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February 16, 2011

Sussex Community College
Administration & Art Gallery Building B/C

Local Government Energy Program
Energy Audit Report FINAL

One College Hill Rd
Newton, NJ 07860

Project Number: LGEA79

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EXECUTIVE SUMMARY

The Administration and Art Gallery building is a three story building with a partial basement comprising a total conditioned floor area of 38,137 square feet. The original structure was built in 1960 with additions/renovations in 1998, 2000, 2004-5, and 2008. The following chart provides an overview of current energy usage in the building based on the analysis period of August 2009 through July 2010:

Table 1: State of Building-Energy Usage

	Electric Usage, kWh/yr	Gas Usage, therms/yr	Annual Cost of Energy, $	Site Energy Use Intensity, kBtu/sq ft yr	Joint Energy Consumption, MMBtu/yr
Current	688,323	23,220	137,511	122.0	4,671
Proposed	554,251	7,542	92,534	69.0	2,642
Savings	134,072	15,678	44,977	53.0	2029
% Savings	19.5%	67.5%	32.7%	43.4%	43.4%

There may be energy procurement opportunities for the Administration and Art Gallery building to reduce annual electric utility costs, which are $4,130 higher when compared to the average estimated NJ commercial utility rates.

SWA has also entered energy information about the Public Administration and Art Gallery building in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager Energy benchmarking system. The resulting Site Energy Use Intensity is 122.0 kBtu/sq ft yr, while the average energy use intensity for campus type buildings is 120.0 kBtu/sq ft yr.

Based on the current state of the building and its energy use, SWA recommends implementing various energy conservation measures from the savings detailed in Table 1. The measures are categorized by payback period in Table 2 below:

Table 2: Energy Conservation Measure Recommendations

ECMs	First Year Savings ($)	Simple Payback Period (years)	Initial Investment, $	CO2 Savings, lbs/yr
0-5 Year	$14,628	2.4	$35,186	152,856
5-10 Year	$4,584	6.8	$31,168	32,059
>10 year	$25,765	15.2	$391,988	227,960
Total	$44,977	10.2	$458,342	412,875

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 13 cars from the roads each year or the equivalent of planting 372 trees to offset the annual CO2 emissions generated.

Further Recommendations: Other recommendations to increase building efficiency pertaining to capital improvements and operations and maintenance are (with additional information in the Proposed Further Recommendations section):

Capital Improvements
- Replace exhaust fans

- Replace window air conditioners
- Install NEMA premium motors when replacements are required

Operations and Maintenance

- Maintain roofs
- Maintain downspouts and cap flashing
- Provide weather-stripping/air-sealing
- Repair/seal wall cracks and penetrations
- Provide water-efficient fixtures and controls
- Use smart power electric strips

The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for Sussex Community College. Based on the requirements of the LGEA program, Sussex Community College must commit to implementing some of these measures, and must submit paperwork to the Local Government Energy Audit program within one year of this report's approval to demonstrate that they have spent, net of other NJCEP incentives, at least 25% of the cost of the audit (per building). The minimum amount to be spent, net of other NJCEP incentives, is $2,239 (or 25% of $8,956).

Financial Incentives and Other Program Opportunities

The table below summarizes the recommended next steps that the Sussex Community College can take to achieve greater energy efficiency and reduce operating expenses.

Table 3: Next Steps for the Administration and Art Gallery building

Recommended ECMs	Incentive Program (Please refer to Appendix F for details)
Install (67) New CFL fixtures	N/A
Retrofit (3) Beverage vending machines with Vending Miser™	Direct Install
Retrofit (1) Snack Vending Machine with Snack Miser™	Direct Install
Install 2 new Daylight Sensors with incentives	Smart Start, Direct Install
Install 3 new Motion Sensors with incentives	Smart Start, Direct Install
Replace windows on 3rd floor	N/A

There are various incentive programs that the Sussex Community College could apply for that could help lower the cost of installing the ECMs. For the Administration and Art Gallery building, and contingent upon available funding, SWA recommends the following incentive programs:

- **Direct Install 2010 Program**: Commercial buildings with peak electric demand below 200kW can receive up to 60% of installed cost of energy saving upgrades.
- **Smart Start**: Most of energy savings equipment and design measures have moderate incentives under this program.
- **Renewable Energy Incentive Program**: Receive up to $0.75/Watt toward installation cost for PV panels upon available funding. For each 1,000 kWh generated by PV renewable energy, receive a credit between $475 and $600.
- **Utility Sponsored Programs**: See available programs with JCP&L https://www.firstenergycorp.com/JCP_L/index.html and Elizabethtown Gas http://www.elizabethtowngas.com/Business/EnergySavings.aspx
- **Energy Efficiency and Conservation Block Grant Rebate Program**: Provides up to $20,000 per local government toward energy saving measures; http://njcleanenergy.com/EECBG

Please refer to Appendix F for further details.

INTRODUCTION

Launched in 2008, the Local Government Energy Audit (LGEA) Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, Sussex Community College halls, police and libraries, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize up to 100% of the cost of the audit. The Board of Public Utilities (BPUs) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 38-year-old architectural/engineering research and consulting firm, with specialized expertise in green technologies and procedures that improve the safety, performance, and cost effectiveness of buildings. SWA has a long-standing commitment to creating energy-efficient, cost-saving and resource-conserving buildings. As consultants on the built environment, SWA works closely with architects, developers, builders, and local, state, and federal agencies to develop and apply sustainable, 'whole building' strategies in a wide variety of building types: commercial, residential, educational and institutional.

SWA performed an energy audit and assessment for the Administration and Art Gallery building at One College Hill Rd, Sussex Community College, 07901. The process of the audit included facility visits on August 24, 27, and September 17, 2010, benchmarking and energy bills analysis, assessment of existing conditions, energy modeling, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

The goal of this Local Government Energy Audit is to provide sufficient information to the Sussex Community College to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Administration and Art Gallery building.

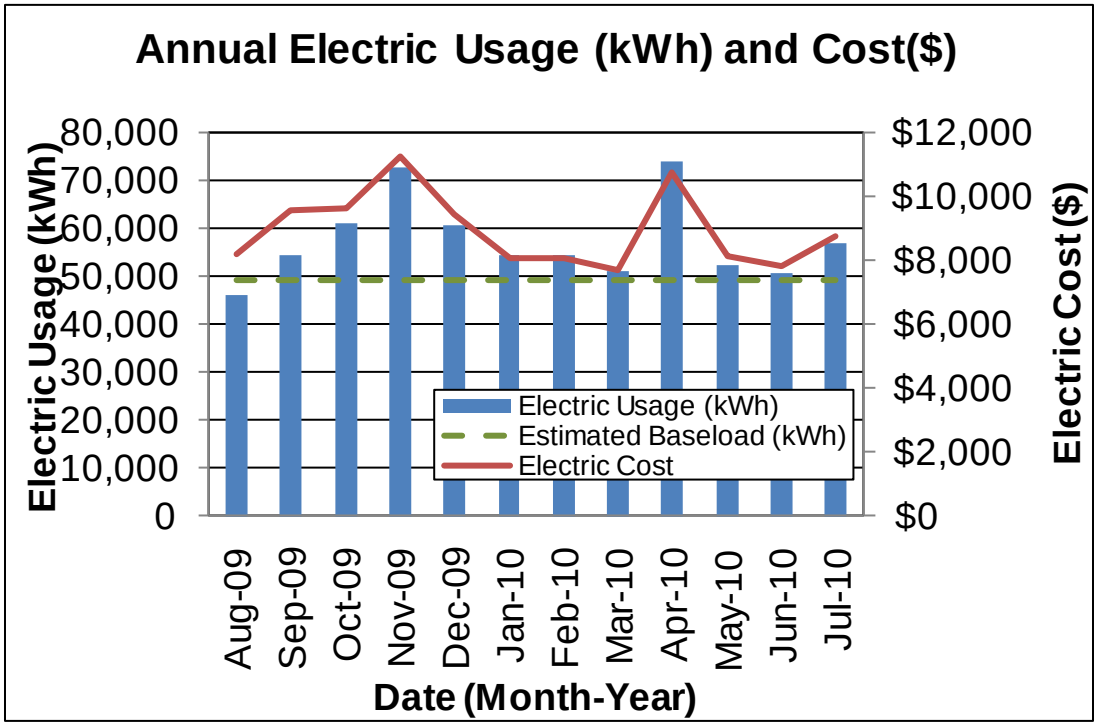
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

SWA reviewed utility bills from July 2008 through July 2010 that were received from the utility companies supplying the Administration and Art Gallery building with electric and natural gas. A 12 month period of analysis from August 2009 through July 2010 was used for all calculations and for purposes of benchmarking the building.

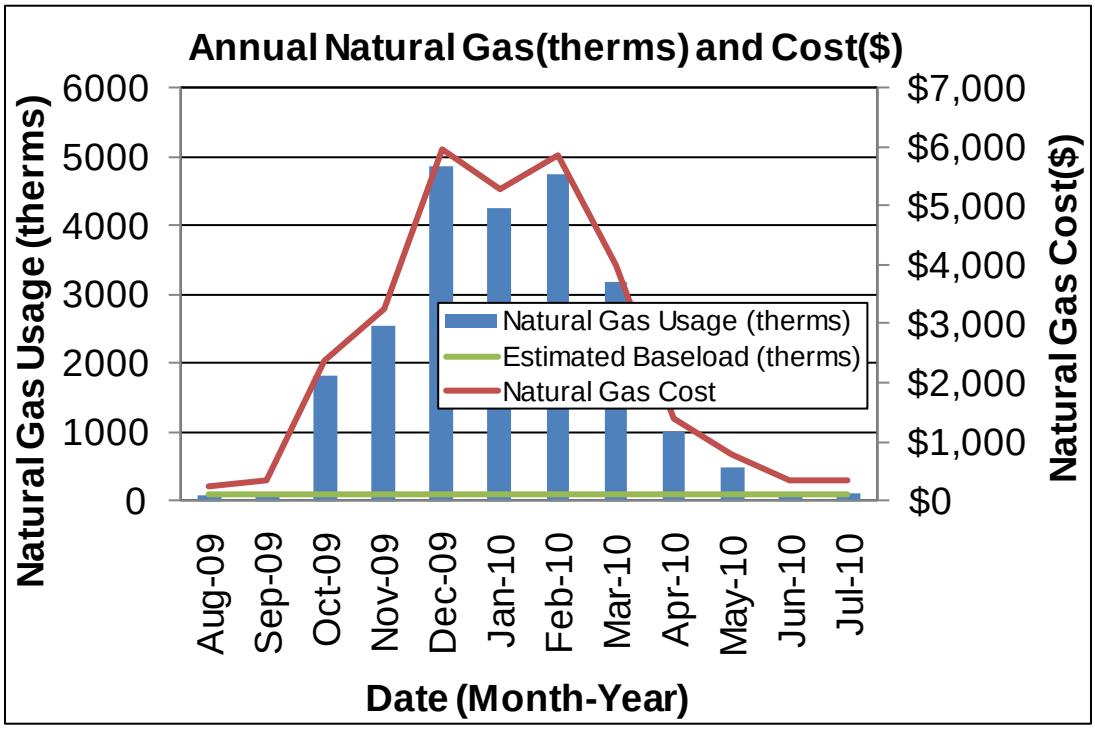
Electricity - The Administration and Art Gallery building is currently served by one electric meter. The Administration and Art Gallery building currently buys electricity from JCP&L at **an average aggregated rate of $0.156/kWh**. The Administration and Art Gallery building purchased **approximately 688,323 kWh, or $107,377 worth of electricity,** in the previous year. The average monthly demand was 156.0 kW and the annual peak demand was 175.6 kW.

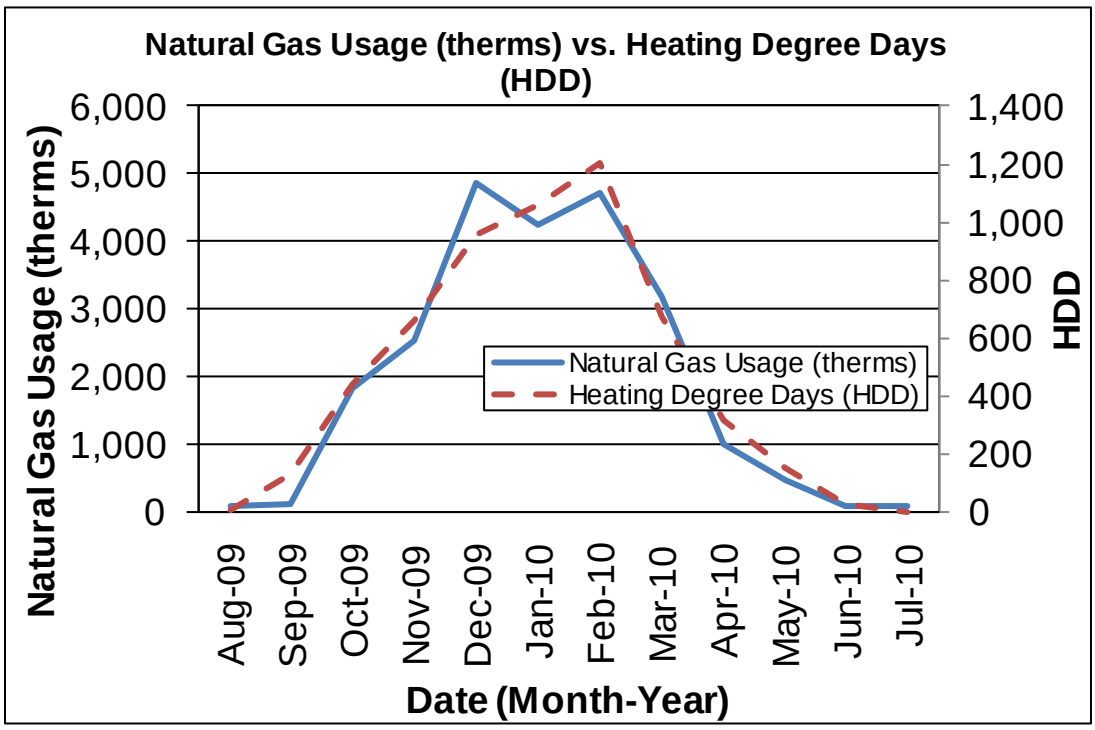
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate base-load or minimum electric usage required to operate the Administration and Art Gallery building.



Natural gas - The Administration and Art Gallery building is currently served by one meter for natural gas. The Administration and Art Gallery building currently buys natural gas from Elizabethtown Gas at **an average aggregated rate of $1.298/therm**. The Administration and Art Gallery building purchased **approximately 23,220 therms, or $30,134 worth of natural gas,** in the previous year.

The following chart shows the monthly natural gas usage and costs. The green line represents the approximate base-load or minimum natural gas usage required to operate the Administration and Art Gallery building.

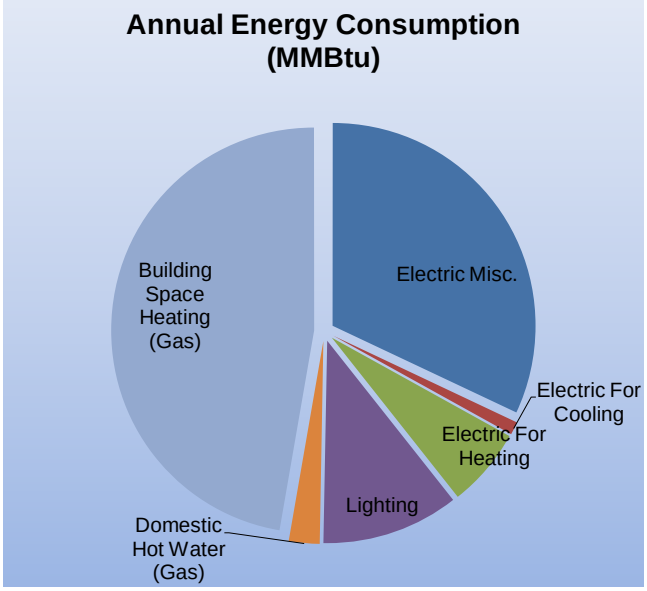


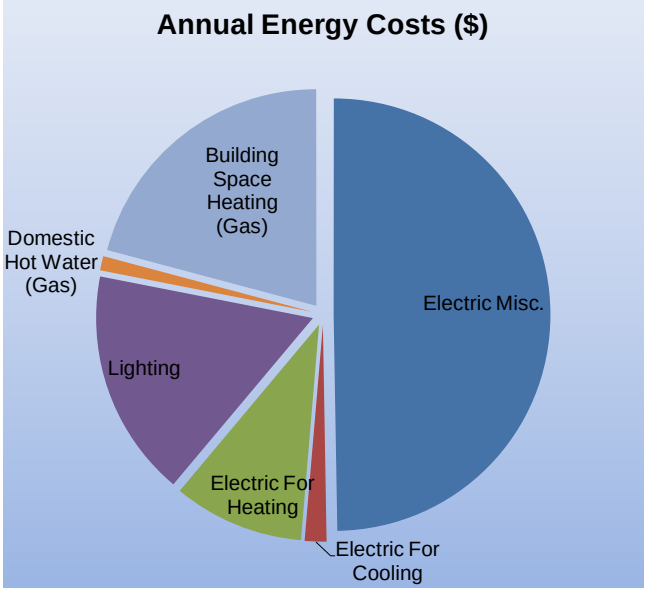


The previous chart shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. SWA's analysis used a base temperature of 65 degrees Fahrenheit.

The following graphs, pie charts, and table show energy use for the Public Administration and Art Gallery building based on utility bills for the 12 month period. Note: electrical cost at $46/MMBtu of energy is 3.5 times as expensive as natural gas at $13/MMBtu.

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Misc.	1,496	32%	$68,385	50%	46
Electric For Cooling	48	1%	$2,209	2%	46
Electric For Heating	294	6%	$13,437	10%	46
Lighting	511	11%	$23,347	17%	46
Domestic Hot Water (Gas)	114	2%	$1,478	1%	13
Building Space Heating	2,208	47%	$28,656	21%	13
Totals	4,671	100%	$137,511	100%	
Total Electric Usage	2,349	50%	$107,378	78%	46
Total Gas Usage	2,322	50%	$30,134	22%	13
Totals	4,671	100%	$137,511	100%	



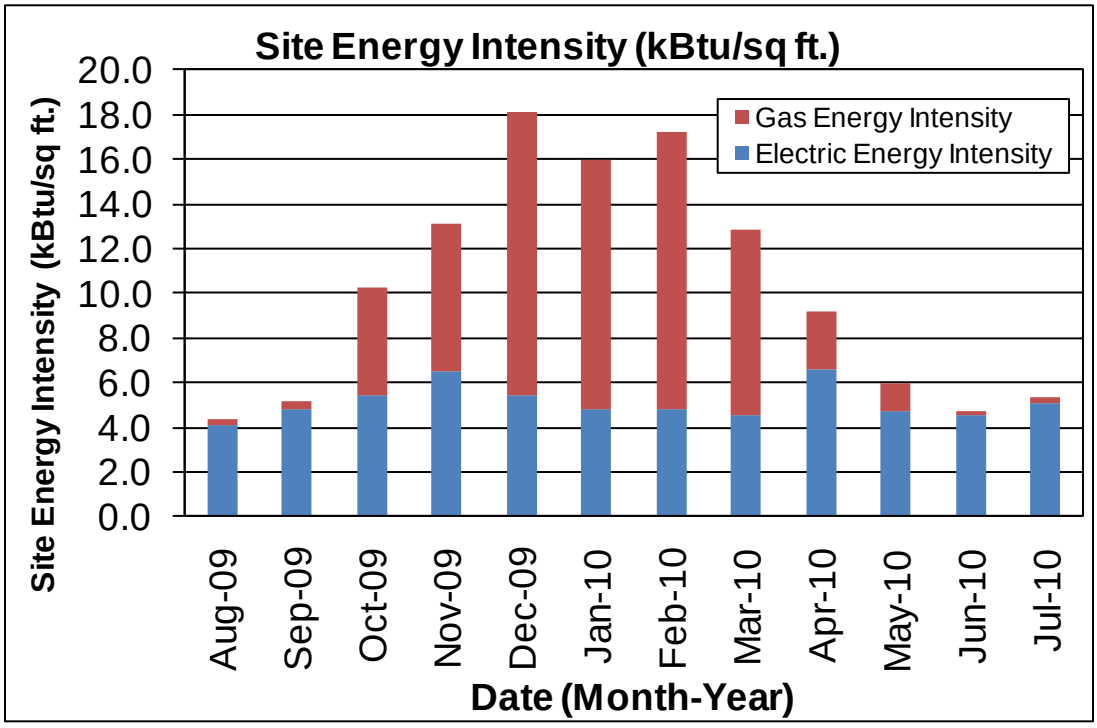


Energy benchmarking

SWA has entered energy information about the Administration and Art Gallery building in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager Energy benchmarking system. This Administration and Art Gallery building facility is categorized as a non-eligible ("Other") space type. Because it is an "Other" space type, there is no rating available. Consequently, the Administration and Art Gallery building is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 122.0 kBtu/sq

ft yr compared to the national average of College/University buildings consuming 120.0 kBtu/sq ft yr. See ECM section for guidance on how to improve the building's rating.

Due to the nature of its calculation based upon a survey of existing buildings of varying usage, the national average for "Other" space types is very subjective, and is not an absolute bellwether for gauging performance. Additionally, should the Sussex Community College desire to improve the building energy use intensity there are other large scale and financially less advantageous improvements that can be made, such as envelope window, door and insulation upgrades that would help to improve the building.



Per the LGEA program requirements, SWA has assisted the Sussex Community College to create an ENERGY STAR® Portfolio Manager account and share the Administration and Art Gallery building facilities information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager Account information with the Sussex Community College [redacted]

Tariff analysis

As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs. Tariffs are typically assigned to buildings based on size and building type.

Tariff analysis is performed to determine if the rate that a building is contracted to pay with each utility provider is the best rate possible resulting in the lowest costs for electric and gas provision. Typically, the natural gas prices increase during the heating months when natural gas is used for heating. Some high gas price per therm fluctuations in the summer may be due to high energy costs that recently occurred and low use caps for the non-heating months.

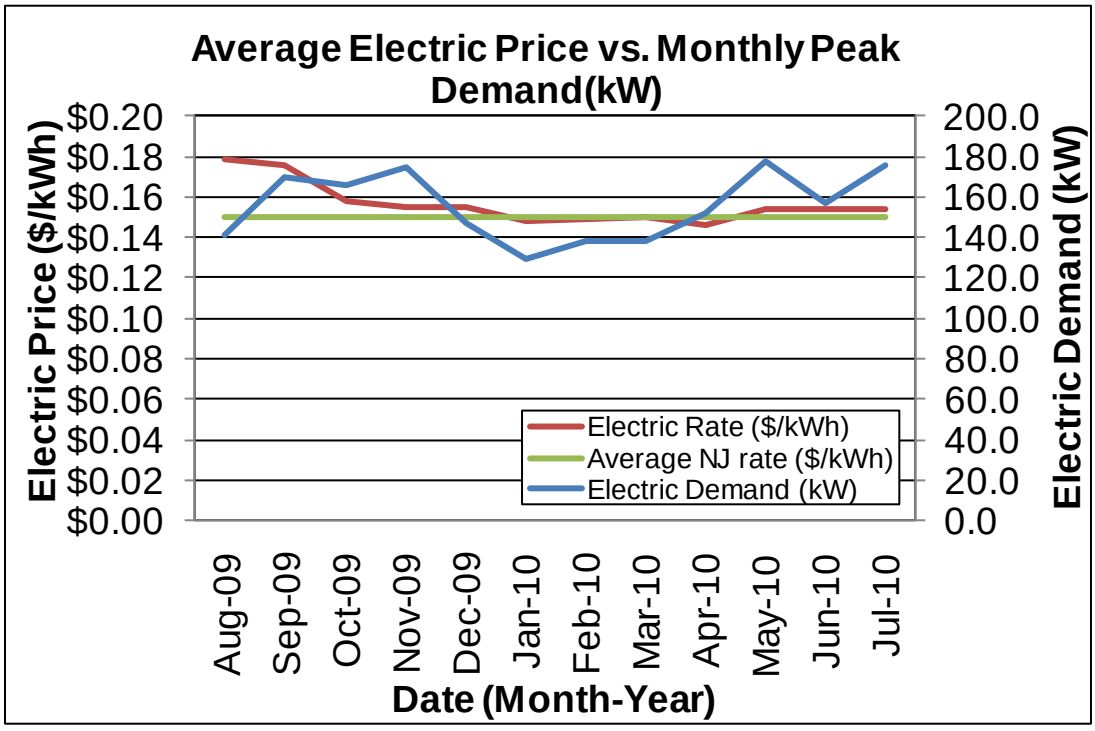
Typically, electricity prices also increase during the cooling months when electricity is used for cooling.

The supplier charges a market-rate price based on use, and the billing does not break down demand costs for all periods because usage and demand are included in the rate. Currently, the building is paying a general service rate for natural gas. Demand charges are not broken out in the bill. Thus the building pays for fixed costs such as meter reading charges during the summer months. The building is direct metered and currently purchases electricity at a general service rate for usage with an additional charge for electrical demand factored into each monthly bill. The general service rate for electric charges is market-rate based on usage and demand. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

Energy Procurement strategies

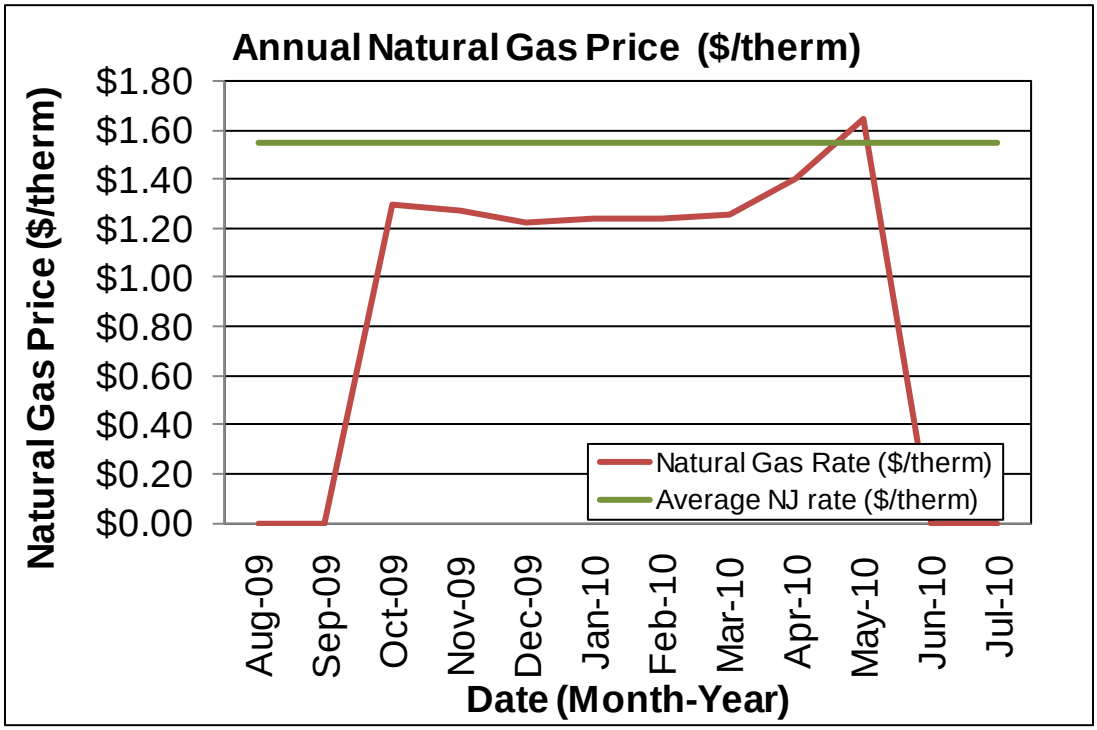
Billing analysis is conducted using an average aggregated rate that is estimated based on the total cost divided by the total energy usage per utility per 12 month period. Average aggregated rates do not separate demand charges from usage, and instead provide a metric of inclusive cost per unit of energy. Average aggregated rates are used in order to equitably compare building utility rates to average utility rates throughout the state of New Jersey.

The average estimated NJ commercial utility rates for electric are $0.150/kWh, while Administration and Art Gallery building pays a rate of $0.156/kWh. The Administration and Art Gallery building annual electric utility costs are $4,130 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 18% over the most recent 12 month period.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while

Administration and Art Gallery building pays a competitive rate of $1.298/therm. Natural gas bill analysis shows fluctuations up to 55% over the most recent 12 month period.



Utility rate fluctuations may have been caused by adjustments between estimated and actual meter readings; others may be due to unusual high and recent escalating energy costs.

SWA recommends that the Administration and Art Gallery building further explore opportunities of purchasing both natural gas and electricity from third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Administration and Art Gallery building. Appendix C contains a complete list of third-party energy suppliers for the Newton service area.

EXISTING FACILITY AND SYSTEMS DESCRIPTION

This section gives an overview of the current state of the facility and systems. Please refer to the Proposed Further Recommendations section for recommendations for improvement.

Based on the visit from SWA on August 24, 27, and September 17, 2010, the following data was collected and analyzed.

Building Characteristics

The three story with partial basement, 38,137 square foot Administration and Art Gallery building was originally built in 1960 with additions/renovations in 1998, 2000, 2004, and 2008. The Administration and Art Gallery building houses classrooms, art galleries, meeting rooms, storage spaces, mechanical rooms, IT area, executive offices, administrative offices, and bathrooms.

North East Façade and Main Entrance


North West Façade


South West Façade


South East Facing Façade

Building Occupancy Profiles

There are approximately 100-140 people in the building at any given time; approximately 100 employees and 100 students when the Administration and Art Gallery building is in use weekdays from 8am through 10pm (approximately 80 hours/week on average). The Administration and Art Gallery building has 100 employees.

Building Envelope

Due to unfavorable weather conditions (min. 18 deg. F delta-T in/outside and no/low wind), no exterior envelope infrared (IR) images were taken during the field audit.

Exterior Walls

There are various types of exterior wall sections including the original building section with 5/8" lath and plaster interior with 6" CMU (Concrete Masonry Unit) with no insulation. The exterior façade of this section consists of painted brick veneer or precast concrete. The newer wall sections contain 8" CMU, no insulation, 4" brick veneer and 5/8" gypsum board or painted CMU interiors. There is a small wall area at the entrance of the building consisting of painted plywood. There are some precast concrete exterior wall sections that are cracked or damaged (as seen in images below).

Note: Wall insulation levels could not be verified in the field and are based on available construction plans or building management provided information.

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall good, age-appropriate condition with some signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all facades.

The following specific exterior wall problem spots and areas were identified:

Horizontal EIFS projections are directly exposed to the elements, lacking sufficient cover or flashing

Horizontal CMU projections are directly exposed to the elements, lacking cover or flashing

Overgrown ground vegetation touching exterior wall surfaces

Insect burrowing in exterior wall section near main entrance

Cracked stucco in overhang ceiling at main entrance to building

Roof

The building's roof is predominantly a flat, no parapet type over steel decking, with a dark-colored EPDM single membrane finish with gravel. There is a decorative metal seamed overhang on the C building section. This roof section was installed partially in 2006 and partially in 2008. One and a half inches of rigid roof insulation was recorded. A smaller area of the roof is standing metal seam, pitched over 2-3" rigid insulation on plywood and steel decking.

Note: Roof insulation levels could not be verified in the field, and are based on available construction plans and building management.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall good, age-appropriate condition, with only a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues.

PV on roof

EPDM roof membrane with gravel

Rotted plywood under ventilation fan

Pooled water without sufficient drainage pitch

Decorative metal seamed roof

Base

The building's base is composed of a below-grade basement with a slab floor with a perimeter footing with poured concrete foundation walls and no detectable slab edge/perimeter insulation.

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall the base was reported to be in good condition with no signs of uncontrolled moisture, air-leakage and/or other energy-compromising issues neither visible on the interior nor exterior.

Windows

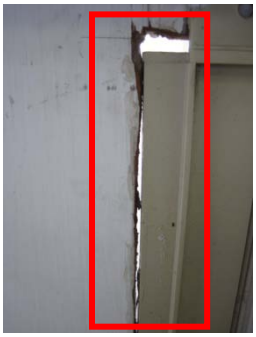
The building contains fixed, casement, and awning type windows with an aluminum clad frame, clear single glazing and interior mini blinds. The windows throughout the 3rd floor of the building are the original 1960 windows. Many of the windows are inoperable, or difficult to operate. The perimeter caulking is cracked, brittle from age and weather, and should be replaced during the next major renovation as a capital improvement.

The 1st and 2nd floor windows are tinted, low-E, insulated aluminum frame double pane windows, replaced during the 1995 renovation. They are fixed, awning, and casement style windows. These windows are in good condition.

Windows, shading devices, sills, related flashing and caulking were inspected as far as accessibility allowed for signs of moisture, air-leakage and other energy compromising issues. Overall, the windows were found to be in good condition with no signs of uncontrolled moisture, air-leakage and/or other energy-compromising issues.

Older windows on 3rd floor, newer windows on 2nd floor

Single-glazed window with ineffective frame



Air-leakage at sleeved window/wall air-conditioning units

Cracked or aged caulk around frame/sill on the exterior

Exterior doors

The building contains two different types of exterior doors:

- Two glass with aluminum/steel frame type exterior doors. They are located in the front of the building and were replaced during renovations.
- There are aluminum and metal doors located on the side entrances

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in acceptable/age appropriate condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

Two door types at side entrances of building in need of weather-stripping

Side door showing signs of rust

Metal rusted door at side entrance

Building air-tightness

Overall, the field auditors found the building to be reasonably air-tight with only a few areas of suggested improvements, as described in more detail earlier in this chapter.

The air tightness of buildings helps maximize all other implemented energy measures and investments, and minimizes potentially costly long-term maintenance, repair and replacement expenses.

Mechanical Systems

Heating Ventilation Air Conditioning

Part of the building is conditioned by one gas-fired packaged rooftop HVAC unit. The third floor is cooled by window air conditioners. There are two boilers that provide hot water for building heating. The faculty offices, on the lower level of the building are air conditioned by air handling units with direct expansion (DX) split cooling and hot water coils for heating.

Equipment

The B/C building contains a roof top packaged unit, air handling units, condensing units, boilers, and pumps. A comprehensive Equipment List can be found in Appendix A.

There is one roof top gas fired packaged unit with a direct expansion (DX) system for cooling made up of an evaporator, condenser and refrigerant loop. It serves the IT area, business office, and art gallery. The unit was manufactured by Trane and installed in 2004. It has about 60% remaining service life and appears to be in good condition. It is a variable flow unit equipped with variable speed drives. The various spaces of the building are provided ventilation by outside air intake louvers on the rooftop units. The outside air louvers are motorized to allow economizer operation when the outside air conditions are favorable.

The B/C building also contains two Magic-Air air handling units (AHUs) equipped with DX coils for cooling and hot water coils for heating the building. They serve the Faculty area. These were installed in 2005 and have about 67% of service life remaining. The units are in good condition. The various spaces of the building are provided ventilation by outside air intake louvers on these units. The units have two stages of cooling, and each stage is served by an independent condensing unit. There are four condensing units located outside on grade which are manufactured by Trane. These units have an efficiency of 10 SEER each and are in good condition.


Roof top packaged unit

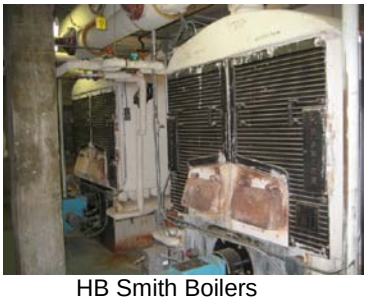

Air handling units


Condensing Units

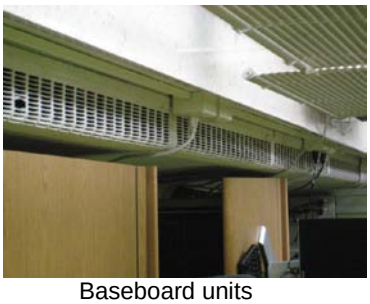
The heating hot water is produced by two (2) hot water boilers located in the boiler room. The boilers were manufactured by HB Smith and are rated for a capacity of 1,885 MBH each and were installed in the year 1961. They are operating beyond their expected service life of 23 years as published in the 2007 ASHRAE HVAC Applications Handbook. The burners were upgraded to Johnson Burners in the 1980's to fire with natural gas.

The third floor of the building is heated by hot water baseboards located under the windows. The baseboard units look in reasonable condition despite their age of about 30 years. The first floor of the building has perimeter hot water radiant panels on the perimeter which are in good condition. There are no hot water baseboards for spaces served by the roof top unit and by the Magic-Air units. The variable air volume (VAV) boxes are equipped with hot water coils.

There are approximately 30 window air conditioners (WAC) serving the third floor. The WACs all have various capacities ranging from 1 ton to 2 tons of cooling, were installed in various years and have different manufacturing brands. Some of the WAC have ENERGY STAR® labels.



HB Smith Boilers



Baseboard units

Window Air Conditioners

There are seven roof mounted mushroom type exhaust fans which serve the bathrooms, mechanical room, and general building. Two of these fans are not in use anymore. All the exhaust fans are operating past their estimated service lives estimated to be ten years.

Distribution Systems

A typical rooftop unit arrangement draws in fresh air and brings it into a mixing box, where it is combined with return air from the building. A small portion of the return air is purged and vented outside prior to entering the mixing box. The mixed air inside the air handler is sent through a filter before passing through the evaporator or direct expansion (DX) coil. The air handler fan then pushes the air through the furnace section before the conditioned air is distributed into the building spaces. The DX system is only active in the cooling season. In between seasons only the blower will be active to provide fresh air to the building.

There are five hot water pumps to provide hot water to the various heating coils, baseboards, and radiant panels. The pumps and respective motors are in good condition.

Hot water pumps

Controls

There is a Trane Tracer building automation system (BAS) to monitor and control the HVAC equipment within the building. Reportedly, the BAS does not function as intended and is not programmed accurately to reflect the occupied and unoccupied modes.

The winter night setback is maintained at 62 deg F, while the summer setback is maintained at 80 deg F. The equipment is not shut down during unoccupied modes in the summer and shoulder season. The baseboards are operated through the BAS and have no local temperature sensor for controls. Magic air units are similarly operated through the BAS, but

there are temperature sensors located in the spaces served. There are multiple variable air volume (VAV) boxes which are connected to the BAS, which regulates the VAV dampers and VFD on the roof top unit. The boilers remain off during summer and there is no hot water supply to the VAV heating coils during summer.

Window air conditioners are manually operated and meant to be turned off by the last person leaving.

Domestic Hot Water

There are two gas fired domestic hot water heaters in the building. The newer DHW was installed in 2007 and the older unit now remains as a back up. The older DHW is AO Smith, with 84 gallons tank and 199 MBH heating capacity. The newer DHW is also AO Smith, with 81 gallon tank and 199 MBH heating capacity. The estimated efficiency of the newer unit is about 82% and appears to be in satisfactory condition.

Domestic Hot Water Heaters

Electrical systems

Lighting

See attached lighting schedule in Appendix B for a complete inventory of lighting throughout the building including estimated power consumption and proposed lighting recommendations.

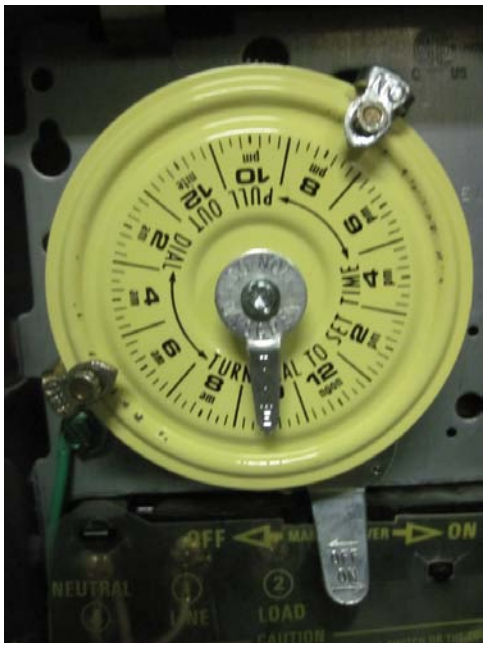
As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps will no longer be produced for commercial and industrial applications. Also, many T12 lamps will be phased out of production starting July 2012.

Interior Lighting - The Administration and Art Gallery building currently contains T12, T8, and a few halogen or incandescent lamps. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas.

75w incandescent flood lamp found in track lighting in Gallery

Exit Lights - Exit signs were found to be LED type.

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mix of Metal Halide and compact fluorescent fixtures. Exterior lights are on manual time clocks.



Exterior lighting time clock

Appliances and process

SWA has conducted a general survey of larger, installed equipment. Appliances and other miscellaneous equipment account for a significant portion of electrical usage within the building. Typically, appliances are referred to as “plug-load” equipment, since they are not inherent to the building’s systems, but rather plug into an electrical outlet. Equipment such as process motors, computers, computer servers, radio and dispatch equipment, refrigerators, vending machines, printers, etc… all create an electrical load on the building

that is hard to separate out from the rest of the building's energy usage based on utility analysis.

Elevators

The Administration and Art Gallery building is a two-story building with basement and one (three level) Schindler 2,500 lbs capacity hydraulic elevator with a 20 HP hydraulic pump driven by an Imperial Electric motor, Cat No. 217FAS0200001, Serial # 24MAY07. The elevator appears in satisfactory condition and no action is required at this time besides routine maintenance.

Other electrical systems

The incoming power main transformer is owned/maintained by JCP&L and it appears in satisfactory condition. The building has photovoltaic panels located on the building roof to generate electricity. Please refer to the next section for details.

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

Renewable energy is defined as any power source generated from sources which are naturally replenished, such as sunlight, wind and geothermal. Technology for renewable energy is improving, and the cost of installation is decreasing, due to both demand and the availability of state and federal government-sponsored funding. Renewable energy reduces the need for using either electricity or fossil fuel, therefore lowering costs by reducing the amount of energy purchased from the utility company. Technology such as photovoltaic panels or wind turbines, use natural resources to generate electricity on the site. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Solar thermal collectors heat a specified volume of water, reducing the amount of energy required to heat water using building equipment. Cogeneration or CHP allows you to generate electricity locally, while also taking advantage of heat wasted during the generation process.

Existing systems

Currently, there is a solar photovoltaic renewable system installed at the Administration and Art Gallery building.

Solar Photovoltaic

Photovoltaic panels convert light energy received from the sun into a usable form of electricity. Panels can be connected into arrays and mounted directly onto building roofs, as well as installed onto built canopies over areas such as parking lots, building roofs or other open areas. Excess electricity generated from photovoltaic panels is sold back to the utility company through a net meter. Net-metering allows the utility to record the amount of electricity generated in order to pay credits to the consumer that can offset usage and demand costs on the electric bill. In addition to generation credits, the Sussex Community College is availing Solar Renewable Energy Credits (SRECs) that are subsidized by the state government. Specifically, the New Jersey State government pays a market-rate SREC to facilities that generate electricity in an effort to meet state-wide renewable energy requirements.

The Administration and Art Gallery building has approximately 138 solar panels generating a maximum of 40 kW installed on the roof.

Solar PV panels on the building roof

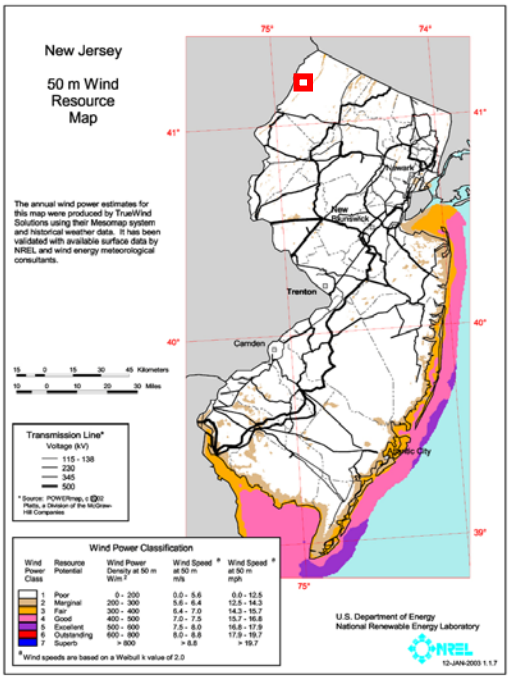
Evaluated Systems

Solar Thermal Collectors

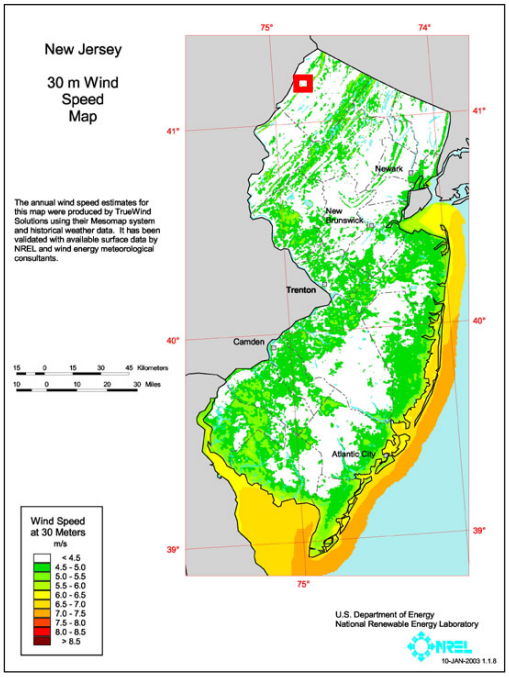
Solar thermal collectors are not cost-effective for this building and would not be recommended due to the insufficient and intermittent use of domestic hot water throughout the building to justify the expenditure.

Wind

The Administration and Art Gallery building is not a good candidate for wind power generation due to unfavorable wind conditions in this area of New Jersey, according to the following wind map by “Wind Powering America”, a US DOE analysis. Average wind speeds in Sussex County are less than 12mph, and most wind turbines tend to be efficient at speeds greater than this. Shown below are two wind maps for New Jersey with the location of Sussex Community College marked as a square.



New Jersey 50-Meter Wind Resource Maps



New Jersey 30-Meter Wind Resource Maps

The first map shows the annual wind power estimates at 50 meters using NREL's standard classification system for utility-scale applications in relation to transmission lines and major cities. The second shows the annual wind speed estimates at 30 meters, which is useful for identifying areas that hold promise for small wind turbine applications. Wind speeds in Sussex County for both these type of applications are less than 12mph (5.3mph) and do not justify wind power systems. Please see the following for more details:

http://www.windpoweringamerica.gov/where_is_wind_new_jersey.asp

Geothermal

The Administration and Art Gallery building is not a good candidate for a geothermal installation since it would require replacement of the entire existing HVAC system, of which major components still have 20% to 80% remaining useful lives. Estimated capital cost for installing a 100 ton geothermal heat pump system for this building is in the ball park of $1.1M, and estimated simple payback would be in excess of 20 years; however, for a new building, the simple payback for incremental cost and benefits over a conventional system is generally in the range of 4-6 years.

Combined Heat and Power

The Administration and Art Gallery building is not a good candidate for a CHP installation and would not be cost-effective due to the size and operations of the building. Typically, CHP is best suited for buildings with a high electrical base-load to accommodate the electricity generated, as well as a means for using waste heat generated. Typical applications include buildings with an absorption chiller, where waste heat would be used efficiently.

PROPOSED ENERGY CONSERVATION MEASURES

Energy Conservation Measures (ECMs) are recommendations determined for the building based on improvements over current building conditions. ECMs have been determined for the building based on installed cost, as well as energy and cost-savings opportunities.

Recommendations: Energy Conservation Measures

ECM #	Description	net est. ECM cost with incentives, $	kWh, 1st yr savings	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	total 1st yr savings, $	life of measure, yrs	simple payback, yrs	annual return on investment, %	net present value, $	CO_2 reduced, lbs/yr
1	67 New CFL fixtures to be installed	627	10,243	0	0.9	1,933	5	0.3	342	8,175	18,341
2	Retrofit (3) Beverage vending machines with Vending Miser™	597	4,836	0	0.4	754	10	0.8	116	5,773	8,659
3	Retrofit (1) Snack Vending Machine with Snack Miser™	99	387	0	0.0	60	10	1.6	51	411	693
4	2 New Daylight Sensors to be installed with incentives	390	437	0	0.0	118	15	3.3	36	1,000	782
5	8 New motion sensors to be installed with incentives	1,600	8,195	0	0.7	1,278	15	1.3	73	13,443	14,673
6	76 New occupancy sensors to be installed with incentives	15,200	29,692	0	2.7	4,632	15	3.3	24	39,305	53,164
7	7 New bi-level fixtures to be installed with incentives	980	1,113	0	0.1	174	15	5.6	11	1,063	1,993
8	124 New T8 fixtures to be installed with incentives	19,668	8,327	0	0.7	3,090	15	6.4	18	16,687	14,910
9	6 New photocells to be installed with incentives	1,200	965	0	0.1	150	15	8.0	6	571	1,727
10	6 New pulse start metal halide fixtures to be installed with incentives	4,238	2,190	0	0.2	377	15	11.2	3	204	3,921
11	Provide demand controlled ventilation using Carbon Dioxide sensors	12,660	3,513	2740	7.5	4,105	12	3.1	24	27,713	36,493
12	Install new Building Management System	150,000	39,170	1633	7.8	8,230	12	18.2	-3	-69,047	88,134
13	Replace 40hp supply fan motor on packaged RTU with premium efficiency motor	2,727	9,251	0	0.8	1,443	15	1.9	46	14,255	16,564
14	Replace 2 hp relief fan motor on packaged RTU with premium efficiency motor	1,286	1,948	0	0.2	304	15	4.2	17	2,290	3,488
15	Replace 2 existing hot water boilers	107,750	-	5000	13.1	7,990	30	13.5	5	44,885	55,115
16	Replace 4 existing 10SEER condensing units	9,320	7,500	0	0.7	1,170	15	8.0	6	4,447	13,429
17	Replace windows on 3rd Floor	130,000	6,305	6305	17.1	9,167	30	14.2	4	45,129	80,789
	TOTALS	458,342	134,072	15,678	53.0	44,977		10.2	-	-	412,875

In order to clearly present the overall energy opportunities for the building and ease the decision of which ECM to implement, SWA calculated each ECM independently and did not incorporate slight/potential overlaps between some of the listed ECMs (i.e. lighting change influence on heating/cooling.

ECM#1: Install 67 New CFL Fixtures

During the field audit, SWA completed a building lighting inventory (see Appendix B). The existing lighting also contains inefficient incandescent lamps. SWA recommends that each incandescent lamp is replaced with a more efficient, Compact Fluorescent Lamp (CFL). CFLs are capable of providing equivalent or better light output while using less power when compared to incandescent, halogen and Metal Halide fixtures. CFL bulbs produce the same lumen output with less wattage than incandescent bulbs and last up to five times longer. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:
Estimated installed cost: $627 (Includes $125 of labor)
Source of cost estimate: Manufacturers information

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
67 New CFL fixtures to be installed	627	0	627	10,243	2.0	0	0.9	335	1,933	5	9,665	0.3	342	308	8,175	18,341

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA also assumed an aggregated 15 hrs/yr to replace aging burnt out lamps/fixtures vs. newly installed.

Rebates/financial incentives:
There is no incentive available for this measure at this time.

Please see Appendix F for more information on Incentive Programs.

ECM#2: Retrofit 3 Existing Refrigerated Vending Machines with VendingMiser™ devices

Energy vending miser devices are now available for conserving energy used by beverage vending machines and coolers. There is not a need to purchase new machines to reduce operating costs and greenhouse gas emissions. When equipped with the vending miser devices, refrigerated beverage vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR® qualified machines. Vending miser devices incorporate innovative energy-saving technology into small plug-and-play devices that installs in minutes, either on the wall or on the vending machine. Vending miser devices use a Passive Infrared Sensor (PIR) to: Power down the machine when the surrounding area is vacant; Monitor the room's temperature; Automatically repower the cooling system at one- to three-hour intervals, independent of sales; Ensure the product stays cold.

Installation cost:
Estimated installed cost: $597 (Includes $60 of labor)
Source of cost estimate: Manufacturers information

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
Retrofit (3) Beverage vending machines with Vending Miser™	597	0	597	4,836	1.0	0	0.4	0	754	10	7,544	0.8	116	126	5,773	8,659

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA assumes energy savings based on modeling calculator found at www.usatech.com or http://www.usatech.com/energy_management/energy_calculator.php .

Rebates/financial incentives:
NJ Clean Energy – Direct Install program (up to 60% of installed cost)

Please see Appendix F for more information on Incentive Programs and Appendix H for calculations.

ECM#3: Install 1 Snack Vending Machine Energy Miser

Energy vending miser devices are now available for conserving energy used by beverage vending machines and coolers. There is not a need to purchase new machines to reduce operating costs and greenhouse gas emissions. Snack vending miser devices can be used on snack vending machines to achieve maximum energy savings that result in reduced operating costs and decreased greenhouse gas emissions with existing machines. Snack vending miser devices also use a Passive Infrared Sensor (PIR) to determine if there is anyone within 25 feet of the machine. It waits for 15 minutes of vacancy, then powers down the machine. If a customer approaches the machine while powered down, the snacks vending miser will sense the presence and immediately power up.

Installation cost:
Estimated installed cost: $99 (Includes $20 of labor)
Source of cost estimate: Manufacturers information

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
Retrofit (1) Snack Vending Machine with Snack Miser™	99	0	99	387	0.1	0	0.0	0	60	10	604	1.6	51	60	411	693

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA assumes energy savings based on modeling calculator found at www.usatech.com or http://www.usatech.com/energy_management/energy_calculator.php .

Rebates/financial incentives:
NJ Clean Energy – Direct Install program (Up to 60% of installed cost)

Please see Appendix F for more information on Incentive Programs and Appendix H for calculations.

ECM#4: Install 2 Day Lighting Sensors

During the field audit, SWA completed a building lighting inventory (see Appendix B). SWA observed that the existing lighting has minimal to no control via day lighting sensors. SWA identified a Hallway that could benefit from the installation of a day lighting sensor. SWA recommends installing one day lighting sensor where lighting fixtures are mounted above windows and where the payback on savings is justified. Ceiling mounted day light sensors measure the ambient light reflected from surfaces ranging from 0 to 6,500 foot candles. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:
Estimated installed cost: $390 (Includes $154 of labor)
Source of cost estimate: Manufacturers information

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2 New Daylight Sensors to be installed with incentives	440	50	390	437	0.1	0	0.0	50	118	15	1,772	3.3	36	29	1,000	782

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis.

Rebates/financial incentives:
NJ Clean Energy - Daylight dimmers ($25 per fixture controlled) - Maximum incentive amount is $50.

Please see Appendix F for more information on Incentive Programs.

ECM#5: Install 8 New Motion Sensors

SWA recommends installing motion sensors in areas that are occupied only part of the day, and where payback on savings is justified. Typically, motion sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advance micro-phonic lighting sensors include sound detection as a means to control lighting operation. Please see Appendix B for a detailed lighting inventory.

Installation cost:
Estimated installed cost: $1,600 (includes $616 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program, ENERGY STAR®*

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
8 New motion sensors to be installed with incentives	1,760	160	1,600	8,195	1.6	0	0.7	0	1,278	15	19,176	1.3	73	80	13,443	14,673

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:
NJ Clean Energy – Smart Start – Ceiling-mounted motion sensors ($20 per sensor). Maximum incentive amount is $160.

Please see Appendix F for more information on Incentive Programs.

ECM#6: Install 76 Lighting Occupancy Sensors

During the field audit, SWA completed a building lighting inventory (see Appendix B). SWA observed that the existing lighting has minimal to no control via occupancy sensors. SWA identified a number of areas that could benefit from the installation of occupancy sensors. SWA recommends installing occupancy sensors in areas that are occupied only part of the day and the payback on savings is justified. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advance micro-phonic lighting sensors include sound detection as a means to control lighting operation. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:
Estimated installed cost: $15,200 (Includes $5,852 of labor)
Source of cost estimate: Manufacturers information

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
76 New occupancy sensors to be installed with incentives	16,720	1,520	15,200	29,692	5.9	0	2.7	0	4,632	15	69,480	3.3	24	29	39,305	53,164

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis.

Rebates/financial incentives:
NJ Clean Energy - Occupancy sensors, wall mounted ($20 per control) - Maximum incentive amount is $1,520.

Please see Appendix F for more information on Incentive Programs.

ECM#7: Install 7 New Bi-level T8 Fixtures in Stairwells

On the day of the site visit, SWA completed a lighting inventory of Administration and Art Gallery building (see Appendix B). The building currently contains T12 and T8 fluorescent lighting fixtures that are operated 16 hours per day in stairwells. New technology called bi-level lighting, combines fluorescent lighting fixtures with an occupancy sensor. These efficient light fixtures operate at a minimal light level in order to meet code and safety requirements and power up to a higher level when any motion is detected in the stairwells. This building would be an appropriate application for these fixtures since there are large periods of time when the stairwells should be unoccupied.

Installation cost:
Estimated installed cost: $980 (includes $346 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
7 New bi-level fixtures to be installed with incentives	1,155	175	980	1,113	0.2	0	0.1	0	174	15	2,604	5.6	11	14	1,063	1,993

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 12 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:
NJ Clean Energy – SmartStart – bi-level T8 fluorescent fixtures ($25 per fixture). Maximum incentive amount is $175.

Please see Appendix F for more information on Incentive Programs

ECM#8: Install 124 New T8 Fixtures

During the field audit, SWA completed a building lighting inventory (see Appendix B). The existing lighting contains inefficient T12 fluorescent fixtures with magnetic ballasts. SWA recommends replacing each existing fixture with more efficient, T8 fluorescent fixtures with electronic ballasts. T8 fixtures with electronic ballasts provide equivalent or better light output while reducing energy consumption by 30% when compared to T12 fixtures with magnetic ballasts. T8 fixtures also provide better lumens for less wattage when compared to incandescent, halogen and Metal Halide fixtures. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:
Estimated installed cost: $19,668 (Includes $5,900 of labor)
Source of cost estimate: Manufacturers information

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
124 New T8 fixtures to be installed with incentives	21,528	1,860	19,668	8,327	1.7	0	0.7	1,791	3,090	15	46,344	6.4	18	11	16,687	14,910

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA also assumed an aggregated 5 hrs/yr to replace aging burnt out lamps/ballasts vs. newly installed.

Rebates/financial incentives:
NJ Clean Energy - Retrofit T12 with T8 fixtures with electronic ballasts ($15 per fixture) - Maximum incentive amount is $1,860.

Please see Appendix F for more information on Incentive Programs.

ECM#9*:* Install 6 New Photocell Sensors

On the day of the site visit, SWA completed a lighting inventory of the Administration and Art Gallery building (see Appendix B). The exterior lighting fixtures are currently operated by timers. SWA recommends installing photocell sensors in replacement of timers. Photocell sensors will help to reduce operating costs of lights left on during daytime hours.

Installation cost:
Estimated installed cost: $1,200 (includes $420 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
6 New photocells to be installed with incentives	1,320	120	1,200	965	0.2	0	0.1	0	150	15	2,257	8.0	6	7	571	1,727

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:
NJ Clean Energy – Smart Start – Photocell sensors in existing facilities ($20 per control). Maximum incentive amount is $120.

Please see Appendix F for more information on Incentive Programs.

ECM#10: Install 6 New Pulse Start Metal Halide Fixtures

During the field audit, SWA completed a building interior as well as exterior lighting inventory (see Appendix B). The existing lighting contains standard probe start Metal Halide (MH) lamps. SWA recommends replacing the higher wattage MH fixtures with pulse start MH lamps which offer the advantages of standard probe start MH lamps, but minimize the disadvantages. They produce higher light output both initially and over time, operate more efficiently, produce whiter light, and turn on and re-strike faster. Due to these characteristics, energy savings can be realized via one-to-one substitution of lower-wattage systems, or by taking advantage of higher light output and reducing the number of fixtures required in the space. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:
Estimated installed cost: $4,238 (Includes $1,316 of labor)
Source of cost estimate: Manufacturers information

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
6 New pulse start metal halide fixtures to be installed with incentives	4,388	150	4,238	2,190	0.4	0	0.2	36	377	15	5,662	11.2	3	1	204	3,921

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA also assumed an aggregated 2 hrs/yr to replace aging burnt out lamps/ballasts vs. newly installed.

Rebates/financial incentives:
NJ Clean Energy - Pulse Start Metal Halide ($25 per fixture) - Maximum incentive amount is $150.

Please see Appendix F for more information on Incentive Programs.

ECM#11: Provide Demand Control Ventilation using Carbon Dioxide Sensors

The roof top unit serving the lower floors provides a fixed amount of outside air during operational hours. Conditioning outside air can be a significant portion of the heating or cooling load. Demand control ventilation involves providing carbon dioxide (CO2) sensors in the occupied spaces or return ducts which can partially or totally shut down the outside air intake dampers in the air handling unit when the space is underutilized or unoccupied. The spaces served are used frequently but may also remain vacant for long periods during the day. By keeping the CO2 level less than 1000ppm within the conditioned space, the outside air is reduced to the minimum allowable in compliance with ASHRAE requirements. This control method can greatly reduce the heating or cooling load seen by the roof top unit and therefore save energy. Along with the two carbon dioxide sensors on each floor (total of eight), necessary motorized air intake dampers and a controller will also have to be installed.

Installation cost:
Estimated installed cost: $12,660 (includes $5,500 labor)
Source of cost estimate: RS Means Cost Data & Similar Projects

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
Provide demand controlled ventilation using Carbon Dioxide sensors	12,660	0	12,660	3,513	0.7	2,740	7.5	0	4,105	12	49,255	3.1	24	31	27,713	36,493

Assumptions: SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. SWA estimated the savings using bin data and assumed 10% outside air savings during occupied hours and 50% outside air savings during unoccupied modes. Roof top unit operates round the clock; SWA estimated hours of use during occupied mode as 5,500 hours.

Rebates/financial incentives:
There are no incentives available for this measure at this time from New Jersey Clean energy Program (NJCEP).

ECM#12: Install new Building Management System

There is an existing Trane Tracer building management system. The existing system is not programmed correctly and many sensors and actuators don't report data into this system. The current system is inadequate to handle the building needs of a tight HVAC controls, and has limited capability for setting occupied/unoccupied mode settings. SWA recommends the Sussex Community College to install a new Direct Digital Control (DDC) Building Automation System (BAS). The new BAS should be open source and be compatible with the existing state of art Automated Logic BMS at the A building. The BAS should be programmable with occupied/unoccupied modes settings and with night-setback schedules for building HVAC system. Space temperature sensors individually and collectively should report to the BAS, which in turn would control the heating and cooling valves on HVAC equipment. The new system would operate the HVAC system tightly and reduce wasteful energy. Savings in therms and kWh will be realized mainly from reducing the hours of operation of the roof top unit, resulting in ventilation load savings and fan savings.

Installation cost:
Estimated installed cost: $150,000 (estimated labor cost $80,000)
Source of cost estimate: Similar projects

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
Install new Building Management System	150,000	0	150,000	39,170	7.8	1,633	7.8	0	8,230	12	98,762	18.2	-3	-6	-69,047	88,134

Assumptions: SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. SWA estimated the savings using bin data calculations. It is assumed that the new BMS would completely shut down the unit and the fans during summer and shoulder seasons during unoccupied modes. Approximately 2,000 hours of unit run time is estimated to be saved thus. The BMS for this building is assumed to be a part of the larger campus wide BMS, which incorporates lighting controls too; the lighting cost component of the BMS was excluded for calculations in this ECM.

Rebates/financial incentives:
There are no incentives available for this measure at this time from New Jersey Clean energy Program (NJCEP).

ECM#13 & 14: Install NEMA Premium Efficiency Motors

Electric motors have a significant impact on the total energy operating costs in a building, and may vary widely in terms of energy efficiency. The NEMA Premium Motors energy efficiency program was established to assist users to optimize motor systems efficiency in light of power supply and utility deregulation issues. NEMA Premium motors help to optimize systems, thereby reducing electrical consumption and reducing pollution associated with electrical power generation.

SWA noted that supply fan and relief fan motors on the roof top unit are of standard efficiency. SWA recommends replacing these motors with premium efficiency motors.

Installation cost:
Estimated installed cost: $4,013 (estimated labor cost $350)
Source of cost estimate: Similar projects and DOE Motor Master International selection & savings analysis

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
Replace 40hp supply fan motor on packaged RTU with premium efficiency motor	2,907	180	2,727	9,251	1.9	0	0.8	0	1,443	15	21,647	1.9	46	53	14,255	16,564
Replace 20 hp relief fan motor on packaged RTU with premium efficiency motor	1,411	125	1,286	1,948	0.4	0	0.2	0	304	15	4,558	4.2	17	21	2,290	3,488

Assumptions: SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. The DOE Motor Master International selection and calculator was used considering equipment should operate for approximately 75% loading factor. Use hours were estimated to be 8760 hours for supply fan motor and 5,000 hours for the relief fan motor.

Rebates/financial incentives:
NJ Clean Energy - Premium three-phase motors ($45-$700 per motor); for 20 hp motors - $125/motor, and for 40 hp motor - $180/motor; maximum incentive available is $305.

ECM #15: Replace Existing Hot Water Boilers (2)

The existing HB Smith boilers were installed in 1960s and have passed the end of their useful life. SWA recommends replacing both boilers under this measure. The initial efficiency of the existing boiler was approximately 80%, which is now estimated to be only around 65% due to performance degradation over time. SWA analyzed the economics of replacing and upgrading the boiler with new condensing technology. Condensing boilers allow condensation of moisture in flue gases resulting in lower flue gas temperatures with increased efficiencies up to 95%. The new high efficiency condensing boilers should have a guaranteed minimum thermal efficiency of 85% and efficiencies of up to 95% achievable during condensing mode at lower return water temperatures. Suggested new boiler capacity is about 1,500 MBH each.

Installation cost
Estimated installed cost: $107,750 (estimated labor cost of $38,500)
Source of cost estimate: RS Means and similar projects

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
Replace 2 existing hot water boilers	113,000	5,250	107,750	-	0.0	5,000	13.1	1,500	7,990	30	239,700	13.5	5	-2	44,885	55,115

Assumptions: SWA assumed the efficiency of the new condensing boilers as 90% for calculating the therms saved, and that of the existing boiler as 65%. Further, SWA estimated the current boilers' contribution of total heat to the building in the proportion of installed capacity of the boilers and the roof top unit.

Rebates/financial incentives:
NJ Clean Energy - Gas-fired boilers ≤ 1500 MBH and 90%+ AFUE ($1.75 per MBH) – Maximum incentive amount is $5,250.

ECM#16: Replace Four (4) 10SEER Condensing Units

SWA recommends replacing the existing 2.5 ton condensing units serving floors 1C with ENERGY STAR® rated condensing units with higher operating efficiencies. A split-system central air conditioner consists of an outdoor metal cabinet called the condensing unit which contains the condenser coil and compressor, and an indoor cabinet contains the evaporator coil and supply air fan. Central air conditioners are rated according to their seasonal energy efficiency ratio (SEER - Btu/Watt-hr), which indicates the relative amount of energy needed to provide a specific cooling output. Each existing condensing unit has an estimated SEER rating of 10; the minimum SEER allowed today is 13. ENERGY STAR® label central air conditioners with SEER ratings of 13 or greater, and up to 16 SEER condensing units are now available. More information can be found in the "Products" section of the ENERGY STAR® website at: http://www.energystar.gov. SWA recommends 14 SEER units or greater.

Installation cost:
Estimated installed cost: $9,320 (includes $280 of labor)
Source of cost estimate: Manufacturer's data and similar projects

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
Replace 4 existing 10SEER condensing units	10,240	920	9,320	7,500	1.5	0	0.7	0	1,170	15	17,550	8.0	6	7	4,447	13,429

Assumptions: SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. SWA estimated annual electric savings calculated from ENERGY STAR® online calculator.

Rebates/financial incentives:
NJ Clean Energy – Unitary HVAC/Split Systems, 14 SEER minimum, $73- $92/ton; maximum incentive available is $920.

ECM#17: Replace windows on 3rd floor

The building contains fixed, casement, and awning type windows with an aluminum clad frame, clear single glazing and interior mini blinds. The windows throughout the 3rd floor of the building are the original 1960 windows. Many of the windows are inoperable, or difficult to operate. Further, the perimeter caulking is cracked and has become brittle from age and weather. A single pane window has little insulating value and acts as a thin barrier to the outside thus wasting useful heat during winter season. Double pane windows are more energy efficient because less heat leaves through a double pane window than through a single pane window. Double pane windows are built with a gap of air between two panes of glass and acts as an insulator. SWA recommends the Sussex Community College to replace approximately 65 windows on the 3rd floor with double pane windows.

Installation cost:
Estimated installed cost: $130,000 (includes $55,000 of labor)
Source of cost estimate: Similar projects

Economics:

Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
Replace windows on 3rd Floor	130,000	0	130,000	6,305	1.3	6305	17.1	0	9,167	30	275,024	14.2	4	-2	45,129	80,789

Assumptions: SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. SWA estimated annual electric savings and gas savings based on HDD and CDD calculations based in Newark, NJ.

Rebates/financial incentives:
There are no incentives available for this measure at this time from New Jersey Clean energy Program (NJCEP).

Please see Appendix F for more information on Incentive Programs.

PROPOSED FURTHER RECOMMENDATIONS

Capital Improvements

Capital Improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available, or if the installed costs can be shared with other improvements, such as major building renovations. SWA recommends the following capital improvements for the Administration and Art Gallery building:

- Replace exhaust fans- There are seven roof mounted mushroom type exhaust fans which serve the bathrooms, mechanical room, and general building. Two of these fans are not in use anymore. The two disconnected units should be removed and roof penetrations should be thermally sealed. SWA recommends replacing the remaining five exhaust fans which are operating past their estimated service lives of ten years. The estimated installed cost of five new fans is $2,000.

- Replace window air conditioners - There are approximately 30 window air conditioners (WAC) serving the third floor. The WACs all have various capacities ranging from 1 ton through 2 tons of cooling, and were manufactured by various manufacturers, and installed at various times in the past. These are manually controlled and there is a good likelihood that the last person leaving may not turn off the unit. SWA recommends replacing all WACs with a central air system comprising a gas fired roof top packaged unit and variable air volume boxes serving each classroom, similar to the system already existing serving lower floors. The new system would cost approximately $225,000 and has an estimated simply pay back of 40 years or more.

- Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives.

- Install waterless urinals campus-wide - Typical paybacks range from 1-3 years based on typical water and sewer savings, depending on use.

Operations and Maintenance

Operations and Maintenance measures consist of low/no cost measures that are within the capability of the current building staff to handle. These measures typically require little investment, and they yield a short payback period. These measures may address equipment settings or staff operations that, when addressed will reduce energy consumption or costs.

- Maintain roofs - SWA recommends regular maintenance to verify water is draining correctly and drains are cleaned.

- Maintain downspouts and cap flashing - Repair/install missing downspouts and cap flashing as needed to prevent water/moisture infiltration and insulation damage.

- Provide weather-stripping/air-sealing - SWA observed that exterior door weather-stripping was beginning to deteriorate in places. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected, and any missing or deteriorated caulking should be re-caulked to

provide an unbroken seal around the window frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.

- Repair/seal wall cracks and penetrations - SWA recommends as part of the maintenance program installing proper flashing and correct masonry efflorescence, and sealing wall cracks and penetrations wherever necessary in order to keep insulation dry and effective.

- Provide water-efficient fixtures and controls - Adding controlled on/off timers on all lavatory faucets is a cost-effective way to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consumption fixtures/appliances will reduce energy consumption for water heating, while also decreasing water/sewer bills. SWA recommends replacing the 2.2 gpm aerators in the bathrooms with 0.5 gpm faucets in bathrooms.

- SWA recommends that the building considers purchasing the most energy-efficient equipment, including ENERGY STAR® labeled appliances, when equipment is installed or replaced. More information can be found in the "Products" section of the ENERGY STAR® website at: http://www.energystar.gov.

- Use smart power electric strips - in conjunction with occupancy sensors to power down computer equipment when left unattended for extended periods of time.

- Create an energy educational program - that teaches how to minimize energy use. The U.S. Department of Energy offers free information for hosting energy efficiency educational programs and plans. For more information please visit: http://www1.eere.energy.gov/education/.

- Change filters on air handling and rooftop package units monthly to ensure efficient operation of the blowers and ensure adequate air delivery to the spaces.

- Tighten belts on exhaust fans and blowers every three to six months - Tightening belts on belt-driven fans/blowers can maximize the overall efficiency of the equipment.

- Inspect air handling and rooftop package units' coils for dirt buildup three to six months. These conditions should be rectified if found because they will cause inefficient operation and possibly damage to the equipment.

The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for Sussex Community College. Based on the requirements of the LGEA program, Sussex Community College must commit to implementing some of these measures, and must submit paperwork to the Local Government Energy Audit program within one year of this report's approval to demonstrate that they have spent, net of other NJCEP incentives, at least 25% of the cost of the audit (per building). The minimum amount to be spent, net of other NJCEP incentives, is $2,239 (or 25% of $8,956).

APPENDIX A: EQUIPMENT LIST

Inventory

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
HVAC	Roof top packaged unit, gas fired heating, DX cooling, 75 tons cooling, R-22, 13000/8200 cfm/OA cfm, 40hp motor for supply fan, standard eff., 20hp relief fan motor	Roof	Trane, model SFHFC75EH666C#AD9001A0Z00GL0NRT0Y8000#, S/N C04F05314	Gas/Elec.	Floors 1B, 2B, 2C, and mezzanine	2004	60%
Ventilation	Roof mounted mushroom type exhaust fan	Roof	Dayton, model 4YC68G, S/N 11511550 0809	Elec.	New Bathrooms, B building	2009	90%
Ventilation	Roof mounted mushroom type exhaust fan, est. 1/2 hp motor	Roof	Penn, model LB 452	Elec.	NIU	est. 1998	0%
Ventilation	Roof mounted mushroom type exhaust fan	Roof	Nameplate N/A	Elec.	Lab exhaust; NIU	est. 1998	0%
Ventilation	Roof mounted mushroom type exhaust fan	Roof	Penn, model 4HX98B	Elec.	Bathrooms, B building	est. 1998	0%
Ventilation	Roof mounted mushroom type exhaust fan, est. 1/2 hp motor	Roof	Penn, model LB 452	Elec.	President's office, board room	est. 1998	0%
Ventilation	Roof mounted mushroom type exhaust fan, est. 1/2 hp motor	Roof	Penn, model LB 452	Elec.	Photography lab	est. 1998	0%
DHW	Domestic water heater, 199MBH in, 84 gallon tank, est. 75% eff.	Boiler room	AO Smith, model BT 199 880, S/N MK91-0210470-880	Gas	Used as a backup to the new DHW	1991	0%
DHW	Domestic water heater, 199MBH in, 81 gallon tank, est. 82% eff.	Boiler room	AO Smith, model BTR 199 118, S/N H07M005889	Gas	Whole building	2007	77%
PV	Utility interactive 3 phase inverter	Boiler room	Xantrex, model PV-45208, S/N 3097	Elec.	Whole building	2007	88%
Heating	Hot water boiler, 12 sections heating, 1885MBH in, c/w Johnson Burner, type DH FG4GM, installed in late 1980s	Boiler room	HB Smith, 450 Mills, S/N 04982	Gas	Whole building	est. 1961	0%
Heating	Hot water boiler, 12 sections heating, 1885MBH in, c/w Johnson Burner, type DH FG4GM, installed in late 1980s	Boiler room	HB Smith, 450 Mills, S/N 04982	Gas	Whole building	est. 1961	0%
DHW	Domestic hot water circulation pump, 1/8HP, 115/1/60, 1.76A	Boiler room	Taco, model 0011-BF4	Elec.	Whole building	2007	85%
Heating	Hot water pump, size 1.5X1.5.8, 50gpm @ 48' head, 1800rpm, 2hp motor, US Motor, model G154, 208-230/3/60, NEMA 80% eff.	Boiler room	Armstrong, model 4380BF, S/N 0604	Elec.	Hot water coils on VAVs	2005	75%
Heating	Hot water pump, size 1.5X1.5.8, 50gpm @ 48' head, 1800rpm, 2hp motor, US Motor, model G154, 208-230/3/60, NEMA 80% eff.	Boiler room	Armstrong, model 4380BF, S/N 0604	Elec.	Hot water coils on VAVs	2005	75%

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
Heating	ITT B&G motor, 3/4HP, 1750rpm, 208/3/60	Boiler room	ITT Bell & Gossett, size 37T, Part no. M80039	Elec.	Baseboard heaters	est. 1998	40%
Heating	ITT B&G motor, 3/4HP, 1750rpm, 208/3/60	Boiler room	ITT Bell & Gossett, size 37T, Indent no. MAG00G-7606B	Elec.	Baseboard heaters	est. 1998	40%
Heating	ITT B&G motor, 3/4HP est., 1750rpm, 208/3/60	Boiler room	ITT Bell & Gossett, nameplate N/A	Elec.	Baseboard heaters	est. 1998	40%
HVAC	Air handler #1, 54MBH cooling, 70.2MBH heating, 1500cfm, 340cfm OA, 1hp fan motor	Mechanical Closet	MagicAire, model 48-BVX-D, S/N W05-849924	Elec.	Floors 1C, Faculty Center	2005	67%
HVAC	Air handler #2, 66MBH cooling, 95MBH heating, 1990cfm, 340cfm OA, 1,5hp fan motor	Mechanical Closet	MagicAire, model 60-BVX-D, S/N W05-849923	Elec.	Floors 1C, Faculty Center	2005	67%
Ventilation	Wall mounted mushroom type exhaust fan	Outside, on wall	Loren Cook	Elec.	General exhaust B building	est. 1998	0%
Cooling	CU-3: Condensing unit, 3 tons cooling, R-22, 208/3/60, MCA 21, 10SEER	Outside, on grade	Trane, model 2TTB036A1000AA, S/N5171KP73F	Elec.	AHU-2, 2nd stage	2005	67%
Cooling	CU-4: Condensing unit, 3 tons cooling, R-22, 208/3/60, MCA 21, 10 SEER	Outside, on grade	Trane, model 2TTB036A1000AA, S/N5171KRB3F	Elec.	AHU-2, 1st stage	2005	67%
Cooling	CU-2: Condensing unit, 2.5 tons cooling, R-22, 208/3/60, MCA 18, 10 SEER	Outside, on grade	Trane, model 2TTB030A1000AA, S/N52835W24F	Elec.	AHU-1, 1st stage	2005	67%
Cooling	CU-1: Condensing unit, 2.5 tons cooling, R-22, 208/3/60, MCA 18, 10 SEER	Outside, on grade	Trane, model 2TTB030A1000AA, S/N52835WM4F	Elec.	AHU-1, 2nd stage	2005	67%
Ventilation	Wall mounted mushroom type exhaust fan	Outside, on wall	Loren Cook	Elec.	General exhaust C building	est. 1998	0%
Cooling	Condensing unit, 3 tons cooling, 208/1/60, MCA 19.9	Outside, on grade	Goodman, model CKL36-1K, S/N 04057879580	Elec.	IT	2005	67%
Cooling	Condensing unit, 3 tons cooling, 208/1/60, MCA 22	Outside, on grade	Mitsubishi, model PU36EK, S/N 22E00472B	Elec.	IT	2000	33%

Note: The remaining useful life of a system (in %) is an estimate based on the system date of built and existing conditions derived from visual inspection.

Appendix B: Lighting Study

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	3	Staircase	Ceiling Mounted	E	4'T8	3	2	32	Sw	12	345	5	207	857	T8-BL	Ceiling Mounted	4'T8	E	BL	3	2	32	0	345	5	207	499	0	358	358
2	3	Hallway	ecessed Parabol	E	4'T8	5	3	32	Sw	12	345	5	505	2,091	C	Recessed Parabolic	4'T8	E	OS	5	3	32	9	345	5	505	1568	0	523	523
3	3	Bathroom Men	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	C	Ceiling Mounted	4'T8	E	OS	1	2	32	5	345	5	69	125	0	42	42
4	3	Executive offices	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
5	3	Executive offices	ecessed Parabol	E	4'T8 U-Shapec	1	2	32	Sw	7	345	5	69	167	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	1	2	32	7	345	5	69	167	0	0	0
6	3	Executive offices	ecessed Parabol	M	4'T12	1	4	40	Sw	7	345	12	172	415	T8	Recessed Parabolic	4'T8	E	Sw	1	4	32	7	345	5	133	321	94	0	94
7	3	Executive offices	Wall Mounted	S	CFL	2	1	23	Sw	7	345	0	46	111	N/A	Wall Mounted	CFL	S	Sw	2	1	23	7	345	0	46	111	0	0	0
8	3	Executive offices B311	Recessed	M	T12 U-Shapec	4	2	40	Sw	7	345	12	368	889	T8	Recessed	4'T8 U-Shaped	E	OS	4	2	32	5	345	5	276	500	222	167	389
9	3	Executive offices B312	Ceiling Mounted	M	4'T12	2	4	40	Sw	7	345	12	344	831	T8	Ceiling Mounted	4'T8	E	OS	2	4	32	5	345	5	266	482	188	161	349
10	3	Executive offices B312 bath	Recessed	E	4'T8 U-Shapec	1	2	32	Sw	1	345	5	69	24	N/A	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	1	345	5	69	24	0	0	0
11	3	Executive offices B314	Ceiling Mounted	M	4'T12	2	2	40	Sw	7	345	12	184	444	T8	Ceiling Mounted	4'T8	E	OS	2	2	32	5	345	5	138	250	111	83	194
12	3	Executive offices B314	Ceiling Mounted	M	4'T12	2	2	40	Sw	7	345	12	184	444	T8	Ceiling Mounted	4'T8	E	OS	2	2	32	5	345	5	138	250	111	83	194
13	3	Executive offices	ecessed Parabol	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed Parabolic	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
14	3	Executive offices	ecessed Parabol	E	4'T8	4	3	32	Sw	7	345	5	404	976	C	Recessed Parabolic	4'T8	E	OS	4	3	32	5	345	5	404	732	0	244	244
15	3	xecutive offices conference	Recessed	M	4'T12	9	4	40	Sw	4	345	12	1,548	2,136	T8	Recessed	4'T8	E	OS	9	4	32	3	345	5	1197	1239	484	413	897
16	3	xecutive offices conference	Track	S	Inc	11	1	60	Sw	1	345	0	660	228	CFL	Track	CFL	S	Sw	11	1	20	1	345	0	220	76	152	0	152
17	3	itive offices conference rm k	Recessed	M	4'T12	1	4	40	Sw	1	345	12	172	59	T8	Recessed	4'T8	E	Sw	1	4	32	1	345	5	133	46	13	0	13
18	3	Classroom (B305)	Ceiling Mounted	M	4'T12	18	2	40	Sw	6	345	12	1,656	3,428	T8	Ceiling Mounted	4'T8	E	OS	18	2	32	5	345	5	1242	1928	857	643	1500
19	3	Classroom (B315)	Ceiling Mounted	E	4'T12	12	2	40	Sw	6	345	12	1,104	2,285	T8	Ceiling Mounted	4'T8	E	OS	12	2	32	5	345	5	828	1285	571	428	1000
20	3	Classroom (B304)	Ceiling Mounted	E	4'T12	18	2	40	Sw	6	345	12	1,656	3,428	T8	Ceiling Mounted	4'T8	E	OS	18	2	32	5	345	5	1242	1928	857	643	1500
21	3	Classroom (B316)	Ceiling Mounted	E	4'T12	12	2	40	Sw	6	345	12	1,104	2,285	T8	Ceiling Mounted	4'T8	E	OS	12	2	32	5	345	5	828	1285	571	428	1000
22	3	Classroom (B317)	Ceiling Mounted	E	4'T12	9	2	40	Sw	6	345	12	828	1,714	T8	Ceiling Mounted	4'T8	E	OS	9	2	32	5	345	5	621	964	428	321	750
23	3	Classroom (B303)	Ceiling Mounted	E	4'T12	9	2	40	Sw	6	345	12	828	1,714	T8	Ceiling Mounted	4'T8	E	OS	9	2	32	5	345	5	621	964	428	321	750
24	3	Office (B318)	Recessed	M	T12 U-Shapec	4	2	40	Sw	6	345	12	368	762	T8	Recessed	4'T8 U-Shaped	E	OS	4	2	32	5	345	5	276	428	190	143	333
25	3	Hallway (B310)	ecessed Parabol	E	4'T8	4	3	32	Sw	12	345	5	404	1,673	C	Recessed Parabolic	4'T8	E	MS	4	3	32	9	345	5	404	1254	0	418	418
26	3	Bathroom Women (B302)	Ceiling Mounted	M	4'T12	2	2	40	Sw	7	345	12	184	444	T8	Ceiling Mounted	4'T8	E	Sw	2	2	32	7	345	5	138	333	111	0	111
27	3	Hallway (B300)	Ceiling Mounted	E	4'T8	2	4	32	Sw	12	345	5	266	1,101	C	Ceiling Mounted	4'T8	E	MS	2	4	32	9	345	5	266	826	0	275	275
28	3	Office (B321)	ecessed Parabol	E	4'T8	1	3	32	Sw	7	345	5	101	244	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	7	345	5	101	244	0	0	0
29	3	Storage Rm	Ceiling Mounted	M	8'T12	1	2	80	Sw	1	345	20	180	62	T8	Ceiling Mounted	8'T8	E	Sw	1	2	59	1	345	7	125	43	19	0	19
30	3	Janitor's Closet (B302A)	Ceiling Mounted	M	4'T12	1	2	40	Sw	1	345	12	92	32	T8	Ceiling Mounted	4'T8	E	Sw	1	2	32	1	345	5	69	24	8	0	8
31	3	Staircase	Ceiling Mounted	M	4'T12	4	2	40	Sw	12	345	12	368	1,524	T8-BL	Ceiling Mounted	4'T8	M	BL	4	2	32	0	345	5	276	666	381	477	858
32	3	Learning center	Ceiling Suspende	E	4'T8	6	2	32	Sw	7	345	5	414	1,000	C	Ceiling Suspended	4'T8	E	OS	6	2	32	5	345	5	414	750	0	250	250
33	3	Learning center	Recessed	S	CFL	8	2	13	Sw	7	345	0	208	502	N/A	Recessed	CFL	S	Sw	8	2	13	7	345	0	208	502	0	0	0
34	3	Learning center	Ceiling Suspende	E	4'T8	4	2	32	Sw	7	345	5	276	667	C	Ceiling Suspended	4'T8	E	OS	4	2	32	5	345	5	276	500	0	167	167
35	3	Learning center	Ceiling Suspende	E	4'T8	30	2	32	Sw	7	345	5	2,070	4,999	C	Ceiling Suspended	4'T8	E	OS	30	2	32	5	345	5	2070	3749	0	1250	1250
36	3	Learning center	ecessed Parabol	E	4'T8	9	3	32	Sw	7	345	5	909	2,195	C	Recessed Parabolic	4'T8	E	OS	9	3	32	5	345	5	909	1646	0	549	549
37	3	Learning center	Exit Sign	S	LED	4	1	5	N	24	365	1	22	193	N/A	Exit Sign	LED	S	N	4	1	5	24	365	1	22	193	0	0	0
38	3	Learning center kitchen	ecessed Parabol	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed Parabolic	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
39	3	Academic Affairs	Ceiling Mounted	M	4'T12	1	4	40	Sw	7	345	12	172	415	T8	Ceiling Mounted	4'T8	E	OS	1	4	32	5	345	5	133	241	94	80	174
40	3	cademic Affairs conference	Ceiling Suspende	E	4'T8	4	2	32	Sw	7	345	5	276	667	C	Ceiling Suspended	4'T8	E	OS	4	2	32	5	345	5	276	500	0	167	167
41	2	Hallway	Recessed	S	CFL	12	2	13	Sw	12	345	0	312	1,292	N/A	Recessed	CFL	S	Sw	12	2	13	12	345	0	312	1292	0	0	0
42	2	Hallway	Recessed	E	4'T8	15	3	32	Sw	12	345	5	1,515	6,272	C	Recessed	4'T8	E	MS	15	3	32	9	345	5	1515	4704	0	1568	1568
43	2	Hallway	Ceiling Mounted	E	4'T8 U-Shapec	5	2	32	Sw	12	345	5	345	1,428	C	Ceiling Mounted	4'T8 U-Shaped	E	MS	5	2	32	9	345	5	345	1071	0	357	357
44	2	Bathroom Women	Recessed	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
45	2	Bathroom Men	Recessed	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
46	2	Bathroom Men	Recessed	E	2'T8	1	2	17	Sw	7	345	2	36	87	N/A	Recessed	2'T8	E	Sw	1	2	17	7	345	2	36	87	0	0	0
47	2	Bathroom Women	Recessed	E	2'T8	1	2	17	Sw	7	345	2	36	87	N/A	Recessed	2'T8	E	Sw	1	2	17	7	345	2	36	87	0	0	0
48	2	Registrar office	Recessed	E	2'T8	2	3	17	Sw	7	345	2	106	256	N/A	Recessed	2'T8	E	Sw	2	3	17	7	345	2	106	256	0	0	0
49	2	Registrar office	Ceiling Mounted	E	4'T8 U-Shapec	2	2	32	Sw	7	345	5	138	333	N/A	Ceiling Mounted	4'T8 U-Shaped	E	Sw	2	2	32	7	345	5	138	333	0	0	0
50	2	Registrar office	ecessed Parabol	E	4'T8	14	3	32	Sw	7	345	5	1,414	3,415	C	Recessed Parabolic	4'T8	E	OS	14	3	32	5	345	5	1414	2561	0	854	854
51	2	Registrar office	ecessed Parabol	E	4'T8	3	3	32	Sw	7	345	5	303	732	C	Recessed Parabolic	4'T8	E	OS	3	3	32	5	345	5	303	549	0	183	183
52	2	Copy rm	ecessed Parabol	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed Parabolic	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
53	2	Office hallway	ecessed Parabol	E	4'T8	3	3	32	Sw	7	345	5	303	732	C	Recessed Parabolic	4'T8	E	OS	3	3	32	5	345	5	303	549	0	183	183
54	2	Office hallway (B210)	ecessed Parabol	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed Parabolic	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
55	2	Counseling center (B208)	ecessed Parabol	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed Parabolic	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
56	2	Counseling center (B209)	ecessed Parabol	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed Parabolic	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
57	2	Counseling center (B207)	ecessed Parabol	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed Parabolic	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
58	2	Counseling center (B201)	ecessed Parabol	E	4'T8	1	3	32	Sw	7	345	5	101	244	C	Recessed Parabolic	4'T8	E	OS	1	3	32	5	345	5	101	183	0	61	61
59	2	Counseling center	ecessed Parabol	E	4'T8	18	3	32	Sw	7	345	5	1,818	4,390	C	Recessed Parabolic	4'T8	E	OS	18	3	32	5	345	5	1818	3293	0	1098	1098
60	2	Counseling center	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
61	2	Hallway	ecessed Parabol	E	4'T8	19	3	32	Sw	12	345	5	1,919	7,945	C	Recessed Parabolic	4'T8	E	MS	19	3	32	9	345	5	1919	5958	0	1986	1986
62	2	Hallway	Recessed	S	CFL	11	2	13	Sw	12	345	0	286	1,184	N/A	Recessed	CFL	S	Sw	11	2	13	12	345	0	286	1184	0	0	0
63	2	Hallway	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
64	2	Business office	ecessed Parabol	E	4'T8	8	3	32	Sw	7	345	5	808	1,951	C	Recessed Parabolic	4'T8	E	OS	8	3	32	5	345	5	808	1463	0	488	488
65	2	Business office	ecessed Parabol	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed Parabolic	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
66	2	Office (B204)	ecessed Parabol	E	2'T8	4	3	17	Sw	7	345	2	212	512	C	Recessed Parabolic	2'T8	E	OS	4	3	17	5	345	2	212	384	0	128	128
67	2	Office	ecessed Parabol	E	2'T8	4	3	17	Sw	7	345	2	212	512	C	Recessed Parabolic	2'T8	E	OS	4	3	17	5	345	2	212	384	0	128	128
68	2	Office	ecessed Parabol	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed Parabolic	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
69	1	Office (B109)	ecessed Parabol	E	4'T8	5	3	32	Sw	7	345	5	505	1,220	C	Recessed Parabolic	4'T8	E	OS	5	3	32	5	345	5	505	915	0	305	305
70	1	Janitors office	Ceiling Mounted	M	4'T12	6	2	40	Sw	1	345	12	552	190	T8	Ceiling Mounted	4'T8	E	OS	6	2	32	1	345	5	414	107	48	36	83
71	1	Janitors office	Ceiling Mounted	M	4'T12	2	4	40	Sw	1	345	12	344	119	T8	Ceiling Mounted	4'T8	E	OS	2	4	32	1	345	5	266	69	27	23	50
72	1	Janitors office	Ceiling Mounted	M	4'T12	3	2	40	Sw	1	345	12	276	95	T8	Ceiling Mounted	4'T8	E	OS	3	2	32	1	345	5	207	54	24	18	42
73	1	Janitors office	Ceiling Mounted	S	CFL	1	1	13	Sw	1	345	0	13	4	N/A	Ceiling Mounted	CFL	S	Sw	1	1	13	1	345	0	13	4	0	0	0

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
74	1	Hallway	ecessed Parabol	E	4'T8	9	3	32	Sw	12	345	5	909	3,763	C	Recessed Parabolic	4'T8	E	MS	9	3	32	9	345	5	909	2822	0	941	941
75	1	Hallway	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
76	1	IT services (B108)	ecessed Parabol	E	4'T8	4	3	32	Sw	7	345	5	404	976	C	Recessed Parabolic	4'T8	E	OS	4	3	32	5	345	5	404	732	0	244	244
77	1	IT services (B108)	ecessed Parabol	E	4'T8	2	4	32	Sw	7	345	5	266	642	C	Recessed Parabolic	4'T8	E	OS	2	4	32	5	345	5	266	482	0	161	161
78	1	IT services (B108)	ecessed Parabol	E	4'T8 U-Shapec	2	2	32	Sw	7	345	5	138	333	C	Recessed Parabolic	4'T8 U-Shapec	E	OS	2	2	32	5	345	5	138	250	0	83	83
79	1	IT services (B106)	ecessed Parabol	E	4'T8	8	4	32	Sw	7	345	5	1,064	2,570	C	Recessed Parabolic	4'T8	E	OS	8	4	32	5	345	5	1064	1927	0	642	642
80	1	IT services (B106)	ecessed Parabol	E	4'T8	4	4	32	Sw	7	345	5	532	1,285	C	Recessed Parabolic	4'T8	E	OS	4	4	32	5	345	5	532	964	0	321	321
81	1	Classroom (B107)	ecessed Parabol	E	4'T8	12	4	32	Sw	6	345	5	1,596	3,304	C	Recessed Parabolic	4'T8	E	OS	12	4	32	5	345	5	1596	2478	0	826	826
82	1	Classroom (B107)	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
83	1	Classroom (B105)	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
84	1	Classroom (B105)	ecessed Parabol	E	4'T8	12	4	32	Sw	6	345	5	1,596	3,304	C	Recessed Parabolic	4'T8	E	OS	12	4	32	5	345	5	1596	2478	0	826	826
85	1	Classroom (B104)	ecessed Parabol	E	4'T8	16	4	32	Sw	6	345	5	2,128	4,405	C	Recessed Parabolic	4'T8	E	OS	16	4	32	5	345	5	2128	3304	0	1101	1101
86	1	Classroom (B104)	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
87	1	Classroom (B103)	ecessed Parabol	E	4'T8	12	4	32	Sw	6	345	5	1,596	3,304	C	Recessed Parabolic	4'T8	E	OS	12	4	32	5	345	5	1596	2478	0	826	826
88	1	Classroom (B103)	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
89	1	Classroom (B102)	ecessed Parabol	E	4'T8	8	4	32	Sw	6	345	5	1,064	2,202	C	Recessed Parabolic	4'T8	E	OS	8	4	32	5	345	5	1064	1652	0	551	551
90	1	Classroom (B102)	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
91	1	Office (B101)	ecessed Parabol	E	4'T8	3	4	32	Sw	7	345	5	399	964	C	Recessed Parabolic	4'T8	E	OS	3	4	32	5	345	5	399	723	0	241	241
92	1	Hallway	ecessed Parabol	E	4'T8	2	3	32	Sw	12	345	5	202	836	C	Recessed Parabolic	4'T8	E	MS	2	3	32	9	345	5	202	627	0	209	209
93	1	Hallway	Ceiling Mounted	M	4'T12	1	2	40	Sw	12	345	12	92	381	T8	Ceiling Mounted	4'T8	E	Sw	1	2	32	12	345	5	69	286	95	0	95
94	1	Hallway	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
95	1	Hallway	Ceiling Mounted	M	4'T12	2	2	40	Sw	12	345	12	184	762	T8	Ceiling Mounted	4'T8	E	DL	2	2	32	9	345	5	138	428	190	143	333
96	1	Building Dept	Ceiling Suspende	M	4'T12	2	2	40	Sw	7	345	12	184	444	T8	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	111	83	194
97	1	Faculty offices (C101)	ecessed Parabol	E	4'T8	17	3	32	Sw	7	345	5	1,717	4,147	C	Recessed Parabolic	4'T8	E	OS	17	3	32	5	345	5	1717	3110	0	1037	1037
98	1	Faculty offices (C101)	Exit Sign	S	LED	4	1	5	N	24	365	1	22	193	N/A	Exit Sign	LED	S	N	4	1	5	24	365	1	22	193	0	0	0
99	1	Faculty offices (C022)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	C	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	0	83	83
100	1	Faculty offices (C022)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
101	1	Faculty offices (C020)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
102	1	Faculty offices (C020)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	N/A	Ceiling Suspended	4'T8	E	Sw	2	2	32	7	345	5	138	333	0	0	0
103	1	Faculty offices (C019)	ecessed Parabol	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed Parabolic	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
104	1	conference room (C017)	ecessed Parabol	E	4'T8	2	3	32	Sw	4	345	5	202	279	C	Recessed Parabolic	4'T8	E	OS	2	3	32	3	345	5	202	209	0	70	70
105	1	Faculty office (C015)	ecessed Parabol	E	4'T8	2	3	32	Sw	7	345	5	202	488	C	Recessed Parabolic	4'T8	E	OS	2	3	32	5	345	5	202	366	0	122	122
106	1	Faculty office (C018)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	C	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	0	83	83
107	1	Faculty office (C018)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
108	1	Faculty office (C016)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	C	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	0	83	83
109	1	Faculty office (C016)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
110	1	Faculty office (C014)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	C	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	0	83	83
111	1	Faculty office (C014)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
112	1	Faculty office (C013)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	C	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	0	83	83
113	1	Faculty office (C013)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
114	1	Faculty office (C011)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	C	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	0	83	83
115	1	Faculty office (C011)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
116	1	Faculty office (C012)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	C	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	0	83	83
117	1	Faculty office (C012)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
118	1	Faculty office (C009)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	C	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	0	83	83
119	1	Faculty office (C009)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
120	1	Faculty office (C010)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	C	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	0	83	83
121	1	Faculty office (C010)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
122	1	Faculty office (C008)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	C	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	0	83	83
123	1	Faculty office (C008)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
124	1	Faculty office (C007)	Ceiling Suspende	E	4'T8	2	2	32	Sw	7	345	5	138	333	C	Ceiling Suspended	4'T8	E	OS	2	2	32	5	345	5	138	250	0	83	83
125	1	Faculty office (C007)	Ceiling Mounted	E	4'T8	1	2	32	Sw	7	345	5	69	167	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	7	345	5	69	167	0	0	0
126	2	Hallway	Ceiling Mounted	S	CFL	4	1	13	Sw	12	345	0	52	215	N/A	Ceiling Mounted	CFL	S	Sw	4	1	13	12	345	0	52	215	0	0	0
127	2	Gallery	Track	S	Inc	9	1	75	Sw	7	345	0	675	1,630	CFL	Track	CFL	S	DL	9	1	25	5	345	0	225	408	1087	136	1223
128	2	Gallery	Recessed	S	CFL	6	1	13	Sw	7	345	0	78	188	N/A	Recessed	CFL	S	Sw	6	1	13	7	345	0	78	188	0	0	0
129	2	Gallery	Recessed	S	Hal	9	1	50	Sw	7	345	11	549	1,326	CFL	Recessed	CFL	S	Sw	9	1	15	7	345	0	135	326	1000	0	1000
130	2	Gallery	Track	S	Inc	16	1	75	Sw	7	345	0	1,200	2,898	CFL	Track	CFL	S	Sw	16	1	25	7	345	0	400	966	1932	0	1932
131	2	Gallery	Ceiling Mounted	E	4'T8	12	3	32	Sw	2	345	5	1,212	836	N/A	Ceiling Mounted	4'T8	E	Sw	12	3	32	2	345	5	1212	836	0	0	0
132	2	Gallery	Recessed	S	CFL	3	1	13	Sw	7	345	0	39	94	N/A	Recessed	CFL	S	Sw	3	1	13	7	345	0	39	94	0	0	0
133	2	Gallery	Recessed	S	CFL	2	2	13	Sw	7	345	0	52	126	N/A	Recessed	CFL	S	Sw	2	2	13	7	345	0	52	126	0	0	0
134	2	Gallery (C107)	Recessed	E	CFL	20	2	13	Sw	7	345	0	520	1,256	N/A	Recessed	CFL	E	Sw	20	2	13	7	345	0	520	1256	0	0	0

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
135	2	Gallery (C107)	Track	S	Inc	16	1	75	Sw	7	345	0	1,200	2,898	CFL	Track	CFL	S	Sw	16	1	25	7	345	0	400	966	1932	0	1932
136	2	Gallery (C107)	Ceiling Mounted	E	4'T8	5	3	32	Sw	7	345	5	505	1,220	C	Ceiling Mounted	4'T8	E	OS	5	3	32	5	345	5	505	915	0	305	305
137	2	Gallery closet (C107)	Ceiling Mounted	E	4'T8	5	3	32	Sw	1	345	5	505	174	N/A	Ceiling Mounted	4'T8	E	Sw	5	3	32	1	345	5	505	174	0	0	0
138	2	Classroom (C105)	Ceiling Mounted	E	4'T8	9	3	32	Sw	7	345	5	909	2,195	C	Ceiling Mounted	4'T8	E	OS	9	3	32	5	345	5	909	1646	0	549	549
139	2	Mechanical Rm (C106A)	Ceiling Mounted	S	CFL	1	1	13	Sw	1	345	0	13	4	N/A	Ceiling Mounted	CFL	S	Sw	1	1	13	1	345	0	13	4	0	0	0
140	3	Hallway	Ceiling Mounted	E	4'T8	4	3	32	Sw	12	345	5	404	1,673	C	Ceiling Mounted	4'T8	E	MS	4	3	32	9	345	5	404	1254	0	418	418
141	3	Darkroom (C207A)	Ceiling Mounted	E	4'T8	1	3	32	Sw	1	345	5	101	35	N/A	Ceiling Mounted	4'T8	E	Sw	1	3	32	1	345	5	101	35	0	0	0
142	3	Darkroom (C207)	Recessed	S	Inc	5	1	60	Sw	1	345	0	300	104	CFL	Recessed	CFL	S	Sw	5	1	20	1	345	0	100	35	69	0	69
143	3	Darkroom (C203)	Recessed	S	Inc	1	1	60	Sw	1	345	0	60	21	CFL	Recessed	CFL	S	Sw	1	1	20	1	345	0	20	7	14	0	14
144	3	Classroom (C202)	Ceiling Mounted	E	4'T8	21	3	32	Sw	6	345	5	2,121	4,390	C	Ceiling Mounted	4'T8	E	OS	21	3	32	5	345	5	2121	3293	0	1098	1098
145	3	Classroom (C202)	Exit Sign	S	LED	1	1	5	N	24	345	1	6	46	N/A	Exit Sign	LED	S	N	1	1	5	24	345	1	6	46	0	0	0
146	3	Classroom (C204)	Ceiling Mounted	E	4'T8	2	3	32	Sw	6	345	5	202	418	C	Ceiling Mounted	4'T8	E	OS	2	3	32	5	345	5	202	314	0	105	105
147	3	Classroom (C205)	Ceiling Mounted	E	4'T8	2	3	32	Sw	6	345	5	202	418	C	Ceiling Mounted	4'T8	E	OS	2	3	32	5	345	5	202	314	0	105	105
148	Ext	Exterior	Wall Mounted	S	CFL	2	1	13	T	12	365	0	26	114	C	Wall Mounted	CFL	S	PC	2	1	13	9	365	0	26	85	0	28	28
149	Ext	Exterior	Wallpack	S	MH	2	1	75	T	12	365	21	192	841	PSMH	Wallpack	PSMH	S	PC	2	1	50	9	365	10	120	394	315	131	447
150	Ext	Exterior	Wallpack	S	CFL	1	1	23	T	12	365	0	23	101	C	Wallpack	CFL	S	PC	1	1	23	9	365	0	23	76	0	25	25
151	Ext	Exterior	Wallpack	S	MH	3	1	150	T	12	365	42	576	2,523	PSMH	Wallpack	PSMH	S	PC	3	1	100	9	365	20	360	1183	946	394	1340
152	Ext	Exterior	Wallpack	S	MH	1	1	400	T	12	365	112	512	2,243	PSMH	Wallpack	PSMH	S	PC	1	1	250	9	365	50	300	986	929	329	1257
153	Ext	Exterior	Recessed	S	CFL	4	1	13	T	12	365	0	52	228	C	Recessed	CFL	S	PC	4	1	13	9	365	0	52	171	0	57	57
Totals:						718	351	5,251				945	61,878	149,660						718	351	4,508			658	55,002	104,514	14,612	30,533	45,145

Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space

Proposed Lighting Summary Table			
Total Gross Floor Area (SF)	38,137		
Average Power Cost ($/kWh)	0.1560		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	6,049	2,894	**3,155**
Exterior Power (watts)	1,381	881	**500**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	143,611	101,620	**41,991**
Lighting Power (watts)	60,497	54,121	**6,376**
Lighting Power Density (watts/SF)	1.59	1.42	**0.17**
Estimated Cost of Fixture Replacement ($)	24,533		
Estimated Cost of Controls Improvements ($)	19,370		
Total Consumption Cost Savings ($)	**8,774**		

Legend							
Fixture Type		**Lamp Type**			**Control Type**	**Ballast Type**	**Retrofit Category**
Ceiling Suspended	Recessed	CFL	3'T12	8'T5	Autom. Timer (T)	S (Self)	N/A (None)
Exit Sign	Sconce	Inc	3'T12 U-Shaped	8'T5 U-Shaped	Bi-Level (BL)	E (Electronic)	T8 (Install new T8)
High Bay	Spotlight	LED	3'T5	8'T8	Contact (Ct)	M (Magnetic)	T5 (Install new T5)
Parabolic Ceiling Mounted	Track	HPS	3'T5 U-Shaped	8'T8 U-Shaped	Daylight & Motion (M)		CFL (Install new CFL)
Parabolic Ceiling Suspended	Vanity	MH	3'T8	Circline - T5	Daylight & Switch (DLSw)		LEDex (Install new LED Exit)
Pendant	Wall Mounted	MV	3'T8 U-Shaped	Circline - T8	Daylight Sensor (DL)		LED (Install new LED)
Recessed Parabolic	Wall Suspended	1'T12	4'T5	Circline - T12	Delay Switch (DSw)		D (De-lamping)
Ceiling Mounted	Wallpack	1'T12 U-Shaped	4'T5 U-Shaped	Fl.	Dimmer (D)		C (Controls Only)
Chandelier		1'T5	6'T12	Hal	Motion Sensor (MS)		PSMH (Install new Pulse-Start Metal Halide)
Equipment / Fume Hood		1'T5 U-Shaped	6'T12 U-Shaped	Induction	Motion& Switch (MSw)		
Flood		1'T8	6'T5	Infrared	None (N)		
Landscape		1'T8 U-Shaped	6'T5 U-Shaped	LPS	Occupancy Sensor (OS)		
Low Bay		2'T12 U-Shaped	6'T8	Mixed Vapor	Occupancy Sensor - CM (OSCM)		
Parabolic Wall Mounted		2'T5	6'T8 U-Shaped	Neon	Photocell (PC)		
Pole Mounted		2'T5 U-Shaped	8'T12	Quartz Halogen	Switch (Sw)		
Pole Mounted Off Building		2'T8 U-Shaped	8'T12 U-Shaped				

APPENDIX C: THIRD PARTY ENERGY SUPPLIERS

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

Third Party Electric Suppliers for JCPL Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for Elizabethtown Gas Co. Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX D: GLOSSARY AND METHOD OF CALCULATIONS

Net ECM Cost: The net ECM cost is the cost experienced by the customer, which is typically the total cost (materials + labor) of installing the measure minus any available incentives. Both the total cost and the incentive amounts are expressed in the summary for each ECM.

Annual Energy Cost Savings (AECS): This value is determined by the audit firm based on the calculated energy savings (kWh or Therm) of each ECM and the calculated energy costs of the building.

Lifetime Energy Cost Savings (LECS): This measure estimates the energy cost savings over the lifetime of the ECM. It can be a simple estimation based on fixed energy costs. If desired, this value can factor in an annual increase in energy costs as long as the source is provided.

Simple Payback: This is a simple measure that displays how long the ECM will take to break-even based on the annual energy and maintenance savings of the measure.

ECM Lifetime: This is included with each ECM so that the owner can see how long the ECM will be in place and whether or not it will exceed the simple payback period. Additional guidance for calculating ECM lifetimes can be found below. This value can come from manufacturer's rated lifetime or warranty, the ASHRAE rated lifetime, or any other valid source.

Operating Cost Savings (OCS): This calculation is an annual operating savings for the ECM. It is the difference in the operating, maintenance, and / or equipment replacement costs of the existing case versus the ECM. In the case where an ECM lifetime will be longer than the existing measure (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

Return on Investment (ROI): The ROI is expresses the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

Net Present Value (NPV): The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (assumes bond rate of 3.2%).

Internal Rate of Return (IRR): The IRR expresses an annual rate that results in a break-even point for the investment. If the owner is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the owner to compare ECMs against each other to determine the most appealing choices.

Gas Rate and Electric Rate ($/therm and $/kWh): The gas rate and electric rate used in the financial analysis is the total annual energy cost divided by the total annual energy usage for the 12 month billing period studied. The graphs of the monthly gas and electric rates reflect the total monthly energy costs divided by the monthly usage, and display how the average rate fluctuates throughout the year. The average annual rate is the only rate used in energy savings calculations.

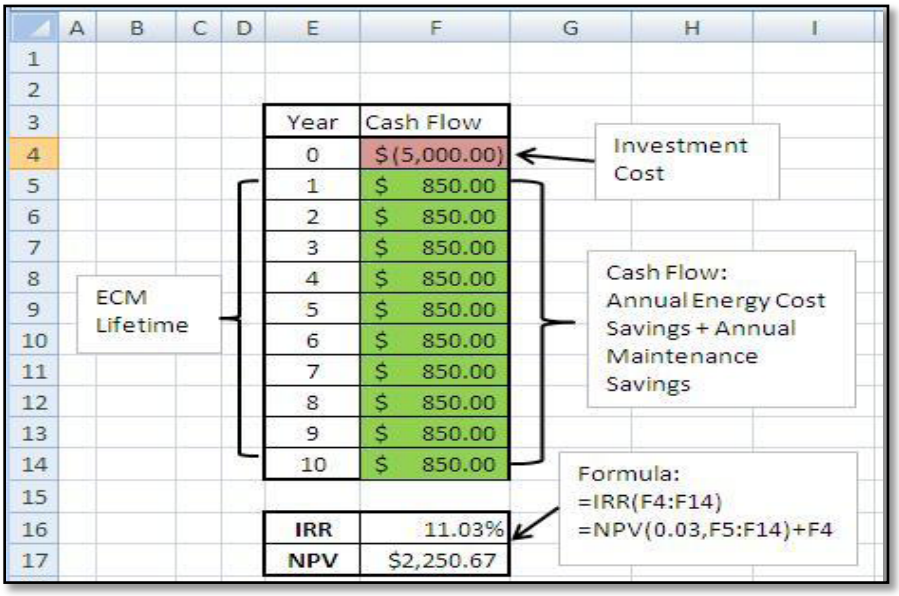
Calculation References

Term	Definition
ECM	Energy Conservation Measure
AOCS	Annual Operating Cost Savings
AECS	Annual Energy Cost Savings
LOCS*	Lifetime Operating Cost Savings
LECS	Lifetime Energy Cost Savings
LCS	Lifetime Cost Savings
NPV	Net Present Value
IRR	Internal Rate of Return
DR	Discount Rate
Net ECM Cost	Total ECM Cost – Incentive
LECS	AECS X ECM Lifetime
AOCS	LOCS / ECM Lifetime
LCS	LOCS+LECS
Simple Payback	Net ECM Cost / (AECS + AOCS)
Lifetime ROI	(LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI	(Lifetime ROI / Lifetime) = [(AECS + OCS) / Net ECM Cost – (1 / Lifetime)]

* The lifetime operating cost savings are all avoided operating, maintenance, and/or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding equipment replacement needed for the existing measure to meet the lifetime of the ECM (e.g. lighting change outs).

Excel NPV and IRR Calculation

In Excel, function =IRR (values) and =NPV (rate, values) are used to quickly calculate the IRR and NPV of a series of annual cash flows. The investment cost will typically be a negative cash flow at year 0 (total cost - incentive) with years 1 through the lifetime receiving a positive cash flow from the annual energy cost savings and annual maintenance savings. The calculations in the example below are for an ECM that saves $850 annually in energy and maintenance costs (over a 10 year lifetime) and takes $5,000 to purchase and install after incentives:



Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years
Incentive 1:	NJ Renewable Energy Incentive Program (REIP), for systems of size 30kW or less, $0.75/Watt incentive subtracted from installation cost
Incentive 2:	Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume $600/Megawatt hour consumed per year for a maximum of 15 years; added to annual energy cost savings for a period of 15 years. (Megawatt hour used is rounded to nearest 1,000 kWh)
Assumptions:	A Solar Pathfinder device is used to analyze site shading for the building and determine maximum amount of full load operation based on available sunlight. When the Solar Pathfinder device is not implemented, amount of full load operation based on available sunlight is assumed to be 1,180 hours in New Jersey.

Total lifetime PV energy cost savings =
kWh produced by panel * [$/kWh cost * 25 years + $600/Megawatt hour /1000 * 15 years]

ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.

Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.

When the bulb lifetime is used (rated burn hours / annual burn hours), the operating cost savings is just reflecting the theoretical cost of replacing the existing case bulb and ballast over the life of the recommended bulb. Dividing by the bulb lifetime will give an annual operating cost savings.

When a fixture lifetime is used (e.g. 15 years) the operating cost savings reflects the avoided bulb and ballast replacement cost of the existing case over 15 years minus the projected bulb and ballast replacement cost of the proposed case over 15 years. This will give the difference of the equipment replacement costs between the proposed and existing cases and when divided by 15 years will give the annual operating cost savings.

New Jersey Clean Energy Program Commercial & Industrial Lifetimes

Measure	Life Span
Commercial Lighting — New	15
Commercial Lighting — Remodel/Replacement	15
Commercial Custom — New	18
Commercial Chiller Optimization	18
Commercial Unitary HVAC — New - Tier 1	15
Commercial Unitary HVAC — Replacement - Tier 1	15
Commercial Unitary HVAC — New - Tier 2	15
Commercial Unitary HVAC — Replacement Tier 2	15
Commercial Chillers — New	25
Commercial Chillers — Replacement	25
Commercial Small Motors (1-10 HP) — New or Replacement	20
Commercial Medium Motors (11-75 HP) — New or Replacement	20
Commercial Large Motors (76-200 HP) — New or Replacement	20
Commercial VSDs — New	15
Commercial VSDs — Retrofit	15
Commercial Comprehensive New Construction Design	18
Commercial Custom — Replacement	18
Industrial Lighting — New	15
Industrial Lighting — Remodel/Replacement	15
Industrial Unitary HVAC — New - Tier 1	15
Industrial Unitary HVAC — Replacement - Tier 1	15
Industrial Unitary HVAC — New - Tier 2	15
Industrial Unitary HVAC — Replacement Tier 2	15
Industrial Chillers — New	25
Industrial Chillers — Replacement	25
Industrial Small Motors (1-10 HP) — New or Replacement	20
Industrial Medium Motors (11-75 HP) — New or Replacement	20
Industrial Large Motors (76-200 HP) — New or Replacement	20
Industrial VSDs — New	15
Industrial VSDs — Retrofit	15
Industrial Custom — Non-Process	18
Industrial Custom — Process	10
Small Commercial Gas Furnace — New or Replacement	20
Small Commercial Gas Boiler — New or Replacement	20
Small Commercial Gas DHW — New or Replacement	10
C&I Gas Absorption Chiller — New or Replacement	25
C&I Gas Custom — New or Replacement (Engine Driven Chiller)	25
C&I Gas Custom — New or Replacement (Gas Efficiency Measures)	18
O&M savings	3
Compressed Air (GWh participant)	8

APPENDIX E: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Sussex County Community College - Building B/C

Building ID: 2473122
For 12-month Period Ending: June 30, 2010[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: October 05, 2010

Facility
Sussex County Community College - Building B/C
One College Hill Road
Newton, NJ 07860

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1960
Gross Floor Area (ft²): 38,137

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	2,348,763
Natural Gas (kBtu)[4]	2,321,983
Total Energy (kBtu)	4,670,746

Energy Intensity[5]

Site (kBtu/ft²/yr)	122
Source (kBtu/ft²/yr)	269

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	481

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	120
National Average Source EUI	280
% Difference from National Average Source EUI	-4%
Building Type	College/University (Campus-Level)

Stamp of Certifying Professional

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

Certifying Professional
N/A

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

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

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

EPA Form 5900-16

APPENDIX F: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

The NJ Clean Energy Pay for Performance (P4P) Program relies on a network of Partners who provide technical services to clients. LGEA participating clients who are not receiving Direct Energy Efficiency and Conservation Block Grants are eligible for P4P. SWA is an eligible Partner and can develop an Energy Reduction Plan for each project with a whole-building traditional energy audit, a financial plan for funding the energy measures and an installation construction schedule.

The Energy Reduction Plan must define a comprehensive package of measures capable of reducing a building's energy consumption by 15+%. P4P incentives are awarded upon the satisfactory completion of three program milestones: submittal of an Energy Reduction Plan prepared by an approved Program Partner, installation of the recommended measures and completion of a Post-Construction Benchmarking Report. The incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum 15%performance threshold savings has been achieved.

For further information, please see: http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings .

Direct Install 2010 Program*

Direct Install is a division of the New Jersey Clean Energy Programs' Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC and other equipment with energy efficient alternatives. The program pays **up to 60%** of the retrofit costs, including equipment cost and installation costs.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 200 kW** within 12 months of applying
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies
    - Electric: Atlantic City Electric, Jersey Central Power & Light, Orange Rockland Electric, PSE&G
    - Natural Gas: Elizabethtown Gas, New Jersey Natural Gas, PSE&G, South Jersey Gas Service

For the most up to date information on contractors in New Jersey who participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/direct-install

Smart Start

New Jersey's SmartStart Building Program is administered by New Jersey's Office of Clean Energy. The program also offers design support for larger projects and technical assistance for smaller projects. If your project specifications do not fit into anything defined by the program, there are even incentives available for custom projects.

There are a number of improvement options for commercial, industrial, institutional, government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while building in energy efficiency to save money. Project categories included in this program are New Construction and Additions, Renovations, Remodeling and Equipment Replacement.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings.

Renewable Energy Incentive Program*

The Renewable Energy Incentive Program (REIP) provides incentives that reduce the upfront cost of installing renewable energy systems, including solar, wind, and sustainable biomass. Incentives vary depending upon technology, system size, and building type. Current incentive levels, participation information, and application forms can be found at the website listed below.

Solar Renewable Energy Credits (SRECs) represent all the clean energy benefits of electricity generated from a solar energy system. SRECs can be sold or traded separately from the power, providing owners a source of revenue to help offset the cost of installation. All solar project owners in New Jersey with electric distribution grid-connected systems are eligible to generate SRECs. Each time a system generates 1,000 kWh of electricity an SREC is earned and placed in the customer's account on the web-based SREC tracking system.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/renewable-energy/home/home.

Utility Sponsored Programs

Check with your local utility companies for further opportunities that may be available.

Energy Efficiency and Conservation Block Grant Rebate Program

The Energy Efficiency and Conservation Block Grant (EECBG) Rebate Program provides supplemental funding up to $20,000 for eligible New Jersey local government entities to lower the cost of installing energy conservation measures. Funding for the EECBG Rebate Program is provided through the American Recovery and Reinvestment Act (ARRA).

For the most up to date information on how to participate in this program, go to: http://njcleanenergy.com/EECBG

Other Federal and State Sponsored Programs

Other federal and state sponsored funding opportunities may be available, including BLOCK and R&D grant funding. For more information, please check http://www.dsireusa.org/.

*Subject to availability. Incentive program timelines might not be sufficient to meet the 25% in 12 months spending requirement outlined in the LGEA program.

APPENDIX G: ENERGY CONSERVATION MEASURES

ECM Counter		ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st year cost savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %
1	0 to 5 Year Payback ECM	67 New CFL fixtures to be installed	627	0	627	10,243	2.0	0	0.9	335	1,933	5	9,665	0.3	1,709
2		Retrofit (3) Beverage vending machines with Vending Miser™	597	0	597	4,836	1.0	0	0.4	0	754	10	7,544	0.8	1,164
5		8 New motion sensors to be installed with incentives	1,760	160	1,600	8,195	1.6	0	0.7	0	1,278	15	19,176	1.3	1,098
3		Retrofit (1) Snack Vending Machine with Snack Miser™	99	0	99	387	0.1	0	0.0	0	60	10	604	1.6	510
13		Replace 40hp supply fan motor on packaged RTU with premium efficiency motor	2,907	180	2,727	9,251	1.9	0	0.8	0	1,443	15	21,647	1.9	694
11		Provide demand controlled ventilation using Carbon Dioxide sensors	12,660	0	12,660	3,513	0.7	2,740	7.5	0	4,105	12	49,255	3.1	289
4		2 New Daylight Sensors to be installed with incentives	440	50	390	437	0.1	0	0.0	50	118	15	1,772	3.3	547
6		76 New occupancy sensors to be installed with incentives	16,720	1,520	15,200	29,692	5.9	0	2.7	0	4,632	15	69,480	3.3	357
14		Replace 2 hp relief fan motor on packaged RTU with premium efficiency motor	1,411	125	1,286	1,948	0.4	0	0.2	0	304	15	4,558	4.2	254
		TOTALS	**37,221**	**2,035**	**35,186**	**68,502**	**14**	**2,740**	**13.2**	**385**	**14,628**		**183,700**	**2.4**	**-**

ECM Counter		ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st year cost savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %
7	5 to 10 Year Payback	7 New bi-level fixtures to be installed with incentives	1,155	175	980	1,113	0.2	0	0.1	0	174	15	2,604	5.6	166
8		124 New T8 fixtures to be installed with incentives	21,528	1,860	19,668	8,327	1.7	0	0.7	1,791	3,090	15	46,344	6.4	272
16		Replace 4 existing 10SEER condensing units	10,240	920	9,320	7,500	1.5	0	0.7	0	1,170	15	17,550	8.0	88
9		6 New photocells to be installed with incentives	1,320	120	1,200	965	0.2	0	0.1	0	150	15	2,257	8.0	88
		TOTALS	**34,243**	**3,075**	**31,168**	**17,905**	**3.6**	**0**	**1.6**	**1,791**	**4,584**		**68,755**	**6.8**	**-**
10	> 10 Year Paybakc (End of Life ECM)	6 New pulse start metal halide fixtures to be installed with incentives	4,388	150	4,238	2,190	0.4	0	0.2	36	377	15	5,662	11.2	46
15		Replace 2 existing hot water boilers	113,000	5,250	107,750	0	0.0	5,000	13.1	1,500	7,990	30	239,700	13.5	164
17		Replace windows on 3rd Floor	130,000	0	130,000	6,305	1.3	6,305	17.1	0	9,167	30	275,024	14.2	112
12		Install new Building Management System	150,000	0	150,000	39,170	7.8	1,633	7.8	0	8,230	12	98,762	18.2	-34
		TOTALS	**397,388**	**5,400**	**391,988**	**47,665**	**9**	**12,938**	**38.2**	**1,536**	**25,765**		**619,148**	**15.2**	**-**

APPENDIX H: VendingMiser™ and SnackMiser™ Energy Savings

Savings Calculator

Please replace the default values in the table below with your location's unique information and then click on the "calculate savings" button.
Note: To calculate for CoolerMiser, use the equivalent VendingMiser results. To calculate for PlugMiser, use the equivalent SnackMiser results.

Energy Costs ($0.000 per kWh)	
Facility Occupied Hours per Week	
Number of Cold Drink Vending Machines	
Number of Non-refrigerated Snack Machines	
Power Requirements of Cold Drink Machine (Watts; 400 typical)	
Power Requirements of Snack Machine (Watts; 80 typical)	
VendingMiser® Sale Price (for cold drink machines)	
SnackMiser™ Sale Price (for snack machines)	

Results of your location's projected savings with VendingMiser® installed:

COLD DRINK MACHINES	Current	Projected	Total Savings	% Savings
kWh	10483	5647	4836	46%
Cost of Operation	$1,635.38	$880.96	$754.42	46%
SNACK MACHINES	**Current**	**Projected**	**Total Savings**	**% Savings**
kWh	699	312	387	55%
Cost of Operation	$109.03	$48.67	$60.35	55%

Location's Total Annual Savings

	Current	Projected	Total Savings	% Savings
kWh	11182	5959	5223	47%
Cost of Operation	$1,744.40	$929.64	$814.77	47%

Total Project Cost	Break Even (Months)
$696	10.25

Estimated Five Year Savings on ALL Machines = $4,073.85

Estimated Five Year Return on Investment = 485%

Service and Support

The Help Desk is available around the clock to answer account, service, installation and reporting questions.

HOW TO BUY — Purchase from our online store or contact us to start saving.

Programs

$$$ — Over 40 utilities nationwide are offering rebates for EnergyMiser products.

Use the Savings Calculator to learn how much you can save.

Testimonials

Paul Lustig
Energy Program Manager
Austin Energy

Written Testimonials

Bottlers' Perspectives

Vending Machine Distributors' Perspectives

Customer Lists

Universities and Colleges
Schools and School Districts
Energy Service Companies (ESCOs)
Federal Government Facilities
Local Government Facilities

Downloads

- Product Sheets
- Installation Guides
- Articles and Technical Papers

Q&A — Still have a question? Read the FAQs.

Contact Us | Online Store

APPENDIX I: METHOD OF ANALYSIS

Assumptions and tools

Energy modeling tool:	Established/standard industry assumptions, E-Quest
Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) Published and established specialized equipment material and labor costs Cost estimates also based on utility bill analysis and prior experience with similar projects

Disclaimer

This engineering audit was prepared using the most current and accurate fuel consumption data available for the site. The estimates that it projects are intended to help guide the owner toward best energy choices. The costs and savings are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, and labor, and other factors. Although we cannot guarantee savings or costs, we suggest that you use this report for economic analysis of the building and as a means to estimate future cash flow.

THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, SWA STAFF HAVE NOT COMPLETED A COMPREHENSIVE EVALUATION FOR CODE-COMPLIANCE OR HEALTH AND SAFETY ISSUES. THE OWNER(S) AND MANAGER(S) OF THE BUILDING(S) CONTAINED IN THIS REPORT ARE REMINDED THAT ANY IMPROVEMENTS SUGGESTED IN THIS SCOPE OF WORK MUST BE PERFORMED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS THAT APPLY TO SAID WORK. PARTICULAR ATTENTION MUST BE PAID TO ANY WORK WHICH INVOLVES HEATING AND AIR MOVEMENT SYSTEMS, AND ANY WORK WHICH WILL INVOLVE THE DISTURBANCE OF PRODUCTS CONTAINING MOLD, ASBESTOS, OR LEAD.