WILLIAM PATTERSON UNIVERSITY

MORRISON HALL

300 Pompton Road, Wayne NJ 07470

LOCAL GOVERNMENT ENERGY AUDIT PROGRAM
FOR
NEW JERSEY
BOARD OF PUBLIC UTILITIES

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CHA PROJECT NO. 28661

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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 building 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 staff and spot measurements taken in the field.

List of Common Energy Audit Abbreviations

- A/C – Air Conditioning
- AHS – Air Handling Unit
- BMS – Building Management System
- Btu – British thermal unit
- CDW – Condenser Water
- CFM – Cubic feet per minute
- CHW – Chilled Water
- DCV – Demand Control Ventilation
- DDC – Direct Digital Control
- DHW – Domestic Hot Water
- DX – Direct Expansion
- EER – Energy Efficiency Ratio
- EF – Exhaust Fan
- EUI – Energy Use Intensity
- Gal – Gallon
- GPD – Gallons per day
- GPF – Gallons Per Flush
- GPH – Gallons per hour
- GPM – Gallons per minute
- GPS – Gallons per second
- HHW – Heating Hot Water
- HID – High Intensity Discharge
- HP – Horsepower
- HRU – Heat Recovery Unit
- HVAC – Heating, Ventilation, Air Conditioning
- HX – Heat Exchanger
- kbtu/mbtu – One thousand (1,000) Btu
- kW – Kilowatt (1,000 watts)
- kWh – Kilowatt-hours
- LED – Light Emitting Diode
- mbh – Thousand Btu per hour
- mmbtu – One million (1,000,000) Btu
- OCC – Occupancy Sensor
- PSI – Pounds per square inch
- RTU – Rooftop Unit
- SBC – System Benefits Charge
- SF – Square foot
- UH – Unit Heater
- V – Volts
- VAV – Variable Air Volume
- VSD – Variable Speed Drive
- W – Watt

1.0 EXECUTIVE SUMMARY

This report summarizes the energy audit performed by CHA for William Patterson University (WPU) in connection with the New Jersey Board of Public Utilities (NJBPU) Local Government Energy Audit (LGEA) Program. The purpose of this report is to identify energy savings opportunities associated with major energy consumers and inefficient practices. Low-cost and no-cost are also identified during the study. This report details the results of the energy audit conducted for the building listed below:

Building Name	Address	Square Feet	Construction Date
Morrison Hall	300 Pompton Road, Wayne NJ 07470	34,000	1955

The potential total annual energy and cost savings for the recommended energy conservation measures (ECM) identified in the survey are shown below:

Building Name	Electric Savings (kWh)	NG Savings (therms)	Total Savings ($)	Payback (years)
Morrison Hall	120,683	2,341	20,014	15.9

Each individual measure's annual savings are dependent on that measure alone, there are no interactive effects calculated. There are three options shown for Lighting ECM savings; only one option can be chosen. Incentives shown (if any) are based only on the SmartStart Incentive Program. Other NJBPU or local utility incentives may also be available/ applicable and are discussed in Section 6.0.

Each measure recommended by CHA typically has a stand-alone simple payback period of 15 years or less. However, if the owner choses to pursue an Energy Savings Improvement Plan (ESIP), high payback measures could be bundled with lower payback measures which ultimately can result in a payback which is favorable for an ESIP project to proceed. Occasionally, we will recommend an ECM that has a longer payback period, based on the need to replace that piece(s) of equipment due to its age, such as a boiler for example.

The following table provides a detailed summary of each ECM for the building surveyed, including costs, savings, SmartStart incentives and payback.

Summary of Energy Conservation Measures

ECM #	Energy Conservation Measure	Est. Costs ($)	Est. Savings ($/year)	Payback w/o Incentive	Potential Incentive ($)*	Payback w/ Incentive	Recommended
ECM-1	Replace Roof	879,160	2,029	433.4	0	433.4	N
ECM-2	Replace RTUs with High Efficiency RTUs	159,017	4,150	43.7	3,400	42.7	Y
ECM-3	Program DDC System to Utilize Temp Setback	69,663	6,307	11.0	0	11.0	Y
ECM-4	Replace High Flow Plumbing Fixtures with Low Flow Plumbing Fixtures	51,780	591	87.7	0	87.7	N
ECM-L1**	Lighting Replacements / Upgrades	74,343	9,170	8.1	16,761	6.3	N
ECM-L2**	Install Lighting Controls (Add Occupancy Sensors)	14,850	818	18.2	1,925	15.8	N
ECM-L3	Lighting Replacements with Controls (Occupancy Sensors)	89,193	9,557	9.3	18,686	7.4	Y
	Total**	1,248,812	22,633	55.2	22,086	54.2	
	Total (Recommended)	317,872	20,014	15.9	22,086	14.8	

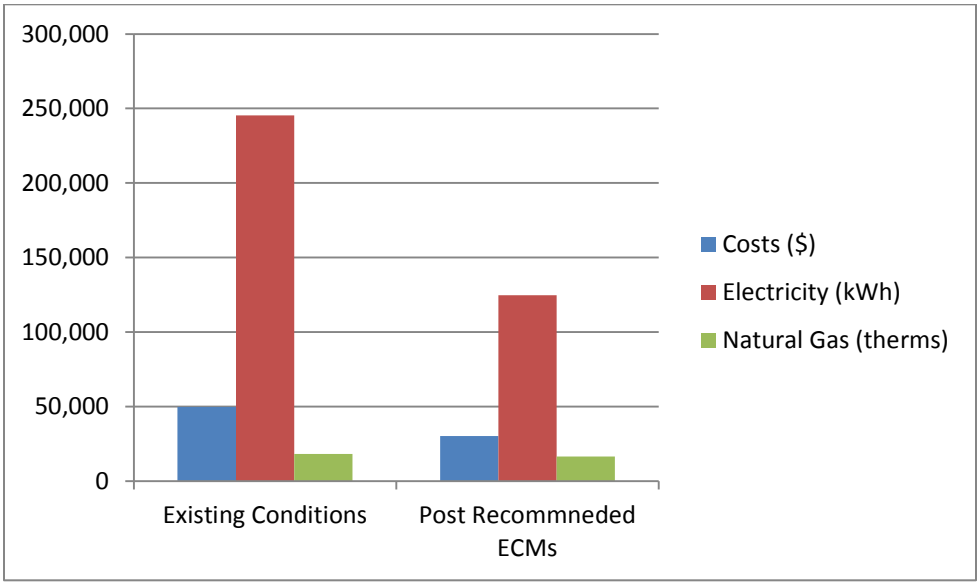
* Incentive shown is per the New Jersey SmartStart Program.
** These ECMs are not included in the Total, as they are alternate measures not recommended.

The following alternative energy measures are also recommended for further study:

- Photovoltaic (PV) Rooftop Solar Power Generation – 70 kW System

If WPU implements the recommended ECMs, energy savings would be as follows:

	Existing Conditions	Post Recommended ECMs	Percent Savings
Costs ($)	49,756	29,742	40%
Electricity (kWh)	245,400	124,717	49%
Natural Gas (therms)	18,116	15,775	13%
Site EUI (kbtu/SF/Yr)	77.9	58.9	



2.0 BUILDING INFORMATION AND EXISTING CONDITIONS

The following is a summary of building information related to HVAC, plumbing, building envelope, lighting, kitchen equipment and domestic hot water systems as observed during CHAs site visit. See appendix B for detailed information on mechanical equipment, including capacities, model numbers and age. See appendix F for some representative photos of some of the existing conditions observed while onsite.

Building Name: Morrison Hall
Address: 300 Pompton Road, Wayne NJ 07470
Gross Floor Area: 34,000
Number of Floors: 2
Year Built: 1955

Building Envelope

Description of Spaces: This building serves as an administrative building which has office rooms, conference rooms restrooms, storage rooms and mechanical rooms.
Description of Occupancy: There are about 50 staff working in this building
Number of Computers: The building has approximately 50 desktop and laptop computers.
Building Usage: The building operates approximately 51 weeks per year. Hours of operation are typically 8:00 AM – 5:00 PM Monday through Friday.
Construction Materials: The building is constructed of structural steel framing, concrete masonry units (CMU) with brick façade.
Roof: The building has a flat roof which is covered with grey rubber membrane. It was observed that some part of roof had water accumulation due to the water drain blockage during the site

visit. The roof appears to be slightly damaged by the water and may lead to water leakage issue in the future. Therefore, an ECM related to roof replacement is evaluated.
Windows: The windows in this building are double pane windows. The windows are in good condition and therefore no ECM is associated with window replacement.
Exterior Doors: Exterior doors throughout the school are aluminum frame with safety glass. Sweeps on exterior doors are still in good condition and therefore no ECM related to door seals is evaluated.

Heating Ventilation & Air Conditioning (HVAC) Systems

Heating: The building has a gas fired boiler to provide heating hot water (HHW) for the baseboard heaters to heat the perimeter areas. The boiler has a rated energy input of 454 MBH and energy output of 390 MBH to 418 MBH which results in a nameplate efficiency of 86% to 92%. The boiler has a rated heating capacity of 454 MBH. The majority of the building is heated by six (6) roof top units (RTU) equipped with gas furnaces and the heating capacities of these RTUs are list as below:

Type	Manufacturer	Heating Capacity	Efficiency	Serve Area
RTU	Trane	200 MBH Heating Input and 166 MBH Heating Output	83% Heating Efficiency	Offices and Common Areas
RTU	Trane	400 MBH Heating Input and 324 MBH Heating Output	81% Heating Efficiency	Offices and Common Areas
RTU	Trane	205 MBH Heating Input and 166 MBH Heating Output	81% Heating Efficiency	Offices and Common Areas
RTU	Trane	350 MBH Heating Input and 280 MBH Heating Output	80% Heating Efficiency	Offices and Common Areas
RTU	Trane	250 MBH Heating Input and 202 MBH Heating Output	81% Heating Efficiency	Offices and Common Areas
RTU	Carrier	220 MBH Heating Input and 178 MBH Heating Output	81% Heating Efficiency	Offices and Common Areas

Cooling: The majority of the building is cooled by the six (6) RTUs. The cooling capacities of these RTUs are as below:

Type	Manufacturer	Heating Capacity	Efficiency	Serve Area
RTU	Trane	10 ton	EER of 9.6	Offices and Common Areas
RTU	Trane	20 ton	EER of 9.5	Offices and Common Areas

RTU	Trane	10 ton	EER of 9.6	Offices and Common Areas
RTU	Trane	17.5 ton	EER of 9.6	Offices and Common Areas
RTU	Trane	12.5 ton	EER of 9.6	Offices and Common Areas
RTU	Carrier	15 ton	EER of 11.2	Offices and Common Areas

Apart from the RTUs, there is a Mitsubishi split ductless unit provides cooling for the conference room. This unit has a rated cooling capacity of 1.5 ton and the condenser is located on the roof.

An ECM related to replace old RTUs is evaluated.

Ventilation: The ventilation of this building is provided by the (6) RTUs. The RTU supply air CFM varies from 5,000 CFM to 8,000 CFM with 40% of the outdoor air. No ECM is associated with the ventilation system.

Exhaust: The RTUs provide exhaust for the office space and common areas. Each RTU has an exhaust damper. Apart from the RTUs, there are two exhaust fans located on the roof to provide exhaust for the restrooms. The exhaust fans appear to be in good condition and therefore no ECM related to the exhaust system is evaluated.

Controls Systems

The majority of the HVAC system is controlled by the central Andover DDC system. After reviewing the central control system, it was noted that the room temperature is set up from 74 ^{o}F to 78 ^{o}F during cooling season and set back from 72 ^{o}F to 65 ^{o}F during heating season from 8:00PM to 12:00AM. An ECM related to extended the temperature setback program is evaluated.

Domestic Hot Water Systems

The domestic hot water is provided by a brand new Rheem electric heater installed in 2014. This heater has a rated heating capacity of 4.5 kW and 40 gallon storage capacity. No ECM is evaluated due to the new heater.

Kitchen Equipment

There is no kitchen in the building and therefore there is no ECM associated with kitchen equipment.

Plug Load

This building has computers, monitors, TVs, projectors and residential appliances (microwave, refrigerator) which contribute to the plug load in the building. No ECM associated with plug load is evaluated.

Plumbing Systems

The restrooms contain older style toilets and urinals that utilize a higher volume of water per flush (3.5 GPF) than currently available new units. The sink faucets are double handle type and do not appear to have low-flow type aerators, dispensing at 2.5 GPM. An ECM is included to evaluate the water savings potential of installing low- flow plumbing fixtures.

Lighting Systems

The building has a mixture of 32W/25W T-8 fluorescent lighting, a few CFLs and some incandescent lights in mechanical room. The majority of lighting fixtures are T-8 fluorescent U-shape and linear fixtures. All of the lights in this building are controlled by manual switches. After discussions with facility staff, it was noted that the office lights are typically turned off after the office hours and the hallway lights are on 24/7. The exterior lights are wall mounted metal halide fixtures and LED outdoor lights. We have provided three alternatives for lighting that include adding occupancy sensors to the existing lights, replacing the lights with LED lights and a third ECM that evaluates adding occupancy sensors to the proposed LED lights.

3.0 UTILITIES

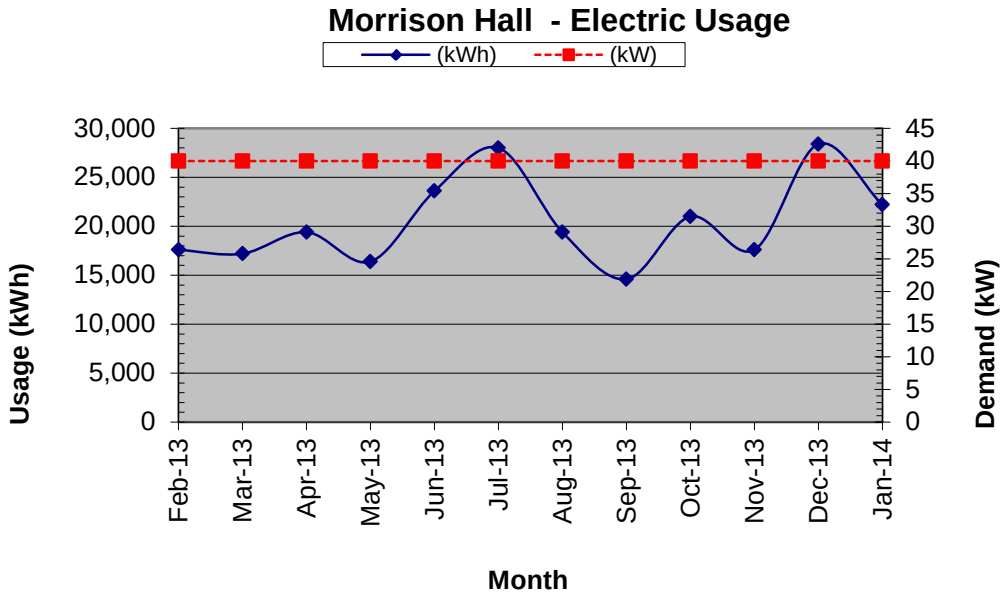
Natural gas and electricity are metered into this building under Account # 67-488-992-06. Utilities used by the building are delivered and supplied by the following utility companies:

	Electric	Natural Gas
Deliverer	PSE&G	PSE&G
Supplier	Direct Energy	HESS

For the 12-month period ending in January 2014, the utilities usages and costs for the building were as follows:

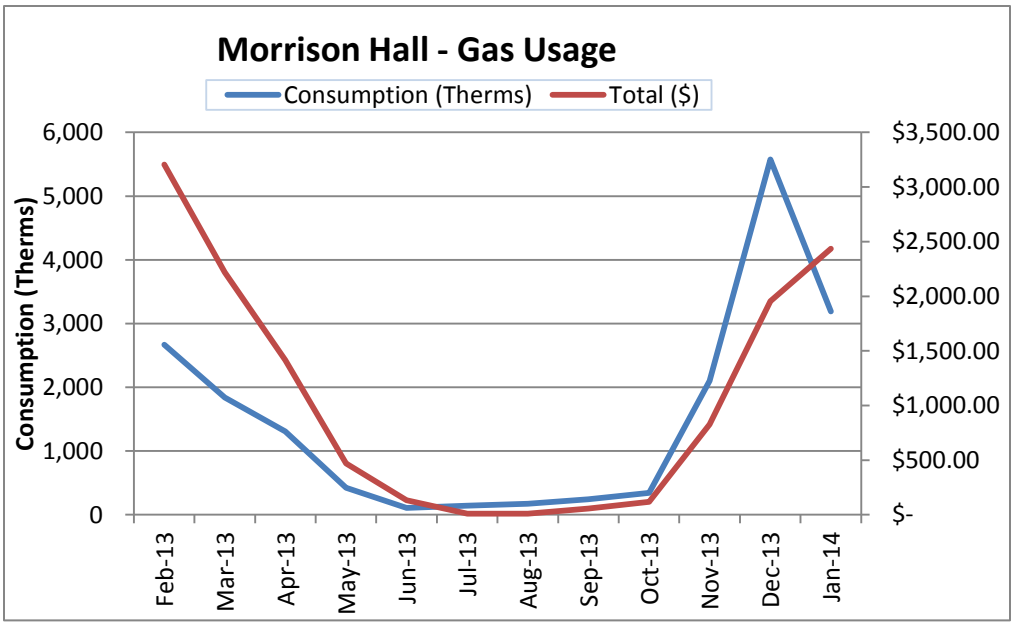
Electric		
Annual Consumption	245,400	kWh
Annual Cost	36,897	$
Blended Unit Rate	0.15	$/kWh
Supply Rate	0.13	$/kWh
Demand Rate	11.93	$/kW
Peak Demand	40.0	kW
Natural Gas		
Annual Consumption	18,116	Therms
Annual Cost	12,859	$
Unit Rate	0.71	$/therm

Blended Rate: Average rate charged determined by the annual cost / annual usage
Supply Rate: Actual rate charged for electricity usage in kWh (based on most recent electric bill)
Demand Rate: Rate charged for actual electrical demand in kW (based on most recent electric bill)
*Some months that do not have utility data and the missing demand usage are estimated and highlighted in the utility spreadsheet



The electric usage in this building has slightly higher usage in summer season and December. It is believed that the summer months peak is due to the electric air

conditioning units and December peak may be due to higher occupied level and utilization rate in that month.



The natural gas usage in this building is for heating and domestic hot water heating. The gas usage in the non-heating season is for domestic hot water only and relatively small. The gas usage during the heating season is correlated to winter weather conditions.

See Appendix A for utility analysis.

Under New Jersey's energy deregulation law, the supply portion of the electric (or natural gas) bill is separated from the delivery portion. The supply portion is open to competition, and customers can shop around for the best price for their energy suppliers. The electric and natural gas distribution utilities will still deliver the gas/ electric supplies through their wires and pipes – and respond to emergencies, should they arise – regardless of where those supplies are purchased. Purchasing the energy supplies from a company other than your electric or gas utility is purely an economic decision; it has no impact on the reliability or safety of the service.

Comparison of Utility Rates to NJ State Average Rates*				Recommended to Shop for Third Party Supplier?
Utility	Units	School Average Rate	NJ Average Rate	
Electricity	$/kWh	$0.15	$0.13	Y
Natural Gas	$/Therm	$0.71	$0.96	N

* Per U.S. Energy Information Administration (2013 data – Electricity and Natural Gas, 2012 data – Fuel Oil)

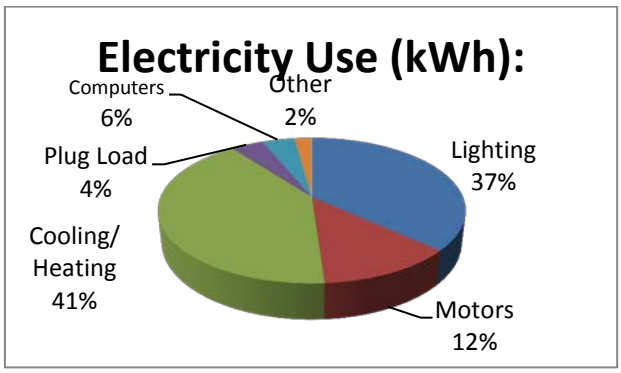
Additional information on selecting a third party energy supplier is available here:

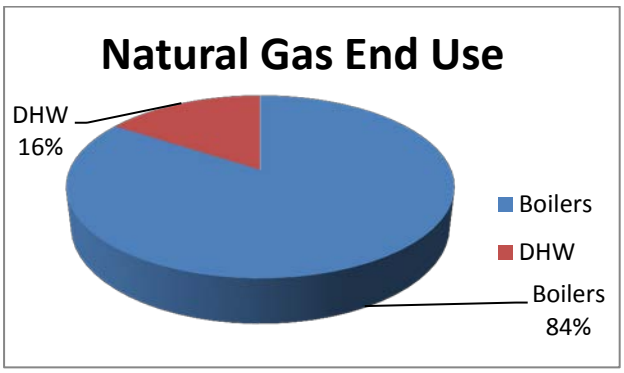
http://www.state.nj.us/bpu/commercial/shopping.html.

See Appendix A for a list of third-party energy suppliers licensed by the Board of Public Utilities to sell within the building's service area.

The charts below represent estimated utility end-use utility profiles for the building. The values used within the charts were estimated from a review of the utility analysis and the energy savings calculations.

Site End-Use Utility Profile





4.0 BENCHMARKING

The EPA Portfolio Manager benchmarking tool 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 measures, the Energy Star rating will increase. However, the EPA does not have score for all types of buildings. The buildings that do not have energy rating now are compared with national median EUI.

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

Site EUI kBtu/ft^2/yr	Source EUI (kBtu/ft^2/yr)	Energy Star Rating (1-100)
77.9	133.3	N/A

The building has lower EUIs than the national median EUIs (national median site EUI is 153.5 kBtu/ft^2 and national median source EUI is 262.6 kBtu/ft^2), and is considered an energy efficient building.

5.0 ENERGY CONSERVATION MEASURES

The following types of energy savings opportunities are identified in this section of the report:

- Energy conservation measures (ECMs) are energy savings recommendations that typically require a financial investment. For these areas of opportunity, CHA prepared detailed calculations, as summarized in this section and in Appendix C. In general, additional savings may exist from reductions in maintenance activities associated with new equipment or better controls; however for conservatism, maintenance savings are not accounted for in this report; instead the only savings which are reported are those derived directly from reductions in energy which can be tracked by the utility bills.

- Operational and Maintenance measures (O&M) consist of low- or no-cost operational opportunities, which if implemented would have positive impacts on overall building operation, comfort levels, and/or energy usage. There are no estimated savings, costs or paybacks associated with the O&M measures included as part of this study.

Energy savings were quantified in the form of:

- electrical usage (kWh=Kilowatt-hour),
- electrical demand (kW=kilowatts),
- natural gas (therms=100,000 Btu),
- propane gas (gallons=91,650 Btu),
- fuel oil (gallons =138,700 Btu), and
- water (kgal=1,000 gallons).

These recommendations are influenced by the time period that it takes for a proposed project to "break even" referred to as "Simple Payback". Simple payback is calculated by dividing the estimated cost of implementing the ECM by the energy cost savings (in dollars) of that ECM.

Another financial indicator of the performance of a particular ECM is the Return on Investment or ROI, which represents the benefit (annual savings over the life of a project) of an investment divided by the cost of the investment. The result is expressed as a percentage or ratio.

Two other financial analyses included in this report are Internal Rate of Return (IRR) and Net Present Value (NPV). Internal Rate of Return is the discount rate at which the present value of a project costs equals the present value of the project savings. Net Present Value is the difference between present value of an investment's future net cash flows and the initial investment. If the NPV equals "0", the project would equate to investing the same amount of dollars at the desired rate. NPV is sometimes referred to as Net Present Worth. These values are provided in the Summary Tab in Appendix C.

5.1 ECM-1 Roof Replacements

The building has a flat roof which is comprised of structural steel, insulation layer, and waterproof membrane. The roof appeared to be in poor condition and has a water draining issue. The roof appears to be slightly damaged by the water and may lead to water leakage issue in the future. It is estimated that the roof insulation is decreased due to the water damage. A new roof would have better insulation and less infiltration.

The calculation uses bin weather data to estimate the occupied and unoccupied bin hours. This is converted to existing energy for the occupied and unoccupied cases using the existing door U-factor and the heating and cooling temperature. The two are added together to create the annual utility usage for the baseline. The same steps are done to calculate the proposed utility usage. The difference in heating/cooling losses results in annual heating natural gas and cooling electricity savings.

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

ECM-1 Roof Replacement

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
879,160	0	2,425	2,345	2,029	(0.9)	0	433.4	433.4

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

This measure is not recommended due to the long payback.

5.2 ECM-2 Replace RTUs with High Efficiency RTUs

The HVAC roof top unit (RTU) serving the building contains DX cooling and gas fired furnaces for heating. Each RTU is mounted on an extended curb, with gravity pressure relief dampers. Supply and return ductwork is routed down through the roof curbs to a duct distribution system above the ceilings to each space. The capacities are received from the manufacturer based on the nameplate model and serial number. A new Carrier RTU was installed recently and the rest of the units are old. It is recommended that these RTUs be replaced through attrition with higher energy efficiency ratio (EER) models. The averaged EER of the existing RTUs is estimated to be 9.8 and the proposed EER would be 13. This ECM assesses the replacement of each size of RTU and gives the resulting energy savings. The total energy savings is the sum of all of the rooftop unit replacements.

The assumption of this calculation is that the operating hours, number of units, and capacity stays the same. The energy savings result from operating higher efficiency units than the existing.

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

ECM-2 Replace RTUs with High Efficiency RTUs

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
159,017	0	24,269	718	4,150	(0.6)	3,400	38.3	37.5

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

This measure is not recommended due to the long payback.

5.3 ECM-3 Program Nighttime Temperature Setback on HVAC System

Currently, the majority of the HVAC system is controlled by the central Andover DDC system. After reviewing the central control system, it was noted that the room temperature is set up from 74 ^{o}F to 78 ^{o}F during cooling season and set back from 72 ^{o}F to 65 ^{o}F during heating season from 8:00PM to 12:00AM. It is suggested to extend the setback temperature hours from 8:00PM to 5:00AM.

The annual natural gas usage for these facilities was taken from utility bills. It is estimated that there is about 1% of electric energy savings and 1% of natural gas savings after the temperature setback. This savings is multiplied by the annual utility usage and converted to monetary savings using the unit cost of the fuel obtained from the utility analysis.

Savings are seen from temperature scheduling for occupied and unoccupied hours.

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

ECM-3 Program Nighttime Temperature Setback on HVAC System

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
69,663	0	34,358	1,624	6,307	0.8	0	11.0	11.0

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

This measure is recommended.

5.4 ECM-4 Install Low Flow Plumbing Fixtures

The plumbing fixtures in this building are older high flow fixtures. The water savings associated from replacing existing high flow fixtures with low-flow fixtures was calculated by taking the difference of the annual water usage for the proposed and base case. The basis of this calculation is the estimate usage of each fixture, gallons per use, and number of fixtures. Replacing the existing fixtures in the restrooms with 1.28 Gals/flush toilets, 1.0 gal/flush urinals, and 0.5 gpm faucets will conserve water which will result in lower annual water and sewer charges. Faucets with low-flow push valves were not considered for replacement.

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

ECM-4 Install Low Flow Plumbing Fixtures

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Water	Total				
$	kW	kWh	Therms	kGal	$		$	Years	Years
51,780	0	1,117	0	56	591	(0.8)	0	87.7	87.7

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

These measures are not recommended due to the long paybacks.

5.5.1 ECM-L1 Lighting Replacement / Upgrades

The existing lighting system consists of mostly T8 linear fluorescent fixtures which until recently represented the most efficient lighting technology available. Exterior lighting includes 175W wall mounted area light fixtures. Recent technological improvements in light emitting diode (LED) technologies have driven down the initial costs making it a viable option for installation.

Overall energy consumption can be reduced by replacing inefficient bulbs and linear fluorescent bulbs with more efficient LED technology. To compute the annual savings for this ECM, the energy consumption of the current lighting fixtures was established and compared to the proposed fixture power requirement with the same annual hours of operation. The difference between the existing and proposed annual energy consumption was the energy savings. These calculations are based on 1 to 1 replacements of the fixtures, and do not take into account lumen output requirements for a given space. A more comprehensive engineering study should be performed to determine correct lighting levels.

Supporting calculations, including assumptions for lighting hours and annual energy usage for each fixture, are provided in Appendix C and summarized below:

ECM-L1 Lighting Replacement / Upgrades

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
74,343	12	59,008	0	9,170	0.4	16,761	8.1	6.3

* LED retrofits must go through the “custom” measures incentive option under New Jersey SmartStart Program. There are no “prescriptive” incentives for LED retrofits. Projects must achieve a minimum of 75,000 kWh annual savings to qualify for “custom” incentives. See section 6.0 for other incentive opportunities

This measure is not recommended in lieu of ECM L3.

5.5.2 ECM-L2 Install Lighting Controls (Occupancy Sensors)

Presently, all interior lighting fixtures are controlled my wall mounted switches. Review of the comprehensive lighting survey determined that lighting in some areas could benefit from installation of occupancy sensors to turn off lights when they are unoccupied.

This measure recommends installing occupancy sensors for the current lighting system. Using a process similar to that utilized in Section L1, the energy savings for this measure was calculated by applying the known fixture wattages in the space to the estimated existing and proposed times of operation for each fixture.

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

ECM-L2 Install Lighting Controls (Occupancy Sensors)

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
14,850	0	6,441	0	818	(0.3)	1,925	18.2	15.8

* Incentive shown is per the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities.

This measure is not recommended in lieu of ECM L3.

5.5.3 ECM-L3 Lighting Replacements with Controls (Occupancy Sensors)

This measure is a combination of ECM-L1 and ECM-L2; recommending replace/upgrade the current lighting fixtures to more efficient ones and installing occupancy sensors on the new lights. Interactive effects of the higher efficiency lights and occupancy sensors lead the energy and cost savings for this measure to not be cumulative or equivalent to the sum of replacing the lighting fixtures alone and installing occupancy sensors without the lighting upgrade. The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-L3 Lighting Replacements with Controls (Occupancy Sensors)

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
89,193	12	62,056	0	9,557	0.2	18,686	9.3	7.4

* LED retrofits must go through the “custom” measures incentive option under New Jersey SmartStart Program. There are no “prescriptive” incentives for LED retrofits. Projects must achieve a minimum of 75,000 kWh annual savings to qualify for “custom” incentives. See section 6.0 for other incentive opportunities

This measure is recommended.

5.6 Additional O&M Opportunities

This list of operations and maintenance (O&M) - type measures represent low-cost or no-cost opportunities, which if implemented will have a positive impact on the overall

building operations, comfort and/or energy consumption. The recommended O&M measures for this building are as follows:

- O&M-1 Replace air filters in all RTUs
- O&M-2 Shut boiler pump off in summer
- O&M-3 Insulate metal roof penetration covers
- O&M-4 Clean roof drains blocking issues and repair roof damage

6.0 PROJECT INCENTIVES

6.1 Incentives Overview

The following sections give detailed information on available incentive programs including New Jersey Smart Start, Direct Install, New Jersey Pay for Performance (P4P) and Energy Savings Improvement Plan (ESIP). If the School District wishes to and is eligible to participate in the Energy Savings Improvement Plan (ESIP) program and/or the Pay for Performance Incentive Program (P4P), it cannot participate in either the Smart Start or Direct Install Programs. Refer to Appendix D for more information on the Smart Start program.

6.1.1 New Jersey Smart Start Program

For this energy audit, The New Jersey Smart Start Incentives are used in the energy savings calculations, where applicable. This program is intended for medium and large energy users and provides incentives for:

- Electric Chillers
- Gas Chillers
- Gas Heating
- Unitary HVAC
- Ground Source Heat Pumps
- Variable frequency Drives/ motors
- Refrigeration
- Prescriptive and performance lighting and lighting controls

The equipment is procured using a typical bid- build method, installed and paid for and then the incentives are reimbursed to the owner.

Refer to Appendix D for more information on the Smart Start program.

6.1.2 Direct Install Program

The Direct Install Program applies to smaller facilities that have a peak electrical demand of 200 kW or less 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 utility companies.

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, refrigeration, and other equipment upgrades with higher efficiency alternatives. If a building is eligible for this funding, the Direct Install Program can reduce the implementation cost of energy conservation projects.

The Direct Install program has specific HVAC equipment and lighting requirements and is generally applicable only to smaller package HVAC units, small boilers and lighting retrofits.

The program pays a maximum amount of $75,000 per building, and up to $250,000 per customer per year. Installations must be completed by an approved Direct Install participating contractor, a list of which can be found on the New Jersey Clean Energy Website. Contractors will coordinate with the applicant to arrange installation of recommended measures identified in a previous energy assessment, such as this energy audit. The incentive is reimbursed to the Owner upon successful replacement and payment of the equipment.

The building qualifies for this program because its electrical demand is less than the maximum peak electrical demand of 200 kW for the last 12 month period.

Refer to Appendix D for more information on this program.

6.1.3 New Jersey Pay For Performance Program (P4P)

This building may 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 to offset the cost of energy conservation projects for facilities that pay the Societal Benefits Charge (SBC) and whose demand (kW) in any of the preceding 12 months exceeds 100 kW. This demand minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations and *is not applicable to public schools*. 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). Additionally, the overall return on investment (ROI) must exceed 10%. 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). The ERP must include a detailed energy audit of the desired ECMs, energy savings calculations (using building modeling software) and inputting of all utility bills into the EPA Portfolio Manager website.

- 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. The ERP must be completed by a Certified Energy Manager (CEM) and submitted along with the project application.

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.

Combining Incentives #2 and #3 will provide a total of $0.18/ kWh and $1.8/therm not to exceed 50% of total project cost. Additional Incentives for #2 and #3 are increased by $0.005/kWh and $0.05/therm for each percentage increase above the 15% minimum target to 20%, calculated with the EPA Portfolio Manager benchmarking tool, not to exceed 50% of total project cost.

For the purpose of demonstrating the eligibility of the ECM's to meet the minimum savings requirement of 15% annual savings and 10% ROI for the Pay for Performance Program, all ECM's identified in this report have been included in the incentive calculations. The results for the building are shown in Appendix C, with more detailed program information in Appendix D.

6.1.4 Energy Savings Improvement Plan

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" (ESO) to pay for the capital costs of energy improvements to their facilities. ESIP loans have a maximum loan term of 15 year. ESOs 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. 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. Refer to Appendix D for more information on this program.

6.1.5 Renewable Energy Incentive Program

The Renewable Energy Incentive Program (REIP) is part of New Jersey's efforts to reach its Energy Master Plan goals of striving to use 30 percent of electricity from renewable sources by 2020.

Incentives for sustainable bio-power projects and for energy storage projects are currently under development, with competitive solicitations for each of those technologies expected to begin in the first quarter of 2014. The wind program is currently on hold.

New solar projects are no longer eligible for REIP incentives, but can register for Solar Renewable Energy Certificates (SRECs) through the SREC Registration Program (SRP).

7.0 ALTERNATIVE ENERGY SCREENING EVALUATION

7.1 Solar

7.1.1 Photovoltaic Rooftop Solar Power Generation

The building 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 amount of available roof area determines how large of a solar array can be installed on any given roof. The table below summarizes the approximate roof area available on the building and the associated solar array size that can be installed.

Available Roof Area (Ft^2)	Potential PV Array Size (kW)
8,819	70

The PVWATTS solar power generation model was utilized to calculate PV power generation; this model is provided in Appendix E.

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. An alternative compliance penalty (ACP) is paid for by the high emission producers and is set each year on a declining scale of 3% per year. 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. Payments that will be received by the PV producer (school) will change from year to year dependent upon supply and demand. There is no definitive way to calculate an exact price that will be received by the PV producer for SREC credits over the next 15 years. Renewable Energy Consultants estimates an average of $175/SREC for 2014 and this number was utilized in the cash flow for this report.

The system costs for PV installations were derived from recent solar contractor budgetary pricing in the state of New Jersey and include the total cost of the system installation (PV panels, inverters, wiring, ballast, controls). The cost of installation is currently about $4.00 per watt or $4,000 per kW of installed system, for a typical system. There are other considerations that have not been included in this pricing, such as the condition of the roof and need for structural reinforcement. Photovoltaic systems can be ground mounted if the roof is not suitable, however, this installation requires a substantial amount of open property (not wooded) and underground wiring, which adds more cost. 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 most likely need to be replaced during the useful life of the PV system.

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

Photovoltaic (PV) Rooftop Solar Power Generation – 70 kW System

Budgetary Cost	Annual Utility Savings			Total Savings	New Jersey Renewable SREC	Payback (without SREC)	Payback (with SREC)	Recommended
	Electricity		Natural Gas					
$	kW	kWh	Therms	$	$	Years	Years	Y/N
280,000	70	83,645	0	12,547	14,638	22.3	10.3	FS

Note: CHA typically recommends a more detailed evaluation be conducted for the installation of PV Solar arrays when the screening evaluation shows a payback of less than 20 years. Therefore, this ECM is recommended for further study. Before implementation is pursued, the school district should consult with a certified solar PV contractor.

It should be noted that the roof has draining issues and some water damage. Therefore, it is suggested that the roof be repaired or replaced and a roof structure study be completed before pursuing roof solar PV installation.

7.1.2 Solar Thermal Hot Water Generation

Active solar thermal systems use solar collectors to gather the sun's energy to heat a fluid. An absorber in the collector (usually black colored piping) converts the sun's energy into heat. The heat is transferred to circulating water, antifreeze, or air for immediate use or is storage for later utilization. Applications for active solar thermal energy include supplementing domestic hot water, heating swimming pools, space heating or preheating air in residential and commercial buildings.

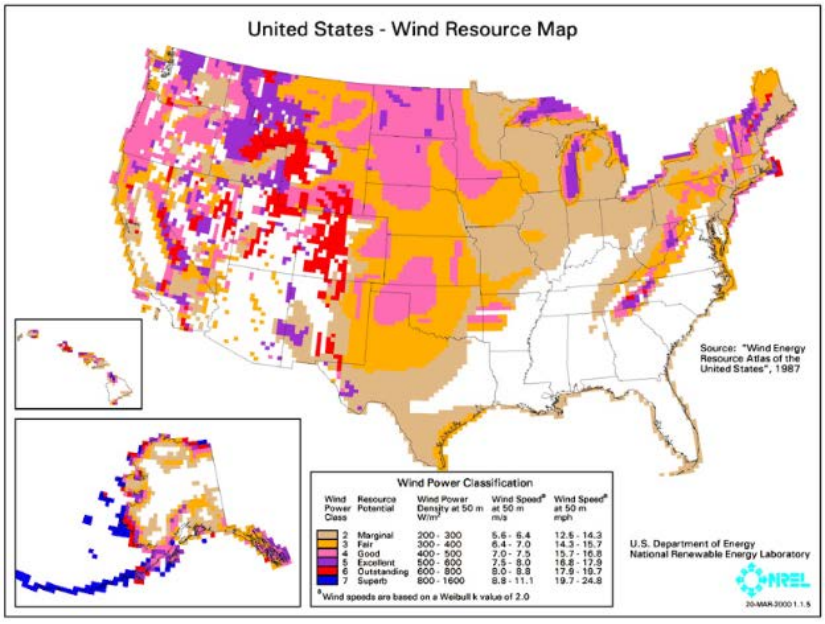
A standard solar hot water system is typically composed of solar collectors, heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually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

Several options exist for using active solar thermal systems for space heating. The most common method is called a passive solar hot water system involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system described above which requires pumping). The most practical system would transfer the heat from the panels to thermal storage tanks and then use the pre-heated water for domestic hot water production. DHW is presently produced by natural gas fired water heaters and, therefore, this measure would offer natural gas utility savings. Unfortunately, the amount of domestic hot water that is currently used by this school is very small. Installing a solar domestic hot water system is not recommended due to the limited amount of domestic hot water presently consumed by the school.

This measure is not recommended due to the relatively low domestic hot water usage.

7.2 Wind Powered Turbines

Wind power is the conversion of kinetic energy from wind into mechanical power that is used to drive a generator which creates electricity by means of a wind turbine. A wind turbine consists of rotor and blades connected to a gearbox and generator that are mounted onto a tower. Newer wind turbines also use advanced technology to generate electricity at a variety of frequencies depending on the wind speed, convert it to DC and then back to AC before sending it to the grid. Wind turbines range from 50 – 750 kW for utility scale turbines down to below 50 kW for residential use. On a scale of 1 (the lowest) to 7 (the highest), Class 3 and above (wind speeds of 13 mph or greater) are generally considered "good wind resource" according to the Wind Energy Development Programmatic EIS Information Center hosted by the Bureau of Land Management. According to the map below, published by NREL, Newark, NJ is classified as Class 1 at 50m, meaning the city would not be a good candidate for wind power.



This measure is not recommended due to the location of the school.

7.3 Combined Heat and Power Plant and Fuel Cell

Combined heat and power (CHP), cogeneration, is self-production of electricity on-site with beneficial recovery of the heat byproduct from the electrical generator. Common CHP equipment includes reciprocating engine-driven, micro turbines, steam turbines, and fuel cells. Typical CHP customers include industrial, commercial, institutional, educational institutions, and multifamily residential facilities. CHP systems that are commercially viable at the present time are sized approximately 50 kW and above, with numerous options in blocks grouped around 300 kW, 800 kW, 1,200 kW and larger. Typically, CHP systems are used to produce a portion of the electricity needed by a facility some or all of the time, with the balance of electric needs satisfied by purchase from the grid.

Any proposed CHP project will need to consider many factors, such as existing system load, use of thermal energy produced, system size, natural gas fuel availability, and proposed plant location. The building has sufficient need for electrical generation and the ability to use most of the thermal byproduct during the winter; however thermal usage during the summer months does not exist. Thermal energy produced by the CHP plant in the warmer months will be wasted. An absorption chiller could be installed to utilize the heat to produce chilled water; however, there is no chilled water distribution system in the building. CHP is not recommended due to the building's limited summer thermal demand.

This measure is not recommended due to the absence of year-round thermal loads which are needed for efficiency CHP operation. However, a mini-size CHP could be an option for the school to consider. The sizing and energy savings of the mini-size CHP require further study.

A fuel cell system with recovery and productive use of waste heat is another alternative energy option viable in the market. A full analysis of all campus buildings would need to be completed to determine the economic viability. The several buildings included in the scope of work are not good candidates for CHP or Fuel cell technology based on their utility usage and geographic locations on their own relative to the main campus.

7.4 Demand Response Curtailment

Presently, electricity is delivered by PSE&G, which receives the electricity from regional power grid RFC. PSE&G is the 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 February 2013 through January 2014 the following table summarizes the electricity load profile for the building.

Building Electric Load Profile

Peak Demand kW	Min Demand kW	Avg Demand kW	Onsite Generation Y/N	Eligible? Y/N
40	40	40	N	N

This measure is not recommended because the building does not have adequate load to meet the required minimum load reduction.

8.0 CONCLUSIONS & RECOMMENDATIONS

The following section summarizes the LGEA energy audit conducted by CHA for the Campus Police building at William Patterson University.

The following projects should be considered for implementation:

- Replace RTUs with High Efficiency RTUs
- Program DDC System to Utilize Temp Setback
- Lighting Replacements with Controls (Occupancy Sensors)

The potential annual energy and cost savings for the recommended ECMs are shown in the following table.

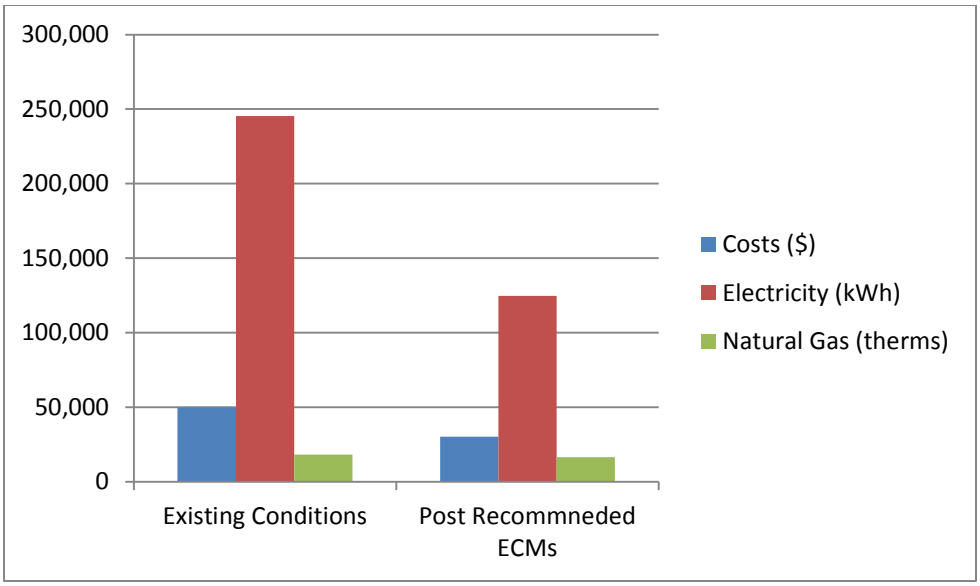
Electric Savings (kWh)	Natural Gas Savings (therms)	Total Savings ($)	Payback (years)
120,683	2,341	20,014	15.9

The following alternative energy measures are recommended for further study:

- Photovoltaic (PV) Rooftop Solar Power Generation – 70 kW System

If WPU implements the recommended ECMs, energy savings would be as follows:

	Existing Conditions	Post Recommended ECMs	Percent Savings
Costs ($)	49,756	29,742	40%
Electricity (kWh)	245,400	124,717	49%
Natural Gas (therms)	18,116	15,775	13%
Site EUI (kbtu/SF/Yr)	77.9	58.9	



Next Steps: This energy audit has identified several areas of potential energy savings. William Paterson University can use this information to pursue incentives offered by the NJBPU's NJ Clean Energy Program. Additional meetings will be scheduled with WPU staff members to review possible options.

APPENDIX A

Utility Usage Analysis and Alternate Utility Suppliers

William Patterson University LGEA
Morrison Hall - Electric Usage

Annual Utilities

12-month Summary

Electric		
Annual Usage	245,400	kWh/yr
Annual Cost	36,897	$
Blended Rate	0.150	$/kWh
Consumption Rate	0.127	$/kWh
Demand Rate	11.93	$/kW
Peak Demand	40.0	kW
Min. Demand	40.0	kW
Avg. Demand	40.0	kW
Natural Gas		
Annual Usage	18,116	therms/yr
Annual Cost	12,859	$
Rate	0.710	$/therm

William Patterson University LGEA
Morrison Hall

Utility Bills: Account Numbers

Account Number	Building Name	Location	Type	Notes
67-488-992-06	Morrison Hall	300 Pompton Road, Wayne NJ 07470	Electricity	
67-488-992-06	Morrison Hall	300 Pompton Road, Wayne NJ 07470	Natural Gas	

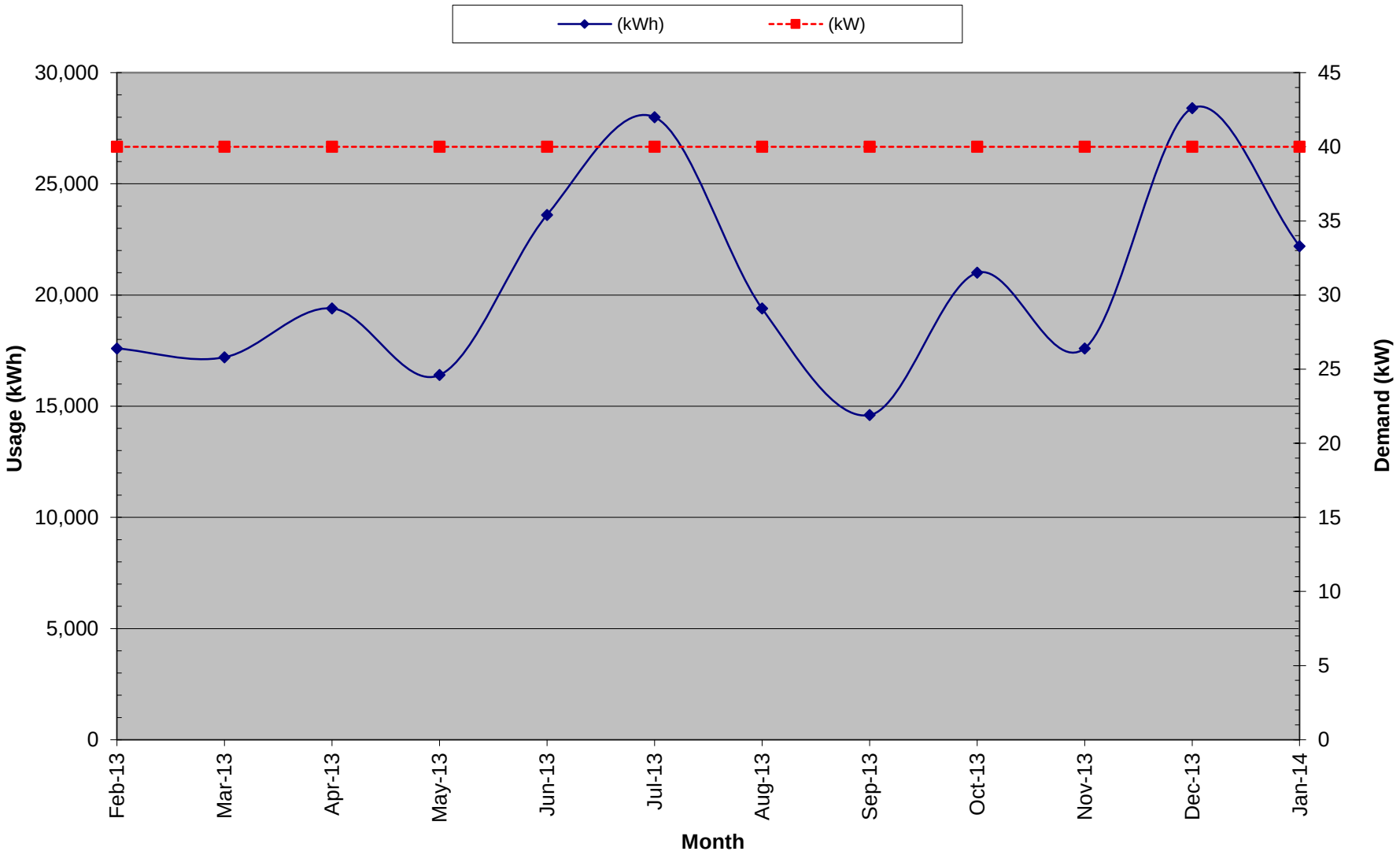
William Patterson University LGEA
Morrison Hall - Electric Usage

For Service at:
Account No.: **67-488-992-06** **Delivery -** **PSE&G**
Meter No.: **728010541** **Supplier -** **HESS**
Electric Service

			Provider Charges			Usage (kWh) vs. Demand (kW) Charges		Unit Costs		
Month	**Consumption (kWh)**	**Demand (kW)**	**Delivery ($)**	**Supplier ($)**	**Total ($)**	**Consumption ($)**	**Demand ($)**	**Blended Rate ($/kWh)**	**Consumption ($/kWh)**	**Demand ($/kW)**
February-13	17,600	40.00	1,736.31	790.57	2,526.88	2,049.68	477.20	0.14	0.12	11.93
March-13	17,200	40.00	1,696.85	810.53	2,507.38	2,030.18	477.20	0.15	0.12	11.93
April-13	19,400	40.00	1,913.89	961.14	2,875.03	2,397.83	477.20	0.15	0.12	11.93
May-13	16,400	40.00	1,617.93	1,016.36	2,634.29	2,157.09	477.20	0.16	0.13	11.93
June-13	23,600	40.00	2,328.23	2,474.02	4,802.25	4,325.05	477.20	0.20	0.18	11.93
July-13	28,000	40.00	2,762.31	2,229.90	4,992.21	4,515.01	477.20	0.18	0.16	11.93
August-13	19,400	40.00	1,913.89	1,376.39	3,290.28	2,813.08	477.20	0.17	0.15	11.93
September-13	14,600	40.00	1,440.35	1,102.43	2,542.78	2,065.58	477.20	0.17	0.14	11.93
October-13	21,000	40.00	1,000.00	189.29	1,189.29	712.09	477.20	0.06	0.03	11.93
November-13	17,600	40.00	1,736.31	708.50	2,444.81	1,967.61	477.20	0.14	0.11	11.93
December-13	28,400	40.00	2,801.77	1,173.62	3,975.39	3,498.19	477.20	0.14	0.12	11.93
January-14	22,200	40.00	2,190.12	926.38	3,116.50	2,639.30	477.20	0.14	0.12	11.93
Total (All)	**245,400**	**40.00**	**$23,137.96**	**$13,759.13**	**$36,897.09**	**$31,170.69**	**$5,726.40**	**$0.150**	**$0.127**	**$11.93**
Notes	1	2	3	4	5	6	7	8	9	10

1.) Number of kWh of electric energy used per month
2.) Number of kW of power measured
3.) Electric charges from Delivery provider
4.) Electric charges from Supply provider
5.) Total charges (Delivery + Supplier)
6.) Charges based on the number of kWh of electric energy used
7.) Charges based on the number of kW of power measured
8.) Total Charges ($) / Consumption (kWh)
9.) Consumption Charges ($) / Consumption (kWh)
10.) Demand Charges ($) / Demand (kW)

Morrison Hall - Electric Usage

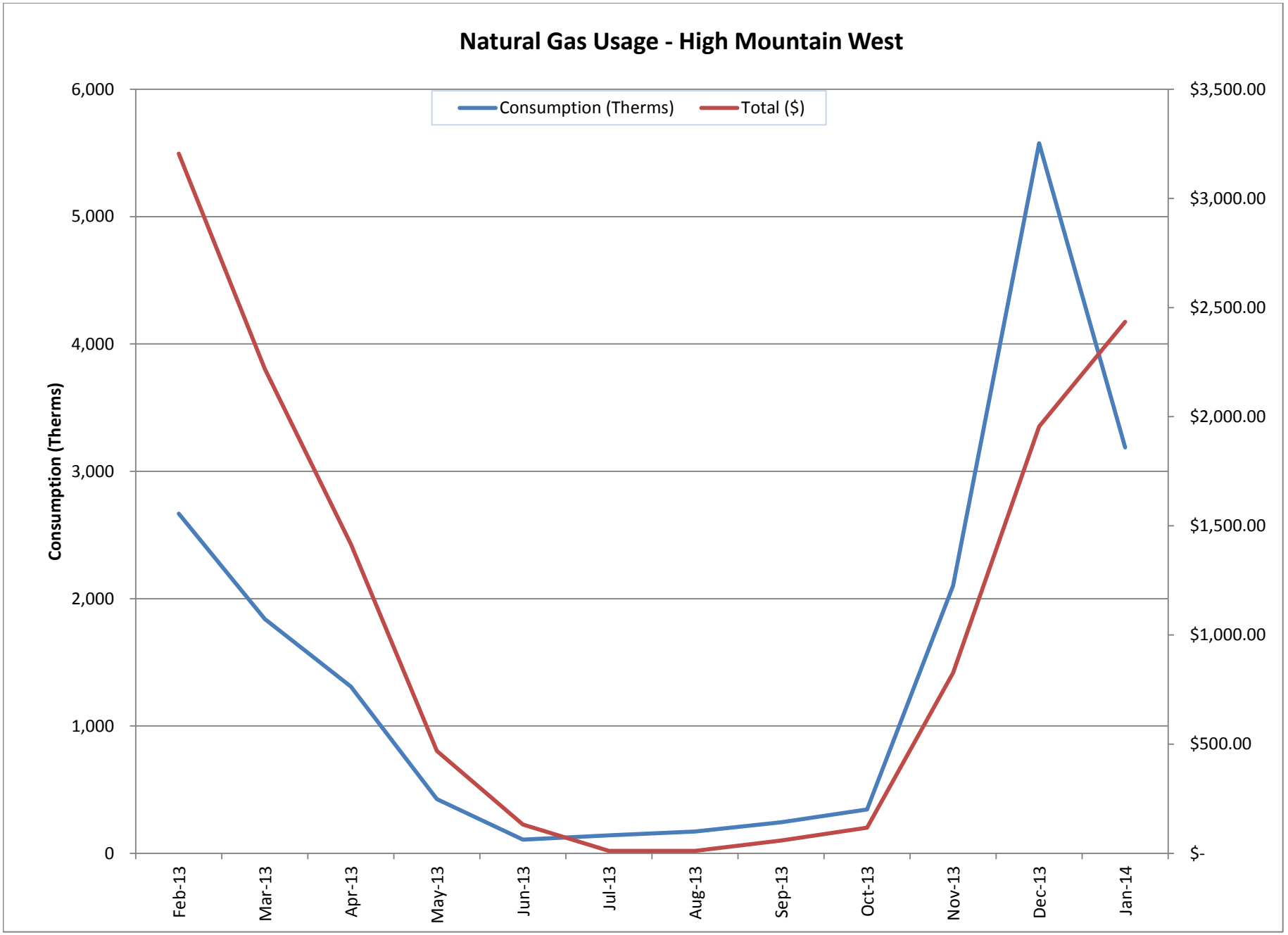


Morrison Hall Utility Data - YY
Electric Graph

William Patterson University LGEA
Morrison Hall - Gas Usage

For Service at:
Account No.: **67-488-992-06**
Meter No: **2522804**
Natural Gas Service **Delivery -** **PSE&G**
Supplier - **HESS**

		Charges			Unit Costs		
Month	**Consumption (Therms)**	**Delivery ($)**	**Supply ($)**	**Total ($)**	**Delivery ($/Therm)**	**Supply ($/Therm)**	**Total ($/Therm)**
February-13	2,668	$ 1,715.57	$ 1,489.72	$ 3,205.29	$ 0.643	$ 0.558	$ 1.201
March-13	1,840	$ 1,192.11	$ 1,027.51	$ 2,219.62	$ 0.648	$ 0.558	$ 1.206
April-13	1,309	$ 685.97	$ 730.85	$ 1,416.82	$ 0.524	$ 0.558	$ 1.082
May-13	426	$ 230.99	$ 237.97	$ 468.96	$ 0.542	$ 0.558	$ 1.100
June-13	108	$ 72.05	$ 60.05	$ 132.10	$ 0.670	$ 0.558	$ 1.228
July-13	142	$ -	$ 11.27	$ 11.27	$ -	$ 0.079	$ 0.079
August-13	171	$ -	$ 11.27	$ 11.27	$ -	$ 0.066	$ 0.066
September-13	244	$ -	$ 58.26	$ 58.26	$ -	$ 0.239	$ 0.239
October-13	344	$ -	$ 117.36	$ 117.36	$ -	$ 0.341	$ 0.341
November-13	2,101	$ -	$ 827.18	$ 827.18	$ -	$ 0.394	$ 0.394
December-13	5,575	$ -	$ 1,955.45	$ 1,955.45	$ -	$ 0.351	$ 0.351
January-14	3,188	$ 655.30	$ 1,779.84	$ 2,435.14	$ 0.206	$ 0.558	$ 0.764
Total	**18,116.34**			**$ 12,858.72**			**$ 0.710**


Natural Gas Usage - High Mountain West
Consumption (Therms)
Total ($)
Consumption (Therms)
6,000
5,000
4,000
3,000
2,000
1,000
0
$3,500.00
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$-
Feb-13
Mar-13
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Dec-13
Jan-14

PSE&G ELECTRIC SERVICE TERRITORY
Last Updated: 10/24/12

***CUSTOMER CLASS - R – RESIDENTIAL C – COMMERCIAL I –INDUSTRIAL**

Supplier	Telephone & Web Site	*Customer Class
AEP Energy, Inc. 309 Fellowship Road, Fl. 2 Mount Laurel, NJ 08054	(866) 258-3782 www.aepenergy.com	**C/I** **ACTIVE**
Alpha Gas and Electric, LLC 641 5th Street Lakewood, NJ 08701	(855) 553-6374 www.alphagasandelectric.com	**R/C** **ACTIVE**
Ambit Northeast, LLC 103 Carnegie Center Suite 300 Princeton, NJ 08540	(877)-30-AMBIT (877) 302-6248 www.ambitenergy.com	**R/C** **ACTIVE**
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com	**C** **ACTIVE**
Amerigreen Energy, Inc. 1463 Lamberton Road Trenton, NJ 08611	888-423-8357 www.amerigreen.com	**R/C** **ACTIVE**
AP Gas & Electric, LLC 10 North Park Place, Suite 420 Morristown, NJ 07960	(855) 544-4895 www.apge.com	**R/C/I** **ACTIVE**
Astral Energy LLC 16 Tyson Place Bergenfield, NJ 07621	(201) 384-5552 www.astralenergyllc.com	**R/C/I** **ACTIVE**
Barclays Capital Services, Inc. 70 Hudson Street Jersey City, NJ 07302-4585	(888) 978-9974 www.group.barclays.com	**C** **ACTIVE**
BBPC, LLC d/b/a Great Eastern Energy 116 Village Blvd. Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateasternenergy.com	**C/I** **ACTIVE**
Champion Energy Services, LLC 72 Avenue L Newark, NJ 07105	(877) 653-5090 www.championenergyservices.com	**R/C/I** **ACTIVE**

Choice Energy, LLC 4257 US Highway 9, Suite 6C Freehold, NJ 07728	888-565-4490 www.4choiceenergy.com	**R/C** **ACTIVE**
Clearview Electric, Inc. 505 Park Drive Woodbury, NJ 08096	(888) CLR-VIEW (800) 746-4702 www.clearviewenergy.com	**R/C/I** **ACTIVE**
Commerce Energy, Inc. 7 Cedar Terrace Ramsey, NJ 07446	1-866-587-8674 www.commerceenergy.com	**R** **ACTIVE**
ConEdison Solutions Cherry Tree Corporate Center 535 State Highway Suite 180 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com	**C/I** **ACTIVE**
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(866) 237-7693 www.constellation.com	**R/C/I** **ACTIVE**
Constellation Energy 900A Lake Street, Suite 2 Ramsey, NJ 07446	(877) 997-9995 www.constellation.com	**R** **ACTIVE**
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.com	**C** **ACTIVE**
Direct Energy Business, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(888) 925-9115 www.directenergybusiness.com	**C/I** **ACTIVE**
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 348-4193 www.directenergy.com	**R** **ACTIVE**
Discount Energy Group, LLC 811 Church Road, Suite 149 Cherry Hill, New Jersey 08002	(800) 282-3331 www.discountenergygroup.com	**R/C** **ACTIVE**
Dominion Retail, Inc. **d/b/a Dominion Energy Solutions** 395 Route #70 West Suite 125 Lakewood, NJ 08701	(866) 275-4240 www.dom.com/products	**R/C** **ACTIVE**

DTE Energy Supply, Inc. One Gateway Center, Suite 2600 Newark, NJ 07102	(877) 332-2450 www.dtesupply.com	**C/I** **ACTIVE**
Energy.me Midwest LLC 90 Washington Blvd Bedminster, NJ 07921	(855) 243-7270 www.energy.me	**R/C/I** **ACTIVE**
Energy Plus Holdings LLC 309 Fellowship Road East Gate Center, Suite 200 Mt. Laurel, NJ 08054	(877) 866-9193 www.energypluscompany.com	**R/C** **ACTIVE**
Ethical Electric Benefit Co. d/b/a Ethical Electric 100 Overlook Center, 2nd Fl. Princeton, NJ 08540	(888) 444-9452 www.ethicalelectric.com	**R/C** **ACTIVE**
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07962	(800) 977-0500 www.fes.com	**C/I** **ACTIVE**
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com	**R/C/I** **ACTIVE**
GDF SUEZ Energy Resources NA, Inc. 333 Thornall Street Sixth Floor Edison, NJ 08837	(866) 999-8374 www.gdfsuezenergyresources.com	**C/I** **ACTIVE**
Glacial Energy of New Jersey, Inc. 75 Route 15 Building E Lafayette, NJ 07848	(888) 452-2425 www.glacialenergy.com	**C/I** **ACTIVE**
Global Energy Marketing LLC 129 Wentz Avenue Springfield, NJ 07081	(800) 542-0778 www.globalp.com	**C/I** **ACTIVE**
Green Mountain Energy Company 211 Carnegie Center Drive Princeton, NJ 08540	(866) 767-5818 www.greenmountain.com/commercial-home	**C/I** **ACTIVE**

Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com	**C/I** **ACTIVE**
HIKO Energy, LLC 655 Suffern Road Teaneck, NJ 07666	(888) 264-4908 www.hikoenergy.com	**R/C** **ACTIVE**
HOP Energy, LLC d/b/a Metro Energy, HOP Fleet Fueling, HOP Energy Fleet Fueling 1011 Hudson Avenue Ridgefield, NJ 07657	(877) 390-7155 www.hopenergy.com	**R/C/I** **ACTIVE**
Hudson Energy Services, LLC 7 Cedar Street Ramsey, New Jersey 07446	(877) Hudson 9 www.hudsonenergyservices.com	**C** **ACTIVE**
IDT Energy, Inc. 550 Broad Street Newark, NJ 07102	(877) 887-6866 www.idtenergy.com	**R/C** **ACTIVE**
Independence Energy Group, LLC 3711 Market Street, 10th Fl. Philadelphia, PA 19104	(877) 235-6708 www.chooseindependence.com	**R/C** **ACTIVE**
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com	**C/I** **ACTIVE**
Keil & Sons, Inc. **d/b/a Systrum Energy** 1 Bergen Blvd. Fairview, NJ 07022	(877) 797-8786 www.systrumenergy.com	**R/C/I** **ACTIVE**
Liberty Power Delaware, LLC 1973 Highway 34, Suite 211 Wall, NJ 07719	(866) 769-3799 www.libertypowercorp.com	**C/I** **ACTIVE**
Liberty Power Holdings, LLC 1973 Highway 34, Suite 211 Wall, NJ 07719	(866) 769-3799 www.libertypowercorp.com	**C/I** **ACTIVE**

Linde Energy Services 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.linde.com	**C/I** **ACTIVE**
Marathon Power LLC 302 Main Street Paterson, NJ 07505	(888) 779-7255 www.mecny.com	**R/C/I** **ACTIVE**
MXenergy Electric Inc. 900 Lake Street Ramsey, NJ 07446	(800) 785-4374 www.mxenergy.com	**R/C/I** **ACTIVE**
NATGASCO, Inc. 532 Freeman St. Orange, NJ 07050	(973) 678-1800 x. 251 www.supremeenergyinc.com	**R/C** **ACTIVE**
NextEra Energy Services New Jersey, LLC 651 Jernee Mill Road Sayreville, NJ 08872	(877) 528-2890 Commercial (800) 882-1276 Residential www.nexteraenergyservices.com	**R/C/I** **ACTIVE**
New Jersey Gas & Electric 1 Bridge Plaza fl. 2 Fort Lee, NJ 07024	(866) 568-0290 www.NJGandE.com	**R/C** **ACTIVE**
Noble Americas Energy Solutions The Mac-Cali Building 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.noblesolutions.com	**C/I** **ACTIVE**
North American Power and Gas, LLC 222 Ridgedale Avenue Cedar Knolls, NJ 07927	(888) 313-9086 www.napower.com	**R/C/I** **ACTIVE**
Palmco Power NJ, LLC One Greentree Centre 10,000 Lincoln Drive East, Suite 201 Marlton, NJ 08053	(877) 726-5862 www.PalmcoEnergy.com	**R/C/I** **ACTIVE**
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) ENERGY-9 (363-7499) www.pepco-services.com	**C/I** **ACTIVE**
Plymouth Rock Energy, LLC 338 Maitland Avenue Teaneck, NJ 07666	(855) 32-POWER (76937) www.plymouthenergy.com	**R/C/I** **ACTIVE**

PPL Energy Plus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com	**C/I** **ACTIVE**
Public Power & Utility of New Jersey, LLC 39 Old Ridgebury Rd. Suite 14 Danbury, CT 06810	(888) 354-4415 www.ppandu.com	**R/C/I** **ACTIVE**
Reliant Energy 211 Carnegie Center Princeton, NJ 08540	(877) 297-3795 (877) 297-3780 www.reliant.com/pjm	**R/C/I** **ACTIVE**
ResCom Energy LLC 18C Wave Crest Ave. Winfield Park, NJ 07036	(888) 238-4041 http://rescomenergy.com	**R/C/I** **ACTIVE**
Respond Power LLC 10 Regency CT Lakewood, NJ 08701	(877) 973-7763 www.respondpower.com	**R/C/I** **ACTIVE**
South Jersey Energy Company 1 South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 266-6020 www.southjerseyenergy.com	**C/I** **ACTIVE**
Sperian Energy Corp. 1200 Route 22 East, Suite 2000 Bridgewater, NJ 08807	(888) 682-8082	**R/C/I** **ACTIVE**
S.J. Energy Partners, Inc. 208 White Horse Pike, Suite 4 Barrington, N.J. 08007	(800) 695-0666 www.sjnaturalgas.com	**R/C** **ACTIVE**
Spark Energy, L.P. 2105 CityWest Blvd., Ste 100 Houston, Texas 77042	(800) 441-7514 www.sparkenergy.com	**R/C/I** **ACTIVE**
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com	**C/I** **ACTIVE**
Starion Energy PA Inc. 101 Warburton Avenue Hawthorne, NJ 07506	(800) 600-3040 www.starionenergy.com	**R/C/I** **ACTIVE**
Stream Energy 309 Fellowship Rd., Suite 200 Mt. Laurel, NJ 08054	(877) 39-8150 www.streamenergy.net	**R** **ACTIVE**

UGI Energy Services, Inc. d/b/a GASMARK 224 Strawbridge Drive Suite 107 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com	**C/I** **ACTIVE**
Verde Energy USA, Inc. 50 East Palisades Avenue Englewood, NJ 07631	(800) 388-3862 www.lowcostpower.com	**R/C/I** **ACTIVE**
Viridian Energy 2001 Route 46, Waterview Plaza Suite 310 Parsippany, NJ 07054	(866) 663-2508 www.viridian.com	**R/C/I** **ACTIVE**
Xoom Energy New Jersey, LLC 744 Broad Street Newark, NJ 07102	(888) 997-8979 www.xoomenergy.com	**R/C/I** **ACTIVE**
YEP Energy 89 Headquarters Plaza North #1463 Morristown, NJ 07960	(855) 363-7736 www.yepenergyNJ.com	**R/C/I** **ACTIVE**
Your Energy Holdings, LLC One International Boulevard Suite 400 Mahwah, NJ 07495-0400	(855) 732-2493 www.thisisyourenergy.com	**R/C/I** **ACTIVE**

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PSE&G GAS SERVICE TERRITORY
Last Updated: 10/24/12

***CUSTOMER CLASS** - **R – RESIDENTIAL C – COMMERCIAL I - INDUSTRIAL**

Supplier	Telephone & Web Site	*Customer Class
Ambit Northeast, LLC 103 Carnegie Center Suite 300 Princeton, NJ 08540	(877)-30-AMBIT (877) 302-6248 www.ambitenergy.com	**R/C** **ACTIVE**
Astral Energy LLC 16 Tyson Place Bergenfield, NJ 07621	888-850-1872 www.astralenergyllc.com	**R/C/I** **ACTIVE**
BBPC, LLC Great Eastern Energy 116 Village Blvd. Suite 200 Princeton, NJ 08540	888-651-4121 www.greateasternenergy.com	**C/I** **ACTIVE**
Clearview Electric Inc. **d/b/a Clearview Gas** 1744 Lexington Ave. Pennsauken, NJ 08110	800-746-4720 www.clearviewenergy.com	**R/C** **ACTIVE**
Colonial Energy, Inc. 83 Harding Road Wyckoff, NJ 07481	845-429-3229 www.colonialgroupinc.com	**C/I** **ACTIVE**
Commerce Energy, Inc. 7 Cedar Terrace Ramsey, NJ 07746	(888) 817-8572 www.commerceenergy.com	**R** **ACTIVE**
Compass Energy Services, Inc. 1085 Morris Avenue, Suite 150 Union, NJ 07083	866-867-8328 908-638-6605 www.compassenergy.net	**C/I** **ACTIVE**
ConocoPhillips Company 224 Strawbridge Drive, Suite 107 Moorestown, NJ 08057	800-646-4427 www.conocophillips.com	**C/I** **ACTIVE**
Consolidated Edison Energy, Inc. **d/b/a Con Edison Solutions** 535 State Highway 38, Suite 140 Cherry Hill, NJ 08002	888-686-1383 x2130 www.conedenergy.com	

Consolidated Edison Solutions, Inc. Cherry Tree Corporate Center 535 State Highway 38, Suite 140 Cherry Hill, NJ 08002	888-665-0955 www.conedsolutions.com	**C/I** **ACTIVE**
Constellation NewEnergy-Gas Division, LLC 900A Lake Street, Suite 2 Ramsey, NJ 07466	(800) 900-1982 www.constellation.com	**C/I** **ACTIVE**
Direct Energy Business, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	888-925-9115 www.directenergy.com	**C/I** **ACTIVE**
Direct Energy Services, LLP 120 Wood Avenue, Suite 611 Iselin, NJ 08830	866-348-4193 www.directenergy.com	**R** **ACTIVE**
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	800-805-8586 www.gesc.com	**R/C/I** **ACTIVE**
UGI Energy Services, Inc. d/b/a GASMARK 224 Strawbridge Drive, Suite 107 Moorestown, NJ 08057	856-273-9995 www.ugienergyservices.com	**C/I** **ACTIVE**
Global Energy Marketing, LLC 129 Wentz Avenue Springfield, NJ 07081	800-542-0778 www.globalp.com	**C/I** **ACTIVE**
Great Eastern Energy 116 Village Blvd., Suite 200 Princeton, NJ 08540	888-651-4121 www.greateastern.com	**C/I** **ACTIVE**
Greenlight Energy 330 Hudson Street, Suite 4 Hoboken, NJ 07030	718-204-7467 www.greenlightenergy.us	**C** **ACTIVE**
Hess Energy, Inc. One Hess Plaza Woodbridge, NJ 07095	800-437-7872 www.hess.com	**C/I** **ACTIVE**
Hess Small Business Services, LLC One Hess Plaza Woodbridge, NJ 07095	888-494-4377 www.hessenergy.com	**C/I** **ACTIVE**
HIKO Energy, LLC 655 Suffern Road Teaneck, NJ 07666	(888) 264-4908 www.hikoenergy.com	**R/C** **ACTIVE**

Hudson Energy Services, LLC 7 Cedar Street Ramsey, NJ 07446	877- Hudson 9 www.hudsonenergyservices.com	**C** **ACTIVE**
IDT Energy, Inc. 550 Broad Street Newark, NJ 07102	877-887-6866 www.idtenergy.com	**R/C** **ACTIVE**
Integrys Energy Services – Natural Gas, LLC 99 Wood Avenue South Suite #802 Iselin, NJ 08830	800-536-0151 www.integrysenergy.com	**C/I** **ACTIVE**
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	800-927-9794 www.intelligentenergy.org	**R/C/I** **ACTIVE**
Keil & Sons, Inc. **d/b/a Systrum Energy** 1 Bergen Blvd. Fairview, NJ 07022	1-877-797-8786 www.systrumenergy.com	**R/C/I** **ACTIVE**
Major Energy Services, LLC 10 Regency CT Lakewood, NJ 08701	888-625-6760 www.majorenergy.com	**R/C/I** **ACTIVE**
Marathon Power LLC 302 Main Street Paterson, NJ 07505	888-779-7255 www.mecny.com	**R/C/I** **ACTIVE**
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	800-828-9427 www.metromediaenergy.com	**C** **ACTIVE**
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	888-53-Metro www.metroenergy.com	**R/C** **ACTIVE**
MxEnergy, Inc. 900 Lake Street Ramsey, NJ 07446	800-758-4374 www.mxenergy.com	**R/C/I** **ACTIVE**
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	800-840-4GAS www.natgasco.com	**C** **ACTIVE**
New Energy Services LLC 101 Neptune Avenue Deal, New Jersey 07723	800-660-3643 www.newenergyservicesllc.com	**R/C/I** **ACTIVE**

New Jersey Gas & Electric 1 Bridge Plaza, Fl. 2 Fort Lee, NJ 07024	866-568-0290 www.NJGandE.com	**R/C** **ACTIVE**
Noble Americas Energy Solutions The Mac-Cali Building 581 Main Street, 8th fl. Woodbridge, NJ 07095	877-273-6772 www.noblesolutions.com	**C/I** **ACTIVE**
North American Power & Gas, LLC d/b/a North American Power 197 Route 18 South Ste. 3000 East Brunswick, NJ 08816	(888) 313-9086 www.napower.com	**R/C/I** **ACTIVE**
Palmco Energy NJ, LLC One Greentree Centre 10,000 Lincoln Drive East, Suite 201 Marlton, NJ 08053	877-726-5862 www.PalmcoEnergy.com	**R/C/I** **ACTIVE**
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	800-363-7499 www.pepco-services.com	**C/I** **ACTIVE**
Plymouth Rock Energy, LLC 338 Maitland Avenue Teaneck, NJ 07666	855-32-POWER (76937) www.plymouthenergy.com	**R/C/I** **ACTIVE**
PPL EnergyPlus, LLC 811 Church Road - Office 105 Cherry Hill, NJ 08002	800-281-2000 www.pplenergyplus.com	**C/I** **ACTIVE**
Respond Power LLC 10 Regency CT Lakewood, NJ 08701	(877) 973-7763 www.respondpower.com	**R/C/I** **ACTIVE**
South Jersey Energy Company 1 South Jersey Plaza, Route 54 Folsom, NJ 08037	800-266-6020 www.southjerseyenergy.com	**C/I** **ACTIVE**
S.J. Energy Partners, Inc. 208 White Horse Pike, Suite 4 Barrington, NJ 08007	800-695-0666 www.sjnaturalgas.com	**R/C** **ACTIVE**
Spark Energy Gas, L.P. 2105 CityWest Blvd, Ste 100 Houston, Texas 77042	800-411-7514 www.sparkenergy.com	**R/C/I** **ACTIVE**
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	855-466-2842 www.spragueenergy.com	**C/I** **ACTIVE**

Stuyvesant Energy LLC 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	800-640-6457 www.stuyfuel.com	**C** **ACTIVE**
Stream Energy New Jersey, LLC 309 Fellowship Road Suite 200 Mt. Laurel, NJ 08054	(973) 494-8097 www.streamenergy.net	**R/C** **ACTIVE**
Systrum Energy 1 Bergen Blvd. Fairview, NJ 07022	877-797-8786 www.systrumenergy.com	**R/C/I** **ACTIVE**
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	800-557-1121 www.woodruffenergy.com	**R/C/I** **ACTIVE**
Woodruff Energy US LLC 73 Water Street, P.O. Box 777 Bridgeton, NJ 08302	856-455-1111 800-557-1121 www.woodruffenergy.com	**C/I** **ACTIVE**
Xoom Energy New Jersey, LLC 744 Broad Street Newark, NJ 07102	888-997-8979 www.xoomenergy.com	**R/C/I** **ACTIVE**
Your Energy Holdings, LLC One International Boulevard Suite 400 Mahwah, NJ 07495-0400	(855) 732-2493 www.thisisyourenergy.com	**R/C/I** **ACTIVE**

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APPENDIX B

Equipment Inventory

CHA Project # 28661
Morrison Hall
William Paterson University

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.
Boiler	1	AERCO	MLX454H	454-09-0150	HHW Boiler	454 MBH Input and 390 MBH to 418 MBH Output	86% to 92% Efficiency	Mechanical Room	HHW Loop for HHW Coils and HHW Heaters	1995	6	
RTU	1	Trane	YCD120C3M0AA	K26102650D	RTU	200 MBH Heating Input and 166 MBH Heating Output and 10 ton Cooling Capacity	83% Heating Efficiency and EER of 9.6	Roof	Offices and Common Areas	1995	1	
RTU	1	Trane	YCD240B3H0DD	N/A	RTU	400 MBH Heating Input and 324 MBH Heating Output and 20 ton Cooling Capacity	81% Heating Efficiency and EER of 9.5	Roof	Offices and Common Areas	1995	1	
RTU	1	Trane	YCD120C3M0AA	N/A	RTU	205 MBH Heating Input and 166 MBH Heating Output and 10 ton Cooling Capacity	81% Heating Efficiency and EER of 9.6	Roof	Offices and Common Areas	1995	1	
RTU	1	Trane	YCD210C3H0AA	K21101966D	RTU	350 MBH Heating Input and 280 MBH Heating Output and 17.5 ton Cooling Capacity	80% Heating Efficiency and EER of 9.6	Roof	Offices and Common Areas	1995	1	
RTU	1	Trane	YCD151B3H0DC	K19102905D	RTU	250 MBH Heating Input and 202 MBH Heating Output and 12.5 ton Cooling Capacity	81% Heating Efficiency and EER of 9.6	Roof	Offices and Common Areas	1995	1	
RTU	1	Carrier	48TCSD17E2M5A2F2C0	2511U25883	RTU	220 MBH Heating Input and 178 MBH Heating Output and 15 ton Cooling Capacity	81% Heating Efficiency and EER of 11.2	Roof	Offices and Common Areas	2011	17	
DHW-1	1	Rheem	PROE40 2 RH92	RH Q131442335	Electric DHW Heater	4.5kW		Mechanical Room	the whole building	2014	20	
Split Unit	1	Mitsubishi	PUY-A18NHA4	OYUOO461A	Split Unit	1.5 ton Cooling Capacity	N/A	Roof	Office room	2000	6	

Energy Audit of Morrison Hall
CHA Project No.28661
Existing Lighting & Audit Input

Cost of Electricity: **$0.127** **$/kWh**
$11.93 **$/kW**

			EXISTING CONDITIONS										
	Area Description	Usage	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Retrofit Control	
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	Describe Usage Type using Operating Hours	No. of fixtures before the retrofit	Lighting Fixture Code	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)	Retrofit control device	Notes
5LED	B01	Offices	10	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.60	SW	2600	1,560	C-OCC	
5LED	B01A	Offices	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.12	SW	2600	312	C-OCC	
5LED	B01B	Offices	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.24	SW	2600	624	C-OCC	
5LED	B01C	Storage Areas	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.12	SW	3640	437	NONE	
71	B04	Mechanical Room	2	I 60	I60/1	60	0.12	SW	8736	1,048	NONE	Wall Mounted
300LED	B05	Restroom	9	6BLMWLED	6BLMWLED	13	0.12	SW	3640	426	C-OCC	
300LED	B07	Restroom	8	6BLMWLED	6BLMWLED	13	0.10	SW	3640	379	C-OCC	
54LED	B06A	Hallways	1	S 34 W F 1 (MAG)	F41EE	43	0.04	SW	8736	376	NONE	
32LED	B06A	Hallways	2	1T 32 R F 2 (ELE)	F42LL	60	0.12	SW	8736	1,048	NONE	
25	B06A Restroom Front	Hallways	1	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.03	SW	8736	245	NONE	Wall Mounted
5LED	B19	Hallways	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	8736	524	NONE	
5LED	B03C	Hallways	44	2T 32 R F 2 (u) (ELE)	FU2LL	60	2.64	SW	8736	23,063	NONE	
5LED	G03C	Conference	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.24	SW	1200	288	C-OCC	
32LED	B08	Storage Areas	2	1T 32 R F 2 (ELE)	F42LL	60	0.12	SW	3640	437	C-OCC	
271LED	B08	Storage Areas	1	1T 32 P F 8	F48ILL	224	0.22	SW	3640	815	C-OCC	
5LED	G03D	Offices	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.12	SW	2600	312	C-OCC	
5LED	G03E	Offices	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.12	SW	2600	312	C-OCC	
5LED	G03F	Offices	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.24	SW	2600	624	C-OCC	
5LED	G03G	Offices	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.24	SW	2600	624	C-OCC	
5LED	G03H	Offices	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.24	SW	2600	624	C-OCC	
5LED	101	Offices	17	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.02	SW	2600	2,652	C-OCC	
5LED	101A	Offices	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.18	SW	2600	468	C-OCC	
5LED	101B	Offices	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.18	SW	2600	468	C-OCC	
5LED	101C	Offices	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.18	SW	2600	468	C-OCC	
5LED	101D	Offices	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.36	SW	2600	936	C-OCC	
5LED	101E	Offices	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.18	SW	2600	468	C-OCC	
5LED	101F	Offices	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.18	SW	2600	468	C-OCC	
5LED	103	Offices	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.36	SW	2600	936	C-OCC	
5LED	101G	Storage Areas	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.12	SW	3640	437	C-OCC	
5LED	102A	Offices	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.36	SW	2600	936	C-OCC	
5LED	102B	Offices	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.24	SW	2600	624	C-OCC	
55LED	102C	Offices	4	2T 17 R F 3 (ELE)	F23ILL	47	0.19	SW	2600	489	C-OCC	
55LED	102D	Offices	4	2T 17 R F 3 (ELE)	F23ILL	47	0.19	SW	2600	489	C-OCC	
55LED	102E	Offices	4	2T 17 R F 3 (ELE)	F23ILL	47	0.19	SW	2600	489	C-OCC	
55LED	102F	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
5LED	102	Offices	19	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.14	SW	2600	2,964	C-OCC	
55LED	102K	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
55LED	102J	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
35LED	Stairwell	Hallways	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	8736	786	NONE	
5LED	Lobby 2	Hallways	17	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.02	SW	8736	8,911	NONE	
35LED	Lobby 2	Hallways	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	8736	3,145	NONE	
5LED	103	Offices	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.36	SW	2600	936	C-OCC	
5LED	104A	Offices	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.12	SW	2600	312	C-OCC	
5LED	104B	Offices	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.12	SW	2600	312	C-OCC	
5LED	104C	Offices	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.12	SW	2600	312	C-OCC	
55LED	104	Offices	14	2T 17 R F 3 (ELE)	F23ILL	47	0.66	SW	2600	1,711	C-OCC	
55LED	104O	Storage Areas	1	2T 17 R F 3 (ELE)	F23ILL	47	0.05	SW	3640	171	C-OCC	
55LED	104L	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
5LED	108	Storage Areas	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.18	SW	3640	655	C-OCC	
55LED	114A	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
55LED	114B	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
55LED	114C	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
55LED	114D	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
55LED	114E	Offices	4	2T 17 R F 3 (ELE)	F23ILL	47	0.19	SW	2600	489	C-OCC	
5LED	114	Hallways	35	2T 32 R F 2 (u) (ELE)	FU2LL	60	2.10	SW	8736	18,346	NONE	
32LED	114	Hallways	10	1T 32 R F 2 (ELE)	F42LL	60	0.60	SW	8736	5,242	NONE	
5LED	108	Hallways	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.30	SW	8736	2,621	NONE	
5LED	106Men	Restroom	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.36	SW	3640	1,310	C-OCC	
5LED	108Women	Restroom	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.36	SW	3640	1,310	C-OCC	
5LED	Lounge in front of 110	Hallways	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	8736	524	C-OCC	
55LED	110	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	NONE	
55LED	110A	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	NONE	Locked
55LED	110B	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	NONE	
25	Front Reception	Hallways	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.25	SW	8736	2,201	C-OCC	
25	118	Offices	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.25	SW	2600	655	C-OCC	
55LED	116A	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
55LED	116B	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
55LED	116C	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
55LED	116D	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
55LED	116E	Offices	2	2T 17 R F 3 (ELE)	F23ILL	47	0.09	SW	2600	244	C-OCC	
55LED	120	Conference	4	2T 17 R F 3 (ELE)	F23ILL	47	0.19	SW	1200	226	C-OCC	Locked

Energy Audit of Morrison Hall
CHA Project No.28661
Existing Lighting & Audit Input

Cost of Electricity: **$0.127** **$/kWh**
$11.93 **$/kW**

			EXISTING CONDITIONS									Retrofit Control	
	Area Description	Usage	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh		
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	Describe Usage Type using Operating Hours	No. of fixtures before the retrofit	Lighting Fixture Code	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)	Retrofit control device	Notes
32LED	Front Reception	Hallways	4	1T 32 R F 2 (ELE)	F42LL	60	0.24	SW	8736	2,097	NONE	Vertical
300LED	Outdoor	Outdoor Lighting	3	6BLMWLED	6BLMWLED	13	0.04	SW	3640	142	NONE	
64LED	Outdoor	Outdoor Lighting	6	175 MH	MH175/1	215	1.29	SW	3640	4,696	NONE	
	Total		**382**				**21.73**			**108,388**		

APPENDIX C

ECM Calculations

William Paterson University - Morrison Hall
CHA Project Numer: 28661

Rate of Discount (used for NPV) 3.0%

	Utility Costs		Yearly Usage	Metric Ton Carbon Dioxide Equivalent	Building Area	Annual Utility Cost		
	$ 0.150	$/kWh blended		0.000420205	34,000	Electric	Natural Gas	Fuel Oil
	$ 0.127	$/kWh supply	245,400	0.000420205		$ 36,897	$ 12,859	
	$ 11.93	$/kW	40.0	0				
	$ 0.71	$/Therm	18,116	0.00533471				
Estimated	$ 7.50	$/kgals		0				
		$/Gal						

Morrison Hall

Recommend? Y or N		Item	Savings kW	kWh	therms	No. 2 Oil gal	Water kgal	$	Cost	Simple Payback	Life Expectancy	Equivalent CO_2 (Metric tons)	NJ Smart Start Incentives	Direct Install Eligible (Y/N)	Payback w/ Incentives	Simple Projected Lifetime Savings kW	kWh	therms	kgal/yr	$	ROI	NPV	IRR
N	ECM-1	Replace Roof	0.0	2,425	2,345	0	0	2,029	$ 879,160	433.4	30	13.5	$ -	N	433.4	0.0	72,745	70,351	0	$ 60,861	(0.9)	($839,397)	-12.5%
Y	ECM-2	Replace RTUs with High Efficiency RTUs	0.0	24,269	718	0	0	4,150	$ 159,017	38.3	15	14.0	$ 3,400	N	37.5	0.0	364,035	10,763	0	$ 62,247	(0.6)	($106,076)	-9.7%
Y	ECM-3	Program DDC System to Utilize Temp Setback	0.0	34,358	1,624	0	0	6,307	$ 69,663	11.0	15	23.1	$ -	N	11.0	0.0	515,375	24,354	0	$ 94,598	0.4	$5,624	4.1%
N	ECM-4	Replace High Flow Plumbing Fixtures with Low Flow Plumbing Fixtures	0.0	1,117	0	0	56	591	$ 51,780	87.7	20	0.5	$ -	N	87.7	0.0	22,336	0	1,128	$ 11,812	(0.8)	($42,993)	-11.2%
N	ECM-L1	Lighting Replacements / Upgrades	11.7	59,008	0	0	0	9,170	$ 74,343	8.1	15	24.8	$ 16,761	N	6.3	175.6	885,120	0	0	$ 157,912	1.1	$51,892	13.6%
N	ECM-L2	Install Lighting Controls (Add Occupancy Sensors)	0.0	6,441	0	0	0	818	$ 14,850	18.2	15	2.7	$ 1,925	N	15.8	0.0	96,615	0	0	$ 14,492	(0.0)	($3,160)	-0.6%
Y	ECM-L3	Lighting Replacements with Controls (Occupancy Sensors)	11.7	62,056	0	0	0	9,557	$ 89,193	9.3	15	26.1	$ 18,686	N	7.4	175.6	930,840	0	0	$ 164,770	0.8	$43,588	10.5%
		Total (Does Not Include ECM-L1 & ECM-L2)	**11.7**	**124,225**	**4,686**	**0**	**56**	**$ 22,633**	**$ 1,248,812**	**55.2**	**19.0**	**77**	**$ 22,086**		**54.2**	**176**	**1,905,331**	**105,469**	**1,128**	**$ 394,288**	**(0.7)**	**-902535**	**-8.8%**
		Recommended Measures (highlighted green above)	**11.7**	**120,683**	**2,341**	**0**	**0**	**$ 20,014**	**$ 317,872**	**15.9**	**15.0**	**63**	**$ 22,086**	**0**	**14.8**	**176**	**1,810,249**	**35,118**	**-**	**$ 321,615**	**0.0**	**-56863.754**	**0.2%**
		% of Existing	**29%**	**49%**	**13%**	**0**	**0**																

City: Newark, NJ
Occupied Hours/Week **168**

Temp	Enthalpy h (Btu/lb)	Bin Hours	Building Operating Hours	Auditorium Occupied Hours	Gymnasium Occupied Hours	Library Occupied Hours	Classrooms Occupied Hours
102.5							
97.5	35.4	6	6	0	0	0	0
92.5	37.4	31	31	0	0	0	0
87.5	35.0	131	131	0	0	0	0
82.5	33.0	500	500	0	0	0	0
77.5	31.5	620	620	0	0	0	0
72.5	29.9	664	664	0	0	0	0
67.5	27.2	854	854	0	0	0	0
62.5	24.0	927	927	0	0	0	0
57.5	20.3	600	600	0	0	0	0
52.5	18.2	730	730	0	0	0	0
47.5	16.0	491	491	0	0	0	0
42.5	14.5	656	656	0	0	0	0
37.5	12.5	1,023	1,023	0	0	0	0
32.5	10.5	734	734	0	0	0	0
27.5	8.7	334	334	0	0	0	0
22.5	7.0	252	252	0	0	0	0
17.5	5.4	125	125	0	0	0	0
12.5	3.7	47	47	0	0	0	0
7.5	2.1	34	34	0	0	0	0
2.5	1.3	1	1	0	0	0	0
-2.5							
-7.5							

Multipliers	
Material:	1.027
Labor:	1.246
Equipment:	1.124

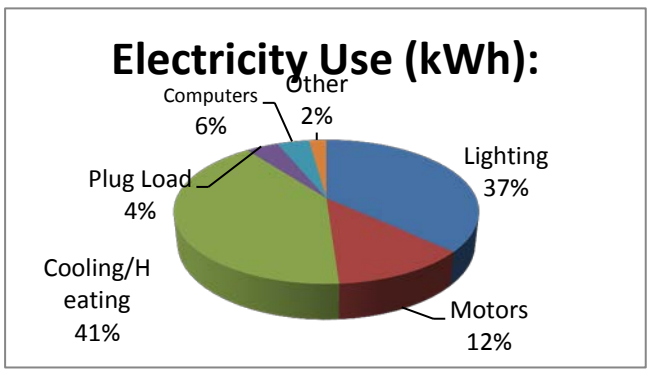
Heating System Efficiency	81%
Cooling Eff (kW/ton)	1.25

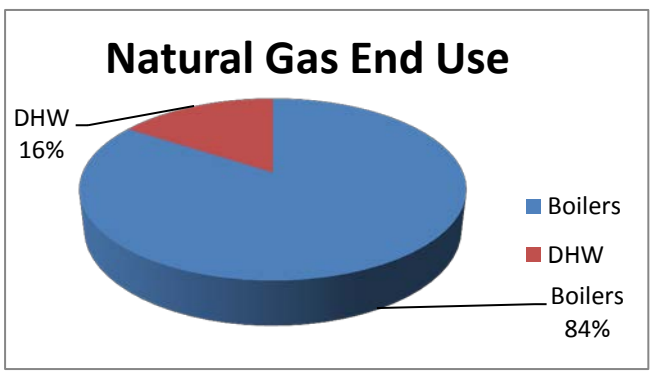
Heating		
Hours	4,427	Hrs
Weighted Avg	40	F
Avg	28	F

Cooling		
Hours	4,333	Hrs
Weighted Avg	68	F
Avg	78	F

William Paterson University - Morrison Hall
CHA Project Numer: 28661
Morrison Hall

Utility End Use Analysis			
Electricity Use (kWh):		**Notes/Comments:**	
245,400	Total	Based on utility analysis	
90,000	Lighting	From Lighting Calculations	37%
30,000	Motors	Estimated	12%
100,000	Cooling/Heating	Estimated	41%
10,000	Plug Load	Estimated	4%
10,000	Computers	Estimated	4%
5,400	Other	Remaining	2%
Natural Gas Use (Therms):		**Notes/Comments:**	
18,116	Total	Based on utility analysis	
15,248	Boilers	Therms/SF x Square Feet Served	84%
2,868	DHW	Based on utility analysis	16%





William Paterson University - Morrison Hall
CHA Project Numer: 28661
Morrison Hall

ECM-1 Replace Roof

Existing: The roof has draining issue and some areas are in poor conditon
Proposed: Roof Replacement

Area of attic	34,000	SF	Cooling System Efficiency	1.25	kW/ton	Heating System Efficiency	81%	
Existing Infiltration Factor	**0.03**	**cfm/SF**	Ex Occupied Clng Temp.	72	*F	Heating On Point	55	*F
Proposed Infiltration Factor	**0.02**	**cfm/SF**	Ex Unoccupied Clng Temp.	72	*F	Ex Occupied Htg Temp.	72	*F
Existing U Value	**0.060**	**Btuh/SF/°F**	Cooling Occ Enthalpy Setpoint	27.5	Btu/lb	Ex Unoccupied Htg Temp.	72	*F
Proposed U Value	**0.033**	**Btuh/SF/°F**	Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb	Cooling Electricity	$ 0.150	$/kWh
						Heating Cost	$ 0.71	$/therm

No significant cooling in building

					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**	**Wall Infiltration & Heat Load BTUH**	**Wall Infiltration & Heat Load BTUH**	**Wall Infiltration & Heat Load BTUH**	**Wall Infiltration & Heat Load BTUH**	**Existing Cooling Energy kWh**	**Proposed Cooling Energy kWh**	**Existing Heating Energy therm**	**Proposed Heating Energy therm**
A		**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
97.5	35.4	6	2	4	-88,314	-88,314	-53,096	-53,096	55	33	0	0
92.5	37.4	31	9	22	-87,270	-87,270	-53,533	-53,533	282	173	0	0
87.5	35.0	131	37	94	-65,975	-65,975	-40,470	-40,470	900	552	0	0
82.5	33.0	500	143	357	-46,881	-46,881	-28,874	-28,874	2442	1504	0	0
77.5	31.5	620	177	443	-29,799	-29,799	-18,620	-18,620	1925	1203	0	0
72.5	29.9	664	190	474	-12,063	-12,063	-7,929	-7,929	834	548	0	0
67.5	27.2	854	244	610	0	0	0	0	0	0	0	0
62.5	24.0	927	265	662	0	0	0	0	0	0	0	0
57.5	20.3	600	171	429	0	0	0	0	0	0	0	0
52.5	18.2	730	209	521	61,261	61,261	36,421	36,421	0	0	552	328
47.5	16.0	491	140	351	76,969	76,969	45,759	45,759	0	0	467	277
42.5	14.5	656	187	469	92,677	92,677	55,098	55,098	0	0	751	446
37.5	12.5	1,023	292	731	108,385	108,385	64,437	64,437	0	0	1,369	814
32.5	10.5	734	210	524	124,093	124,093	73,775	73,775	0	0	1,124	669
27.5	8.7	334	95	239	139,801	139,801	83,114	83,114	0	0	576	343
22.5	7.0	252	72	180	155,509	155,509	92,453	92,453	0	0	484	288
17.5	5.4	125	36	89	171,217	171,217	101,791	101,791	0	0	264	157
12.5	3.7	47	13	34	186,925	186,925	111,130	111,130	0	0	108	64
7.5	2.1	34	10	24	202,633	202,633	120,469	120,469	0	0	85	51
2.5	1.3	1	0	1	218,341	218,341	129,807	129,807	0	0	3	2
TOTALS		**8,760**	**2,503**	**6,257**					**6,438**	**4013**	**5,783**	**3,438**

Existing Ceiling Infiltration	**1,020**	**cfm**
Existing Ceiling Heat Transfer	**2,040**	**Btuh/°F**
Proposed Ceiling Infiltration	**680**	**cfm**
Proposed Ceiling Heat Transfer	**1,133**	**Btuh/°F**

Savings	**2,345**	**therms**	**$ 1,665**
	2,425	**kWh**	**$ 364**
			$ 2,029

William Paterson University - Morrison Hall
CHA Project Numer: 28661
Morrison Hall

ECM-1 Replace Roof - Cost

Multipliers	
Material:	1.03
Labor:	1.25
Equipment:	1.12

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
New Roof (3-ply Built-up System)	34,000	SF	$ 20.000	$ -	$ 0.130	$ 698,360	$ -	$ 4,968	$ 703,328	Vendor Rule of Thumb Pricing
						$ -	$ -	$ -	$ -	

Note: Cost estimates are for energy savings calculations only, do not use for procurement

$ 703,328	Subtotal
$ 175,832	25% Contingency
$ 879,160	**Total**

William Paterson University - Morrison Hall
CHA Project Numer: 28661
Morrison Hall

ECM-2 Replace RTUs with High Efficiency RTUs
This measure looks at replacing the RTUs with High Efficiency RTUs

Cooling Savings

ASSUMPTIONS			Comments
Electric Cost	$0.150	/ kWh	
Space Balance Point	55	F	
Space Temperature Setpoint	72	deg F	setpoint
BTU / Hr Rating of Existing DXs	1,020,000	Btu / Hr	Total Cooling BTU/H of RTUs
Average EER	9.8		Nameplate

Item	Value	Units	Comments
Existing Annual Electric Usage	98,593	kWh	
Proposed EER	13.0		
Proposed Annual Electric Usage	74,324	kWh	Unit will cycle on w/ temp of room. Possible operating time

Heating Savings

ASSUMPTIONS			Comments
Gas Cost	$0.710	/therm	
Space Balance Point	55	F	
Space Temperature Setpoint	72	deg F	setpoint
Existing Heaters	1,625	MBH	

Item	Value	Units	Comments
Existing Efficiency	81%		
Existing Annual Gas Usage	15,248	therm	
Proposed Efficiency	85%		Heat Pump with Supplemental Heat
Proposed Annual Electric Usage	14,530	therm	Unit will cycle on w/ temp of room. Possible operating time

ANNUAL SAVINGS		
Annual Electric Savings	24,269	kWh
Annual Gas Savings	718	therm
Annual Cost Savings	$4,150	

OAT - DB Bin Temp F	Enthalpy	Annual Hours	Assumed % of time of operation	Assumed hrs of Cooling Operation	Assumed % of time of operation	Assumed hrs of Heating Operation
102.5	0	0	100%	0	0%	0
97.5	35	6	89%	5	0%	0
92.5	37	31	79%	24	0%	0
87.5	35	131	68%	90	0%	0
82.5	33	500	58%	289	0%	0
77.5	32	620	47%	294	0%	0
72.5	30	664	37%	245	0%	0
67.5	27	854	0%	0	0%	0
62.5	24	927	0%	0	50%	464
57.5	20	600	0%	0	54%	325
52.5	18	730	0%	0	58%	426
47.5	16	491	0%	0	63%	307
42.5	15	656	0%	0	67%	437
37.5	13	1023	0%	0	71%	725
32.5	10	734	0%	0	75%	551
27.5	9	334	0%	0	79%	264
22.5	7	252	0%	0	83%	210
17.5	5	125	0%	0	88%	109
12.5	4	47	0%	0	92%	43
7.5	2	34	0%	0	96%	33
2.5	1	1	0%	0	100%	1
-2.5	0	0	0%	0	100%	0
-7.5	0	0	0%	0	100%	0
Total	374	8,760	11%	947	44%	3894

William Paterson University - Morrison Hall
CHA Project Numer: 28661
Morrison Hall

ECM-2 Replace RTUs with High Efficiency RTUs - Cost

Multipliers	
Material:	1.03
Labor:	1.25
Equipment:	1.12

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
RTU	5	EA	$ 16,700	$ 2,325	$ -	$ 85,755	$ 14,485	$ -	$ 100,239	RS Means 2012
Wiring & Misc.	1	EA	$ 2,000	$ 20,000		$ 2,054	$ 24,920	$ -	$ 26,974	Estimated
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 127,213	Subtotal
$ 31,803	25% Contingency
$ 159,017	**Total**

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

William Paterson University - Morrison Hall
CHA Project Numer: 28661
Morrison Hall

ECM-3 Program DDC System to Utilize Temp Setback

Description: This ECM evaluates adding automatic temperature controls to DDC

Day Setback

EXISTING CONDITIONS			
Heating			
Heating Season Facility Temp	72	F	Th
Weekly Occupied Hours	48	hrs	H
Heating Season Setback Temp	65	F	Sh
Heating Season % Savings per	1%		Ph
Annual Heating Capacity	1,524,800	Mbtu/yr	
Connected Heating Load	1,524,800	Btu/hr	Caph
Equivalent Full Load Heating	900	hrs	EFLHh
Heating Equipment Efficiency	81%		AFUEh
Cooling			
Cooling Season Facility Temp	72	F	Tc
Weekly Occupied Hours	48	hrs	H
Cooling Season Setback Temp	77	F	Sc
Cooling Season % Savings per	1%		Pc
Connected Cooling Load	85	Tons	Capc
Equivalent Full Load Cooling	381	hrs	EFLHc
Cooling Equipment EER	9.8		AFUEc
SAVINGS			
Natural Gas Savings	812	Therms[3]	
Cooling Electricity Savings	16,658	kWh	

Nighttime Setback

EXISTING CONDITIONS		
Heating		
Heating Season Facility Temp	72	F
Weekly Occupied Hours	48	hrs
Heating Season Setback Temp	65	F
Heating Season % Savings per	1%	
Annual Heating Capacity	1,524,800	Mbtu/yr
Connected Heating Load Capacity	1,524,800	Btu/hr
Equivalent Full Load Heating Hours	900	hrs
Heating Equipment Efficiency	81%	
Cooling		
Cooling Season Facility Temp	74	F
Weekly Occupied Hours	48	hrs
Cooling Season Setback Temp	77	F
Cooling Season % Savings per	1%	
Connected Cooling Load Capacity	85	Tons
Equivalent Full Load Cooling Hours	381	hrs
Cooling Equipment EER	9.8	
SAVINGS		
Natural Gas Savings	812	Therms[3]
Cooling Electricity Savings	17,701	kWh

$0.15	$/kWh Blended
$0.71	$/Therm

COMBINED SAVINGS		
Natural Gas Savings	1,624	Therms
Cooling Electricity Savings	34,358	kWh
Total Cost Savings	$ 6,307	
Estimated Total Project Cost	$ 69,663	
Simple Payback	11.0	Yrs

Savings calculation formulas are taken from NJ Protocols document for Occupancy Controlled Thermostats

Algorithms

Cooling Energy Savings (kWh) = (((Tc*(H+5)+Sc*(168-(H+5)))/168) Tc)*(Pc*Caphp*12*EFLHc/EERhp)

Heating Energy Savings (kWh) = (((Th*(H+5)+Sh*(168-(H+5)))/168)-Th)*(Ph*Caphp*12*EFLHh/EERhp)

Heating Energy Savings (Therms) = (Th-(Th*(H+5)+Sh*(168-(H+5)))/168)*(Ph*Caph*EFLHh/AFUEh/100,000)

Definition of Variables

T_h = Heating Season Facility Temp. (°F)
T_c = Cooling Season Facility Temp. (°F)
S_h = Heating Season Setback Temp. (°F)
S_c = Cooling Season Setup Temp. (°F)
H = Weekly Occupied Hours
Cap_{hp} = Connected load capacity of heat pump/AC (Tons) – Provided on Application.
Cap_h = Connected heating load capacity (Btu/hr) – Provided on Application.
$EFLH_c$ = Equivalent full load cooling hours
$EFLH_h$ = Equivalent full load heating hours
P_h = Heating season percent savings per degree setback
P_c = Cooling season percent savings per degree setup
$AFUE_h$ = Heating equipment efficiency – Provided on Application.
EER_{hp} = Heat pump/AC equipment efficiency – Provided on Application

Occupancy Controlled Thermostats

Component	Type	Value	Source
T_h	Variable		Application
T_c	Variable		Application
S_h	Fixed	T_h-5°	
S_c	Fixed	T_c+5°	
H	Variable		Application; Default of 56 hrs/week
Cap_{hp}	Variable		Application
Cap_h	Variable		Application
$EFLH_c$	Fixed	381	1
$EFLH_h$	Fixed	900	PSE&G
P_h	Fixed	3%	2
P_c	Fixed	6%	2
$AFUE_h$	Variable		Application
EER_{hp}	Variable		Application

Sources:
1. JCP&L metered data from 1995-1999
2. ENERGY STAR Products website

William Paterson University - Morrison Hall
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Multipliers	
Material:	1.03
Labor:	1.25
Equipment:	1.00

ECM-3 Program DDC System to Utilize Temp Setback - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
DDC Control System	1	ea	$ 30,000	$ 20,000		$ 30,810	$ 24,920	$ -	$ 55,730	Estimated
						$ -	$ -	$ -	$ -	

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

$ 55,730	Subtotal
$ 13,933	25% Contingency
$ 69,663	**Total**

William Paterson University - Morrison Hall
CHA Project Numer: 28661
Morrison Hall

ECM: Replace urinals and flush valves with low flow

Description: This ECM evaluates the water savings associated with replacing/ upgrading urinals with 0.125 GPF urinals and or flush valves.

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$7.50	$ / kGal
Urinals in Building to be replaced	3	
Average Flushes / Urinal (per Day)	5	
Average Gallons / Flush	1.5	Gal

PROPOSED CONDITIONS		
Proposed Urinals to be Replaced	3	
Proposed Gallons / Flush	0.125	Gal
Proposed Material Cost of new urinal & valve	$1,200	RS Means 2012
Proposed Installation Cost of new urinal & valve	$1,000	RS Means 2012
Total cost of new urinals & valves		

SAVINGS		
Current Urinal Water Use	8.21	kGal / year
Proposed Urinal Water Use	0.68	kGal / year
Water Savings	7.53	kGal / year
Cost Savings	$56	/ year

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

William Paterson University - Morrison Hall
CHA Project Numer: 28661
Morrison Hall

ECM: Replace toilets and flush valves with low flow

Description: This ECM evaluates the water savings associated with repalcing/ upgrading toilets to 1.28 GPF fixtures and/or flush valves.

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$7.50	$ / kGal
Toilets in Building	9	
Average Flushes / Toilet (per Day)	5	
Average Gallons / Flush	3.5	Gal

PROPOSED CONDITIONS		
Proposed Toilets to be Replaced	9	
Proposed Gallons / Flush	1.28	Gal

SAVINGS		
Current Toilet Water Use	57.49	kGal / year
Proposed Toilet Water Use	21.02	kGal / year
Water Savings	36.46	kGal / year
Cost Savings	$273	/ year

William Paterson University - Morrison Hall
CHA Project Numer: 28661
Morrison Hall

ECM: Replace faucets with low flow

Description; This ECM evaluates the water savings resulting from replacing/ upgrading faucets to 0.5 gallon per minute flow

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$7.50	$ / kGal
Faucets in Building	9	
Average Uses / Faucet (per day)	8	# Uses
Average Time of Use	30	seconds
Average Flowrate	2.0	gpm

PROPOSED CONDITIONS		
Proposed Faucets to be Replaced	9	
Proposed Flowrate	0.5	gpm

HEATING SAVINGS		
Fuel Cost	$ 0.15	/kWh
Number of Faucets	9	
Hours per Day of Usage	0.067	hrs
Days per Year of Facility Usage	230	days
Average Flowrate	2.0	gpm
Proposed Flowrate	0.5	gpm
Heat Content of Water	8.33	Btu/gal/F
Temperature Difference (Intake and Output)	35	F
Water Heating Equipment Efficiency	95%	
Conversion Factor	3,413	btu/kWh
SAVINGS		
Current Faucet Water Use	16.56	kGal / year
Proposed Faucet Water Use	4.14	kGal / year
Water Savings	12.42	kGal / year
Heating Savings	1,117	kWh
Cost Savings	$261	/ year

Savings calculation formulas are taken from NJ Protocols document for Faucet

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

William Paterson University - Morrison Hall
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Morrison Hall

Multipliers	
Material:	1.03
Labor:	1.25
Equipment:	1.12

ECM-4 Replace High Flow Plumbing Fixtures with Low Flow Plumbing Fixtures - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
									$ -	
Low-Flow Urinal	3	EA	$ 1,200	$ 1,000	$ -	$ 3,697	$ 3,738	$ -	$ 7,435	Vendor Estimate
Low-Flow Toilet	9	EA	$ 1,400	$ 1,000	$ -	$ 12,940	$ 11,214	$ -	$ 24,154	Vendor Estimate
Low-Flow Faucet	9	EA	$ 700	$ 300	$ -	$ 6,470	$ 3,364	$ -	$ 9,834	Vendor Estimate
						$ -	$ -	$ -	$ -	

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

$ 41,424	Subtotal
$ 10,356	25% Contingency
$ 51,780	**Total**

William Paterson University - Morrison Hall
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Morrison Hall

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 2012.
Building must have a minimum average electric demand of 100 kW. This minimum is waived for buildings owned by local governements or non-profit organizations.
At a minimum, all recommended measures were used for this calculation. To qualify for P4P incentives, the following P4P requirements must be met:

- At least 15% source energy savings
- No more than 50% savings from lighting measures
- Scope includes more than one measure
- Project has at least a 10% internal rate of return
- At least 50% of the source energy savings must come from investor-owned electricity and/or natural gas (note: exemption for fuel conversions)

Total Building Area (Square Feet)	34,000
Is this audit funded by NJ BPU (Y/N)	Yes

Board of Public Utilites (BPU)

Incentive #1		
Audit is funded by NJ BPU	$0.05	$/sqft

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$36,897	$12,859
Existing Usage (from utility)	245,400	18,116
Proposed Savings	120,683	2,341
Existing Total MMBtus	2,649	
Proposed Savings MMBtus	646	
% Energy Reduction	**24.4%**	
Proposed Annual Savings	$20,014	

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

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$5,000
Incentive #2	$13,275	$2,926	$16,202
Incentive #3	$13,275	$2,926	$16,202
Total All Incentives	**$26,550**	**$5,853**	**$37,403**

Total Project Cost	$317,872

		Allowable Incentive
% Incentives #1 of Utility Cost*	10.0%	$5,000
% Incentives #2 of Project Cost**	5.1%	$16,202
% Incentives #3 of Project Cost**	5.1%	$16,202
Total Eligible Incentives***	**$37,403**	
Project Cost w/ Incentives	$280,469	

Project Payback (years)	
w/o Incentives	w/ Incentives
15.9	14.0

* 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

Energy Audit of Morrison Hall
CHA Project No.28661

ECM-L1 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
$74,343	**11.709**	**59,008**	**0**	**$9,170**	**0**	**$9,170**	**$16,761**	**8.1**	**6.3**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

ECM-L2 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
$14,850	**0.0**	**6,441**	**0**	**$818**	**0**	**$818**	**$1,925**	**18.2**	**15.8**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

ECM-L3 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
$89,193	**11.7**	**62,056**	**0**	**$9,557**	**0**	**$9,557**	**$18,686**	**9.3**	**7.4**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

Energy Audit of Morrison Hall
CHA Project No.28661
ECM-L1 Lighting Replacements

		EXISTING CONDITIONS							RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
Field Code	Area Description Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of Fixtures No. of fixtures before the retrofit	Standard Fixture Code "Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Fixture Code Code from Table of Standard Fixture Wattages	Watts per Fixture Value from Table of Standard Fixture Wattages	kW/Space (Watts/Fixt) * (Fixt No.)	Exist Control Pre-inst. control device	Annual Hours Estimated daily hours for the usage group	Annual kWh (kW/space) * (Annual Hours)	Number of Fixtures No. of fixtures after the retrofit	Standard Fixture Code "Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Fixture Code Code from Table of Standard Fixture Wattages	Watts per Fixture Value from Table of Standard Fixture Wattages	kW/Space (Watts/Fixt) * (Number of Fixtures)	Retrofit Control Retrofit control device	Annual Hours Estimated annual hours for the usage group	Annual kWh (kW/space) * (Annual Hours)	Annual kWh Saved (Original Annual kWh) - (Retrofit Annual kWh)	Annual kW Saved (Original Annual kW) - (Retrofit Annual kW)	Annual $ Saved (kWh Saved) * ($/kWh)	Retrofit Cost Cost for renovations to lighting system	NJ Smart Start Lighting Incentive Prescriptive Lighting Measures	Simple Payback With Out Incentive Length of time for renovations cost to be recovered	Simple Payback Length of time for renovations cost to be recovered
5LED	B01	10	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.6	SW	2600	1,560	10	2T XX R LED	2RTLED	25	0.3	SW	2,600	650	910	0.4	$ 165.68	$ 2,025.00	$500	12.2	9.2
5LED	B01A	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	SW	2,600	130	182	0.1	$ 33.14	$ 405.00	$100	12.2	9.2
5LED	B01B	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624	4	2T XX R LED	2RTLED	25	0.1	SW	2,600	260	364	0.1	$ 66.27	$ 810.00	$200	12.2	9.2
5LED	B01C	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	3640	437	2	2T XX R LED	2RTLED	25	0.1	SW	3,640	182	255	0.1	$ 42.38	$ 405.00	$100	9.6	7.2
71	B04	2	I 60	I60/1	60	0.1	SW	8736	1,048	2	CF 26	CFQ26/1-L	27	0.1	SW	8,736	472	577	0.1	$ 82.67	$ 13.50	$0	0.2	0.2
300LED	B05	9	6BLMWLED	6BLMWLED	13	0.1	SW	3640	426	9	6BLMWLED	6BLMWLED	13	0.1	SW	3,640	426	-	0.0	$ -	$ -	$0		#DIV/0!
300LED	B07	8	6BLMWLED	6BLMWLED	13	0.1	SW	3640	379	8	6BLMWLED	6BLMWLED	13	0.1	SW	3,640	379	-	0.0	$ -	$ -	$0		#DIV/0!
54LED	B06A	1	S 34 W F 1 (MAG)	F41EE	43	0.0	SW	8736	376	1	4 ft LED Tube	200732x1	15	0.0	SW	8,736	131	245	0.0	$ 35.07	$ 145.20	$30	4.1	3.3
32LED	B06A	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	8736	1,048	2	4 ft LED Tube	200732x2	30	0.1	SW	8,736	524	524	0.1	$ 75.16	$ 467.40	$70	6.2	5.3
25	B06A Restroom Front	1	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.0	SW	8736	245	1	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.0	SW	8,736	245	-	0.0	$ -	$ -	$0		#DIV/0!
5LED	B19	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	8736	524	1	2T XX R LED	2RTLED	25	0.0	SW	8,736	218	306	0.0	$ 43.84	$ 202.50	$50	4.6	3.5
5LED	B03C	44	2T 32 R F 2 (u) (ELE)	FU2LL	60	2.6	SW	8736	23,063	44	2T XX R LED	2RTLED	25	1.1	SW	8,736	9,610	13,453	1.5	$ 1,929.05	$ 8,910.00	$2,200	4.6	3.5
5LED	G03C	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	1200	288	4	2T XX R LED	2RTLED	25	0.1	SW	1,200	120	168	0.1	$ 41.38	$ 810.00	$200	19.6	14.7
32LED	B08	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	3640	437	2	4 ft LED Tube	200732x2	30	0.1	SW	3,640	218	218	0.1	$ 36.33	$ 467.40	$70	12.9	10.9
271LED	B08	1	1T 32 P R 8	F48ILL	224	0.2	SW	3640	815	1	1T 15 P LED 8	200732x8	120	0.1	SW	3,640	437	379	0.1	$ 62.97	$ 955.80	$1	15.2	15.2
5LED	G03D	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	SW	2,600	130	182	0.1	$ 33.14	$ 405.00	$100	12.2	9.2
5LED	G03E	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	SW	2,600	130	182	0.1	$ 33.14	$ 405.00	$100	12.2	9.2
5LED	G03F	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624	4	2T XX R LED	2RTLED	25	0.1	SW	2,600	260	364	0.1	$ 66.27	$ 810.00	$200	12.2	9.2
5LED	G03G	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624	4	2T XX R LED	2RTLED	25	0.1	SW	2,600	260	364	0.1	$ 66.27	$ 810.00	$200	12.2	9.2
5LED	G03H	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624	4	2T XX R LED	2RTLED	25	0.1	SW	2,600	260	364	0.1	$ 66.27	$ 810.00	$200	12.2	9.2
5LED	101	17	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.0	SW	2600	2,652	17	2T XX R LED	2RTLED	25	0.4	SW	2,600	1,105	1,547	0.6	$ 281.65	$ 3,442.50	$850	12.2	9.2
5LED	101A	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T XX R LED	2RTLED	25	0.1	SW	2,600	195	273	0.1	$ 49.70	$ 607.50	$150	12.2	9.2
5LED	101B	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T XX R LED	2RTLED	25	0.1	SW	2,600	195	273	0.1	$ 49.70	$ 607.50	$150	12.2	9.2
5LED	101C	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T XX R LED	2RTLED	25	0.1	SW	2,600	195	273	0.1	$ 49.70	$ 607.50	$150	12.2	9.2
5LED	101D	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936	6	2T XX R LED	2RTLED	25	0.2	SW	2,600	390	546	0.2	$ 99.41	$ 1,215.00	$300	12.2	9.2
5LED	101E	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T XX R LED	2RTLED	25	0.1	SW	2,600	195	273	0.1	$ 49.70	$ 607.50	$150	12.2	9.2
5LED	101F	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T XX R LED	2RTLED	25	0.1	SW	2,600	195	273	0.1	$ 49.70	$ 607.50	$150	12.2	9.2
5LED	103	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936	6	2T XX R LED	2RTLED	25	0.2	SW	2,600	390	546	0.2	$ 99.41	$ 1,215.00	$300	12.2	9.2
5LED	103G	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	3640	437	2	2T XX R LED	2RTLED	25	0.1	SW	3,640	182	255	0.1	$ 42.38	$ 405.00	$100	9.6	7.2
5LED	102A	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936	6	2T XX R LED	2RTLED	25	0.2	SW	2,600	390	546	0.2	$ 99.41	$ 1,215.00	$300	12.2	9.2
5LED	102B	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624	4	2T XX R LED	2RTLED	25	0.1	SW	2,600	260	364	0.1	$ 66.27	$ 810.00	$200	12.2	9.2
55LED	102C	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	489	4	2T 25 R LED	2RTLED	25	0.1	SW	2,600	260	229	0.1	$ 41.66	$ 810.00	$200	19.4	14.6
55LED	102D	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	489	4	2T 25 R LED	2RTLED	25	0.1	SW	2,600	260	229	0.1	$ 41.66	$ 810.00	$200	19.4	14.6
55LED	102E	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	489	4	2T 25 R LED	2RTLED	25	0.1	SW	2,600	260	229	0.1	$ 41.66	$ 810.00	$200	19.4	14.6
55LED	102F	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
5LED	102	19	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.1	SW	2600	2,964	19	2T XX R LED	2RTLED	25	0.5	SW	2,600	1,235	1,729	0.7	$ 314.78	$ 3,847.50	$950	12.2	9.2
55LED	102K	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	102J	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
35LED	Stairwell	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	8736	786	1	T 59 R LED	RTLED38	38	0.0	SW	8,736	332	454	0.1	$ 65.14	$ 236.25	$0	3.6	3.6
5LED	Lobby 2	17	2T 32 R F 2 (ELE)	FU2LL	60	1.0	SW	8736	8,911	17	2T XX R LED	2RTLED	25	0.4	SW	8,736	3,713	5,198	0.6	$ 745.32	$ 3,442.50	$850	4.6	3.5
35LED	Lobby 2	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	8736	3,145	4	T 59 R LED	RTLED38	38	0.2	SW	8,736	1,328	1,817	0.2	$ 260.55	$ 945.00	$0	3.6	3.6
5LED	103	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936	6	2T XX R LED	2RTLED	25	0.2	SW	2,600	390	546	0.2	$ 99.41	$ 1,215.00	$300	12.2	9.2
5LED	104A	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	SW	2,600	130	182	0.1	$ 33.14	$ 405.00	$100	12.2	9.2
5LED	104B	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	SW	2,600	130	182	0.1	$ 33.14	$ 405.00	$100	12.2	9.2
5LED	104C	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	SW	2,600	130	182	0.1	$ 33.14	$ 405.00	$100	12.2	9.2
55LED	104	14	2T 17 R F 3 (ELE)	F23ILL	47	0.7	SW	2600	1,711	14	2T 25 R LED	2RTLED	25	0.4	SW	2,600	910	801	0.3	$ 145.79	$ 2,835.00	$700	19.4	14.6
55LED	104O	1	2T 17 R F 3 (ELE)	F23ILL	47	0.0	SW	3640	171	1	2T 25 R LED	2RTLED	25	0.0	SW	3,640	91	80	0.0	$ 13.32	$ 202.50	$50	15.2	11.4
55LED	104L	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	114A	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	114B	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	114C	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	114D	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	114E	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	489	4	2T 25 R LED	2RTLED	25	0.1	SW	2,600	260	229	0.1	$ 41.66	$ 810.00	$200	19.4	14.6
5LED	114	35	2T 32 R F 2 (u) (ELE)	FU2LL	60	2.1	SW	8736	18,346	35	2T XX R LED	2RTLED	25	0.9	SW	8,736	7,644	10,702	1.2	$ 1,534.47	$ 7,087.50	$1,750	4.6	3.5
32LED	114	10	1T 32 R F 2 (ELE)	F42LL	60	0.6	SW	8736	5,242	10	4 ft LED Tube	200732x2	30	0.3	SW	8,736	2,621	2,621	0.3	$ 375.79	$ 2,337.00	$350	6.2	5.3
5LED	108	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	8736	2,621	5	2T XX R LED	2RTLED	25	0.1	SW	8,736	1,092	1,529	0.2	$ 219.21	$ 1,012.50	$250	4.6	3.5
5LED	106Men	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	3640	1,310	6	2T XX R LED	2RTLED	25	0.2	SW	3,640	546	764	0.2	$ 127.14	$ 1,215.00	$300	9.6	7.2
5LED	108Women	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	3640	1,310	6	2T XX R LED	2RTLED	25	0.2	SW	3,640	546	764	0.2	$ 127.14	$ 1,215.00	$300	9.6	7.2
5LED	Lounge in front of 110	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	8736	524	1	2T XX R LED	2RTLED	25	0.0	SW	8,736	218	306	0.0	$ 43.84	$ 202.50	$50	4.6	3.5
55LED	110	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	110A	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	110B	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
25	Front Reception	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	SW	8736	2,201	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	SW	8,736	2,201	-	0.0	$ -	$ -	$0		#DIV/0!
25	118	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	SW	2600	655	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	SW	2,600	655	-	0.0	$ -	$ -	$0		#DIV/0!
55LED	116A	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	116B	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	116C	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	116D	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	116E	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	SW	2,600	130	114	0.0	$ 20.83	$ 405.00	$100	19.4	14.6
55LED	120	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	1200	226	4	2T 25 R LED	2RTLED	25	0.1	SW	1,200	120	106	0.1	$ 26.01	$ 810.00	$200	31.1	23.5
32LED	Front Reception	4	1T 32 R F 2 (ELE)	F42LL	60	0.2	SW	8736	2,097	4	4 ft LED Tube	200732x2	30	0.1	SW	8,736	1,048	1,048	0.1	$ 150.32	$ 934.80	$140	6.2	5.3
300LED	Outdoor	3	6BLMWLED	6BLMWLED	13	0.0	SW	3640	142	3	6BLMWLED	6BLMWLED	13	0.0	SW	3,640	142	-	0.0	$ -	$ -	$0		#DIV/0!
64LED	Outdoor	6	175 MH	MH175/1	215	1.3	SW	3640	4,696	6	BAYLED78W	BAYLED78W	93	0.6	SW	3,640	2,031	2,664	0.7	$ 443.18	$ 5,065.17	$600	11.4	10.1
	Total	**382**				**21.7**			**108,388**	**382**			**2,024**	**10.0**				**49,380**	**59,008**	**11.7**	**$9,170**	**$74,343**	**$16,761**		
																			Demand Savings		**11.7**	**$1,676**			
																			kWh Savings		**59,008**	**$7,494**			
																			Total savings			**$9,170**		**8.1**	**6.3**

Energy Audit of Morrison Hall

CHA Project No.28661

ECM-L2 Install Occupancy Sensors

		EXISTING CONDITIONS							RETROFIT CONDITIONS							COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	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	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
5LED	B01	10	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.6	SW	2600	1,560.0	10	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.6	C-OCC	2080	1,248.0	312.0	0.0	$39.62	$270.00	$35.00	6.8	5.9
5LED	B01A	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	C-OCC	2080	249.6	62.4	0.0	$7.92	$270.00	$35.00	34.1	29.7
5LED	B01B	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624.0	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	2080	499.2	124.8	0.0	$15.85	$270.00	$35.00	17.0	14.8
5LED	B01C	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	3640	436.8	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	NONE	3640	436.8	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
71	B04	2	I 60	I60/1	60	0.1	SW	8736	1,048.3	2	I 60	I60/1	60	0.1	NONE	8736	1,048.3	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
300LED	B05	9	6BLMWLED	6BLMWLED	13	0.1	SW	3640	425.9	9	6BLMWLED	6BLMWLED	13	0.1	C-OCC	2912	340.7	85.2	0.0	$10.82	$270.00	$35.00	25.0	21.7
300LED	B07	8	6BLMWLED	6BLMWLED	13	0.1	SW	3640	378.6	8	6BLMWLED	6BLMWLED	13	0.1	C-OCC	2912	302.8	75.7	0.0	$9.62	$270.00	$35.00	28.1	24.4
54LED	B06A	1	S 34 W F 1 (MAG)	F41EE	43	0.0	SW	8736	375.6	1	S 34 W F 1 (MAG)	F41EE	43	0.0	NONE	8736	375.6	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
32LED	B06A	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	8736	1,048.3	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	NONE	8736	1,048.3	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
25	B06A Restroom Front	1	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.0	SW	8736	244.6	1	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.0	NONE	8736	244.6	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
5LED	B19	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	8736	524.2	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	NONE	8736	524.2	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
5LED	B03C	44	2T 32 R F 2 (u) (ELE)	FU2LL	60	2.6	SW	8736	23,063.0	44	2T 32 R F 2 (u) (ELE)	FU2LL	60	2.6	NONE	8736	23,063.0	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
5LED	G03C	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	1200	288.0	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	960	230.4	57.6	0.0	$7.32	$270.00	$35.00	36.9	32.1
32LED	B08	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	3640	436.8	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	C-OCC	2912	349.4	87.4	0.0	$11.09	$270.00	$35.00	24.3	21.2
271LED	B08	1	1T 32 P F 8	F48ILL	224	0.2	SW	3640	815.4	1	1T 32 P F 8	F48ILL	224	0.2	C-OCC	2912	652.3	163.1	0.0	$20.71	$270.00	$35.00	13.0	11.3
5LED	G09D	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	C-OCC	2080	249.6	62.4	0.0	$7.92	$270.00	$35.00	34.1	29.7
5LED	G03E	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	C-OCC	2080	249.6	62.4	0.0	$7.92	$270.00	$35.00	34.1	29.7
5LED	G03F	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624.0	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	2080	499.2	124.8	0.0	$15.85	$270.00	$35.00	17.0	14.8
5LED	G03G	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624.0	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	2080	499.2	124.8	0.0	$15.85	$270.00	$35.00	17.0	14.8
5LED	G09H	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624.0	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	2080	499.2	124.8	0.0	$15.85	$270.00	$35.00	17.0	14.8
5LED	101	17	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.0	SW	2600	2,652.0	17	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.0	C-OCC	2080	2,121.6	530.4	0.0	$67.36	$270.00	$35.00	4.0	3.5
5LED	101A	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468.0	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	2080	374.4	93.6	0.0	$11.89	$270.00	$35.00	22.7	19.8
5LED	101B	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468.0	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	2080	374.4	93.6	0.0	$11.89	$270.00	$35.00	22.7	19.8
5LED	101C	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468.0	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	2080	374.4	93.6	0.0	$11.89	$270.00	$35.00	22.7	19.8
5LED	101D	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936.0	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	C-OCC	2080	748.8	187.2	0.0	$23.77	$270.00	$35.00	11.4	9.9
5LED	101E	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468.0	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	2080	374.4	93.6	0.0	$11.89	$270.00	$35.00	22.7	19.8
5LED	101F	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468.0	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	2080	374.4	93.6	0.0	$11.89	$270.00	$35.00	22.7	19.8
5LED	103	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936.0	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	C-OCC	2080	748.8	187.2	0.0	$23.77	$270.00	$35.00	11.4	9.9
5LED	101G	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	3640	436.8	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	C-OCC	2912	349.4	87.4	0.0	$11.09	$270.00	$35.00	24.3	21.2
5LED	102A	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936.0	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	C-OCC	2080	748.8	187.2	0.0	$23.77	$270.00	$35.00	11.4	9.9
5LED	102B	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624.0	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	2080	499.2	124.8	0.0	$15.85	$270.00	$35.00	17.0	14.8
55LED	102C	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	488.8	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	C-OCC	2080	391.0	97.8	0.0	$12.42	$270.00	$35.00	21.7	18.9
55LED	102D	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	488.8	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	C-OCC	2080	391.0	97.8	0.0	$12.42	$270.00	$35.00	21.7	18.9
55LED	102E	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	488.8	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	C-OCC	2080	391.0	97.8	0.0	$12.42	$270.00	$35.00	21.7	18.9
55LED	102F	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
5LED	102	19	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.1	SW	2600	2,964.0	19	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.1	C-OCC	2080	2,371.2	592.8	0.0	$75.29	$270.00	$35.00	3.6	3.1
55LED	102K	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
55LED	102J	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
35LED	Stairwell	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	8736	786.2	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	NONE	8736	786.2	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
5LED	Lobby 2	17	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.0	SW	8736	8,910.7	17	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.0	NONE	8736	8,910.7	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
35LED	Lobby 2	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	8736	3,145.0	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	NONE	8736	3,145.0	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
5LED	103	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936.0	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	C-OCC	2080	748.8	187.2	0.0	$23.77	$270.00	$35.00	11.4	9.9
5LED	104A	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	C-OCC	2080	249.6	62.4	0.0	$7.92	$270.00	$35.00	34.1	29.7
5LED	104B	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	C-OCC	2080	249.6	62.4	0.0	$7.92	$270.00	$35.00	34.1	29.7
5LED	104C	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	C-OCC	2080	249.6	62.4	0.0	$7.92	$270.00	$35.00	34.1	29.7
55LED	104	14	2T 17 R F 3 (ELE)	F23ILL	47	0.7	SW	2600	1,710.8	14	2T 17 R F 3 (ELE)	F23ILL	47	0.7	C-OCC	2080	1,368.6	342.2	0.0	$43.45	$270.00	$35.00	6.2	5.4
55LED	104O	1	2T 17 R F 3 (ELE)	F23ILL	47	0.0	SW	3640	171.1	1	2T 17 R F 3 (ELE)	F23ILL	47	0.0	C-OCC	2912	136.9	34.2	0.0	$4.35	$270.00	$35.00	62.1	54.1
55LED	104L	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
5LED	108	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	3640	655.2	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	C-OCC	2912	524.2	131.0	0.0	$16.64	$270.00	$35.00	16.2	14.1
55LED	114A	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
55LED	114B	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
55LED	114C	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
55LED	114D	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
55LED	114E	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	488.8	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	C-OCC	2080	391.0	97.8	0.0	$12.42	$270.00	$35.00	21.7	18.9
5LED	114	35	2T 32 R F 2 (u) (ELE)	FU2LL	60	2.1	SW	2600	18,345.6	35	2T 32 R F 2 (u) (ELE)	FU2LL	60	2.1	NONE	8736	18,345.6	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
32LED	114	10	1T 32 R F 2 (ELE)	F42LL	60	0.6	SW	8736	5,241.6	10	1T 32 R F 2 (ELE)	F42LL	60	0.6	NONE	8736	5,241.6	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
5LED	108	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	8736	2,620.8	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	NONE	8736	2,620.8	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
5LED	106Men	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	3640	1,310.4	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	C-OCC	2912	1,048.3	262.1	0.0	$33.28	$270.00	$35.00	8.1	7.1
5LED	108Women	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	3640	1,310.4	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	C-OCC	2912	1,048.3	262.1	0.0	$33.28	$270.00	$35.00	8.1	7.1
5LED	Lounge in front of 110	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	8736	524.2	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	C-OCC	8736	524.2	0.0	0.0	$0.00	$270.00	$35.00		#DIV/0!
55LED	110	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	NONE	2600	244.4	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
55LED	110A	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	NONE	2600	244.4	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
55LED	110B	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	NONE	2600	244.4	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
25	Front Reception	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	SW	8736	2,201.5	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	C-OCC	8736	2,201.5	0.0	0.0	$0.00	$270.00	$35.00		#DIV/0!
25	118	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	SW	2600	655.2	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	C-OCC	2080	524.2	131.0	0.0	$16.64	$270.00	$35.00	16.2	14.1
55LED	116A	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
55LED	116B	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
55LED	116C	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
55LED	116D	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
55LED	116E	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244.4	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	C-OCC	2080	195.5	48.9	0.0	$6.21	$270.00	$35.00	43.5	37.9
55LED	120	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	1200	225.6	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	C-OCC	960	180.5	45.1	0.0	$5.73	$270.00	$35.00	47.1	41.0
32LED	Front Reception	4	1T 32 R F 2 (ELE)	F42LL	60	0.2	SW	8736	2,096.6	4	1T 32 R F 2 (ELE)	F42LL	60	0.2	NONE	8736	2,096.6	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
300LED	Outdoor	3	6BLMWLED	6BLMWLED	13	0.0	SW	3640	142.0	3	6BLMWLED	6BLMWLED	13	0.0	NONE	3640	142.0	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
64LED	Outdoor	6	175 MH	MH175/1	215	1.3	SW	3640	4,695.6	6	175 MH	MH175/1	215	1.3	NONE	3640	4,695.6	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
															0	#N/A	#VALUE!	#VALUE!	#N/A	#VALUE!			#VALUE!	#VALUE!
															0	#N/A	#VALUE!	#VALUE!	#N/A	#VALUE!			#VALUE!	#VALUE!
															0	#N/A	#VALUE!	#VALUE!	#N/A	#VALUE!			#VALUE!	#VALUE!
	Total	**382**				**21.7**			**108,388.33**	**382.0**				**21.7**			**101947.4**	**6440.9**	**0.0**	**818.0**	**14850.0**	**1925.0**		
																	Demand Savings			**0.0**	**$0**			
																	kWh Savings			**6,441**	**$818**			
																	Total Savings				**$818**		**18.2**	**15.8**

Energy Audit of Morrison Hall

CHA Project No.28661

ECM-L3 Lighting Replacements with Occupancy Sensors

		EXISTING CONDITIONS							RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	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	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	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
5LED	B01	10	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.6	SW	2600	1,560	10	2T XX R LED	2RTLED	25	0.3	C-OCC	2,080	520	1,040	0.4	$ 182.19	$ 2,295.00	$ 535	12.6	9.7
5LED	B01A	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	104	208	0.1	$ 36.44	$ 675.00	$ 135	18.5	14.8
5LED	B01B	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624	4	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	208	416	0.1	$ 72.87	$ 1,080.00	$ 235	14.8	11.6
5LED	B01C	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	3640	437	2	2T XX R LED	2RTLED	25	0.1	NONE	3,640	182	255	0.1	$ 42.38	$ 405.00	$ 100	9.6	7.2
71	B04	2	I 60	I60/1	60	0.1	SW	8736	1,048	2	CF 26	CFQ26/1-L	27	0.1	NONE	8,736	472	577	0.1	$ 82.67	$ 13.50	$ -	0.2	0.2
300LED	B05	9	6BLMWLED	6BLMWLED	13	0.1	SW	3640	426	9	6BLMWLED	6BLMWLED	13	0.1	C-OCC	2,912	341	85	0.0	$ 10.82	$ 270.00	$ 35	25.0	21.7
300LED	B07	8	6BLMWLED	6BLMWLED	13	0.1	SW	3640	379	8	6BLMWLED	6BLMWLED	13	0.1	C-OCC	2,912	303	76	0.0	$ 9.62	$ 270.00	$ 35	28.1	24.4
54LED	B06A	1	S 34 W F 1 (MAG)	F41EE	43	0.0	SW	8736	376	1	4 ft LED Tube	200732x1	15	0.0	NONE	8,736	131	245	0.0	$ 35.07	$ 145.20	$ 30	4.1	3.3
32LED	B06A	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	8736	1,048	2	4 ft LED Tube	200732x2	30	0.1	NONE	8,736	524	524	0.1	$ 75.16	$ 467.40	$ 70	6.2	5.3
25	B06A Restroom Front	1	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.0	SW	8736	245	1	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.0	NONE	8,736	245	-	0.0	$ -	$ -	$ -	-	-
5LED	B19	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	8736	524	1	2T XX R LED	2RTLED	25	0.0	NONE	8,736	218	306	0.0	$ 43.84	$ 202.50	$ 50	4.6	3.5
5LED	B03C	44	2T 32 R F 2 (u) (ELE)	FU2LL	60	2.6	SW	8736	23,063	44	2T XX R LED	2RTLED	25	1.1	NONE	8,736	9,610	13,453	1.5	$ 1,929.05	$ 8,910.00	$ 2,200	4.6	3.5
5LED	G03C	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	1200	288	4	2T XX R LED	2RTLED	25	0.1	C-OCC	960	96	192	0.1	$ 44.43	$ 1,080.00	$ 235	24.3	19.0
32LED	B08	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	3640	437	2	4 ft LED Tube	200732x2	30	0.1	C-OCC	2,912	175	262	0.1	$ 41.87	$ 737.40	$ 105	17.6	15.1
271LED	B08	1	1T 32 P F 8	F48LL	224	0.2	SW	3640	815	1	1T 15 P LED 8	200732x8	120	0.1	C-OCC	2,912	349	466	0.1	$ 74.06	$ 1,225.80	$ 35	16.6	16.1
5LED	G03D	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	104	208	0.1	$ 36.44	$ 675.00	$ 135	18.5	14.8
5LED	G03E	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	104	208	0.1	$ 36.44	$ 675.00	$ 135	18.5	14.8
5LED	G03F	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624	4	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	208	416	0.1	$ 72.87	$ 1,080.00	$ 235	14.8	11.6
5LED	G03G	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624	4	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	208	416	0.1	$ 72.87	$ 1,080.00	$ 235	14.8	11.6
5LED	G03H	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624	4	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	208	416	0.1	$ 72.87	$ 1,080.00	$ 235	14.8	11.6
5LED	101	17	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.0	SW	2600	2,652	17	2T XX R LED	2RTLED	25	0.4	C-OCC	2,080	884	1,768	0.6	$ 309.72	$ 3,712.50	$ 885	12.0	9.1
5LED	101A	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	156	312	0.1	$ 54.66	$ 877.50	$ 185	16.1	12.7
5LED	101B	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	156	312	0.1	$ 54.66	$ 877.50	$ 185	16.1	12.7
5LED	101C	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	156	312	0.1	$ 54.66	$ 877.50	$ 185	16.1	12.7
5LED	101D	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936	6	2T XX R LED	2RTLED	25	0.2	C-OCC	2,080	312	624	0.2	$ 109.31	$ 1,485.00	$ 335	13.6	10.5
5LED	101E	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	156	312	0.1	$ 54.66	$ 877.50	$ 185	16.1	12.7
5LED	101F	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	156	312	0.1	$ 54.66	$ 877.50	$ 185	16.1	12.7
5LED	103	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936	6	2T XX R LED	2RTLED	25	0.2	C-OCC	2,080	312	624	0.2	$ 109.31	$ 1,485.00	$ 335	13.6	10.5
5LED	101G	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	3640	437	2	2T XX R LED	2RTLED	25	0.1	C-OCC	2,912	146	291	0.1	$ 47.00	$ 675.00	$ 135	14.4	11.5
5LED	102A	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936	6	2T XX R LED	2RTLED	25	0.2	C-OCC	2,080	312	624	0.2	$ 109.31	$ 1,485.00	$ 335	13.6	10.5
5LED	102B	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	624	4	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	208	416	0.1	$ 72.87	$ 1,080.00	$ 235	14.8	11.6
55LED	102C	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	489	4	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	208	281	0.1	$ 48.26	$ 1,080.00	$ 235	22.4	17.5
55LED	102D	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	489	4	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	208	281	0.1	$ 48.26	$ 1,080.00	$ 235	22.4	17.5
55LED	102E	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	489	4	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	208	281	0.1	$ 48.26	$ 1,080.00	$ 235	22.4	17.5
55LED	102F	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
5LED	102	19	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.1	SW	2600	2,964	19	2T XX R LED	2RTLED	25	0.5	C-OCC	2,080	988	1,976	0.7	$ 346.15	$ 4,117.50	$ 985	11.9	9.0
55LED	102K	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
55LED	102J	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
35LED	Stairwell	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	8736	786	1	T 59 R LED	RTLED38	38	0.0	NONE	8,736	332	454	0.1	$ 65.14	$ 236.25	$ -	3.6	3.6
5LED	Lobby 2	17	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.0	SW	8736	8,911	17	2T XX R LED	2RTLED	25	0.4	NONE	8,736	3,713	5,198	0.6	$ 745.32	$ 3,442.50	$ 850	4.6	3.5
35LED	Lobby 2	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	8736	3,145	4	T 59 R LED	RTLED38	38	0.2	NONE	8,736	1,328	1,817	0.2	$ 260.55	$ 945.00	$ -	3.6	3.6
5LED	103	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	2600	936	6	2T XX R LED	2RTLED	25	0.2	C-OCC	2,080	312	624	0.2	$ 109.31	$ 1,485.00	$ 335	13.6	10.5
5LED	104A	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	104	208	0.1	$ 36.44	$ 675.00	$ 135	18.5	14.8
5LED	104B	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	104	208	0.1	$ 36.44	$ 675.00	$ 135	18.5	14.8
5LED	104C	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T XX R LED	2RTLED	25	0.1	C-OCC	2,080	104	208	0.1	$ 36.44	$ 675.00	$ 135	18.5	14.8
55LED	104	14	2T 17 R F 3 (ELE)	F23ILL	47	0.7	SW	2600	1,711	14	2T 25 R LED	2RTLED	25	0.4	C-OCC	2,080	728	983	0.3	$ 168.91	$ 3,105.00	$ 735	18.4	14.0
55LED	104O	1	2T 17 R F 3 (ELE)	F23ILL	47	0.0	SW	3640	171	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	2,912	73	98	0.0	$ 15.63	$ 472.50	$ 85	30.2	24.8
55LED	104L	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
5LED	108	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	3640	655	3	2T XX R LED	2RTLED	25	0.1	C-OCC	2,912	218	437	0.1	$ 70.51	$ 877.50	$ 185	12.4	9.8
55LED	114A	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
55LED	114B	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
55LED	114C	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
55LED	114D	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
55LED	114E	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	2600	489	4	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	208	281	0.1	$ 48.26	$ 1,080.00	$ 235	22.4	17.5
5LED	114	35	2T 32 R F 2 (u) (ELE)	FU2LL	60	2.1	SW	8736	18,346	35	2T XX R LED	2RTLED	25	0.9	NONE	8,736	7,644	10,702	1.2	$ 1,534.47	$ 7,087.50	$ 1,750	4.6	3.5
32LED	114	10	1T 32 R F 2 (ELE)	F42LL	60	0.6	SW	8736	5,242	10	4 ft LED Tube	200732x2	30	0.3	NONE	8,736	2,621	2,621	0.3	$ 375.79	$ 2,337.00	$ 350	6.2	5.3
5LED	108	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	8736	2,621	5	2T XX R LED	2RTLED	25	0.1	NONE	8,736	1,092	1,529	0.2	$ 219.21	$ 1,012.50	$ 250	4.6	3.5
5LED	106Men	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	3640	1,310	6	2T XX R LED	2RTLED	25	0.2	C-OCC	2,912	437	874	0.2	$ 141.01	$ 1,485.00	$ 335	10.5	8.2
5LED	108Women	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	3640	1,310	6	2T XX R LED	2RTLED	25	0.2	C-OCC	2,912	437	874	0.2	$ 141.01	$ 1,485.00	$ 335	10.5	8.2
5LED	Lounge in front of 110	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	8736	524	1	2T XX R LED	2RTLED	25	0.0	C-OCC	8,736	218	306	0.0	$ 43.84	$ 472.50	$ 85	10.8	8.8
55LED	110	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	NONE	2,600	130	114	0.0	$ 20.83	$ 405.00	$ 100	19.4	14.6
55LED	110A	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	NONE	2,600	130	114	0.0	$ 20.83	$ 405.00	$ 100	19.4	14.6
55LED	110B	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	NONE	2,600	130	114	0.0	$ 20.83	$ 405.00	$ 100	19.4	14.6
25	Front Reception	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	SW	8736	2,201	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	C-OCC	8,736	2,201	-	0.0	$ -	$ 270.00	$ 35	-	-
25	118	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	SW	2600	655	9	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.3	C-OCC	2,080	524	131	0.0	$ 16.64	$ 270.00	$ 35	16.2	14.1
55LED	116A	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
55LED	116B	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
55LED	116C	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
55LED	116D	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
55LED	116E	2	2T 17 R F 3 (ELE)	F23ILL	47	0.1	SW	2600	244	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	2,080	104	140	0.0	$ 24.13	$ 675.00	$ 135	28.0	22.4
55LED	120	4	2T 17 R F 3 (ELE)	F23ILL	47	0.2	SW	1200	226	4	2T 25 R LED	2RTLED	25	0.1	C-OCC	960	96	130	0.1	$ 29.06	$ 1,080.00	$ 235	37.2	29.1
32LED	Front Reception	4	1T 32 R F 2 (ELE)	F42LL	60	0.2	SW	8736	2,097	4	4 ft LED Tube	200732x2	30	0.1	NONE	8,736	1,048	1,048	0.1	$ 150.32	$ 934.80	$ 140	6.2	5.3
300LED	Outdoor	3	6BLMWLED	6BLMWLED	13	0.0	SW	3640	142	3	6BLMWLED	6BLMWLED	13	0.0	NONE	3,640	142	-	0.0	$ -	$ -	$ -	-	
64LED	Outdoor	6	175 MH	MH175/1	215	1.3	SW	3640	4,696	6	BAYLED78W	BAYLED78W	93	0.6	NONE	3,640	2,031	2,664	0.7	$ 443.18	$ 5,065.17	$ 600	11.4	10.1
															0	#N/A							#VALUE!
															0	#N/A							#VALUE!
															0	#N/A							#VALUE!
S	Total	0				21.7			108,388	382				10.0				46,333	11.7	9,557	89,193	$18,686		
S																		Demand Savings		11.7	$1,676			
S																		kWh Savings		62,056	$7,881			
S																		Total Savings			$9,557		9.3	7.4

APPENDIX D

New Jersey Board of Public Utilities Incentives

i. **Smart Start**

ii. **Direct Install**

iii. **Pay for Performance (P4P)**

iv. **Energy Savings Improvement Plan (ESIP)**

I. SMART START

NJ SmartStart Buildings

Program Overview

With New Jersey SmartStart Buildings ...

... A smart start now means better performance later! Whether you're starting a commer industrial project from the ground up, renovating existing space, or upgrading equipmen unique opportunities to upgrade the energy efficiency of the project.

Special Notice

Enhanced incentives are available for NJ SmartStart Building upgrades in buildings im Hurricane Sandy. Eligible projects receive an additional 50% and new incentives have added for high efficiency food service equipment.

Visit the Sandy web page for details and important links.

New Jersey SmartStart Buildings can provide a range of support — at no cost to you — substantial energy savings, both now and for the future. Learn more about:

- Project Categories
- Custom Measures
- Incentives for Qualifying Equipment and Projects
- Program Terms and Conditions
- Find a Trade Ally

Please note: pre-approval is required for almost all energy efficiency incentives. T you must submit an application form (and applicable worksheets) and receive an approv from the program before any equipment is installed (click here for complete Terms and Upon receipt of an approval letter, you may proceed to install the equipment listed on yc approved application. Equipment installed prior to the date of the approval letter is not e an incentive. **Any customer and/or agent who purchases equipment prior to the re incentive approval letter does so at his/her own risk.**

Getting Started

Submit your project application form as soon as you know you will be doing a constructi or replacing/adding equipment.

PAST PROGRAMS

TOOLS AND RESOURCES

PROGRAM UPDATES

CONTACT US

Apply for pre-approval by submitting an application for the type of equipment you have c install. The application should be accompanied by a related worksheet, where applicabl manufacturer's specification sheet (refer to the specific program requirements on the ba application for specs needed for your project) for the equipment you are planning to inst (Program representatives will review your application package and approve it, reject it, a advise you of upgrades in equipment that will save energy costs and/or increase your in

Support for Custom Energy-Efficiency Measures

Custom measures allows program participants the opportunity to receive an incentive fo energy-efficiency measures that are not on the prescriptive equipment Incentive list, but project/facility specific.

Incentives for Qualifying Equipment and Projects

Financial incentives are available for large and small projects. These incentives offset s maybe even all! — of the added cost to purchase qualifying energy-efficient equipment, provides significant long-term energy savings. Ranges of incentives are available for qu equipment (depending on type, size, and efficiency) in several categories.

Find out more about equipment incentives

For specific details on equipment requirements and financial incentives, including ince equipment not listed here, contact a program representative. Fiscal year financial incent be limited to a maximum of $500,000 per customer utility account and are available as f permits.

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COMMERCIAL, INDUSTRIAL AND LOCAL GOVERNMENT

HURRICANE SANDY

PROGRAMS

NJ SMARTSTART BUILDINGS

EQUIPMENT INCENTIVES

FOOD SERVICE EQUIPMENT

APPLICATION FORMS

TOOLS AND RESOURCES

PAY FOR PERFORMANCE

COMBINED HEAT & POWER AND FUEL CELLS

LOCAL GOVERNMENT ENERGY AUDIT

LARGE ENERGY USERS PROGRAM

ENERGY SAVINGS IMPROVEMENT PROGRAM

DIRECT INSTALL

ENERGY BENCHMARKING

OIL, PROPANE & MUNICIPAL ELECTRIC CUSTOMERS

EDA PROGRAMS

SBC CREDIT PROGRAM

Home » Commercial & Industrial » Programs » NJ SmartStart Buildings

Equipment Incentives

Special Notice

Enhanced incentives are available for NJ SmartStart Building upgrades in buildings im Hurricane Sandy. Eligible projects receive an additional 50% and new incentives have added for high efficiency food service equipment.

Visit the Sandy web page for details and important links.

More reasons for a smart start on your next project!

New Jersey SmartStart Buildings provides **financial incentives for qualifying equipment**. These incentives were developed to help our customers offset some of the added cost to purchase qualifying energy-efficient equipment, which provides significant long-term energy savings. A wide range of incentives are available for qualifying equipment (depending on type, size and efficiency).

Listed below are the types of qualifying equipment and ranges of incentives. For details on equipment requirements and full listings of incentives, refer to the **online application forms**.

Please note that almost all equipment incentives require pre-approval before equipment is installed. (**click for exceptions**)To start the pre-approval process, submit an Equipment Application, and appropriate Equipment Worksheets, for the type types of equipment you are planning to install along with equipment specification sheets (refer to the specific program requirements on the back of the application for specificatic needed for your project) and a current utility bill(s).

In order to be eligible to receive financial incentives under this Program, Applicants mus receive electric and/or gas service from one of the regulated electric and/or gas utilities the State of New Jersey. They are: Atlantic City Electric, Jersey Central Power & Light, Rockland Electric Company, New Jersey Natural Gas, Elizabethtown Gas, PSE&G, and South Jersey Gas.

Electric Chillers

Water-cooled chillers ($12 - $170 per ton)
Air-cooled chillers ($8 - $52 per ton)

Gas Cooling

Gas absorption chillers ($185-$450 per ton)
Gas Engine-Driven Chillers (Calculated through Custom Measure F

PAST PROGRAMS

TOOLS AND RESOURCES

PROGRAM UPDATES

CONTACT US

Desiccant Systems ($1.00 per cfm - gas or electric)

Electric Unitary HVAC

Unitary AC and split systems ($73 - $92 per ton)
Air-to-air heat pumps ($73 - $92 per ton)
Water-source heat pumps ($81 per ton)
Packaged terminal AC & HP ($65 per ton)
Central DX AC Systems ($40 - $72 per ton)
Dual Enthalpy Economizer Controls ($250)
Occupancy Controlled Thermostats ($75 each)
A/C Economizing Controls ($85 - $170 each)

Ground Source Heat Pumps

Closed Loop ($450-750 per ton)

Gas Heating

Gas-fired boilers < 300 MBH ($300 per unit)
Gas-fired boilers ≥ 300 MBH - 1500 MBH ($1.75 per MBH)
Gas-fired boilers ≥ 1500 MBH - ≤ 4000 MBH ($1.00 per MBH)
Gas-fired boilers > 4000 MBH (Calculated through Custom Measur
Gas furnaces ($300-$400 per unit)
Gas infrared heaters - indoor only ($300 - $500 per unit)
Boiler economizing controls ($1,200 - $2,700 per unit)

Variable Frequency Drives

Variable air volume ($65 - $155 per hp)
Chilled-water pumps ($60 per hp)
Compressors ($5,250 to $12,500 per drive)

Natural Gas Water Heating

Gas water heaters ≤ 50 gallons ($50 per unit)
Gas-fired water heaters > 50 gallons ($1.00 - $2.00 per MBH)
Tankless water heaters replacing a free standing water heater > 82 energy factor ($300 per heater)
Gas-fired booster water heaters ($17 - $35 per MBH)

Premium Motors

Three-phase motors ($45 - $700 per motor) **(Incentive was discor effective March 1, 2013 except for buildings impacted by Hurri Sandy. Approved applications will have the standard timefram year from the program commitment date to complete the instal**

Refrigerator/Freezer Case Premium Efficiency Motors (ECM)

Fractional (< 1 HP) Electronic Commutated Motors (ECM) ($40 per for replacement of existing shaded-pole motor in refrigerated/freeze

Prescriptive Lighting

New Linear Fluorescent

- T-12, HID and Incandescent to T-5 and T-8 ($25 - $200 p fixture) **(Note: T12 replacements are only available for buildings impacted by Hurricane Sandy)**
- New Induction ($70 per replaced HID fixture)
- New LED
  - Screw-in/Plug-in ($10 - $20 per lamp)
  - Refrigerator/Freezer Case ($30 - $65 per fixture)
  - Outdoor pole/arm/wall-mounted luminaires ($100 - $175 p fixture)
  - Display case ($30 per case)
  - Shelf-mounted display and task ($15 per linear foot)
  - Wall-wash, desk, recessed ($20 - $35 per fixture)
  - Parking garage luminaires ($100 per fixture)
  - Track or Mono-Point directional ($50 per fixture)
  - Stairwell and Passageway luminaires ($40 per fixture)
  - High-Bay, Low-Bay ($150 per fixture)
  - Bollard ($50 per fixture)
  - luminaires for Ambient Lighting of Interior Commercial Spa *Linear panels ($50 per fixture)*
  - Fuel pump canopy ($100 per fixture)
  - LED retrofit kits (custom measures)
- New Pulse-Start Metal Hallide ($25 per fixture)
- Linear Fluorescent Retrofit ($10 - $20 per fixture)
- Induction Retrofit ($50 per retrofitted HID fixture)
- New Construction/Complete Renovation (performance-based)

Note: Incentives for T-12 to T-5 and T-8 lamps with electronic ballast in facilities ($10 per fixture, 1-4 lamps) and T-5/T-8 high bay fixtures ($16 - per fixture) were discontinued effective March 1, 2013 for T-12 retrofits replacements except for buildings impacted by Hurricane Sandy. Appr applications will have the standard timeframe of one year from the pro commitment date to complete the installation

Lighting Controls

- Occupancy Sensors
  - Wall mounted ($20 per control)
  - Remote mounted ($35 per control)
  - Daylight dimmers ($25 per fixture controlled, $50 per fixtu office applications only)
  - Occupancy controlled hi-low fluorescent controls ($25 per controlled)
- HID or Fluorescent Hi-Bay Controls
  - Occupancy hi-low ($35 per fixture controlled)
  - Daylight dimming ($45 per fixture controlled)

Refrigeration

- Covers and Doors
  - Energy-Efficient doors for open refrigerated doors/covers per door)
  - Aluminum Night Curtains for open refrigerated cases ($3.5 linear foot)
- Controls
  - Door Heater Control ($50 per control)
  - Electric Defrost Control ($50 per control)
  - Evaporator Fan Control ($75 per control)
  - Novelty Cooler Shutoff ($50 per control)

Food Service Equipment

Cooking
- Combination Electric Oven/Steamer ($1,000 per oven)
- Combination Gas Oven/Steamer ($750 per oven)
- Electric Convection Oven ($350 per oven)
- Gas Convection Oven ($500 per oven)
- Gas Rack Oven ($1,000 single, $2,000 double)
- Gas Conveyor Oven ($500 small deck, $750 large deck)
- Electric Fryer ($200 per vat)
- Gas Fryer ($749 per vat)
- Electric Large Vat Fryer ($200 per vat)
- Gas Large Vat Fryer ($500 per vat)
- Electric Griddle ($300 per griddle)
- Gas Griddle ($125 per griddle)
- Electric Steam Cooker ($1,250 per steamer)
- Gas Steam Cooker ($2,000 per steamer)

Holding
- Full Size Insulated Cabinets ($300 per cabinet)
- Three Quarter Size Insulated Cabinets ($250 per cabinet)
- Half Size Insulated Cabinets ($200 per cabinet)

Cooling
- Glass Door Refrigerators ($75 - $150 per unit)
- Solid Door Refrigerators ($50 - $200 per unit)
- Glass Door Freezers ($200 - $1,000 per unit)
- Solid Door Freezers ($100 - $600 per unit)
- Ice Machines ($50 - $500 per unit)

Cleaning
- Dishwashers ($400 - $1,500 per unit)

Other Equipment Incentives*

- Performance Lighting ($1.00 per watt per square foot below progra incentive threshold, currently 5% more energy efficient than ASHR/ 2007 for New Construction only.)
- Custom electric and gas equipment incentives (not prescriptive)

*Equipment incentives are calculated based on type, efficiency, size, and ap and are evaluated on a case-by-case basis. Contact us for details.

II. DIRECT INSTALL

COMMERCIAL, INDUSTRIAL AND LOCAL GOVERNMENT

HURRICANE SANDY

PROGRAMS

NJ SMARTSTART BUILDINGS

PAY FOR PERFORMANCE

COMBINED HEAT & POWER AND FUEL CELLS

LOCAL GOVERNMENT ENERGY AUDIT

LARGE ENERGY USERS PROGRAM

ENERGY SAVINGS IMPROVEMENT PROGRAM

DIRECT INSTALL

PARTICIPATION STEPS

PARTICIPATING CONTRACTORS

SUSTAINABLE JERSEY

ENERGY BENCHMARKING

OIL, PROPANE & MUNICIPAL ELECTRIC CUSTOMERS

EDA PROGRAMS

SBC CREDIT PROGRAM

Direct Install

NEW JERSEY'S CLEAN ENERGY PROGRAM
DIRECT Install

Let us pay up to 70% of your energy efficiency upgrade.

Sometimes, the biggest challenge to improving energy efficiency is knowing where t and how to get through the process. Created specifically for existing small to mediun facilities, Direct Install is a turnkey solution that makes it easy and affordable to upgr high efficiency equipment. Direct Install is designed to cut your facility's energy costs replacing lighting, HVAC and other outdated operational equipment with energy effic alternatives. The program pays up to 70% of retrofit costs, dramatically improving yo payback on the project. There is a $125,000 incentive cap on each project.

ELIGIBILITY

Existing small to mid-sized commercial and industrial f with a peak electric demand that did not exceed 200 k any of the preceding 12 months are eligible to participa Direct Install. Applicants will submit the last 12 months electric utility bills indicating that they are below the de threshold and have occupied the building during that ti Buildings must be located in New Jersey and served b the state's public, regulated electric or natural gas utilit companies.

SYSTEMS & EQUIPMENT ADDRESSED BY THE PROGRAM

- Lighting
- Heating, Cooling & Ventilation (HVAC)
- Refrigeration
- Motors
- Natural Gas
- Variable Frequency Drives

Measures eligible for Direct Install are limited to specific equipment categories, type capacities. Boilers may not exceed 500,000 Btuh and furnaces may not exceed 140,

III. PAY FOR PERFORMANCE (P4P)

COMMERCIAL, INDUSTRIAL AND LOCAL GOVERNMENT

HURRICANE SANDY

PROGRAMS

NJ SMARTSTART BUILDINGS

PAY FOR PERFORMANCE

EXISTING BUILDINGS

PARTICIPATION STEPS

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APPROVED PARTNERS

NEW CONSTRUCTION

FAQS

BECOME A PARTNER

COMBINED HEAT & POWER AND FUEL CELLS

LOCAL GOVERNMENT ENERGY AUDIT

LARGE ENERGY USERS PROGRAM

ENERGY SAVINGS IMPROVEMENT PROGRAM

DIRECT INSTALL

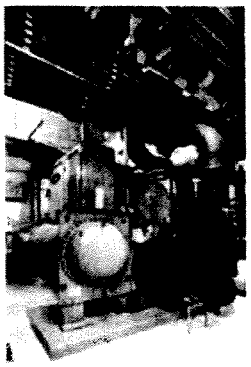
ENERGY BENCHMARKING

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 facilit earn incentives that are directly linked to your savings. Pay for Performance relies on a program partners who provide technical services under direct you. Acting as your energy expert, your partner will develop a reduction plan for each project with a whole-building technica component of a traditional energy audit, a financial plan for fu energy efficient measures and a construction schedule for ins



Eligibility

Existing commercial, industrial and institutional buildings with demand over 100 kW for any of the preceding twelve months to participate including hotels and casinos, large office buildir family buildings, supermarkets, manufacturing facilities, scho shopping malls and restaurants. Buildings that fall into the fol customer classes are not required to meet the 100 kW dema to participate in the program: hospitals, public colleges and universities, 501(c)(3) non-p affordable multifamily housing, and local governmental entities. Your energy reduction p 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, manuf water treatment and datacenter building types whose annual energy consumption is hea weighted on process loads. Details are available in the high energy intensity section of t 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 ir facilities and comparing it to similar buildings. That can be a big help in locating opportu cost-justified energy efficiency upgrades. And, based on our findings, you may be invite participate in the Building Performance with ENERGY STAR initiative and receive speci recognition as an industry leader in energy efficiency.

Incentives

OIL, PROPANE & MUNICIPAL ELECTRIC CUSTOMERS

EDA PROGRAMS

SBC CREDIT PROGRAM

PAST PROGRAMS

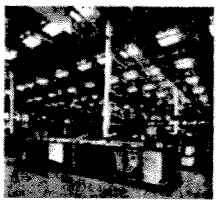
TOOLS AND RESOURCES

PROGRAM UPDATES

CONTACT US

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

Incentive #1 - Submittal of complete energy reduction plan prepared by an app program partner - Contingent on moving forward, incentives will be between $5 $50,000 based on approximately $.10 per square foot, not to exceed 50% of th 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 based on actual savings, provided that the minimum performance threshold of savings has been achieved.

A detailed Incentive Structure document is available on the applications and form

Steps to Participation

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

Home | Residential | Commercial & Industrial | Renewable Energy
About Us | Press Room | Library | FAQs | Calendar | Newsletters | Contact Us | Site

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

BPU New Jersey Board of Public Utilities

PAY FOR PERFORMANCE APPLICATION FORM

July 1, 2013 - June 30, 2014

Utility Serving Applicant: ☐ Atlantic City Electric ☐ Jersey Central Power & Light ☐ PSE&G
☐ New Jersey Natural Gas ☐ Elizabethtown Gas ☐ Rockland Electric Co. ☐ South Jersey Gas
☐ Other Electric Service Provider (please specify): _____
☐ Other Fuel Provider: _____ ☐ Oil: _____ ☐ Other (Please specify): _____

Instructions

1. Read the program material to determine project qualification.
2. Read the Participation Agreement and sign where indicated.
3. Fill out all applicable spaces on this form.
4. Provide a copy of the customer's company W-9 form.
5. Provide the most recent consecutive 12 month period of utility bills for the project.
6. Provide brief description of facility.
7. Partner must submit the application package via e-mail, mail or fax DIRECTLY to the Market Manager – see back of this form.

Approval of this Application is not an approval of the project's scope of work. Scope of work is only approved upon approval of the Energy Reduction Plan. See application and program guidelines for more information.

Customer/Owner Information (payment will be made to entity entered here)

Company Name		Project Contact/Title	
Company Address	City	State	Zip
Phone/Fax	E-mail	Federal ID/SSN	

Partner Information

Company Name		Project Contact/Title	
Company Address	City	State	Zip
Phone	Fax	E-mail	

Project Information

Project Name			
Building Address	City	State	Zip
Utility Account Number(s): Electric		Gas	
* Note: Please use the back of this page for additional utility accounts if quantity exceeds space allotment.			
Annual Peak kW Demand	Building Type		Number of Buildings
Size of Building(s) (gross sq/ft)	Direct, Master or Sub Metered		

Funding

❑ Check the box if an Energy Savings Improvement Program (ESIP) will be a source of funding. ESIP allows government agencies to pay for energy related improvements using the value of the resulting energy savings.

Do you expect to receive funding under any other efficiency programs? ☐ No ☐ Yes If Yes, please specify below:

Utility Program #1 – Utility: _____ Program Name: _____
Utility Program #2 – Utility: _____ Program Name: _____
Federal Program #1 – Organization: _____ Program Name: _____
Federal Program #2 – Organization: _____ Program Name: _____
Other Program – Organization: _____ Program Name: _____

Additional Project information

Additional Utility Account(s)

Account type	Account number
Account type	Account number
Account type	Account number
Account type	Account number
Account type	Account number
Account type	Account number
Account type	Account number
Account type	Account number
Account type	Account number
Account type	Account number
Account type	Account number
Account type	Account number

Additional Comments:

Complete this application form and send it directly to the Commercial/Industrial Market Manager by e-mail, mail or fax.

New Jersey's Clean Energy Program
c/o TRC Energy Services-P4P
900 Route 9 North, Suite 404 • Woodbridge, NJ 07095

Phone: 866-657-6278 • Fax: 732-855-0422
E-mail: P4P@NJCleanEnergy.com

Visit our website: NJCleanEnergy.com/P4P

Pay For Performance-Existing Buildings

Participation Agreement

Definitions:

Design Incentives – Incentives that may be offered to design professionals by the Program.

Design Services – Services that may be offered to design professionals under the Program.

Energy-Efficient Measures – Any device eligible to receive a Program Incentive payment through the NJ Clean Energy Commercial and Industrial Program (New Jersey SmartStart Buildings).

New Jersey Utilities – The regulated electric and/or gas utilities in the State of New Jersey. They are: Atlantic City Electric, Jersey Central Power & Light, Rockland Electric Company, New Jersey Natural Gas, Elizabethtown Gas, PSE&G, and South Jersey Gas.

Administrator – New Jersey Board of Public Utilities, Office of Clean Energy

Participating Customers – Those non-residential electric and/or gas service customers of the New Jersey Utilities who participate in this Program.

Product Installation or Equipment Installation – Installation of the Energy-Efficient Measures.

Projects with a contract threshold of $14,187 (increasing to $15,444 effective July 1, 2014) are required to pay no less than prevailing wage rate to workers employed in the performance of any construction undertaken in connection with Board of Public Utilities financial assistance, or undertaken to fulfill any condition of receiving Board of Public Utilities financial assistance, including the performance of any contract to construct, renovate or otherwise prepare a facility, the operations of which are necessary for the receipt of Board of Public Utilities financial assistance. By submitting an application, or accepting program incentives, applicant agrees to adhere to New Jersey Prevailing Wage requirements, as applicable.

Program – The Commercial and Industrial Energy-Efficient Construction Program (New Jersey SmartStart Buildings) offered herein by the New Jersey Board of Public Utilities, Office of Clean Energy pursuant to state regulatory approval under the New Jersey Electric Discount and Energy Competition Act, NJSA 48:3-49, et seq.

Program Incentives – Refers to the amount or level of incentive that the Program provides to Participating Customers pursuant to the Program offered herein (see description under "Incentive Amount" heading).

Program Offer – Program Incentives are available to non-residential retail electric and/or gas service customers of the New Jersey Utilities identified above.

Program Manager – TRC Energy Services.

Application and Eligibility Process – The Program pays incentives after the installation of qualified energy-efficient measures that were pre-approved (for exceptions to this condition, please refer to "Exceptions for Approval".) In order to be eligible for Program Incentives, a Customer, or an agent (contractor/vendor) authorized by a Customer, must submit a properly completed application package. The package must include an application signed by the customer; a complete (current) utility bill; and technology worksheet and manufacturer's cut sheets (where appropriate). This information must be submitted to the Program Manager before equipment is installed. Applications for measures that are self installed by customers must be submitted by the customer and not the sales vendor of the measure, however, the customer may elect to assign payment of the incentive to the sales vendor. This application package must be received by the Program Manager on or before June 30, 2014 in order to be eligible for the fiscal year July 1, 2013-June 30, 2014 incentives. The Program Manager will review the application package to determine if the project is eligible for a Program Incentive. If eligible, the Customer will receive an approval letter with the estimated authorized incentive amount and the date by which the equipment must be installed in order for the approval to remain in effect. Upon receipt of an approval letter, the Customer may then proceed to install the equipment listed on the approved application. Equipment installed prior to the date of the Program Manager's approval letter is not eligible for an incentive. The Program Manager reserves the right to conduct a pre-inspection of the facility prior to the installation of equipment. This will be done prior to the issuance of the approval letter. All equipment must be purchased within 12 months of date of application. **Any Customer and/ or agent who purchases equipment prior to the receipt of an incentive approval letter does so at his/her own risk.**

Exceptions for Approval – The Application and Eligibility Process pertains to all projects except for those involving either Gas Heating, Unitary HVAC or Motors having an incentive amount less than $5,000 that were installed within 12 months of receipt of the application. These measures, at this incentive level, may be installed without prior approval. In addition, but at the sole discretion of the Program Manager, emergency replacement of equipment may not require a prior approval determination and letter. **In such cases, please notify the Program Manager of such emergencies as early as possible, that an application will soon be sent in that was not pre-approved.**

Post-Installation Approval – After installation is completed, the Customer, or an agent authorized by the Customer, must finalize and submit an invoice for the purchase of the equipment (material cost must be broken out from labor costs), and any other required documentation as specified on the equipment application or in the Program Manager's initial approval letter.

Please refer to the program guide on the NJCleanEnergy.com/ssb website for the complete Application and Eligibility Process.

The Program Manager reserves the right to verify sales transactions and to have reasonable access to Participating Customer's facility to inspect both pre-existing product or equipment (if applicable) and the Energy-Efficient Measures

installed under this Program, either prior to issuing incentives or at a later time.

Energy-Efficient Measures must be installed in buildings located within a New Jersey Utilities' service territory and designated on the Participating Customer's incentive application. Program Incentives are available for qualified Energy-Efficient Measures as listed and described in the Program materials and incentive applications. The Participating Customer must ultimately own the equipment, either through an up-front purchase or at the end of a short-term lease. Design Incentives are available to design professionals as described in the Program materials and applications. A different and separate agreement must be executed by participating design professionals to be eligible for this type of incentive. The design professional does not need to be based in New Jersey.

Equipment procured by Participating Customers through another program offered by New Jersey's Clean Energy Program or the New Jersey Utilities, as applicable, is not eligible for incentives through this program. Customers who have not contributed to the Societal Benefits Charge of the applicable New Jersey Utility are not be eligible for incentives offered through this program.

Incentive Amount – Program Incentives will equal either: a) the approved Program Incentive amount, or b) the actual equipment cost of the Energy-Efficient Measure, whichever is less, as determined by the Program Manager. Products offered at no direct cost to the customer are ineligible. Incomplete application submissions, applications requiring inspections and unanticipated high volume of activities may cause processing delays. Program Incentives are limited to $500,000 per utility account in a calendar year. Contact the Program Manager regarding any questions.

Tax Liability – The Program Manager will not be responsible for any tax liability that may be imposed on any Participating Customer as a result of the payment of Program Incentives. All Participating Customers must supply their federal tax identification number or social security number to the Program Manager on the application form in order to receive a Program Incentive. In addition, Participating Customers must also provide a Tax Clearance Form (entitled "Business Assistance or Incentive Clearance Certificate") that is dated within 90 days of equipment installation.

Endorsement – The Program Manager and Administrator do not endorse, support or recommend any particular manufacturer, product or system design in promoting this Program.

Warranties – THE PROGRAM MANAGER AND ADMINISTRATOR DO NOT WARRANT THE PERFORMANCE OF INSTALLED EQUIPMENT, AND/OR SERVICES RENDERED AS PART OF THIS PROGRAM, EITHER EXPRESSLY OR IMPLICITLY. NO WARRANTIES OR REPRESENTATIONS OF ANY KIND, WHETHER STATUTORY, EXPRESSED, OR IMPLIED, INCLUDING, WITHOUT LIMITATIONS, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING EQUIPMENT OR SERVICES PROVIDED BY A MANUFACTURER OR VENDOR. CONTACT YOUR VENDOR/SERVICES PROVIDER FOR DETAILS REGARDING PERFORMANCE AND WARRANTIES.

Limitation of Liability – By virtue of participating in this Program, Participating Customers agree to waive any and all claims or damages against the Program Manager or the Administrator, except the receipt of the Program Incentive. Participating Customers agree that the Program Manager's and Administrator's liability, in connection with this Program, is limited to paying the Program Incentive specified. Under no circumstances shall the Program Manager, its representatives, or subcontractors, or the Administrator, be liable for any lost profits, special, punitive, consequential or incidental damages or for any other damages or claims connected with or resulting from participation in this Program. Further, any liability attributed to the Program Manager under this Program shall be individual, and not joint and/or several.

Assignment – The Participating Customer may assign Program Incentive payments to a specified vendor.

Participating Customer's Certification – Participating Customer certifies that he/she purchased and installed the equipment listed in their application at their defined New Jersey location. Participating Customer agrees that all information is true and that he/she has conformed to all of the Program and equipment requirements listed in the application.

Termination – The New Jersey Board of Public Utilities reserves the right to extend, modify (this includes modification of Program Incentive levels) or terminate this Program without prior or further notice.

Acknowledgement – I have read, understood and am in compliance with all rules and regulations concerning this incentive program. I certify that all information provided is correct to the best of my knowledge, and I give the Program Manager permission to share my records with the New Jersey Board of Public Utilities, and contractors it selects to manage, coordinate or evaluate the NJ SmartStart Buildings Program. Additionally, I allow reasonable access to my property to inspect the installation and performance of the technologies and installations that are eligible for incentives under the guidelines of New Jersey's Clean Energy Program.

CUSTOMER'S SIGNATURE
PARTNER SIGNATURE
By signing, I certify that I have read, understand and agree to the Participation Agreement listed above.

IV. ENERGY SAVINGS IMPROVEMENT PLAN (ESIP)

COMMERCIAL, INDUSTRIAL AND LOCAL GOVERNMENT

HURRICANE SANDY

PROGRAMS

NJ SMARTSTART BUILDINGS

PAY FOR PERFORMANCE

COMBINED HEAT & POWER AND FUEL CELLS

LOCAL GOVERNMENT ENERGY AUDIT

LARGE ENERGY USERS PROGRAM

ENERGY SAVINGS IMPROVEMENT PROGRAM

DIRECT INSTALL

ENERGY BENCHMARKING

OIL, PROPANE & MUNICIPAL ELECTRIC CUSTOMERS

EDA PROGRAMS

SBC CREDIT PROGRAM

PAST PROGRAMS

TOOLS AND RESOURCES

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Energy Savings Improvement Program

A new State law allows government agencies to make energy related improvements to t facilities and pay for the costs using the value of energy savings that result from the imp Under 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 and reduce energy usage with minimal expenditure of new financial resources.

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

Local Government
School Districts (K-12)

All RFPs must be submitted to the Board for approval at ESIP@bpu.state.nj.us.

The Board also adopted protocols to measure energy savings:

Measuring Energy Savings
Procedures for Implementation

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

The NJ Board of Public Utilities sponsored Sustainable Jersey in the creation of an ESIF Guidebook that explains how to implement the program. The guidebook also includes ca of successful projects and a list of helpful resources.

FIRST STEP – ENERGY AUDIT

For local governments interested in pursuing an ESIP, the first step is to perform an ene as prescribed in P.L.2012 c.55.

ENERGY REDUCTION PLANS

If you have an ESIP plan that needs to be submitted to the Board of Public Utilities, plea 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)*

ESIP PROGRAM

Final version 42413

BPU RULES

1. Public Entity must decide if they will use an ESCO or DIY method or Hybrid thereof prior to issuing the RFP and the RFP must state the intended method. A change in the project procurement model after the RFP closing date will be cause for immediate rejection and disqualification of potential Clean Energy program incentives.

2. RFP procedures shall be adhered to as per the legislation, including the use of BPU approved forms. Any alteration of the forms, without prior approval from the BPU shall be grounds for rejection.

3. RFP must include copy of an audit (ASHRAE Level II w/Level III for lighting) and audit must be prepared by a firm classified by DPMC in the 036 discipline.

4. All firms, including professional services, whether using ESCO or DIY model, must be DPMC classified.

5. If an Architect is engaged by the public entity, the architectural fees are the responsibility of the public entity and must be paid directly to the firm. These fees may be included in the energy cost savings analysis and payback.

   ESCO's may contract directly with an architectural firm, in which case the architectural firm serves as a subcontractor to the ESCO and the project related service costs may be included within the project's economic model.

6. Public entity shall conduct pre-bid meetings and site visits per existing statutes.

   In the interest of open public bidding transparency, it is a requirement of the BPU that all proposers must attend the pre-proposal bid meeting.

7. There shall be no negative cash flow in any year of the program.
   section 7 (1)(a)
   > "the energy savings resulting from the program will be sufficient to cover the cost of the program's energy conservation measures."

8. SREC values are not permitted to be used in the energy cost savings calculations.

9. Capital cost avoidance values are not to be used in the energy savings calculations.

10. Operational and Maintenance (O&M) cost savings may be permitted in the cost savings calculations, but only with supporting documentation.

11. Blended utility rates shall not be permitted. Use the actual utility tariff or local contracted rates if there is a third party supplier.

    For the RFP proposals, the public entity shall define the utility rates in the RFP

12. Contracted third party utility rates may only be used for the term of the contract (5 yr. maximum) Subsequent years are to be projected at the utility tariff rates plus the annual BPU escalation rates.

13. Public entity shall conduct M&V (measurement and verification) at the one (1) year operational date and shall provide a copy of the M&V report to the Board of Public Utilities.

    For the RFP proposals, the ESCO shall provide the cost for the one (1) year M&V only. For comparative purposes, the one year M&V pricing shall be indicated on the proposal Form VI, under the "Annual Service Costs" column. Additional M&V costs are at the discretion of the local unit and are not to be included in the proposal.

14. The decisions made by BPU staff regarding compliance or other issues that arise in connection with the RFP procurement process shall be considered a final decision of the BPU. Any appeal will need to be through the New Jersey Superior Court, Appellate Division.

15. For the RFP proposals only, Demand Response (DR) revenues claimed by ESCO's can only be projected for a maximum period of three (3) years. DR revenue projections beyond three years will not be permitted. DR revenues must be included and presented under the "Energy Rebates/Incentives" column of FORM VI.

16. ESCO "fees" proposed during the RFP phase of the project cannot increase post-award. ESCO's are required to maintain the fee percentages through final contract negotiations and construction of the Board approved Energy Savings Plan

17. Public Bid openings shall be held on the due date of the proposal submissions. The public entity shall announce the name of the bidder and the total dollar amount. After award of a contract, all proposals received will be made available by the owner for public inspection

18. Rejection of bids by the public entity shall be conducted in accordance with the appropriate sections of the applicable legislation, as stated in Title 40A:11-13.2. Additionally all proposals must be returned to the respective ESCO's upon rejection.

19. Field changes that exceed 5% of the project cost require BPU approval.

20. Energy Savings Plans (ESP) that is dependent upon incentives from the Clean Energy Program must review the current program requirements, at the time of application, for each incentive to insure eligibility. If any program incentive is denied, resubmission of all ESIP related forms will be necessary to remain ESIP qualified.

APPENDIX E

Photovoltaic Analysis

William Patterson University
Morrison Hall

Cost of Electricity	$0.150	/kWh
Electricity Usage	245,400	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
$280,000	**70.0**	**83,645**	**0**	**$12,547**	**0**	**$12,547**	**$0**	**$14,638**	**22.3**	**10.3**

** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $175 /1000kwh

Area Output*
1,543 m2
16,606 ft2

Perimeter Output*
190 m
623 ft

Available Roof Space for PV:
(Area Output - 10 ft x Perimeter) x 85%
8,819 ft2

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

8 watt/ft2
70,556 DC watts
70 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	07470	Enter into PV Watts
DC/AC Derate Factor	0.83	Enter info PV Watts

PV Watts Output
83,645 annual kWh calculated in PV Watts program

% Offset Calc

Usage	245,400	(from utilities)
PV Generation	83,645	(generated using PV Watts)
% offset	34%	

* http://www.freemaptools.com/area-calculator.htm
** http://www.flettexchange.com
*** http://gisatnrel.nrel.gov/PVWatts_Viewer/index.html

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at http://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

RESULTS

83,645 kWh per Year

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Energy Value ($)
January	2.91	5,294	794
February	3.51	5,655	848
March	4.21	7,368	1,105
April	4.19	6,885	1,033
May	5.95	9,905	1,486
June	6.27	9,758	1,464
July	5.24	8,358	1,254
August	4.75	7,603	1,140
September	5.09	7,930	1,189
October	3.55	5,985	898
November	2.73	4,521	678
December	2.49	4,385	658
Annual	**4.24**	**83,645**	**$ 12,547**

Location and Station Identification

Requested Location	300 Pompton Rd, Wayne, NJ
Weather Data Source	CALDWELL/ESSEX CO., NJ (TMY3)
Latitude	40.88° N
Longitude	74.28° W

PV System Specifications *(Commercial)*

DC Rating	70 kW
DC to AC Derate Factor	0.83
Array Type	Fixed (open rack)
Array Tilt	20°
Array Azimuth	180°

Initial Economic Comparison

Average Cost of Electricity Purchased from Utility	0.15 $/kWh
Cost of Electricity Generated by System	0.21 $/kWh

These values can be compared to get an idea of the cost-effectiveness of this system. However, system costs, system financing options (including 3rd party ownership) and complex utility rates can significantly change the relative value of the PV system.

APPENDIX F

Photos

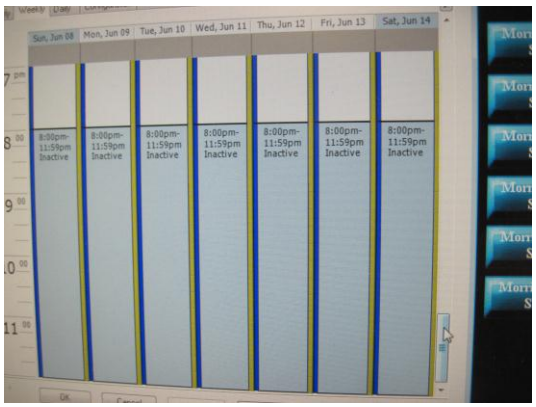
ECM-1 Replace Roof- Increase Insulation

Existing Roof

ECM-2 Replace five (5) Trane DX/Gas packaged roof top units

Existing RTU

ECM-3 Reprogram the Temperature Setback in the DDC System



Existing controls

ECM-4 Replace High Flow Plumbing Fixtures with Low Flow Plumbing Fixtures

No Pictures Available

ECM-L1 Lighting Replacement / Upgrades

Existing Lights

ECM-L2 Install Lighting Controls (Occupancy Sensors)

No Pictures Available

ECM-L3 Lighting Replacements with Controls (Occupancy Sensors)

See ECM L-1 and L-2

APPENDIX G

EPA Benchmarking Report

ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

Morrison Hall

Primary Property Function: College/University
Gross Floor Area (ft²): 34,000
Built: 1955

For Year Ending: January 31, 2014
Date Generated: July 20, 2014

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Morrison Hall 300 Pompton Road Wayne, New Jersey 07470	_____ , (____)____-_____	____ _____ , (____)____-_____ _____

Property ID: 4113367

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
77.9 kBtu/ft²

Source EUI
133.3 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	1,811,634 (68%)
Electric - Grid (kBtu)	837,305 (32%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	153.5
National Median Source EUI (kBtu/ft²)	262.6
% Diff from National Median Source EUI	-49%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	202

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

Professional Engineer Stamp (if applicable)