Water Storage Tank	1973	-19	Orignal Equip, Shell & Tube HX
P-9	1	B&G	Series 60 2"AA	NOT AVAILABLE	DHW HX Circulation Pump / Electric	1.5 HP / 1750 RPM / Standard Efficiency	Mechanical Mezzanine	Papiano Gym / Hot Water Circulator to Plant	1973	-4	Original Equipment, Fair Condition
P-10	1	B&G	Series 60 2"AA	NOT AVAILABLE	DHW HX Circulation Pump / Electric	1/6 HP / 1750 RPM / Standard Efficiency	Mechanical Mezzanine	Papiano Gym / DHW Storage Tank Circulator	1973	-4	Original Equipment, Fair Condition
P-11	1	B&G	Series 60 1.5"AA	NOT AVAILABLE	Pool Area Slab Circulation / Electric	1/12 HP / 1750 RPM / Standard Efficiency	Mechanical Mezzanine	Papiano Gym / Pool Slab Heating Circulator	1973	-4	Original Equipment, Fair Condition
P-12	1	Pacific Pumping Co.	ASM-5	NOT AVAILABLE	HVAC Heating Hot Water Circulator / Electric	1/2 HP / 1750 RPM / Standard Efficiency	Pool Equipment Room	Papiano Gym / Pool Room Sump Pump	1973	-24	Original Equipment, Fair Condition
AHU-1	1	TRANE	T-50	KUA252974	HVAC / Hot Water Heating & Ventilation Unit	40,000 CFM / HTG: 1,382 MBH / 15 HP SF Standard Efficiency	Penthouse Mechanical Room	Gym (Basketball Courts)	1973	-19	Original Equipment, Fair Condition
AHU-2	1	TRANE	T-8	K3L248167	HVAC / Hot Water Heating & Ventilation Unit	5,800 CFM / HTG: 219 MBH / 3.0 HP SF Standard Efficiency	Penthouse Mechanical Room	Gym (Basketball Courts)	1973	-15	Original Equipment, Fair Condition
AHU-3	1	TRANE	T-6	K3M248166	HVAC / Hot Water Heating & Ventilation Unit	3,600 CFM / HTG: 137 MBH / 2.0 HP SF Standard Efficiency	Penthouse Mechanical Room	Gym (Basketball Courts)	1973	-19	Original Equipment, Fair Condition
AHU-4	1	TRANE	T-41	K4A252975	HVAC / Hot Water Heating & Ventilation Unit	28,000 CFM / HTG: 816 MBH / 7.5 HP SF Standard Efficiency	Penthouse Over Pool	Pool	1973	-19	Pool Abandoned, Equipment Not Used

New Jersey BPU Energy Audit Program
CHA #24364
Camden County College
Papiano Gym
Original Construction Date: 1974
Renovation/Addtion Date:

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.
AHU-5	1	TRANE	T-6	K3L248168	HVAC / Hot Water Heating & Ventilation Unit	2,000 CFM / HTG: 151 MBH / 1.0 HP SF Standard Efficiency	Penthouse Over Pool	Pool	1973	-19	Original Equipment, Fair Condition
FC	~6	Modine	x/OM (from original schedules)	NOT AVAILABLE	HVAC / Chilled Water Cooling, Hot Water Heating	Various Heating and Cooling Capacities, Fractional HP fan motors	Above Ceiling of Area Served	Gym Offices, Lockers and Classrooms	1973	-19	Original Equipment, Fair Condition
HC	~15	Modine	NOT AVIALABLE	NOT AVAILABLE	HVAC / Hot Water Heating	Various Heating Capacities, Duct Mounted Heating Coils	Above Ceiling of Area Served	Gym Handball Court, Racquet Ball Court, Storage Areas, Lobby, Restrooms, etc.	1973	-19	Original Equipment, Fair Condition
UH	~5	Modine	CR-3 HS-60	NOT AVAILABLE	HVAC / Hot Water Heating	330 CFM, 700 CFM / Cabinet Unit Heaters Fractional HP Motors	Above Ceiling of Area Served	Lobbies to South of the Gym/Basketball Courts, Electrical Equipment Room and Mechanical Rooms	1973	-19	Original Equipment, Fair Condition
AC-1	1	Fujitsu	NOT AVIALABLE	NOT AVAILABLE	HVAC / DX Electric Cooling	800 CFM CLG: 24 MBH 1/8 HP SF	In Space Being Served	Athletic Equipment Room	Recent	-	Good Condition
AC-2	1	Fujitsu	NOT AVIALABLE	NOT AVAILABLE	HVAC / DX Electric Cooling	800 CFM CLG: 18 MBH 1/8 HP SF	In Space Being Served	Athletic Equipment Room	Recent	-	-

Energy Audit of Camden County College (Papiano Gym)

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
11A	Room 103	14	**4' 2-LAMP T-12**	F42EL	60	0.84	SW	2500	None	2,100	
11A	Natatorium	2	**4' 2-LAMP T-12**	F42EL	60	0.12	SW	2500	None	300	
227	Natatorium	8	**W60CF1**	F81EL	60	0.48	SW	2500	None	1,200	
11A	Hallway	63	**4' 2-LAMP T-12**	F42EL	60	3.78	SW	2125	C-OCC	8,033	
71	Old Men's Locker Room	4	**I 60**	I60/1	60	0.24	SW	2125	C-OCC	510	
111A	Display Case	4	**4' 1-LAMP T-12**	F41EL	32	0.13	SW	2125	C-OCC	272	
11A	Room 102 Classroom	14	**4' 2-LAMP T-12**	F42EL	60	0.84	SW	2500	None	2,100	
11A	Women's Bathroom	5	**4' 2-LAMP T-12**	F42EL	60	0.30	SW	2125	OCC	638	
111A	Women's Locker Room	22	**4' 1-LAMP T-12**	F41EL	32	0.70	SW	2125	OCC	1,496	
71	Women's Locker Room	12	**I 60**	I60/1	60	0.72	SW	2125	OCC	1,530	
11A	Women's Locker Room Bathroom	4	**4' 2-LAMP T-12**	F42EL	60	0.24	SW	2250	C-OCC	540	
11A	Women's Team Room	6	**4' 2-LAMP T-12**	F42EL	60	0.36	SW	2250	C-OCC	810	
111A	Storage Room	6	**4' 1-LAMP T-12**	F41EL	32	0.19	SW	2125	OCC	408	
11A	Entry Outer Room	3	**4' 2-LAMP T-12**	F42EL	60	0.18	SW	2125	OCC	383	
169	Gym (Basketball Court)	45	**SP 250 MH ROOF**	MH250/1	295	13.28	SW	2125	OCC	28,209	
11A	Room 135 - Fitness Center	12	**4' 2-LAMP T-12**	F42EL	60	0.72	SW	2000	OCC	1,440	
11A	Room 135 - Fitness Center	27	**4' 2-LAMP T-12**	F42EL	60	1.62	SW	2125	OCC	3,443	
11A	Men's Entrance	9	**4' 2-LAMP T-12**	F42EL	60	0.54	SW	2125	OCC	1,148	
111A	Sorage Space Gym	9	**4' 1-LAMP T-12**	F41EL	32	0.29	SW	2125	OCC	612	
111A	Mechanical Mezzanine	15	**4' 1-LAMP T-12**	F41EL	32	0.48	SW	2125	OCC	1,020	
11A	Handball Court	13	**4' 2-LAMP T-12**	F42EL	60	0.78	SW	2125	OCC	1,658	
180	Training Room	3	**T 32 R F 4 (ELE)**	F44ILL	112	0.34	SW	2125	OCC	714	
175A	Training Room	4	**4' 2-LAMP T-8 (32W)**	F42ILL	32	0.13	SW	2125	OCC	272	
180	Office - Basketball	2	**T 32 R F 4 (ELE)**	F44ILL	112	0.22	SW	2125	OCC	476	
175A	Office - Basketball	1	**4' 2-LAMP T-8 (32W)**	F42ILL	32	0.03	SW	2500	None	80	
175A	Office - Softball	2	**4' 2-LAMP T-8 (32W)**	F42ILL	32	0.06	SW	2125	OCC	136	
204	Laundry Room	3	**S 96 P F 2 (MAG) 8'**	F82EHE	207	0.62	SW	2125	OCC	1,320	
111A	Athletic Equipment Room	2	**4' 1-LAMP T-12**	F41EL	32	0.06	SW	500	None	32	
11A	Athletic Equipment Room	5	**4' 2-LAMP T-12**	F42EL	60	0.30	SW	2125	OCC	638	
111A	Athletic Equipment Room	9	**4' 1-LAMP T-12**	F41EL	32	0.29	SW	2500	None	720	
71	Athletic Equipment Room	2	**I 60**	I60/1	60	0.12	SW	2500	None	300	
11A	Athletic Equipment Room	3	**4' 2-LAMP T-12**	F42EL	60	0.18	SW	2500	None	450	
11A	Men's Staff Locker Room	6	**4' 2-LAMP T-12**	F42EL	60	0.36	SW	2125	OCC	765	
11A	Toilet Room	3	**4' 2-LAMP T-12**	F42EL	60	0.18	SW	1063	None	191	
111A	Public Men's Locker Room	33	**4' 1-LAMP T-12**	F41EL	32	1.06	SW	2125	OCC	2,244	
180	Shower Room	2	**T 32 R F 4 (ELE)**	F44ILL	112	0.22	SW	1063	None	238	
11A	Toilet Room	5	**4' 2-LAMP T-12**	F42EL	60	0.30	SW	1063	None	319	
111A	Physiology Room	7	**4' 1-LAMP T-12**	F41EL	32	0.22	SW	2125	OCC	476	
11A	Room 116 - Athletic Office	8	**4' 2-LAMP T-12**	F42EL	60	0.48	SW	500	None	240	
11A	Room 121 - Athletic Office	4	**4' 2-LAMP T-12**	F42EL	60	0.24	SW	500	None	120	
11A	Room 119 - Athletic Office	4	**4' 2-LAMP T-12**	F42EL	60	0.24	SW	500	None	120	
11A	Room 116 - Athletic Office	4	**4' 2-LAMP T-12**	F42EL	60	0.24	SW	2125	OCC	510	
11A	Room 117 - Athletic Office	4	**4' 2-LAMP T-12**	F42EL	60	0.24	SW	1063	None	255	
11A	Room 100B - Athletic Office	8	**4' 2-LAMP T-12**	F42EL	60	0.48	SW	2125	OCC	1,020	
11A	Room 118 - Athletic Office	8	**4' 2-LAMP T-12**	F42EL	60	0.48	SW	1063	None	510	

Energy Audit of Camden County College (Papiano Gym)

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
11A	Server Room	1	**4' 2-LAMP T-12**	F42EL	60	0.06	SW	2250	None	135	
11A	Men's Bathroom	3	**4' 2-LAMP T-12**	F42EL	60	0.18	SW	2250	None	405	
180	Men's Bathroom	4	**T 32 R F 4 (ELE)**	F44ILL	112	0.45	SW	500	None	224	
141A	Exterior	7	**HPS 200**	HPS200/1	250	1.75	SW	520	None	910	
146	Exterior	6	**High Bay MH 400**	MH400/1	458	2.75	SW	520	C-OCC	1,429	
	Total	**450**				**39.11**				**73,095**	

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	186,800	4,800	38.9	4,000	38.1	
ECM-2	Replace Domestic Hot Water Storage Tank and Heat Exchanger	73,700	3,800	19.4	240	19.3	
ECM-3	HVAC Install Speed Frequency Drives, High Efficiency Motors	22,400	3,800	5.9	4,025	4.8	X
ECM-4	HVAC Demand Control Ventilation	15,000	700	21.4	0	21.4	
ECM-5	Upgrade / Recommission BAS System	20,000	4,800	4.2	0	4.2	X
ECM-6	Install Vending Machine Occupancy Sensors	600	600	1.0	0	1.0	X
ECM-7	Replace Rooftop Exhaust Fans with High Efficiency Units	6,270	300	20.9	0	20.9	
ECM-8	Replace Domestic Hot Water Pumps	328	200	1.6	0	1.6	X
ECM-9	Replace Windows	36,600	200	183.0	0	183.0	
ECM-10	Lighting Replacement Upgrades	69,700	4,800	14.5	1,356	14.2	X
ECM-11	Lighting Controls Installation (Occupancy Sensors)	3,500	3,600	1.0	520	0.8	X
ECM-12	Lighting Replacements with Lighting Controls (Occupancy Sensors)	73,200	6,600	11.1	1,876	10.8	X

Camden County College Blackwood Campus- NJBPU
CHA Project #24364
Papiano Gym

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	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
186,800	0	0	6,000	4,800	0	4,800	(0.4)	4,000	>20	>20

ECM-2 Replace Domestic Hot Water Storage Tank and Heat Exchanger

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
73,700	0	0	4,750	3,800	0	3,800	(0.4)	240	19.4	19.3

ECM-3 HVAC Install Speed Frequency Drives, High Efficiency Motors

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
22,400	28,600	0	0	3,800	0	3,800	2.4	4,025	5.9	4.8

ECM-4 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
15,000	5,600	0	0	700	0	700	(0.1)	0	>20	>20

ECM-5 Upgrade / Recommission BAS 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
20,000	9,360	0	4,430	4,800	0	4,800	1.4	0	4.2	4.2

ECM-6 Install Vending Machine 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
600	4,340	0	0	600	0	600	13.2	0	1.0	1.0

ECM-7 Replace Rooftop Exhaust Fans with High Efficiency Units

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
6,270	1,860	0	70	300	0	300	(0.1)	0	>20	>20

ECM-8 **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-9 **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
36,600	170	0	250	200	0	200	(0.8)	0	>20	>20

ECM-10 **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
69,700	30,300	17	0	4,800	0	4,800	0.0	1,356	14.5	14.2

ECM-11 **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
3,500	27,200	0	0	3,600	0	3,600	14.3	520	1.0	0.8

ECM-12 **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
73,200	45,500	20	0	6,600	0	6,600	0.4	1,876	11.1	10.8

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	40,000	Electric	Natural Gas
$ 0.119	$/kWh consumpti	389,865	0.00042021		$52,058	$21,522
$ 5.940	$/kW	138	0			
$ 0.80	$/Therm	58,276	0.00533471			
$ -	$/kgals	-	0			

Papiano Gym

	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	6,000	0	0	$ 4,800	$ 186,800	38.9	32.0	25	$ 4,000	Y	$ 75,000	$ 4,000	38.1	0	0	150,000	0	0	$ 119,900	(0.4)
ECM-2	Replace Domestic Hot Water Storage Tank and Heat Exchanger	0.0	0	4,750	0	0	$ 3,800	$ 73,700	19.4	25.3	12	$ 240	Y	$ 51,600	$ 240	19.3	0	0	57,000	0	0	$ 45,500	(0.4)
ECM-3	HVAC Install Speed Frequency Drives, High Efficiency Motors	0.0	28,600	0	0	0	$ 3,800	$ 22,400	5.9	12.0	20	$ 4,025	y	$ 15,700	$ 4,025	4.8	0	572,000	0	0	0	$ 75,200	2.4
ECM-4	HVAC Demand Control Ventilation	0.0	5,600	0	0	0	$ 700	$ 15,000	21.4	2.4	18			$ -	$ -	21.4	0	100,800	0	0	0	$ 13,200	(0.1)
ECM-5	Upgrade / Recommission BAS System	0.0	9,357	4,429	0	0	$ 4,800	$ 20,000	4.2	27.6	10			$ -	$ -	4.2	0	93,568	44,290	0	0	$ 47,700	1.4
ECM-6	Install Vending Machine Occupancy Sensors	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-7	Replace Rooftop Exhaust Fans with High Efficiency Units	0.2	1,856	74	0	0	$ 300	$ 6,270	20.9	1.2	20			$ -	$ -	20.9	4	37,110	1,471	0	0	$ 5,800	(0.1)
ECM-8	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-9	Replace Windows	0.0	173	250	0	0	$ 200	$ 36,600	183.0	1.4	30			$ -	$ -	183.0	0	5,194	7,501	0	0	$ 6,700	(0.8)
ECM-10	Lighting Replacement Upgrades	17.4	30,300	0	0	0	$ 4,800	$69,700	14.5	12.7	15	$ 1,356		$ -	$ 1,356	14.2	261	454,500	0	0	0	$ 72,500	0.0
ECM-11	Lighting Controls Installation (Occupancy Sensors)	0.0	27,200	0	0	0	$ 3,600	$3,500	1.0	11.4	15	$ 520		$ -	$ 520	0.8	0	408,000	0	0	0	$ 53,600	14.3
ECM-12	Lighting Replacements with Lighting Controls (Occupancy Sensors)	17.4	45,500	0	0	0	$ 6,600	$73,200	11.1	19.1	15	$ 1,876	Y	$ 51,200	$ 1,876	10.8	261	682,500	0	0	0	$ 99,600	0.4
	Total (Does Not Include ECM-6& ECM-7)	**17.7**	**96,612.0**	**15,502.5**	**0.0**	**0.0**	**25,800.0**	**434,897.5**	16.9		19	$ 10,141		$ 193,500	$ 10,141	16.5	**267.3**	**1,580,022**	**260,261**	**0**	**0**	**$ 425,100**	(0.0)
	Total Measures with Positive ROI	**17.4**	**74,100.0**	**0.0**	**0.0**	**0.0**	**10,400.0**	**95,600.0**	9.2		15.7142857	$ 5,901		$ 66,900	$ 5,901	8.6	**263.6**	**1,436,917**	**44,290**	**0**	**0**	**$ 234,000**	1.4
	% of Existing	**13%**	**25%**	**27%**	**0%**	**#DIV/0!**																	

$ 333,700

**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
Papiano Gym

ECM-1: HVAC Condensing Boiler Added

ECM Description Summary

Two (2) high efficiency condensing boilers will be added to provide heating to the building and decouple it from the central plantt hot water system. 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	20,486	Therms	Based on utility data from Juy 2011 to May 2012
Existing Boiler Plant Efficiency	65%		Estimated or Measured
Baseline Boiler Load	1,331,571	Mbtu/yr	Baseline Fuel Use x Existing Efficiency x 100 Mbtu/Therms
Baseline Fuel Cost	$ 16,370		
Proposed Boiler Plant Efficiency	92%		New Condensing Boilers Efficiency, (2) NG condensing boilers
Proposed Fuel Use	14,474	Therms	Baseline Boiler Load / Proposed Efficiency / 100 Mbtu/Therms
Proposed Fuel Cost	$ 11,566		
Annual Utility Savings	**6,000**	**Therms**	
Annual Savings	$ 4,800		
Boiler Addition Project Cost	**$ 186,800**		
Simple Payback	38.9	Years	

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Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-1: HVAC Condensing Boiler Added - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
2,000 MBH NG Condensing Boiler	2	EA	$ 40,000	$ 2,000		$ 88,000	$ 5,400	$ -	$ 93,400	
Flue Installation	25	LF	$ 75.0	$ 15.00		$ 2,063	$ 506	$ -	$ 2,569	
Reprogram DDC system	2	EA	$ 100.0	$ 350.00		$ 220	$ 945	$ -	$ 1,165	
Miscellaneous Electrical	2	LS	$ 500	$ 250		$ 1,100	$ 675	$ -	$ 1,775	
Miscellaneous HW Piping	2	LS	$ 2,000	$ 1,000		$ 4,400	$ 2,700	$ -	$ 7,100	
Boiler room/space construction	1	LS	$ 20,000	$ 10,000		$ 22,000	$ 13,500	$ -	$ 35,500	
						$ -	$ -	$ -	$ -	

$ 141,509	Subtotal
$ 14,151	10% Contingency
$ 31,132	20% Contractor O&P
$ -	0% Engineering
$ 186,800	**Total**

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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	**8,490**	Therms/yr	From utility bill for month of September when DHW is primary NG usage
Total Annual Utility Demand by Water Heater	849,044	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	65%		Old main boilers to heat exchanger to tank and under ground to gym
Total Annual Hot Water Demand (w/ standby losses)	551,878	MBTU/yr	
Existing Tank Size	2,000	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)	25.1	MBH	
Annual Standby Hot Water Load	220,095	MBTU/yr	
New Tank Size	600	Gallons	3 X 200 gallon Indirect storage tanks
Hot Water Piping System Capacity	20	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	130	˚F	
Room Temperature	70	˚F	
Standby Losses (% by Volume)	1.0%		
Standby Losses (Heat Loss)	3.1	MBH	
Annual Standby Hot Water Load	27,156	MBTU/yr	
Total Annual Hot Water Demand	358,939	MBTU/yr	
Proposed Avg. Hot water heater efficiency	96%		Dedicated condensing boiler for DHW production located at gym
Proposed Fuel Use	3,739	Therms	
Utility Cost	$0.80	$/Therm	
Existing Operating Cost of DHW	$6,785	$/yr	
Proposed Operating Cost of DHW	$2,988	$/yr	
Simple Payback	**19**		

Savings Summary:

Utility	Energy Savings Therms	Cost Savings
Therms/yr	**4,750**	**$3,797**

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Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-2: Replace large domestic hot water generator (from main boilers) with a Condensing Gas-Fired DHW Heater

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Hot water HX and existing DHW storage tank removal (possible asbestos abatement)	1	LS	$ 500	$ 5,000		$ 550	$ 6,750	$ -	$ 7,300	
High Efficiency Gas-Fired boiler	1	EA	$ 15,000	$ 7,500		$ 16,500	$ 10,125	$ -	$ 26,625	
200 gallon indirect storage tank	3	EA	$ 1,500	$ 1,000		$ 4,950	$ 4,050	$ -	$ 9,000	
Circulator pumps and re-circ pump	2	EA	$ 1,500	$ 1,000		$ 3,300	$ 2,700	$ -	$ 6,000	
Miscellaneous Electrical- wire boiler and pumps	1	EA	$ 500	$ 1,000		$ 550	$ 1,350	$ -	$ 1,900	
Venting Kit- PVC	1	EA	$ 500	$ 1,000		$ 550	$ 1,350	$ -	$ 1,900	
Miscellaneous Piping and Valves	1	LS	$ 1,000	$ 1,500		$ 1,100	$ 2,025	$ -	$ 3,125	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 55,850	Subtotal
$ 5,585	10% Contingency
$ 12,287	20% Contractor O&P
$ -	0% Engineering
$ 73,700	**Total**

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Papiano Gym

ECM-3A: 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

The current 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 variable 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 hot water system and as valves close (due to satisfying the load), 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-6	1	5.0	5.0	83.8%	93.6%	3.56	3.19
					Total:	3.56	3.19

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
92.5	74	34	0	0%	0	0.0	0%	0	0
87.5	72	131	0	0%	0	0.0	0%	0	0
82.5	69	500	0	0%	0	0.0	0%	0	0
77.5	67	620	0	0%	0	0.0	0%	0	0
72.5	64	664	0	0%	0	0.0	0%	0	0
67.5	62	854	0	0%	0	0.0	0%	0	0
62.5	58	927	0	0%	0	0.0	0%	0	0
57.5	53	600	0	0%	0	0.0	0%	0	0
52.5	47	610	610	53%	2,172	0.7	84%	475	1,697
47.5	43	611	611	58%	2,176	0.8	89%	579	1,597
42.5	38	656	656	64%	2,336	1.1	93%	747	1,589
37.5	34	1,023	1,023	69%	3,643	1.3	96%	1,388	2,255
32.5	30	734	734	75%	2,614	1.6	98%	1,179	1,435
27.5	25	334	334	81%	1,189	1.9	100%	631	558
22.5	20	252	252	86%	897	2.2	100%	561	336
17.5	16	125	125	92%	445	2.6	100%	325	120
12.5	11	47	47	97%	167	3.0	100%	142	25
7.5	6	22	22	100%	78	3.2	99%	72	6
2.5	2	13	13	100%	46	3.2	99%	42	4
-2.5	-3	0	0	0%	0	0.0	0%	0	0
-7.5	-8	0	0	0%	0	0.0	0%	0	0
		8,760	4,427		15,764			6,142	9,622

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	9,600	kWh
Annual Savings	$ 1,300	
Install Variable Speed Drives	$ 13,000	
- HW Pump Cost		
Simple Payback	10.0	Years

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Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-3A: Install Variable Speed Drives - HW Pump - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
5.0 HP VFD	1	ea	$ 1,485	$ 490		$ 1,634	$ 662	$ -	$ 2,295	
5.0 HP Motors	1	ea	$ 525	$ 85		$ 578	$ 115	$ -	$ 692	
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	
						$ -	$ -	$ -	$ -	

$ 9,825	Subtotal
$ 982	10% Contingency
$ 2,161	20% Contractor O&P
$ -	0% Engineering
$ 13,000	**Total**

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AIR HANDLER	AREA SERVED	FAN MOTOR HP
AHU-1	Gym/Baskettball Court	15.0

Total Combined Motor Horsepower: *15.0* *HP*

ECM-3B: Install Variable Speed Drives - AHU Fans

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
AHU-1	15.0	87.8%	93.0%	10.20	9.63		55.0
				10.20	9.63	**VFD Eff. (CC)**	98.5%

OAT - DB Avg Temp F	Bin Hours 120	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	10.2	0	50%	1.73	81.5%	0	0
97.5	3	1	1	10.2	9	50%	1.73	81.5%	2	7
92.5	34	10	10	10.2	103	50%	1.73	81.5%	21	82
87.5	131	39	39	10.2	398	50%	1.73	81.5%	83	315
82.5	500	149	149	10.2	1,517	50%	1.73	81.5%	315	1,202
77.5	620	185	185	10.2	1,881	50%	1.73	81.5%	391	1,490
72.5	664	198	198	10.2	2,015	50%	1.73	81.5%	419	1,596
67.5	854	254	254	10.2	2,591	50%	1.73	81.5%	539	2,053
62.5	927	276	276	10.2	2,813	50%	1.73	81.5%	585	2,228
57.5	600	179	179	10.2	1,821	50%	1.73	81.5%	379	1,442
52.5	610	182	182	10.2	1,851	52%	1.93	83.7%	419	1,432
47.5	611	182	182	10.2	1,854	57%	2.38	87.6%	494	1,361
42.5	656	195	195	10.2	1,991	61%	2.88	91.1%	618	1,373
37.5	1,023	304	304	10.2	3,104	66%	3.45	94.0%	1117	1,988
32.5	734	218	218	10.2	2,227	70%	4.07	96.3%	923	1,304
27.5	334	99	99	10.2	1,014	75%	4.76	98.2%	482	532
22.5	252	75	75	10.2	765	80%	5.51	99.5%	416	349
17.5	125	37	37	10.2	379	84%	6.34	100.0%	236	144
12.5	47	14	14	10.2	143	89%	7.23	100.0%	101	42
7.5	22	7	7	10.2	67	93%	8.19	100.0%	54	13
2.5	13	4	4	10.2	39	98%	9.23	99.6%	36	4
-2.5	0	0	0	10.2	0	100%	9.77	99.0%	0	0
-7.5	0	0	0	10.2	0	100%	9.77	99.0%	0	0
TOTALS		**2,607**	**2,607**	**235**	**26,582**				**7,628**	**18,954**

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	19,000	kWh
Annual Savings	$ 2,500	
Install Variable Speed Drives	$ 9,400	
- Air Handling Fan Cost		
Simple Payback	3.8	Years

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ECM-3B: Install Variable Speed Drives - AHU Fans - 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.		
15 HP VFD	1	ea	$ 1,925	$ 880		$ 2,118	$ 1,188	$ -	$ 3,306	
15 HP Motors	1	ea	$ 845	$ 150		$ 930	$ 203	$ -	$ 1,132	
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	

$ 7,085	Subtotal
$ 709	10% Contingency
$ 1,559	20% Contractor O&P
$ -	0% Engineering
$ 9,400	**Total**

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AIR HANDLER	AREA SERVED	FAN MOTOR HP	CFM	OA CFM
AHU-1	Gym/Basketball Courts	15.0	40,000	12,000
		15.0	*HP*	*12,000* *CFM*

ECM-4: HVAC Demand Control Ventilation

ECM Description Summary

It is assumed the original system controls provide the full design ventilation outside air flow. Reducing outside air during occupied time periods will reduce heating and cooling energy used during the occupied period. A limit of 1000 PPM of CO2 is recommended in ASHRAE Standard 62-1982, Ventilation for Acceptable Indoor Air Quality. During unoccupied periods the outside air dampers should be closed.

Electric Cost	$ 0.131	/kWh
Natural Gas Cost	$ 0.80	/therm
Facility Ventilation Heating Load	453,600	BTU/Hour[1,2,3]
Facility Ventilation Cooling Load	0	BTU/Hour[1,2,3]
Existing Ventilation Heating Usage	6,858	therms[5]
Existing Ventilation Cooling Usage	0	kWh[5]
Proposed Ventilation Heating Usage	5,487	therms[6]
Proposed Ventilation Cooling Usage	0	kWh[6]
Proposed Ventilation Fan Savings	5,637	kWh[7]
Total heating savings	1,370	**therms**
Total cooling savings	5,600	**kWh**
Total cost savings	$1,831	
Estimated Total Project Cost	$5,100	[8]
Simple Payback	3	**years**

Assumptions

1	12,000	CFM, OA AHU airflow based exsiting design drawing schedules
2	35	°F, Assumed average heating Δt (mixed air and supply)
3	0	°F, Assumed average cooling Δt (mixed air and supply); H&V unit only
4	11.2	kW of existing supply fan motor calculated based on electrical data from nameplate
5	1,512	AHU run time per heating/cooling seasons [12 hours/day, 21 days/month, 6 months/year]
6	20%	Estimated savings for DCV based on reducing unit run time from 12 hours to 10 hours per day
7	504	Assumed supply fan run time reduction based on 2 hours/day fan is "off" due to DCV
8	$ 5,100	estimated measure cost for installation of sensors and associated controls

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ECM-4: 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	$ -	$ 753	
Replace damper actuators	3	ea	$ 250	$ 50	$ -	$ 825	$ 203	$ -	$ 1,028	
Reprogram DDC system	1	ea	$ 150	$ 350	$ -	$ 165	$ 473	$ -	$ 638	
Miscellaneous electrical/wiring	1	ls	$ 300	$ 750	$ -	$ 330	$ 1,013	$ -	$ 1,343	

$	3,760	Subtotal
$	752	10% Contingency
$	564	20% Contractor O&P
$	-	0% Engineering
$	**5,100**	**Total**

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ECM-5: Re-commission Facility BAS and Integrate Existing HVAC Equipment

ECM Description Summary

40,000 Sq Footage

EXISTING CONDITIONS		
Existing Facility Total Electric usage	389,865	kWh
Existing Facility Total Gas usage	58,276	Therms
Existing Facility Cooling Electric usage	93,568	kWh[1]
Existing Facility Heating Natural Gas usage	44,290	Therms[2]
PROPOSED CONDITIONS		
Proposed Facility Cooling Electric Usage	84,211	kWh
Proposed Facility Natural Gas Usage	39,861	Therms
SAVINGS		
Retro-Commissioning Electric Savings	9,357	**kWh**
Retro-Commissioning Natural Gas Savings	4,429	**Therms**
Total cost savings	$ 4,769	
Estimated Total Project Cost	$ 20,000	[4]
Simple Payback	4.2	**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

ECM-6 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

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ECM-7: Install Modern Roof Top Exhaust Fans with Premium Efficiency Motors

Demand Cost $/kW-month
$ 5.94

Energy Cost $/kWh
$ 0.13

Multipliers		
Material	Labor	Equipment
1.10	1.30	1.10

Savings Analysis

Cost Estimates

#	Description	Location	Existing HP	Load Factor	Existing Efficiency[a]	Existing kW	New HP[b]	New Load Factor	New Efficiency[a]	New kW	Demand Savings	Demand Savings $	Annual Hours	kWh Savings	$ kWh Savings	Total $ Savings	Estimated Cost	Payback Years	Unit Costs Materials	Unit Costs Labor	Unit Costs Equipment	Subtotal Costs Materials	Subtotal Costs Labor	Subtotal Costs Equipment	Total Cost	Remarks
1	EF-1	N/A	0.17	0.75	70%	0.1	0	0.75	0.802	0.1	0.017	$ 1	8,760	149	$ 20	$ 21	$ 570	27.4	$ 400	$ 100	$ -	$ 440	$ 130	$ -	$ 570	
2	EF-2	N/A	0.17	0.75	70%	0.1	0	0.75	0.802	0.1	0.017	$ 1	8,760	149	$ 20	$ 21	$ 570	27.4	$ 400	$ 100	$ -	$ 440	$ 130	$ -	$ 570	
3	EF-3	N/A	0.17	0.75	70%	0.1	0	0.75	0.802	0.1	0.017	$ 1	8,760	149	$ 20	$ 21	$ 570	27.4	$ 400	$ 100	$ -	$ 440	$ 130	$ -	$ 570	
4	EF-4	N/A	0.17	0.75	70%	0.1	0	0.75	0.802	0.1	0.017	$ 1	8,760	149	$ 20	$ 21	$ 570	27.4	$ 400	$ 100	$ -	$ 440	$ 130	$ -	$ 570	
5	EF-5	N/A	0.17	0.75	70%	0.1	0	0.75	0.802	0.1	0.017	$ 1	8,760	149	$ 20	$ 21	$ 570	27.4	$ 400	$ 100	$ -	$ 440	$ 130	$ -	$ 570	
6	EF-6	N/A	0.17	0.75	70%	0.1	0	0.75	0.802	0.1	0.017	$ 1	8,760	149	$ 20	$ 21	$ 570	27.4	$ 400	$ 100	$ -	$ 440	$ 130	$ -	$ 570	
7	EF-7	N/A	0.17	0.75	70%	0.1	0	0.75	0.802	0.1	0.017	$ 1	8,760	149	$ 20	$ 21	$ 570	27.4	$ 400	$ 100	$ -	$ 440	$ 130	$ -	$ 570	
8	EF-8	N/A	0.17	0.75	70%	0.1	0	0.75	0.802	0.1	0.017	$ 1	8,760	149	$ 20	$ 21	$ 570	27.4	$ 400	$ 100	$ -	$ 440	$ 130	$ -	$ 570	
9	EF-9	N/A	0.17	0.75	70%	0.1	0	0.75	0.802	0.1	0.017	$ 1	8,760	149	$ 20	$ 21	$ 570	27.4	$ 400	$ 100	$ -	$ 440	$ 130	$ -	$ 570	
10	EF-10	N/A	0.17	0.75	70%	0.1	0	0.75	0.802	0.1	0.017	$ 1	8,760	149	$ 20	$ 21	$ 570	27.4	$ 400	$ 100	$ -	$ 440	$ 130	$ -	$ 570	
11	EF-11	N/A	0.17	0.75	70%	0.1	0	0.75	0.802	0.1	0.017	$ 1	8,760	149	$ 20	$ 21	$ 570	27.4	$ 400	$ 100	$ -	$ 440	$ 130	$ -	$ 570	
		Total	**1.833333**			**1.5**	**1.833**			**1.3**	**0.19**	**$ 13**		**1,637**	**$ 215**	**$ 228**	**$ 6,270**										

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-9[B]: 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	88	LF	Cooling System Efficiency	1.2	kW/ton	Heating System Efficiency	80%	
Area of Exhaust Fans	44	SF	Ex Occupied Clng Temp.	74	*F	Heating On Temp.	60	*F
Existing Infiltration Factor	**4.4**	**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	42.5	3	1	2	-13,068	-13,068	-8,910	-8,910	4	3	0	0
97.5	39.5	34	13	21	-10,454	-10,454	-7,128	-7,128	36	24	0	0
92.5	36.6	131	51	80	-7,928	-7,928	-5,405	-5,405	104	71	0	0
87.5	34.0	500	196	304	-5,663	-5,663	-3,861	-3,861	283	193	0	0
82.5	31.6	620	244	376	-3,572	-3,572	-2,435	-2,435	221	151	0	0
77.5	29.2	664	261	403	-1,481	0	-1,010	0	39	26	0	0
72.5	27.0	854	336	519	0	0	0	0	0	0	0	0
67.5	24.5	927	364	563	0	0	0	0	0	0	0	0
62.5	21.4	600	236	364	0	0	0	0	0	0	0	0
57.5	18.7	610	240	370	2,195	523	1,497	356	0	0	9	6
52.5	16.2	611	240	371	3,241	1,568	2,210	1,069	0	0	17	12
47.5	14.4	656	258	398	4,286	2,614	2,922	1,782	0	0	27	18
42.5	12.6	1,023	402	621	5,332	3,659	3,635	2,495	0	0	55	38
37.5	10.7	734	288	446	6,377	4,704	4,348	3,208	0	0	49	34
32.5	8.6	334	131	203	7,423	5,750	5,061	3,920	0	0	27	18
27.5	6.8	252	99	153	8,468	6,795	5,774	4,633	0	0	23	16
22.5	5.5	125	49	76	9,514	7,841	6,486	5,346	0	0	13	9
17.5	4.1	47	18	29	10,559	8,886	7,199	6,059	0	0	6	4
12.5	2.6	22	9	13	11,604	9,932	7,912	6,772	0	0	3	2
7.5	1.0	13	5	8	12,650	10,977	8,625	7,484	0	0	2	1
2.5	0.0	0	0	0	13,695	12,023	9,338	8,197	0	0	0	0
TOTALS		**8,760**	**3,441**	**5,319**					687	468	**231**	**158**

Existing Exhaust Infiltration	**194**	**cfm**
Proposed Exhaust Infiltration	**132**	**cfm**

Savings	**74**	**Therms**	**$**	**59**
	218	**kWh**	**$**	**29**
			$	**87**

Window ID	Location	Quantity	Width (ft)	Height (ft)	Linear Feet (LF)	Area (SF)	Airflow (CFM)	Infiltration Rate (CFM/SF)	Infiltration (CFM)
EF-1	N/A	1	2	2	8.0	4.0	880.0	4.40	17.6
EF-2	N/A	1	2	2	8.0	4.0	880.0	4.40	17.6
EF-3	N/A	1	2	2	8.0	4.0	880.0	4.40	17.6
EF-4	N/A	1	2	2	8.0	4.0	880.0	4.40	17.6
EF-5	N/A	1	2	2	8.0	4.0	880.0	4.40	17.6
EF-6	N/A	1	2	2	8.0	4.0	880.0	4.40	17.6
EF-7	N/A	1	2	2	8.0	4.0	880.0	4.40	17.6
EF-8	N/A	1	2	2	8.0	4.0	880.0	4.40	17.6
EF-9	N/A	1	2	2	8.0	4.0	880.0	4.40	17.6
EF-10	N/A	1	2	2	8.0	4.0	880.0	4.40	17.6
EF-11	N/A	1	2	2	8.0	4.0	880.0	4.40	17.6
Total		**11**	**22**	**22**	**88.0**	**44.0**	**9,680.0**	**4.40**	**193.6**

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Demand Cost
$/kW-month
$ 5.94

Energy Cost
$/kWh
$ 0.13

Multipliers		
Material	Labor	Equipment
1.10	1.35	1.10

ECM-8: DHW Pumps

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

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

ECM-9: Window Replacement

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

Linear Feet of window Edge	228.0	LF	Cooling System Efficiency	1.2	kW/ton	Heating System Efficiency	80%	
Area of window glass	252.0	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	-12,722	-11,714	-5,448	-4,994	0	0	0	0
97.5	42.5	3.0	1	2	-9,770	-8,762	-4,204	-3,750	3	1	0	0
92.5	39.5	34.0	13	21	-7,740	-6,732	-3,329	-2,876	24	10	0	0
87.5	36.6	131.0	51	80	-5,736	-4,728	-2,465	-2,011	67	29	0	0
82.5	34	500.0	196	304	-3,809	-2,801	-1,631	-1,177	160	68	0	0
77.5	31.6	620.0	244	376	-1,934	0	-818	0	47	20	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	3,292	784	1,449	345	0	0	13	6
52.5	18.7	610.0	240	370	4,860	2,352	2,139	1,035	0	0	25	11
47.5	16.2	611.0	240	371	6,428	3,920	2,829	1,725	0	0	37	16
42.5	14.4	656.0	258	398	7,996	5,487	3,520	2,415	0	0	53	23
37.5	12.6	1,023.0	402	621	9,564	7,055	4,210	3,106	0	0	103	45
32.5	10.7	734.0	288	446	11,131	8,623	4,900	3,796	0	0	88	39
27.5	8.6	334.0	131	203	12,699	10,191	5,590	4,486	0	0	47	21
22.5	6.8	252.0	99	153	14,267	11,759	6,280	5,176	0	0	40	18
17.5	5.5	125.0	49	76	15,835	13,326	6,970	5,866	0	0	22	10
12.5	4.1	47.0	18	29	17,403	14,894	7,660	6,556	0	0	9	4
7.5	2.6	22.0	9	13	18,970	16,462	8,350	7,246	0	0	5	2
2.5	1	13.0	5	8	20,538	18,030	9,041	7,936	0	0	3	1
-2.5	0	0.0	0	0	22,106	19,598	9,731	8,627	0	0	0	0
TOTALS		**8,760**	**3,441**	**5,319**					301	128	**447**	**197**

Existing Window Infiltration	**57**	**cfm**
Existing Window Heat Transfer	**252**	**Btuh/°F**
Proposed Window Infiltration	**23**	**cfm**
Proposed Window Heat Transfer	**113**	**Btuh/°F**

Savings			
	250	**Therms**	**$ 200**
	173	**kWh**	**$ 23**
			$ 223

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	12	3.5	6	228.0	252.0	0.25	1.00	57.0	252.0
Total		**12**	**3.5**	**6**	**228.0**	**252.0**	**0.25**	**1.00**	**57.0**	**252.0**

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ECM-10: 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.		
						$ -	$ -	$ -	$ -	
3.5' x 6' x 4.5" Energy Efficient Vinyl Window	252	SF	$ 100.0		$ -	$ 27,720	$ -	$ -	$ 27,720	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 27,720	Subtotal
$ 2,772	10% Contingency
$ 6,098	20% Contractor O&P
$ -	0% Engineering
$ 36,600	**Total**

ECM-5 Lighting Replacements

Budgetary	Annual Utility Savings				Estimated	Total	New Jersey	Payback	Payback
Cost					Maintenance	Savings	Incentive	(without incentive)	(with incentive)
					Savings				
$	kW	kWh	therms	$	$	$	$	Years	Years
$69,700	**17.4**	**30,300**	**0**	**$5,798**	**0**	**$5,798**	**$1,356**	**12.0**	**11.8**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

ECM-6 Install 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
$3,500	**0.0**	**27,200**	**0**	**$4,080**	**0**	**$4,080**	**$520**	**0.9**	**0.7**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

ECM-7 Lighting Replacements with 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
$73,200	**17.4**	**45,500**	**0**	**$8,078**	**0**	**$8,078**	**$1,876**	**9.1**	**8.8**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

Energy Audit of Camden County College (Papiano Gym)

CHA Project No. 24364

ECM-5 Lighting Replacements

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
11A	Room 103	14	4' 2-LAMP T-12	F42EL	60	0.8	SW	2500	2,100	14	F32T8	F42ILL-R	52	0.7	SW	2,500	1,820	280	0.1	$ 50.06	$ 3,500.00		69.9	69.9
11A	Natatorium	2	4' 2-LAMP T-12	F42EL	60	0.1	SW	2500	300	2	F32T8	F42ILL-R	52	0.1	SW	2,500	260	40	0.0	$ 7.15	$ 500.00	$50	69.9	62.9
227	Natatorium	8	W60CF1	F81EL	60	0.5	SW	2500	1,200	8	CF42W	CF42/1-L	48	0.4	SW	2,500	960	240	0.1	$ 42.91	$ 1,620.00		37.8	37.8
11A	Hallway	63	4' 2-LAMP T-12	F42EL	60	3.8	SW	2125	8,033	63	F32T8	F42ILL-R	52	3.3	SW	2,125	6,962	1,071	0.5	$ 196.94	$ 15,750.00		80.0	80.0
71	Old Men's Locker 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
111A	Display Case	4	4' 1-LAMP T-12	F41EL	32	0.1	SW	2125	272	4	F28T8	F41SSILL-R	23	0.1	SW	2,125	196	77	0.0	$ 14.07	$ -	$100	0.0	-7.1
11A	Room 102 Classroom	14	4' 2-LAMP T-12	F42EL	60	0.8	SW	2500	2,100	14	F32T8	F42ILL-R	52	0.7	SW	2,500	1,820	280	0.1	$ 50.06	$ 3,500.00	$350	69.9	62.9
11A	Women's Bathroom	5	4' 2-LAMP T-12	F42EL	60	0.3	SW	2125	638	5	F32T8	F42ILL-R	52	0.3	SW	2,125	553	85	0.0	$ 15.63	$ 1,250.00		80.0	80.0
111A	Women's Locker Room	22	4' 1-LAMP T-12	F41EL	32	0.7	SW	2125	1,496	22	F28T8	F41SSILL-R	23	0.5	SW	2,125	1,075	421	0.2	$ 77.37	$ -	$550	0.0	-7.1
71	Women's Locker Room	12	I 60	I60/1	60	0.7	SW	2125	1,530	12	CF 26	CFQ26/1-L	27	0.3	SW	2,125	689	842	0.4	$ 154.74	$ 486.00		3.1	3.1
11A	Women's Locker Room Bathroom	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	2250	540	4	F32T8	F42ILL-R	52	0.2	SW	2,250	468	72	0.0	$ 13.10	$ 1,000.00		76.3	76.3
11A	Women's Team Room	6	4' 2-LAMP T-12	F42EL	60	0.4	SW	2250	810	6	F32T8	F42ILL-R	52	0.3	SW	2,250	702	108	0.0	$ 19.66	$ 1,500.00		76.3	76.3
111A	Storage Room	6	4' 1-LAMP T-12	F41EL	32	0.2	SW	2125	408	6	F28T8	F41SSILL-R	23	0.1	SW	2,125	293	115	0.1	$ 21.10	$ -		0.0	0.0
11A	Entry Outer Room	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	2125	383	3	F32T8	F42ILL-R	52	0.2	SW	2,125	332	51	0.0	$ 9.38	$ 750.00		80.0	80.0
169	Gym (Basketball Court)	45	SP 250 MH ROOF	MH250/1	295	13.3	SW	2125	28,209	45	FXLED78	FXLED78/1	78	3.5	SW	2,125	7,459	20,751	9.8	$ 3,815.67	$ 5,771.25		1.5	1.5
11A	Room 135 - Fitness Center	12	4' 2-LAMP T-12	F42EL	60	0.7	SW	2000	1,440	12	F32T8	F42ILL-R	52	0.6	SW	2,000	1,248	192	0.1	$ 35.71	$ 3,000.00		84.0	84.0
11A	Room 135 - Fitness Center	27	4' 2-LAMP T-12	F42EL	60	1.6	SW	2125	3,443	27	F32T8	F42ILL-R	52	1.4	SW	2,125	2,984	459	0.2	$ 84.40	$ 6,750.00		80.0	80.0
11A	Men's Entrance	9	4' 2-LAMP T-12	F42EL	60	0.5	SW	2125	1,148	9	F32T8	F42ILL-R	52	0.5	SW	2,125	995	153	0.1	$ 28.13	$ 2,250.00		80.0	80.0
111A	Sorage Space Gym	9	4' 1-LAMP T-12	F41EL	32	0.3	SW	2125	612	9	F28T8	F41SSILL-R	23	0.2	SW	2,125	440	172	0.1	$ 31.65	$ -		0.0	0.0
111A	Mechanical Mezzanine	15	4' 1-LAMP T-12	F41EL	32	0.5	SW	2125	1,020	15	F28T8	F41SSILL-R	23	0.3	SW	2,125	733	287	0.1	$ 52.75	$ -		0.0	0.0
11A	Handball Court	13	4' 2-LAMP T-12	F42EL	60	0.8	SW	2125	1,658	13	F32T8	F42ILL-R	52	0.7	SW	2,125	1,437	221	0.1	$ 40.64	$ 3,250.00		80.0	80.0
180	Training Room	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2125	714	3	T 28 C F 4	F43SSILL	72	0.2	SW	2,125	459	255	0.1	$ 46.89	$ 344.25	$75	7.3	5.7
175A	Training Room	4	4' 2-LAMP T-8 (32W)	F42ILL	32	0.1	SW	2125	272	4	4' 2-LAMP T-8	F42ILL	59	0.2	SW	2,125	502	(230)	(0.1)	$ (42.20)	$ -			
180	Office - Basketball	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
175A	Office - Basketball	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	SW	2500	80	1	4' 2-LAMP T-8	F42ILL	59	0.1	SW	2,500	148	(68)	(0.0)	$ (12.07)	$ -			
175A	Office - Softball	2	4' 2-LAMP T-8 (32W)	F42ILL	32	0.1	SW	2125	136	2	4' 2-LAMP T-8	F42ILL	59	0.1	SW	2,125	251	(115)	(0.1)	$ (21.10)	$ -			
204	Laundry Room	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	SW	2125	1,320	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	SW	2,125	1,320	-	0.0	$ -	$ -			
111A	Athletic Equipment Room	2	4' 1-LAMP T-12	F41EL	32	0.1	SW	500	32	2	F28T8	F41SSILL-R	23	0.0	SW	500	23	9	0.0	$ 2.65	$ -	$50	0.0	-18.9
11A	Athletic Equipment Room	5	4' 2-LAMP T-12	F42EL	60	0.3	SW	2125	638	5	F32T8	F42ILL-R	52	0.3	SW	2,125	553	85	0.0	$ 15.63	$ 1,250.00		80.0	80.0
111A	Athletic Equipment Room	9	4' 1-LAMP T-12	F41EL	32	0.3	SW	2500	720	9	F28T8	F41SSILL-R	23	0.2	SW	2,500	518	203	0.1	$ 36.21	$ -		0.0	0.0
71	Athletic Equipment Room	2	I 60	I60/1	60	0.1	SW	2500	300	2	CF 26	CFQ26/1-L	27	0.1	SW	2,500	135	165	0.1	$ 29.50	$ 81.00	$50	2.7	1.1
11A	Athletic Equipment Room	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	2500	450	3	F32T8	F42ILL-R	52	0.2	SW	2,500	390	60	0.0	$ 10.73	$ 750.00	$75	69.9	62.9
11A	Men's Staff Locker Room	6	4' 2-LAMP T-12	F42EL	60	0.4	SW	2125	765	6	F32T8	F42ILL-R	52	0.3	SW	2,125	663	102	0.0	$ 18.76	$ 1,500.00		80.0	80.0
11A	Toilet Room	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	1062.5	191	3	F32T8	F42ILL-R	52	0.2	SW	1,063	166	26	0.0	$ 5.55	$ 750.00		135.1	135.1
111A	Public Men's Locker Room	33	4' 1-LAMP T-12	F41EL	32	1.1	SW	2125	2,244	33	F28T8	F41SSILL-R	23	0.8	SW	2,125	1,613	631	0.3	$ 116.05	$ -		0.0	0.0
180	Shower Room	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1062.5	238	2	T 28 C F 4	F43SSILL	72	0.1	SW	1,063	153	85	0.1	$ 18.51	$ 229.50		12.4	12.4
11A	Toilet Room	5	4' 2-LAMP T-12	F42EL	60	0.3	SW	1062.5	319	5	F32T8	F42ILL-R	52	0.3	SW	1,063	276	43	0.0	$ 9.26	$ 1,250.00		135.1	135.1
111A	Physiology Room	7	4' 1-LAMP T-12	F41EL	32	0.2	SW	2125	476	7	F28T8	F41SSILL-R	23	0.2	SW	2,125	342	134	0.1	$ 24.62	$ -		0.0	0.0
11A	Room 116 - Athletic Office	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	500	240	8	F32T8	F42ILL-R	52	0.4	SW	500	208	32	0.1	$ 9.41	$ 2,000.00		212.6	212.6
11A	Room 121 - Athletic Office	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	$ 1,000.00		212.6	212.6
11A	Room 119 - Athletic Office	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	$ 1,000.00		212.6	212.6
11A	Room 116 - Athletic Office	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	2125	510	4	F32T8	F42ILL-R	52	0.2	SW	2,125	442	68	0.0	$ 12.50	$ 1,000.00		80.0	80.0
11A	Room 117 - Athletic Office	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	$ 1,000.00		135.1	135.1
11A	Room 100B - Athletic Office	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	2125	1,020	8	F32T8	F42ILL-R	52	0.4	SW	2,125	884	136	0.1	$ 25.01	$ 2,000.00		80.0	80.0
11A	Room 118 - Athletic Office	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	1062.5	510	8	F32T8	F42ILL-R	52	0.4	SW	1,063	442	68	0.1	$ 14.81	$ 2,000.00	$56	135.1	131.3
11A	Server Room	1	4' 2-LAMP T-12	F42EL	60	0.1	SW	2250	135	1	F32T8	F42ILL-R	52	0.1	SW	2,250	117	18	0.0	$ 3.28	$ 250.00		76.3	76.3
11A	Men's Bathroom	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	2250	405	3	F32T8	F42ILL-R	52	0.2	SW	2,250	351	54	0.0	$ 9.83	$ 750.00		76.3	76.3
180	Men's Bathroom	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	500	224	4	T 28 C F 4	F43SSILL	72	0.3	SW	500	144	80	0.2	$ 23.52	$ 459.00		19.5	19.5
141A	Exterior	7	HPS 200	HPS200/1	250	1.8	SW	520	910	7	FXLED78	FXLED78/1	78	0.5	SW	520	284	626	1.2	$ 180.60	$ 803.25		4.4	4.4
146	Exterior	6	High Bay MH 400	MH400/1	458	2.7	SW	520	1,429	6	P 54 C F 4	FC20	20	0.1	SW	520	62	1,367	2.6	$ 394.20	$ -		0.0	0.0
	Total	**450**				**39.1**			**73,095**	**450**			**2,536**	**21.7**			**42,830**	**30,300**	**17.4**	**$5,793**	**$69,700**	**$1,356**		
																	Demand Savings			**17.4**	**$1,253**			
																	kWh Savings			**30,300**	**$4,545**			
																	Total savings				**$5,798**		**12.0**	**11.8**

Energy Audit of Camden County College (Papiano Gym)

CHA Project No. 24364

ECM-6 Install 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
11A	Room 103	14	4' 2-LAMP T-12	F42EL	60	0.8	SW	2500	2,100.0	14	4' 2-LAMP T-12	F42EL	60	0.8	None	2500	2,100.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Natatorium	2	4' 2-LAMP T-12	F42EL	60	0.1	SW	2500	300.0	2	4' 2-LAMP T-12	F42EL	60	0.1	None	2500	300.0	0.0	0.0	$0.00	$0.00	$0.00		
227	Natatorium	8	W60CF1	F81EL	60	0.5	SW	2500	1,200.0	8	W60CF1	F81EL	60	0.5	None	2500	1,200.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Hallway	63	4' 2-LAMP T-12	F42EL	60	3.8	SW	2125	8,032.5	63	4' 2-LAMP T-12	F42EL	60	3.8	C-OCC	1200	4,536.0	3,496.5	0.0	$524.48				
71	Old Men's Locker Room	4	I 60	I60/1	60	0.2	SW	2125	510.0	4	I 60	I60/1	60	0.2	C-OCC	1200	288.0	222.0	0.0	$33.30	$202.50	$35.00	0.4	0.3
111A	Display Case	4	4' 1-LAMP T-12	F41EL	32	0.1	SW	2125	272.0	4	4' 1-LAMP T-12	F41EL	32	0.1	C-OCC	1200	153.6	118.4	0.0	$17.76				
11A	Room 102 Classroom	14	4' 2-LAMP T-12	F42EL	60	0.8	SW	2500	2,100.0	14	4' 2-LAMP T-12	F42EL	60	0.8	None	2500	2,100.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Women's Bathroom	5	4' 2-LAMP T-12	F42EL	60	0.3	SW	2125	637.5	5	4' 2-LAMP T-12	F42EL	60	0.3	OCC	1200	360.0	277.5	0.0	$41.63	$118.75	$20.00	2.9	2.4
111A	Women's Locker Room	22	4' 1-LAMP T-12	F41EL	32	0.7	SW	2125	1,496.0	22	4' 1-LAMP T-12	F41EL	32	0.7	OCC	1200	844.8	651.2	0.0	$97.68	$118.75	$20.00	1.2	1.0
71	Women's Locker Room	12	I 60	I60/1	60	0.7	SW	2125	1,530.0	12	I 60	I60/1	60	0.7	OCC	1200	864.0	666.0	0.0	$99.90	$118.75	$20.00	1.2	1.0
11A	Women's Locker Room Bathroom	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	2250	540.0	4	4' 2-LAMP T-12	F42EL	60	0.2	C-OCC	1000	240.0	300.0	0.0	$45.00	$202.50	$35.00	4.5	3.7
11A	Women's Team Room	6	4' 2-LAMP T-12	F42EL	60	0.4	SW	2250	810.0	6	4' 2-LAMP T-12	F42EL	60	0.4	C-OCC	1000	360.0	450.0	0.0	$67.50	$202.50	$35.00	3.0	2.5
111A	Storage Room	6	4' 1-LAMP T-12	F41EL	32	0.2	SW	2125	408.0	6	4' 1-LAMP T-12	F41EL	32	0.2	OCC	1200	230.4	177.6	0.0	$26.64	$118.75	$20.00	4.5	3.7
11A	Entry Outer Room	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	2125	382.5	3	4' 2-LAMP T-12	F42EL	60	0.2	OCC	1200	216.0	166.5	0.0	$24.98	$118.75	$20.00	4.8	4.0
169	Gym (Basketball Court)	45	SP 250 MH ROOF	MH250/1	295	13.3	SW	2125	28,209.4	45	SP 250 MH ROOF	MH250/1	295	13.3	OCC	1200	15,930.0	12,279.4	0.0	$1,841.91	$118.75	$20.00	0.1	0.1
11A	Room 135 - Fitness Center	12	4' 2-LAMP T-12	F42EL	60	0.7	SW	2000	1,440.0	12	4' 2-LAMP T-12	F42EL	60	0.7	OCC	1000	720.0	720.0	0.0	$108.00	$118.75	$0.00	1.1	1.1
11A	Room 135 - Fitness Center	27	4' 2-LAMP T-12	F42EL	60	1.6	SW	2125	3,442.5	27	4' 2-LAMP T-12	F42EL	60	1.6	OCC	1200	1,944.0	1,498.5	0.0	$224.78	$118.75	$20.00	0.5	0.4
11A	Men's Entrance	9	4' 2-LAMP T-12	F42EL	60	0.5	SW	2125	1,147.5	9	4' 2-LAMP T-12	F42EL	60	0.5	OCC	1200	648.0	499.5	0.0	$74.93	$118.75	$20.00	1.6	1.3
111A	Sorage Space Gym	9	4' 1-LAMP T-12	F41EL	32	0.3	SW	2125	612.0	9	4' 1-LAMP T-12	F41EL	32	0.3	OCC	1200	345.6	266.4	0.0	$39.96	$118.75	$20.00	3.0	2.5
111A	Mechanical Mezzanine	15	4' 1-LAMP T-12	F41EL	32	0.5	SW	2125	1,020.0	15	4' 1-LAMP T-12	F41EL	32	0.5	OCC	1200	576.0	444.0	0.0	$66.60	$118.75	$20.00	1.8	1.5
11A	Handball Court	13	4' 2-LAMP T-12	F42EL	60	0.8	SW	2125	1,657.5	13	4' 2-LAMP T-12	F42EL	60	0.8	OCC	1200	936.0	721.5	0.0	$108.23	$118.75	$20.00	0.8	0.6
180	Training Room	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2125	714.0	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	OCC	1200	403.2	310.8	0.0	$46.62				
175A	Training Room	4	4' 2-LAMP T-8 (32W)	F42ILL	32	0.1	SW	2125	272.0	4	4' 2-LAMP T-8 (32W)	F42ILL	32	0.1	OCC	1200	153.6	118.4	0.0	$17.76	$118.75	$20.00	6.7	5.6
180	Office - Basketball	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	$20.00	3.8	3.2
175A	Office - Basketball	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	SW	2500	80.0	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	None	2500	80.0	0.0	0.0	$0.00	$0.00	$0.00		
175A	Office - Softball	2	4' 2-LAMP T-8 (32W)	F42ILL	32	0.1	SW	2125	136.0	2	4' 2-LAMP T-8 (32W)	F42ILL	32	0.1	OCC	1200	76.8	59.2	0.0	$8.88	$118.75	$20.00	13.4	11.1
204	Laundry Room	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	SW	2125	1,319.6	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	OCC	1000	621.0	698.6	0.0	$104.79	$118.75	$20.00	1.1	0.9
111A	Athletic Equipment Room	2	4' 1-LAMP T-12	F41EL	32	0.1	SW	500	32.0	2	4' 1-LAMP T-12	F41EL	32	0.1	None	500	32.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Athletic Equipment Room	5	4' 2-LAMP T-12	F42EL	60	0.3	SW	2125	637.5	5	4' 2-LAMP T-12	F42EL	60	0.3	OCC	1200	360.0	277.5	0.0	$41.63	$118.75	$20.00	2.9	2.4
111A	Athletic Equipment Room	9	4' 1-LAMP T-12	F41EL	32	0.3	SW	2500	720.0	9	4' 1-LAMP T-12	F41EL	32	0.3	None	2500	720.0	0.0	0.0	$0.00	$0.00	$0.00		
71	Athletic Equipment Room	2	I 60	I60/1	60	0.1	SW	2500	300.0	2	I 60	I60/1	60	0.1	None	2500	300.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Athletic Equipment Room	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	2500	450.0	3	4' 2-LAMP T-12	F42EL	60	0.2	None	2500	450.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Men's Staff Locker Room	6	4' 2-LAMP T-12	F42EL	60	0.4	SW	2125	765.0	6	4' 2-LAMP T-12	F42EL	60	0.4	OCC	1200	432.0	333.0	0.0	$49.95	$118.75	$0.00	2.4	2.4
11A	Toilet Room	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	1062.5	191.3	3	4' 2-LAMP T-12	F42EL	60	0.2	None	1062.5	191.3	0.0	0.0	$0.00	$0.00	$0.00		
111A	Public Men's Locker Room	33	4' 1-LAMP T-12	F41EL	32	1.1	SW	2125	2,244.0	33	4' 1-LAMP T-12	F41EL	32	1.1	OCC	1200	1,267.2	976.8	0.0	$146.52	$118.75	$20.00	0.8	0.7
180	Shower Room	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1062.5	238.0	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	None	1062.5	238.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Toilet Room	5	4' 2-LAMP T-12	F42EL	60	0.3	SW	1062.5	318.8	5	4' 2-LAMP T-12	F42EL	60	0.3	None	1062.5	318.8	0.0	0.0	$0.00	$0.00	$0.00		
111A	Physiology Room	7	4' 1-LAMP T-12	F41EL	32	0.2	SW	2125	476.0	7	4' 1-LAMP T-12	F41EL	32	0.2	OCC	1200	268.8	207.2	0.0	$31.08	$118.75	$20.00	3.8	3.2
11A	Room 116 - Athletic Office	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	500	240.0	8	4' 2-LAMP T-12	F42EL	60	0.5	None	500	240.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Room 121 - Athletic Office	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		
11A	Room 119 - Athletic Office	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		
11A	Room 116 - Athletic Office	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	2125	510.0	4	4' 2-LAMP T-12	F42EL	60	0.2	OCC	1200	288.0	222.0	0.0	$33.30	$118.75	$20.00	3.6	3.0
11A	Room 117 - Athletic Office	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		
11A	Room 100B - Athletic Office	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	2125	1,020.0	8	4' 2-LAMP T-12	F42EL	60	0.5	OCC	1200	576.0	444.0	0.0	$66.60	$118.75	$0.00	1.8	1.8
11A	Room 118 - Athletic Office	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	1062.5	510.0	8	4' 2-LAMP T-12	F42EL	60	0.5	None	1062.5	510.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Server Room	1	4' 2-LAMP T-12	F42EL	60	0.1	SW	2250	135.0	1	4' 2-LAMP T-12	F42EL	60	0.1	None	2250	135.0	0.0	0.0	$0.00	$0.00	$0.00		
11A	Men's Bathroom	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	2250	405.0	3	4' 2-LAMP T-12	F42EL	60	0.2	None	2250	405.0	0.0	0.0	$0.00	$0.00	$0.00		
180	Men's Bathroom	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	500	224.0	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	None	500	224.0	0.0	0.0	$0.00	$0.00	$0.00		
141A	Exterior	7	HPS 200	HPS200/1	250	1.8	SW	520	910.0	7	HPS 200	HPS200/1	250	1.8	None	520	910.0	0.0	0.0	$0.00	$0.00	$0.00		
146	Exterior	6	High Bay MH 400	MH400/1	458	2.7	SW	520	1,429.0	6	High Bay MH 400	MH400/1	458	2.7	C-OCC	390	1,071.7	357.2	0.0	$53.59	$202.50	$35.00	3.8	3.1
	Total	**450**				**39.1**			**73,095**	**450**				**39**			**45,929**	**27,200**	**0**	**$4,100**	**$3,500**	**520**		
																		Demand Savings		**0.0**	**$0**			
																		kWh Savings		**27,200**	**$4,080**			
																		Total Savings			**$4,080**		**0.9**	**0.7**

Energy Audit of Camden County College (Papiano Gym)

CHA Project No. 24364

ECM-7 Lighting Replacements with 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
11A	Room 103	14	4' 2-LAMP T-12	F42EL	60	0.8	SW	2500	2,100	14	F32T8	F42ILL-R	52	0.7	None	2,500	1,820	280	0.1	$ 50.06	$ 3,500.00	$ -	69.9	69.9
11A	Natatorium	2	4' 2-LAMP T-12	F42EL	60	0.1	SW	2500	300	2	F32T8	F42ILL-R	52	0.1	None	2,500	260	40	0.0	$ 7.15	$ 500.00	$ 50	69.9	62.9
227	Natatorium	8	W60CF1	F81EL	60	0.5	SW	2500	1,200	8	CF42W	CF42/1-L	48	0.4	None	2,500	960	240	0.1	$ 42.91	$ 1,620.00	$ -	37.8	37.8
11A	Hallway	63	4' 2-LAMP T-12	F42EL	60	3.8	SW	2125	8,033	63	F32T8	F42ILL-R	52	3.3	C-OCC	1,200	3,931	4,101	0.5	$ 651.48	$ 15,952.50	$ 35	24.5	24.4
71	Old Men's Locker Room	4	I 60	I60/1	60	0.2	SW	2125	510	4	CF 26	CFQ26/1-L	27	0.1	C-OCC	1,200	130	380	0.1	$ 66.56	$ 162.00	$ -	2.4	2.4
111A	Display Case	4	4' 1-LAMP T-12	F41EL	32	0.1	SW	2125	272	4	F28T8	F41SSILL-R	23	0.1	C-OCC	1,200	110	162	0.0	$ 26.83	$ -	$ 100	0.0	-3.7
11A	Room 102 Classroom	14	4' 2-LAMP T-12	F42EL	60	0.8	SW	2500	2,100	14	F32T8	F42ILL-R	52	0.7	None	2,500	1,820	280	0.1	$ 50.06	$ 3,500.00	$ 350	69.9	62.9
11A	Women's Bathroom	5	4' 2-LAMP T-12	F42EL	60	0.3	SW	2125	638	5	F32T8	F42ILL-R	52	0.3	OCC	1,200	312	326	0.0	$ 51.71	$ 1,368.75	$ 20	26.5	26.1
111A	Women's Locker Room	22	4' 1-LAMP T-12	F41EL	32	0.7	SW	2125	1,496	22	F28T8	F41SSILL-R	23	0.5	OCC	1,200	607	889	0.2	$ 147.58	$ 118.75	$ 570	0.8	-3.1
71	Women's Locker Room	12	I 60	I60/1	60	0.7	SW	2125	1,530	12	CF 26	CFQ26/1-L	27	0.3	OCC	1,200	389	1,141	0.4	$ 199.69	$ 604.75	$ 20	3.0	2.9
11A	Women's Locker Room Bathroom	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	2250	540	4	F32T8	F42ILL-R	52	0.2	C-OCC	1,000	208	332	0.0	$ 52.10	$ 1,202.50	$ 35	23.1	22.4
11A	Women's Team Room	6	4' 2-LAMP T-12	F42EL	60	0.4	SW	2250	810	6	F32T8	F42ILL-R	52	0.3	C-OCC	1,000	312	498	0.0	$ 78.16	$ 1,702.50	$ 35	21.8	21.3
111A	Storage Room	6	4' 1-LAMP T-12	F41EL	32	0.2	SW	2125	408	6	F28T8	F41SSILL-R	23	0.1	OCC	1,200	166	242	0.1	$ 40.25	$ 118.75	$ 20	3.0	2.5
11A	Entry Outer Room	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	2125	383	3	F32T8	F42ILL-R	52	0.2	OCC	1,200	187	195	0.0	$ 31.02	$ 868.75	$ 20	28.0	27.4
169	Gym (Basketball Court)	45	SP 250 MH ROOF	MH250/1	295	13.3	SW	2125	28,209	45	FXLED78	FXLED78/1	78	3.5	OCC	1,200	4,212	23,997	9.8	$ 4,302.69	$ 5,890.00	$ 20	1.4	1.4
11A	Room 135 - Fitness Center	12	4' 2-LAMP T-12	F42EL	60	0.7	SW	2000	1,440	12	F32T8	F42ILL-R	52	0.6	OCC	1,000	624	816	0.1	$ 129.31	$ 3,118.75	$ -	24.1	24.1
11A	Room 135 - Fitness Center	27	4' 2-LAMP T-12	F42EL	60	1.6	SW	2125	3,443	27	F32T8	F42ILL-R	52	1.4	OCC	1,200	1,685	1,758	0.2	$ 279.21	$ 6,868.75	$ 20	24.6	24.5
11A	Men's Entrance	9	4' 2-LAMP T-12	F42EL	60	0.5	SW	2125	1,148	9	F32T8	F42ILL-R	52	0.5	OCC	1,200	562	586	0.1	$ 93.07	$ 2,368.75	$ 20	25.5	25.2
111A	Sorage Space Gym	9	4' 1-LAMP T-12	F41EL	32	0.3	SW	2125	612	9	F28T8	F41SSILL-R	23	0.2	OCC	1,200	248	364	0.1	$ 60.37	$ 118.75	$ 20	2.0	1.6
111A	Mechanical Mezzanine	15	4' 1-LAMP T-12	F41EL	32	0.5	SW	2125	1,020	15	F28T8	F41SSILL-R	23	0.3	OCC	1,200	414	606	0.1	$ 100.62	$ 118.75	$ 20	1.2	1.0
11A	Handball Court	13	4' 2-LAMP T-12	F42EL	60	0.8	SW	2125	1,658	13	F32T8	F42ILL-R	52	0.7	OCC	1,200	811	846	0.1	$ 134.43	$ 3,368.75	$ 20	25.1	24.9
180	Training Room	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2125	714	3	T 28 C F 4	F43SSILL	72	0.2	OCC	1,200	259	455	0.1	$ 76.86	$ 463.00	$ 75	6.0	5.0
175A	Training Room	4	4' 2-LAMP T-8 (32W)	F42ILL	32	0.1	SW	2125	272	4	4' 2-LAMP T-8	F42ILL	59	0.2	OCC	1,200	283	(11)	(0.1)	$ (9.46)	$ 118.75	$ 20		
180	Office - Basketball	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	$ 20	6.8	6.4
175A	Office - Basketball	1	4' 2-LAMP T-8 (32W)	F42ILL	32	0.0	SW	2500	80	1	4' 2-LAMP T-8	F42ILL	59	0.1	None	2,500	148	(68)	(0.0)	$ (12.07)	$ -	$ -		
175A	Office - Softball	2	4' 2-LAMP T-8 (32W)	F42ILL	32	0.1	SW	2125	136	2	4' 2-LAMP T-8	F42ILL	59	0.1	OCC	1,200	142	(6)	(0.1)	$ (4.73)	$ 118.75	$ 20		
204	Laundry Room	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	SW	2125	1,320	3	S 96 P F 2 (MAG) 8'	F82EHE	207	0.6	OCC	1,000	621	699	0.0	$ 104.79	$ 118.75	$ 20	1.1	0.9
111A	Athletic Equipment Room	2	4' 1-LAMP T-12	F41EL	32	0.1	SW	500	32	2	F28T8	F41SSILL-R	23	0.0	None	500	23	9	0.0	$ 2.65	$ -	$ 50	0.0	-18.9
11A	Athletic Equipment Room	5	4' 2-LAMP T-12	F42EL	60	0.3	SW	2125	638	5	F32T8	F42ILL-R	52	0.3	OCC	1,200	312	326	0.0	$ 51.71	$ 1,368.75	$ 20	26.5	26.1
111A	Athletic Equipment Room	9	4' 1-LAMP T-12	F41EL	32	0.3	SW	2500	720	9	F28T8	F41SSILL-R	23	0.2	None	2,500	518	203	0.1	$ 36.21	$ -	$ -	0.0	0.0
71	Athletic Equipment Room	2	I 60	I60/1	60	0.1	SW	2500	300	2	CF 26	CFQ26/1-L	27	0.1	None	2,500	135	165	0.1	$ 29.50	$ 81.00	$ 50	2.7	1.1
11A	Athletic Equipment Room	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	2500	450	3	F32T8	F42ILL-R	52	0.2	None	2,500	390	60	0.0	$ 10.73	$ 750.00	$ 75	69.9	62.9
11A	Men's Staff Locker Room	6	4' 2-LAMP T-12	F42EL	60	0.4	SW	2125	765	6	F32T8	F42ILL-R	52	0.3	OCC	1,200	374	391	0.0	$ 62.05	$ 1,618.75	$ -	26.1	26.1
11A	Toilet Room	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	1062.5	191	3	F32T8	F42ILL-R	52	0.2	None	1,063	166	26	0.0	$ 5.55	$ 750.00	$ -	135.1	135.1
111A	Public Men's Locker Room	33	4' 1-LAMP T-12	F41EL	32	1.1	SW	2125	2,244	33	F28T8	F41SSILL-R	23	0.8	OCC	1,200	911	1,333	0.3	$ 221.36	$ 118.75	$ 20	0.5	0.4
180	Shower Room	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1062.5	238	2	T 28 C F 4	F43SSILL	72	0.1	None	1,063	153	85	0.1	$ 18.51	$ 229.50	$ -	12.4	12.4
11A	Toilet Room	5	4' 2-LAMP T-12	F42EL	60	0.3	SW	1062.5	319	5	F32T8	F42ILL-R	52	0.3	None	1,063	276	43	0.0	$ 9.26	$ 1,250.00	$ -	135.1	135.1
111A	Physiology Room	7	4' 1-LAMP T-12	F41EL	32	0.2	SW	2125	476	7	F28T8	F41SSILL-R	23	0.2	OCC	1,200	193	283	0.1	$ 46.96	$ 118.75	$ 20	2.5	2.1
11A	Room 116 - Athletic Office	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	500	240	8	F32T8	F42ILL-R	52	0.4	None	500	208	32	0.1	$ 9.41	$ 2,000.00	$ -	212.6	212.6
11A	Room 121 - Athletic Office	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	$ 1,000.00	$ -	212.6	212.6
11A	Room 119 - Athletic Office	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	$ 1,000.00	$ -	212.6	212.6
11A	Room 116 - Athletic Office	4	4' 2-LAMP T-12	F42EL	60	0.2	SW	2125	510	4	F32T8	F42ILL-R	52	0.2	OCC	1,200	250	260	0.0	$ 41.36	$ 1,118.75	$ 20	27.0	26.6
11A	Room 117 - Athletic Office	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	$ 1,000.00	$ -	135.1	135.1
11A	Room 100B - Athletic Office	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	2125	1,020	8	F32T8	F42ILL-R	52	0.4	OCC	1,200	499	521	0.1	$ 82.73	$ 2,118.75	$ -	25.6	25.6
11A	Room 118 - Athletic Office	8	4' 2-LAMP T-12	F42EL	60	0.5	SW	1062.5	510	8	F32T8	F42ILL-R	52	0.4	None	1,063	442	68	0.1	$ 14.81	$ 2,000.00	$ 56	135.1	131.3
11A	Server Room	1	4' 2-LAMP T-12	F42EL	60	0.1	SW	2250	135	1	F32T8	F42ILL-R	52	0.1	None	2,250	117	18	0.0	$ 3.28	$ 250.00	$ -	76.3	76.3
11A	Men's Bathroom	3	4' 2-LAMP T-12	F42EL	60	0.2	SW	2250	405	3	F32T8	F42ILL-R	52	0.2	None	2,250	351	54	0.0	$ 9.83	$ 750.00	$ -	76.3	76.3
180	Men's Bathroom	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	500	224	4	T 28 C F 4	F43SSILL	72	0.3	None	500	144	80	0.2	$ 23.52	$ 459.00	$ -	19.5	19.5
141A	Exterior	7	HPS 200	HPS200/1	250	1.8	SW	520	910	7	FXLED78	FXLED78/1	78	0.5	None	520	284	626	1.2	$ 180.60	$ 803.25	$ -	4.4	4.4
146	Exterior	6	High Bay MH 400	MH400/1	458	2.7	SW	520	1,429	6	P 54 C F 4	FC20	20	0.1	C-OCC	390	47	1,382	2.6	$ 396.54	$ 202.50	$ 35	0.5	0.4
	Total	**450**				**39.1**			**73,095**	**450**				**21.7**			**27,615**	**45,500**	**17.4**	**$8,100**	**73,200**	**1,876**		
																	Demand Savings		**17.4**	**$1,253**			
																	kWh Savings		**45,500**	**$6,825**			
																	Total Savings			**$8,078**		**9.1**	**8.8**

APPENDIX D

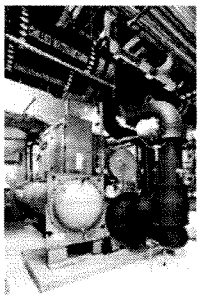
New Jersey Pay For Performance Incentive Program

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.

CONTACT US

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
Papiano Gym

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)	40,000
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)	$52,058	$21,522
Existing Usage (from utility)	389,865	58,276
Proposed Savings	74,100	0
Existing Total MMBtus	7,158	
Proposed Savings MMBtus	253	
% Energy Reduction	**3.5%**	
Proposed Annual Savings	$10,400	

	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	$0.00	$0.00
Incentive #3	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.00	$0.00

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$4,000
Incentive #2	$0	$0	$0
Incentive #3	$0	$0	$0
Total All Incentives	**$0**	**$0**	**$4,000**

Total Project Cost	$95,600

		Allowable Incentive
% Incentives #1 of Utility Cost*	5.4%	$4,000
% Incentives #2 of Project Cost**	0.0%	$0
% Incentives #3 of Project Cost**	0.0%	$0
Total Eligible Incentives***	**$4,000**	
Project Cost w/ Incentives	$91,600	

Project Payback (years)	
w/o Incentives	w/ Incentives
9.2	8.8

* 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.

APPENDIX F

Solar Photovoltaic Analysis

Camden County College
Papiano Gym

Cost of Electricity	$0.160	/kWh
Electricity Usage	389,865	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
$840,000	**210.0**	**268,334**	**0**	**$42,933**	**0**	**$42,933**	**$0**	**$21,467**	**19.6**	**13.0**

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

Area Output*

3,665 m2
39,453 ft2

Perimeter Output*

247 m
809 ft

Available Roof Space for PV:
(Area Output - 10 ft x Perimeter) x 85%
26,655 ft2

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

8	watt/ft2	
213,242	DC watts	
210	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

268,334 annual kWh calculated in PV Watts program

% Offset Calc

Usage	389,865	(from utilities)
PV Generation	268,334	(generated using PV Watts)
% offset	69%	

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

AC Energy & Cost Savings

Cautions for Interpreting the Results

Papiano Gym (Camden County College)

Station Identification

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

PV System Specifications

DC Rating:	210.0 kW
DC to AC Derate Factor:	0.830
AC Rating:	174.3 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	14716	1927.80
2	3.50	17325	2269.58
3	4.81	25388	3325.83
4	5.27	26252	3439.01
5	5.81	29140	3817.34
6	6.13	28811	3774.24
7	5.76	27716	3630.80
8	5.63	26984	3534.90
9	5.03	23855	3125.01
10	4.04	20539	2690.61
11	2.90	14644	1918.36
12	2.46	12965	1698.42
Year	4.51	268334	35151.76

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

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

APPENDIX G

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Papiano Gymnasium and Swimming Pool

Building ID: 3251849
For 12-month Period Ending: April 30, 2012[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: November 08, 2012

Facility
Papiano Gymnasium and Swimming Pool
College Drive
Blackwood, NJ 08012

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1974
Gross Floor Area (ft²): 40,000

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	2,475,940
Natural Gas (kBtu)[4]	35,053
Total Energy (kBtu)	2,510,993

Energy Intensity[4]

Site (kBtu/ft²/yr)	63
Source (kBtu/ft²/yr)	208

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	352

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

National Median Comparison

National Median Site EUI	39
National Median Source EUI	100
% Difference from National Median Source EUI	108%
Building Type	Recreation

Stamp of Certifying Professional

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

Certifying Professional
N/A

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

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

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Values represent energy intensity, annualized to a 12-month period.
5. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

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

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Papiano Gymnasium and Swimming Pool	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Recreation	Is this an accurate description of the space in question?		☐
Location	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.		☐
Gym (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	40,000 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.		☐
Pool (Swimming Pool)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Pool Size	Recreational (20 yards x 15 yards)	Is this the correct size of the swimming pool?		☐
Indoor Outdoor	Indoor	Is the pool located inside or outside the building?		☐
Months in Use	N/A(Optional)	Is this the total months out of the year that the pool is open for use?		☐

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	53,877.44
02/26/2012	03/25/2012	52,466.18
01/26/2012	02/25/2012	59,724.41
12/26/2011	01/25/2012	51,236.87
11/26/2011	12/25/2011	52,671.96
10/26/2011	11/25/2011	57,555.46
09/26/2011	10/25/2011	55,361.34
08/26/2011	09/25/2011	72,059.94
07/26/2011	08/25/2011	69,186.14
06/26/2011	07/25/2011	73,168.40
05/26/2011	06/25/2011	69,114.83
83431473 Consumption (kWh (thousand Watt-hours))		**666,422.97**
83431473 Consumption (kBtu (thousand Btu))		**2,273,835.17**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**2,273,835.17**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: 180448 (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
03/24/2012	04/23/2012	26.78
02/24/2012	03/23/2012	42.23
01/24/2012	02/23/2012	42.35
12/24/2011	01/23/2012	34.06
11/24/2011	12/23/2011	35.81
10/24/2011	11/23/2011	29.84
09/24/2011	10/23/2011	29.84
08/24/2011	09/23/2011	37.19
07/24/2011	08/23/2011	21.86
06/24/2011	07/23/2011	0.00
05/24/2011	06/23/2011	23.87

180448 Consumption (therms)	**323.83**
180448 Consumption (kBtu (thousand Btu))	**32,383.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**32,383.00**
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
Papiano Gymnasium and Swimming Pool
College Drive
Blackwood, NJ 08012

Facility Owner
N/A

Primary Contact for this Facility
N/A

General Information

Papiano Gymnasium and Swimming Pool	
Gross Floor Area Excluding Parking: (ft^2)	40,000
Year Built	1974
For 12-month Evaluation Period Ending Date:	April 30, 2012

Facility Space Use Summary

Gym	
Space Type	Other - Recreation
Gross Floor Area (ft^2)	40,000
Number of PCs ◦	N/A
Weekly operating hours ◦	N/A
Workers on Main Shift ◦	N/A

Pool	
Space Type	Swimming Pool
Pool Size	Recreational (20 yards x 15 yards)
Indoor Outdoor	Indoor
Months in Use ◦	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)	63	63	6	N/A	39
Source (kBtu/ft²)	208	208	21	N/A	100
Energy Cost					
$/year	$ 82,032.40	$ 82,032.40	$ 8,442.40	N/A	$ 50,968.04
$/ft²/year	$ 2.05	$ 2.05	$ 0.21	N/A	$ 1.27
Greenhouse Gas Emissions					
$MtCO_2e$/year	352	352	36	N/A	219
$kgCO_2e/ft^2$/year	9	9	1	N/A	6

More than 50% of your building is defined as Recreation. This building is currently ineligible for a rating. Please note the National Median column represents the CBECS national median data for Recreation. This building uses 108% more energy per square foot than the CBECS national median for Recreation.

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