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February 16, 2010

Sussex Community College
Student Center Building D

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 Student Center building is a four story building with a partial basement comprising a total conditioned floor area of 29,957 square feet. The original structure was built in 1932 with additions/renovations pre-college occupancy in 1962 and later in 2003. 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	Current Annual Cost of Energy, $	Site Energy Use Intensity, kBtu/sq ft yr	Joint Energy Consumption, MMBtu/yr
Current	402,062	27,289	$95,370	137.0	4,101
Proposed	319,618	16,172	$68,248	77.6	2,322
Savings	82,444	11,117	$27,122*	59.4	1,779
% Savings	20.5%	40.7%	28.4%	43.4%	43.4%

There may be energy procurement opportunities for the Student Center building to reduce annual electric utility costs, which are $3,216 higher, when compared to the average estimated NJ commercial utility rates.

SWA has also entered energy information about the Public Student Center building in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager Energy benchmarking system. The resulting Site Energy Use Intensity is 137.0 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	$9,085	2.4	$21,397	97,189
5-10 Year	$4,768	7.7	$36,644	39,214
>10 year	$19,307	23.6	$455,400	185,846
Total	$27,122	18.9	$513,441	322,249

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 8 cars from the roads each year or the equivalent of planting 237 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 window air conditioners with a central air system
- Replace windows throughout building
- Install waterless urinals

Operations and Maintenance

- o Maintain roofs
- o Replace thermostatic radiator valves
- o Maintain downspouts and cap flashing
- o Provide weather-stripping/air-sealing
- o Repair/seal wall cracks and penetrations
- o Provide water-efficient fixtures and controls
- o 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 $1,956.75 (or 25% of $7,827).

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 Student Center building

Recommended ECMs	Incentive Program (Please refer to Appendix F for details)
Retrofit 1 existing refrigerated vending machine with VendingMiser™ device	Direct Install
Retrofit 3 existing refrigerated chillers with CoolerMiser™ devices	Direct Install
Install 40 new CFL fixtures	N/A
Retrofit 1 existing vending machine with SnackMiser™ device	Direct Install
Replace two 5hp motors on H/V units with premium efficiency motors	Smart Start
Install 4 new Motion sensors with incentives	Smart Start, Direct Install

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 Student Center 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, 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 Student Center 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 Student Center building.

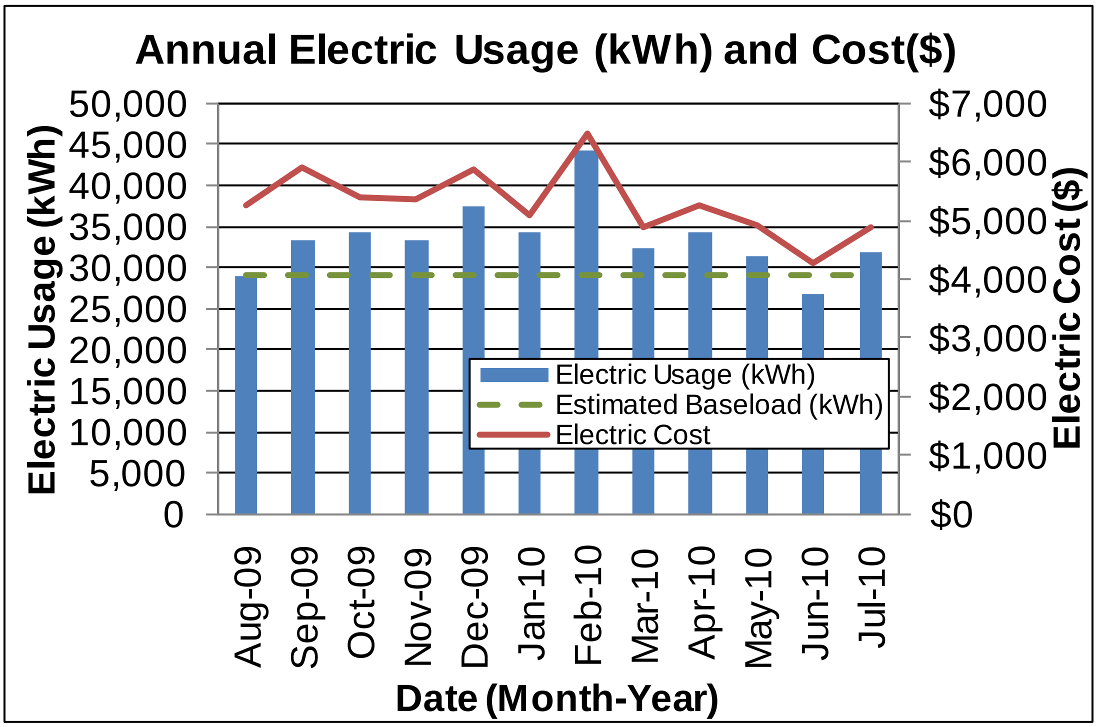
HISTORICAL ENERGY CONSUMPTION

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 Student Center 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.

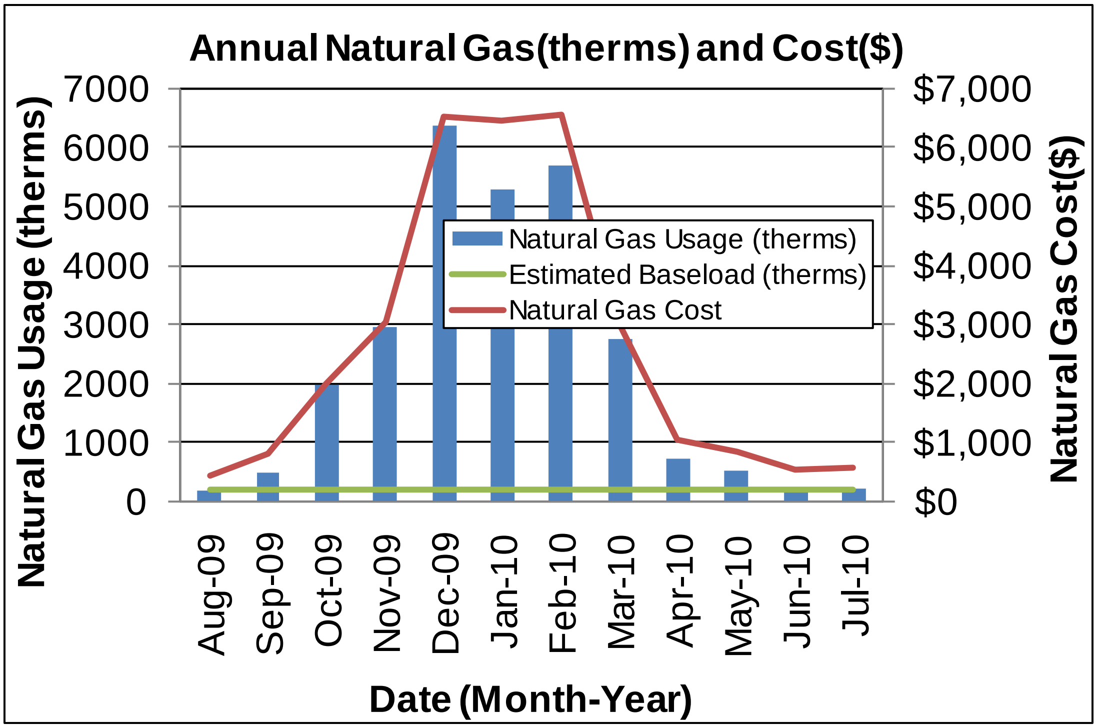
Electricity - The Student Center building is currently served by one electric meter. The Student Center building currently buys electricity from JCP&L at **an average aggregated rate of $0.158/kWh**. The Student Center building purchased **approximately 402,062 kWh, or $63,580 worth of electricity,** in the previous year. The average monthly demand was 102.0 kW and the annual peak demand was 117.8 kW.

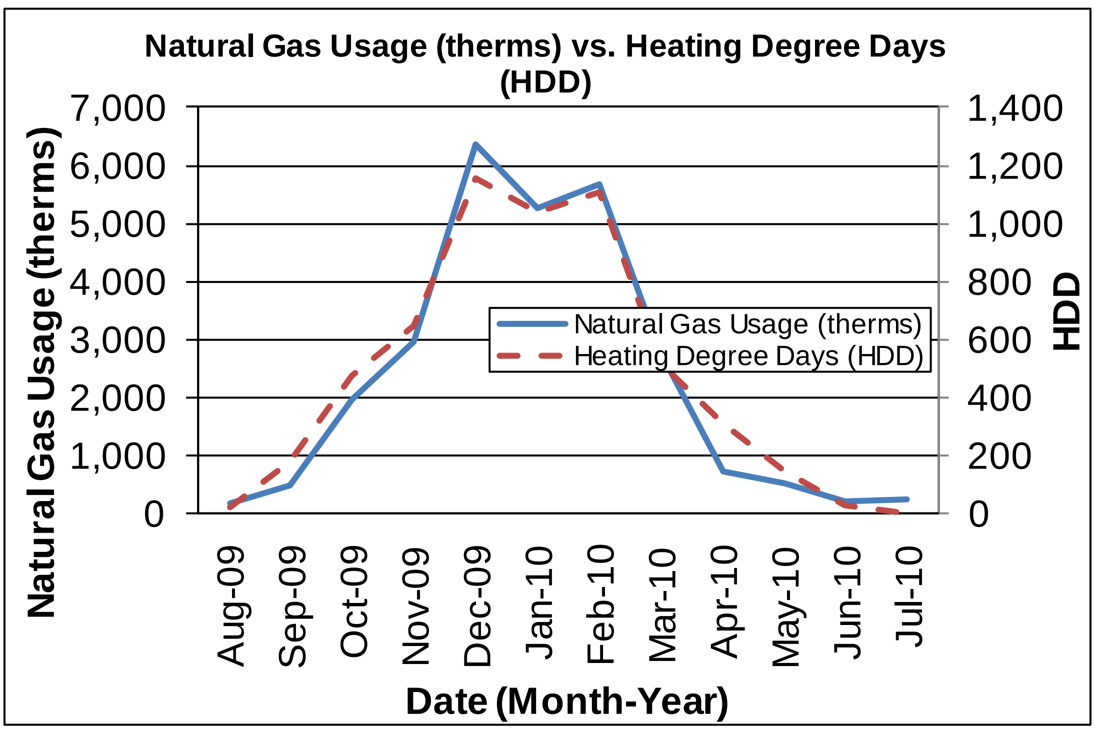
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate base-load or minimum electric usage required to operate the Student Center building.



Natural gas - The Student Center building is currently served by one meter for natural gas. The Student Center building currently buys natural gas from Elizabethtown Gas at **an average aggregated rate of $1.165/therm**. The Student Center building purchased **approximately 27,289 therms, or $31,789 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 Student Center building.

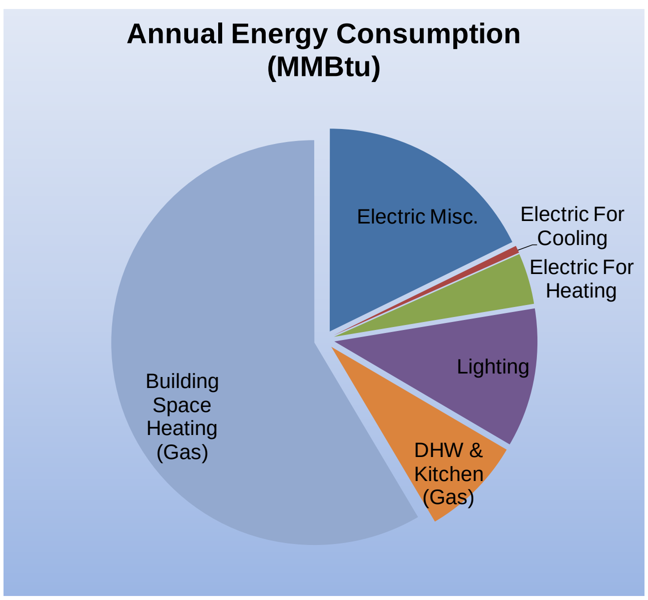


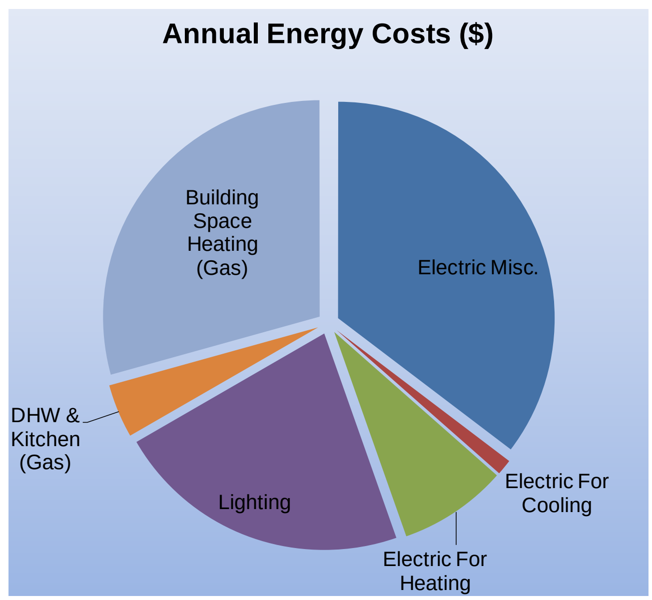


The previous chart shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the 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 Student Center building based on utility bills for the 12 month period. Note: electrical cost at $46/MMBtu of energy is 3.8 times as expensive as natural gas at $12/MMBtu.

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Misc.	727	18%	$33,704	35%	46
Electric For Cooling	24	1%	$1,105	1%	46
Electric For Heating	167	4%	$7,734	8%	46
Lighting	454	11%	$21,038	22%	46
DHW & Kitchen (Gas)	329	8%	$3,835	4%	12
Building Space Heating	2,400	59%	$27,955	29%	12
Totals	4,101	100%	$95,370	100%	
Total Electric Usage	1,372	33%	$63,581	67%	46
Total Gas Usage	2,729	67%	$31,789	33%	12
Totals	4,101	100%	$95,370	100%	

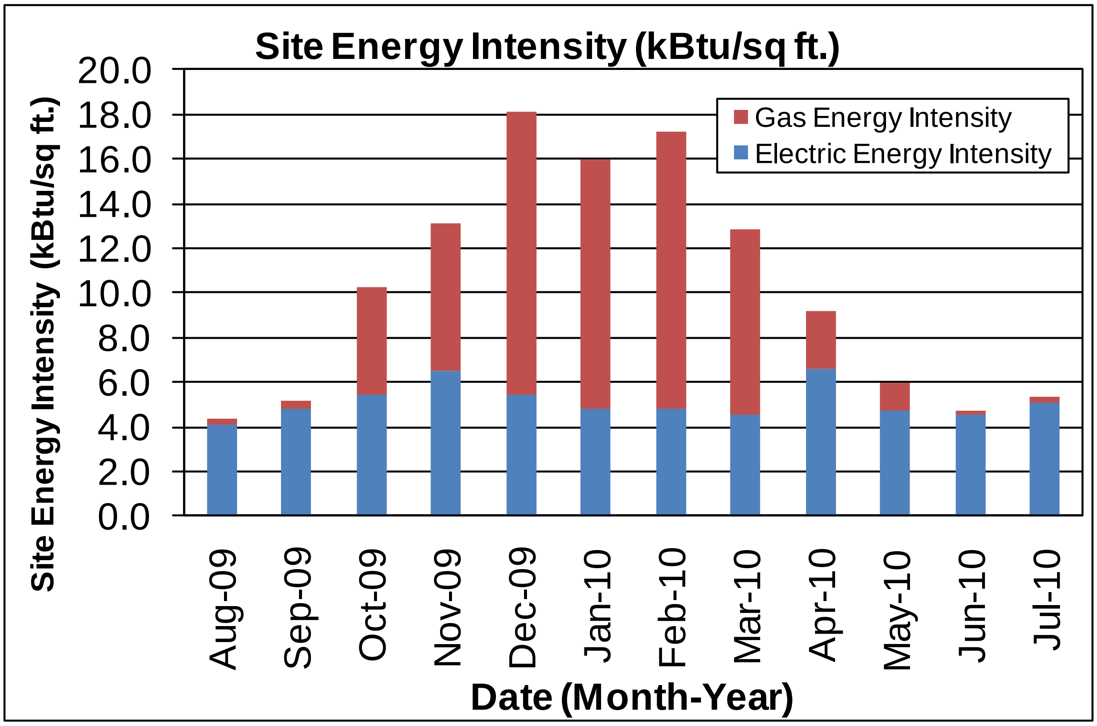




Energy benchmarking

SWA has entered energy information about the Student Center building in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager Energy benchmarking system. This Student Center 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 Student Center building is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 137.0 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 Student Center 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.

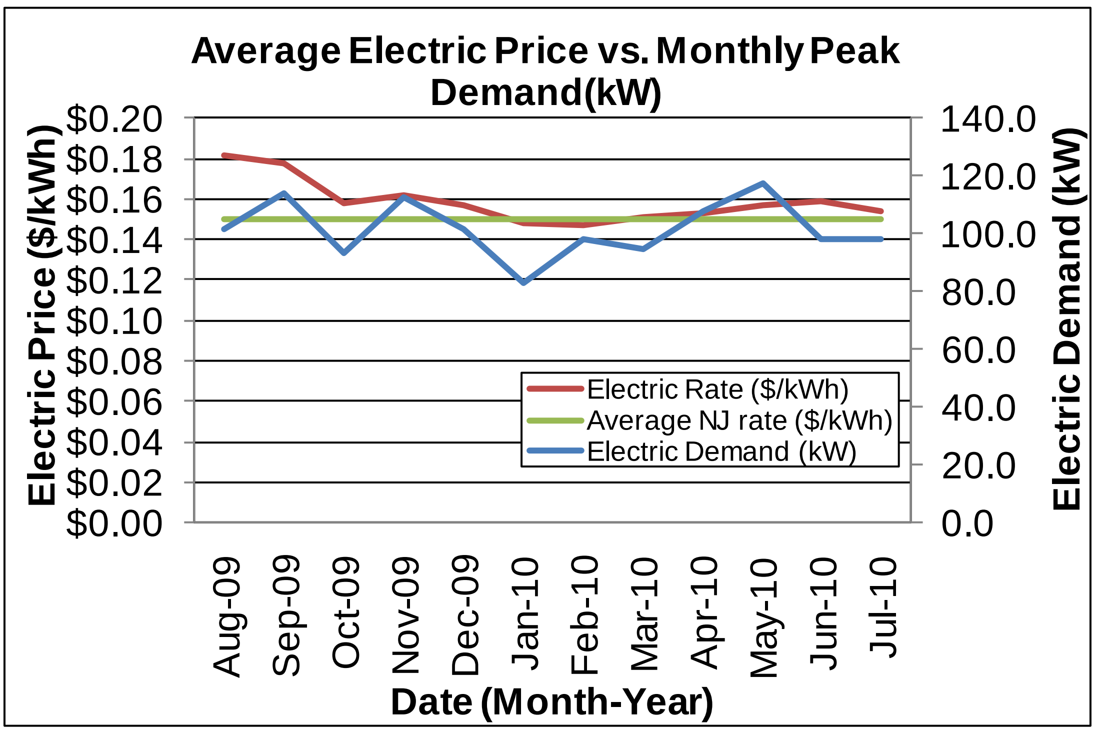
Tariff analysis is performed to determine if the rate that a building is contracted to pay with each utility provider is the best rate possible resulting in the lowest costs for electric and gas provision. Typically, the natural gas prices increase during the heating months when natural gas is used for 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.

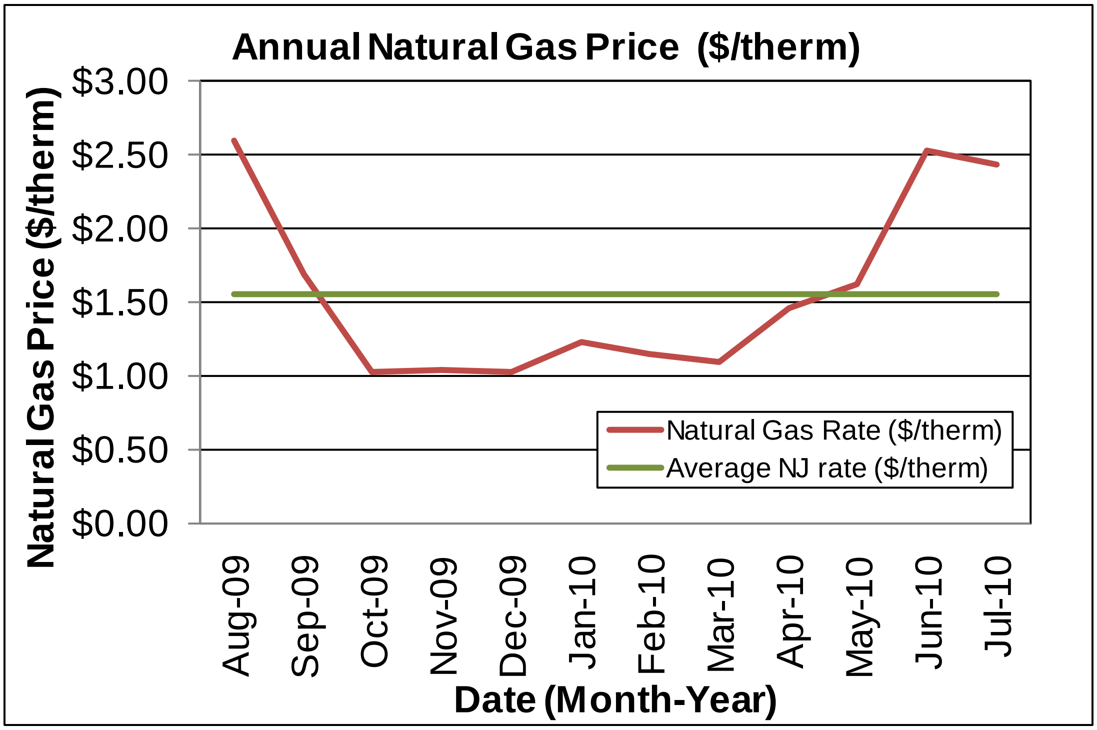
Energy Procurement strategies

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 Student Center building pays a rate of $0.158/kWh. The Student Center building annual electric utility costs are $3,216 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 19% over the most recent 12 month period.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while Student Center building pays a competitive rate of $1.165/therm. Natural gas bill analysis shows fluctuations up to 61% 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 Student Center 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 Student Center 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 four-story with partial basement, 29,957 square foot, Student Center building was originally built in 1923 with additions/renovations in pre-college occupancy 1962 and in 2003 with the Cafeteria and game room addition. The Student Center building houses classrooms, office areas, meeting rooms, a theater, storage spaces, mechanical rooms, and bathrooms.

North West Façade and Main Entrance

South West Façade

South East Façade

North West Facing Façade from roof of L Bldg

Building Occupancy Profiles

There are approximately 100-140 people in the building at any given time; approximately 100 employees and 1,000 students when the Student Center building is in use weekdays from 8am through 10pm (approximately 80 hours/week on average). The Student Center 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.

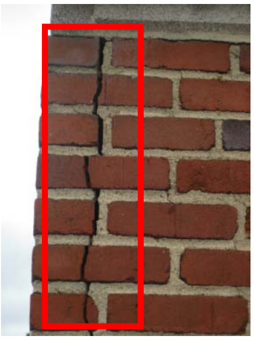
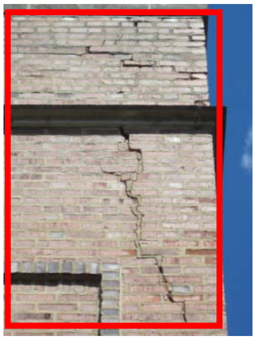
Exterior Walls

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 brick veneer with precast concrete sills. The newer wall sections (Cafeteria and game room additions) contain 8" CMU, no insulation, 4" brick veneer and 5/8" gypsum board or painted CMU interiors. There are many sections of brick veneer in need of repair (examples 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 poor, age-appropriate condition with numerous signs of uncontrolled moisture, air-leakage and other energy-compromising issues detected on all facades.

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


Cracked/deteriorated bricks and mortar joints

Insect nest near exterior wall

Overgrown ground vegetation touching/blocking exterior wall surfaces

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. This roof section was installed in 2007. Two to three inches of rigid insulation on plywood and steel decking of rigid roof insulation was recorded.

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


Old lighting fixtures near scupper


EPDM membrane over entrance


Single pane glass skylight over 4th floor – in need of repair/caulking

Base

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

Note: Slab/perimeter insulation levels could not be verified in the field and are based on available construction plans.

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 double hung windows with an aluminum clad frame, clear single glazing and interior roller shades. A majority of windows have broken seals and are 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.

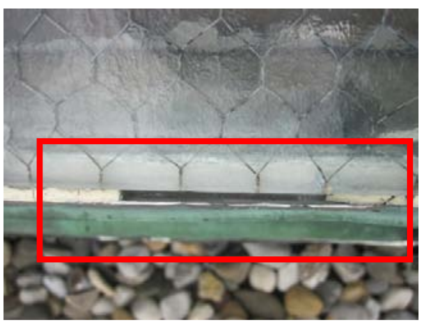
The Theater has original single pane stained glass panels. They appear to be in satisfactory condition.

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. SWA notes the windows to be in overall poor condition allowing large infiltration of outside air.


Windows seen from classroom with broken seals


Missing/aged sealants


Cracked or aged caulk around frame/sill on the exterior


Cracked or aged caulk around skylight glass panels


Cracked aged brittle caulk around perimeter of glass skylight

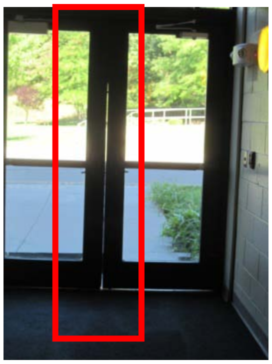

Original stained glass in theater

Exterior doors

The building contains two different types of exterior doors.

- There are glass-type exterior doors with aluminum/steel frame type. They are located at many building entrances 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

Building air-tightness

Overall, the field auditors found the building to be not adequately air-tight with numerous 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

The Student Center building has many separate heating/ventilation systems. Most of the building is cooled by window air conditioners. Kitchen and Game room are cooled by direct expansion roof top units with gas fired heating. The first and second floors of the 1923/1962 section are heated via radiators with steam provided by two cast iron boilers located in the basement boiler room. The third and fourth floors of the 1923/1962 building sections are heated with hot water baseboards served by two hot water boilers. Ventilation for the building is provided by two gas-fired heating and ventilation (H/V) units located on the roof.

Equipment

The D building contains two roof top packaged units, two H/V units, two steam boilers, two hot water boilers, and pumps. A comprehensive Equipment List can be found in Appendix A.

There are two roof-top gas fired packaged units with direct expansion (DX) system for cooling made up of an evaporator, condenser and refrigerant loop. These units serve the cafeteria and the game room respectively. Estimated combined total installed cooling capacity of these units is 23 tons. The units were manufactured by Trane and installed in 2004 and have about 60% remaining service life. They appear to be in good condition. The various spaces of the building are provided ventilation by outside air intake louvers on these rooftop units. The outside air louvers are motorized to allow economizer operation when the outside air conditions are favorable.

There are two Reznor heating and ventilation units that provide ventilation to the main building. The units have gas fired heating and no cooling. These units were installed in 1994 and are operating beyond their service lives of approximately 15 years. The building is provided ventilation by outside air intake louvers on these units.

Roof Top Units serving Kitchen and Game room

Reznor RTU

Steam is produced by two (2) HB Smith boilers located in the boiler room. The boilers are rated for a capacity of 1,526 MBH each and were installed in 1996 and 1997 respectively. They still have about 40% of useful service life of 23 years as published in the 2007 ASHRAE HVAC Applications Handbook. The burners were upgraded to Johnson Burners in 1980's to fire with natural gas, and these burners were retrofitted for the new boilers in 1996. Estimated efficiency of these boilers is about 72%. There are two AO Smith steam condensate pumps located in the boiler room, 0.25kW each, that were installed in 2001and appear to be in good condition.

The heating hot water is produced by two (2) hot water boilers located on the fourth floor. The boilers were manufactured by Slant/Fin and have cast iron sections for heating. The boilers are rated for a capacity of 200 MBH each and were installed in the year 1991. They still have about 17% of useful service life of 23 years as published in the 2007 ASHRAE HVAC Applications Handbook. Estimated efficiency of these boilers is about 75%.

1st and 2nd floor steam boilers

3rd and 4th floor hot water boilers

First and second floors of the buildings are equipped with steam radiators majority of which were installed in 1932. As a consequence they are quite old and inefficient. Most of the steam radiators are equipped with manual valves while some have been retrofitted with Danfoss thermostatic valves. Third and fourth floors of the building are heated by hot water baseboards located under the windows. The baseboard units appear to be in reasonable condition.

There are approximately 37 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. Estimated total tons of WAC is about 55 tons. As a result, a total of 78 tons of cooling exist in this 29,147 square foot building, which is apparently adequate; however, the theater is not air conditioned. SWA estimates a total of approximately 100 tons of cooling requirement for this building if it were air-conditioned completely.


Steam radiator on ground floor


Steam radiators in Theater/Chapel


Manual valve on steam radiator

The Student Center building is provided ventilation by outside air intake louvers on the Reznor units and on the roof top packaged units. The outside air louvers on RTUs serving Kitchen and Game room are motorized to allow economizer operation when the outside air conditions are favorable. The Kitchen also contains a Loren Cook exhaust and make-up air fan for the kitchen hood. Both the supply and exhaust fans were installed in 2004 and are in good condition.

The Cafeteria is ventilated by two roof mounted mushroom type exhaust fans installed around 1985. Bathrooms throughout the building are exhausted by a Dayton centrifugal roof mounted exhaust fan that was installed in 1994. The Student Center building has general exhaust provided by two Penn fans interlocked with the Reznor H/V unit. The elevator machine room contains two Penn Zephyr cabinet exhaust fans installed in 2005. Both fans appear to be in good condition. There are two roof mounted mushroom type exhaust fans serving the theater/chapel believed to have been installed around 1932 that do not operate anymore.


Theater ventilation fan from 1932

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.

Hot water to the third and fourth floors is delivered via a Taco circulation pump with a 1/25 hp motor. It was installed in 2007 and is in good condition.

Controls

There is no building automation system (BAS) to monitor and control the HVAC equipment at this building.

Steam boilers are controlled directly from one programmable thermostat on the first floor. The thermostat is programmed to keep the boiler off during summer and to maintain a constant temperature without any night set-back for unoccupied modes during winter. The radiators manual valves were reported to have problems, and may result in blowing excess steam in individual spaces. As a result, the spaces would become overheated and occupants would have to open windows allowing ingress of cold outside air. This type of system fault would waste a lot of heat energy.

Hot water served on third and fourth floors is controlled by many zone thermostats. These thermostats are not programmable, and the hot water boilers have no set-back settings.

The Reznor H/V units are controlled from a time clock controller in fourth floor mechanical room, and then from thermostats located on second floor. It is programmed to run from 7am through 9pm when the college is in session. The units operate and provide ventilation year round.

Reznor unit controls

RTU for Kitchen and Game room

Steam boiler controls

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

Domestic Hot Water

The domestic hot water (DHW) for the Student Center building is provided by a natural gas-fired AO Smith, 199 MBH input domestic hot water heater with 81 gal storage. It has an estimated efficiency of 80%. This DHW heater was installed in 2006 and is in good condition.

Gas fired AO Smith 81 gal DHW

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 Student Center 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.

100W incandescent flood lamp found
in recessed fixture in Theater

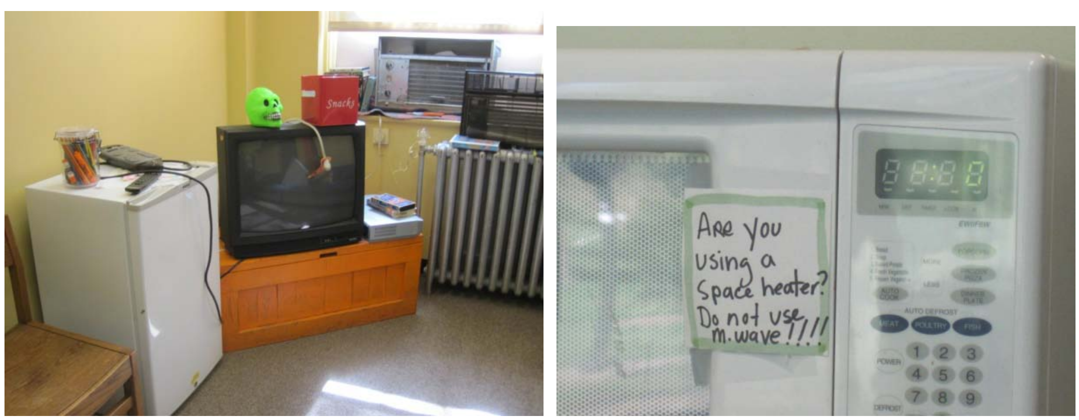
Exit Lights - Exit signs were found to be LED type and incandescent type. The Area of Rescue signs contain incandescent lamps.

LED exit sign next to incandescent Area of Rescue sign

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.

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.



Personal refrigerators, TVs, microwaves, and space heaters contribute to plug loads

Elevators

The Student Center building has one Electro-Hydraulic Power Unit hydraulic elevator with a 30 HP motor, type U10, model No. 1. It is rated for 208V, 3 phase, and 60 Hz. 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 Student Center 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 Student Center building has approximately 104 solar panels generating a maximum of 30 kW installed on the roof.

Solar PV panels on the building roof

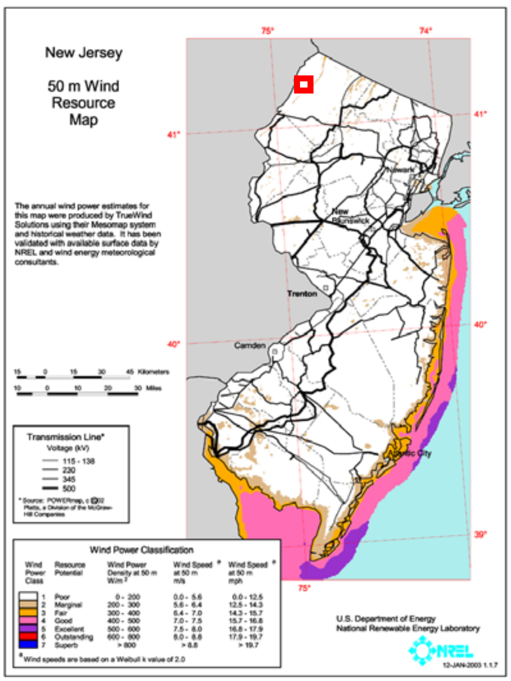
Evaluated Systems

Solar Thermal Collectors

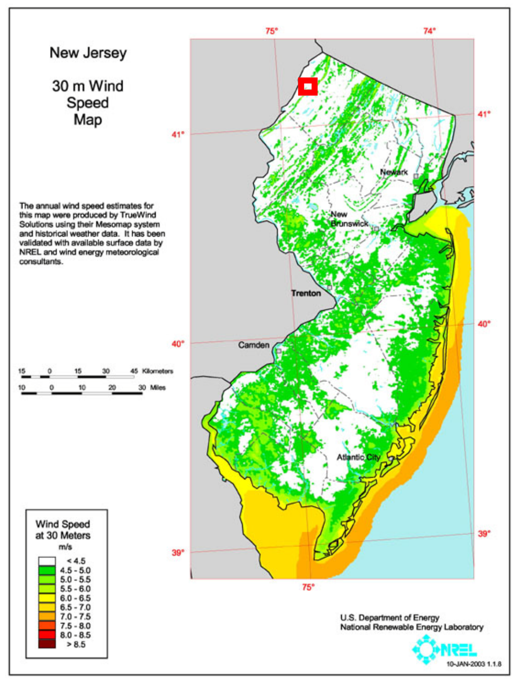
Solar thermal collectors are not cost-effective for this building and would not be recommended due to the insufficient and intermittent use of domestic hot water throughout the building to justify the expenditure.

Wind

The Student Center 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 Student Center building has approximately 37 window air conditioners (WAC) with varying capacities and ages. SWA recommends replacing all WACs with a central system comprising water source heat pumps for classrooms and extend air conditioning to other spaces not conditioned presently such as the Theater. The new system would cost approximately $1M and is categorized as capital improvement as the energy savings will be marginal, if any. This system can be extended to include a geothermal heat pumps system complete with a vertical ground bore loop. The incremental benefits of a geothermal system usually result in a simple pay back of 4-6 years and is highly recommended. The incremental cost of incorporating a geothermal loop is approximately $400,000.

Combined Heat and Power

The Student Center 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	Retrofit 1 existing refrigerated vending machine with VendingMiser™ device	199	1,612	0	0.2	255	10	0.8	118	1,952	2,886
2	Retrofit 3 existing refrigerated chillers with CoolerMiser™ devices	597	4,836	0	0.6	764	10	0.8	118	5,855	8,659
3	Install 40 new CFL fixtures	392	1,339	5.1	0.2	431	5	0.9	144	1,568	2,454
4	Retrofit 1 existing vending machine with SnackMiser™ device	99	387	0	0.0	61	10	1.6	52	417	693
5	Install 11 new Motion sensors with incentives	2,200	8,425	0	1.0	1,331	15	1.7	54	13,464	15,085
6	Install 3 new Daylight sensors with incentives	585	1,696	0	0.2	285	15	2.1	45	2,768	3,037
7	Install 53 new Occupancy sensors with incentives	10,600	17,014	0	1.9	2,688	15	3.9	19	21,032	30,464
8	Install 10 new LED exit signs with incentives	1,305	1,489	0	0.2	266	15	4.9	16	1,828	2,666
9	Install 69 new T8 fixtures with incentives	12,644	6,510	0	0.7	1,856	15	6.8	15	9,191	11,656
10	Install 17 new Pulse start metal halide fixtures with incentives	12,400	5,777	0.6	0.7	970	15	12.8	2	-980	10,350
11	Install heat recovery units	67,000	10,433	3117	11.6	5,280	30	12.7	5	33,860	53,039
12	Install programmable thermostats for RTUs	2,600	6,950	474	2.4	1,650	15	1.6	57	16,819	17,669
13	Install programmable thermostats for HW boiler	1,800	-	811	2.7	945	15	1.9	46	9,318	8,940
14	Replace (2) 5HP motors on H/V units with premium efficiency motors	1,020	2,590	0	0.3	409	20	2.5	35	4,957	4,637
15	Replace all four boilers	24,000	-	2500	8.3	2,913	30	8.2	9	31,638	27,558
16	Install new Building Management System	100,000	6,950	3597	12.8	6,039	12	16.6	-2	-40,603	52,094
17	Replace windows throughout building (approx 138)	276,000	13,386	4209	15.6	7,018	30	39.3	-1	-141,924	70,363
	TOTALS	513,441	89,394	14,714	59.4	33,161		15.5	-	-	322,249

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: Retrofit 1 Existing Refrigerated Vending Machine with VendingMiser™ Device

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: $199 (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 existing refrigerated vending machine with VendingMiser™ device	199	0	199	1,612	0.0	0	0.2	0	255	10	2,547	0.8	118	128	1,952	2,886

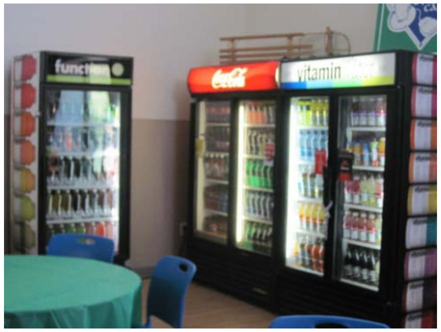
Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA assumes energy savings based on modeling calculator found at www.usatech.com or http://www.usatech.com/energy_management/energy_calculator.php .

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.

ECM#2: Retrofit 3 Existing Refrigerated Chillers with CoolerMiser™ 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 existing refrigerated chillers with CoolerMiser™ devices	597	0	597	4,836	0.1	0	0.6	0	764	10	7,641	0.8	118	128	5,855	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.

ECM#3: Install 40 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: $392 (Includes $117 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
Install 40 new CFL fixtures	392	0	392	1,339	0.0	5.1	0.2	213	431	5	2,153	0.9	144	107	1,568	2,454

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 6 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#4: Retrofit 1 Existing Vending Machine with SnackMiser™ Device

Energy vending miser devices are now available for conserving energy used by snack vending machines. 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 existing vending machine with SnackMiser™ device	99	0	99	387	0.0	0	0.0	0	61	10	611	1.6	52	61	417	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.

ECM#5: Install 11 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: $2,200 (includes $726 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
Install 11 new Motion sensors with incentives	2,420	220	2,200	8,425	0.2	0	1.0	0	1,331	15	19,967	1.7	54	60	13,464	15,085

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 $220.

Please see Appendix F for more information on Incentive Programs.

ECM#6: Install 3 New Daylight 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 an area 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: $585 (Includes $198 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
Install 3 new Daylight sensors with incentives	660	75	585	1,696	0.0	0	0.2	17	285	15	4,275	2.1	45	48	2,768	3,037

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 ($25 per control) - Maximum incentive amount is $75.

Please see Appendix F for more information on Incentive Programs.

ECM#7: Install 53 New 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: $10,600 (Includes $3,498 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
Install 53 new Occupancy sensors with incentives	11,660	1,060	10,600	17,014	0.4	0	1.9	0	2,688	15	40,323	3.9	19	23	21,032	30,464

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 $1,060.

Please see Appendix F for more information on Incentive Programs.

ECM#8: Install 10 new LED exit signs

During the field audit, SWA completed a building lighting inventory (see Appendix B). SWA observed that the building contains a number of incandescent Exit signs. SWA recommends replacing these with LED type. Replacing existing Exit signs with LED Exit signs can result in lower kilowatt-hour consumption, as well as lower maintenance costs. Since Exit signs operate 24 hours per day, they can consume large amounts of energy. In addition, older Exit signs require frequent maintenance due to the short life span of the lamps that light them. LED Exit sign last at least 5 years. In addition, LED Exit signs offer better fire code compliance because they are maintenance free in excess of 10 years. LED Exit signs are usually brighter than comparable incandescent or fluorescent signs, and have a greater contrast with their background due to the monochromatic nature of the light that LEDs emit. 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: $1,305 (Includes $451 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
Install 10 new LED exit signs with incentives	1,505	200	1,305	1,489	0.0	0	0.2	31	266	15	3,994	4.9	16	17	1,828	2,666

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 hr/yr to replace aging burnt out lamps/ballasts vs. newly installed and included this with the annual savings.

Rebates/financial incentives:

NJ Clean Energy - LED Exit Signs ($20 per fixture) - Maximum incentive amount is $200.

Please see Appendix F for more information on Incentive Programs.

ECM#9: Install 69 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: $12,644 (Includes $1,035 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
Install 69 new T8 fixtures with incentives	13,679	1,035	12,644	6,510	0.1	0	0.7	827	1,856	15	27,834	6.8	15	10	9,191	11,656

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 $1,035.

Please see Appendix F for more information on Incentive Programs.

ECM#10: Install 17 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: $12,400 (Includes $3,847 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
Install 17 new Pulse start metal halide fixtures with incentives	12,825	425	12,400	5,777	0.1	0	0.7	57	970	15	14,546	12.8	2	-1	-989	10,344

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 $425.

Please see Appendix F for more information on Incentive Programs.

ECM#11: Install Heat Recovery Units

SWA noted two Reznor heating and ventilation units that provide ventilation only to the main building. These work in conjunction with two exhaust fans, respectively, to balance the air pressure within the building. Currently, the exhaust fans exhaust the conditioned air. SWA recommends replacing both these systems with two, new, Heat Recovery Unit (HRU) systems. Generally, heat recovery is intended to extract heat from exhaust air prior to being exhausted. It can be recovered in a variety of ways – one, by installing small fan powered four ducts air to air heat exchanger boxes generally called Energy Recovery Ventilators (ERVs), two, by a fan powered heat recovery unit with a rotating sensible heat recovery wheel, and three, by installing simple air to air heat exchanger with no moving parts. SWA recommends using a rotating sensible heat recovery wheel. If required, DX cooling can be added as part of the HRU to condition the incoming air during summer; however, SWA did not consider this option in the proposed design. SWA estimated the cost and benefit of installing the HRU based on the air volume of the existing equipment. The heat recovery unit will save heating therms during winter and indirectly save cooling kWh during summer too as the incoming air will be at a relatively lower temperature.

Installation cost:

Estimated installed cost: $67,000 (estimated labor cost $32,000)
Source of cost estimate: RS Means and other projects

Economics (with no incentives):

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 heat recovery units	67,000	0	67,000	10,433	3.1	3117	11.6	0	5,280	30	158,392	12.7	5	-1	33,860	53,039

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. SWA estimated the savings arising only during the occupied hours and assumed that the units remain off during unoccupied hours from the time controller. SWA assumed the heat exchanger efficiency of 65% to calculate the savings using bin analysis.

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#12 & 13: Install Programmable Thermostats

There are two gas fired heating and DX cooling roof top package units serving Kitchen and Game room respectively. Currently, they are controlled from manual thermostats and remain on 24/7. They also provide a constant amount of fresh air to these areas at all times. SWA recommends that the Sussex Community College install two (2) new programmable thermostats and a new central controller to program schedules from a computer. In the new proposed settings, most equipment would operate at minimum settings and remain off during unoccupied hours in summer and shoulder seasons. The proposed temperature settings may be as follows:

	Summer		Winter		Shoulder	
	Occupied	**Unoccupied**	**Occupied**	**Unoccupied**	**Occupied**	**Unoccupied**
Proposed settings	78F	Off	62F	62F	Off	Off

This schedule cannot be achieved with the existing thermostats as they have limited programming capability and would require intervention at the onset of a new season. The intention is to turn down the set point temperature during unoccupied modes in winter, and to shut down the units completely during unoccupied modes of other seasons. Savings will be realized as a result of ventilation heating savings, fan energy savings, and cooling energy savings.

Also, the hot water boiler on the fourth floor continues to work during unoccupied mode at day time occupied mode settings. SWA recommends installing a programmable thermostat with night set back capabilities to control the boiler operation. The same controller for the RTUs can be wired to operate the thermostat and boilers.

Installation cost:

Estimated installed cost: $4,400 (includes $2,000 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
Install programmable thermostats for RTUs	2,600	0	2,600	6,950	2.1	474	2.4	0	1,650	15	24,755	1.6	57	63	16,819	17,669
Install programmable thermostats for HW boiler	1,800	0	1,800	-	0.0	811	2.7	0	945	15	14,172	1.9	46	52	9,318	8,940

Assumptions: SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. SWA used the bin analysis to estimate the savings. SWA assumed the winter night setback temperature would be reduced to 62 deg F and the units will be shut down during unoccupied modes of other seasons. SWA assumed a loading factor of 70% to calculate the fan savings. SWA assumed a total of 3,200 off peak hours for the unit from which savings are realized. SWA split the cost of the central controller equally for the two measures.

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#14: *Install NEMA Premium Efficiency Motors on H/V units*

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 motors on the two Reznor heating and ventilation units are of standard efficiency. SWA recommends replacing these motors with premium efficiency motors.

Installation cost:

Estimated installed cost: $1,020 (estimated labor cost $150)
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 (2) 5HP motors on H/V units with premium efficiency motors	1,140	120	1,020	2,590	0.8	0	0.3	0	409	20	8,184	2.5	35	39	4,957	4,637

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 5,500 hours for supply fan motor.

Rebates/financial incentives:

NJ Clean Energy - Premium three-phase motors ($45-$700 per motor): for 5 hp motors - $60/motor; maximum incentive available is $120.

Please see Appendix F for more information on Incentive Programs.

ECM #15: *Replace Existing Hot Water and Steam Boilers*

The existing HB Smith steam boilers (2) rated for 1,526 MBH each are estimated to run at 75% efficiency. The existing Slant/Fin hot water boilers (2) are estimated to run at 72% efficiency. SWA recommends replacing all four boilers under this measure with two new boilers. 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. From the heating usage pattern of the building, SWA inferred that steam boilers are highly oversized. The total installed boiler capacity is about 3,500 MBH, while SWA estimates only 800MBH would be enough given that there are gas fired heating sources also available in the building. Suggested new boiler capacity is about 400MBH each.

SWA determined the simple payback of replacing the existing steam boiler with a hot water boiler to be around 8.2 years as per the Economics below. This measure cannot be carried out just as recommended; it will also require some capital improvement associated with a changeover of steam pipes and coils to hot water pipes and coils. The estimated cost of this replacement is $120,000, and results in a simple payback of around 49 years with all the factors considered. SWA only shows the economics of the boiler replacement below to throw light on the energy savings and economics arising only from the boiler replacements.

Installation cost

Estimated installed cost: $24,000 (estimated labor cost of $8,500)
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 all four boilers	25,400	1,400	24,000	-	0.0	2500	8.3	0	2,913	30	87,375	8.2	9	6	31,638	27,558

Assumptions: SWA assumed the efficiency of the new condensing boilers as 90% for calculating the therms saved and that of the existing boilers, combined, as 75%. SWA did not estimate the effect of converting the steam system to hot water system as part of this measure. SWA estimated a total of 9,000 therms of heating delivered by the boiler systems to the building presently using the bin analysis and billing analysis.

Rebates/financial incentives: *NJ Clean Energy - Gas-fired boilers ≤ 1500 MBH and 90%+ AFUE ($1.75 per MBH) – Maximum incentive amount is $1,400 for both boilers.*

Please see Appendix F for more information on Incentive Programs.

ECM#12: *Install new Building Management System*

There is no building management system at this building. 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. Please note that savings below are duplicative in the sense that the savings may already have been accounted for in some of the earlier ECMs.

Installation cost:

Estimated installed cost: $100,000 (estimated labor cost $50,000)
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	100,000	0	100,000	6,950	2.1	3597	12.8	750	6,039	12	72,463	16.6	-2	-5	-40,603	52,094

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 2000 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 is no incentive available for this measure at this time.

Please see Appendix F for more information on Incentive Programs.

ECM#17: *Replace Windows*

The building contains double hung windows with an aluminum clad frame, clear single glazing and interior roller shades. A majority of windows have broken seals and are difficult to operate. The perimeter caulking is cracked, brittle from age and weather, and should be replaced. Many of the windows are inoperable, or difficult to operate. A single pane window has little insulating value (approximately R-1) 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 windows on the entire building with double pane windows.

Installation cost:

Estimated installed cost: $276,000 (includes $105,000 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 throughout building (approx 138)	276,000	0	276,000	13,386	4.0	4209	15.6	0	7,018	30	210,554	39.3	-1	n/a	-141,924	70,363

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 is no incentive available for this measure at this time.

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 Student Center building:

- Replace exhaust fans- There are seven roof mounted mushroom type exhaust fans which serve the bathrooms, cafeteria, theater, and general building. SWA recommends replacing these exhaust fans which are operating past their estimated service lives of ten years. The estimated installed cost of seven new fans is $4,000.

- Replace window air conditioners - There are approximately 37 window air conditioners (WAC) serving the building. 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 system comprising water source heat pumps for classrooms and extend air conditioning to other spaces not conditioned presently such as the Theater. The new system would cost approximately $1M and is categorized as capital improvement as the energy savings will be marginal, if any. This system can be extended to include a geothermal heat pumps system complete with a vertical ground bore loop. The incremental benefits of a geothermal system usually result in a simple pay back of 4-6 years and is highly recommended. The incremental cost of incorporating a geothermal loop is approximately $400,000.

- 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, 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.

- Replace thermostatic radiator valves - The Student Center building has steam radiators installed throughout the building. Thermostatic radiators valves, TRV's, are a simple, low cost, and effective method of controlling steam radiator heating. TRV's regulate the amount of steam through the radiator by controlling the venting of air. The valve is self-regulating, and consists of a valve and a sensor. As the space conditions change, the valve will respond to maintain the temperature set point. This avoids having to open windows to compensate for over-heating the space. The TRVs can be manually adjusted at the valve itself, or by a remote thermostat. The valves have a set point range of 41˚F to 78.8˚C, but can be limited to a smaller range through a minor adjustment. SWA recommends installing manual TRV valves on the steam supply for each radiator. This control upgrade would only be effective if the steam traps are operating properly and therefore the float-thermostatic steam straps on each radiator should be serviced before the TRVs are installed.

- Maintain downspouts and cap flashing - Repair/install missing downspouts and cap flashing as needed to prevent water/moisture infiltration and insulation damage. SWA recommends round downspout elbows to minimize clogging.

- 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 gpmaerators 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 $1,956.75. (or 25% of $7,827).

APPENDIX A: EQUIPMENT LIST

Inventory

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
Ventilation	Roof mounted mushroom type exhaust fan	Roof	Nameplate N/A	Elec.	Cafeteria general exhaust	est. 1985	0%
Ventilation	Roof mounted mushroom type exhaust fan	Roof	Nameplate N/A	Elec.	Cafeteria general exhaust	est. 1985	0%
H/V	MAU-1: 5400cfm, 540/432 in/out MBH, 5hp motor, 208/3/60	Roof	Reznor, nameplate N/A	Gas/Elec.	Whole building	1994	0%
H/V	MAU-1: 5400cfm, 540/432 in/out MBH, 5hp motor, 208/3/60	Roof	Reznor, nameplate N/A	Gas/Elec.	Whole building	1994	0%
Ventilation	EF-1: 4000 cfm, 1hp motor, interlocked with Reznor unit	Roof	Penn, model DX18B,	Elec.	General exhaust	1994	0%
Ventilation	EF-3: 2700 cfm, 3/4hp motor, 20 1/4" Belt drive, centrifugal fan, roof mounted mushroom type	Roof	Dayton, model 6D594	Elec.	Toilet exhaust	1994	0%
Ventilation	EF-2: 4000 cfm, 1hp motor, interlocked with Reznor unit	Roof	Penn, model DX18B,	Elec.	General exhaust	1994	0%
Ventilation	Roof mounted mushroom type exhaust fan	Roof	Nameplate N/A	Elec.	Theater/Chapel	1932	0%
Ventilation	Roof mounted mushroom type exhaust fan	Roof	Nameplate N/A	Elec.	Theater/Chapel	1932	0%
Heating	Boiler, Cast Iron Section, input/output 200/167 MBH, est. 75% eff.	Boiler room, 4th floor	Slant/Fin, model GG-200 HP, S/N 523983	Gas	3rd and 4th floor	1991	17%
Heating	Boiler, Cast Iron Section, input/output 200/167 MBH, est. 75% eff.	Boiler room, 4th floor	Slant/Fin, model GG-200 HP, S/N 523984	Gas	3rd and 4th floor	1991	17%
Heating	Hot water circulation pump, 1/25HP, 115/1/60, 0.7A	Boiler room, 4th floor	Taco, model 007-F4	Elec.	3rd and 4th floor	2007	85%
Heating	Steam Boiler, 1526 MBH in, c/w Johnson Burner, type DH FG4GM, est. 72% eff	Boiler room	HB Smith, Series 28A-B, S/N N96-999	Gas	1st and 2nd floor	1996	39%
Heating	Steam Boiler, 1526 MBH in, c/w Johnson Burner, type DH FG4GM, est. 72% eff	Boiler room	HB Smith, Series 28A-B, S/N N96-1022	Gas	1st and 2nd floor	1997	43%
DHW	Domestic water heater, 199MBH in, 81 gallon tank, est. 80% eff.	Boiler room	AO Smith, model BTR 199 114, S/N F06M009032	Gas	Whole building	2006	69%
Ventilation	Cabinet exhaust fan, sheet metal, 115/1/60, 6.1 Amps, qty of 2	Basement	Penn Zephyr, model Z-11	Elec.	Elevator machine room	est. 2005	50%
Heating	Steam condensate pump unit, comprises 2 pumps, 0.25kW each, 3450 rpm, 115/1/60, 8.8Amps	Boiler room	AO Smith motor, U27-791	Elec.	Whole building	est. 2001	55%

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
HVAC	Roof top packaged unit, 3 tons cooling, DX, R-22, 208-230/3/60, MCA17.2, 1hp supply blower motor, 120/96 in/out MBH, c/w economizer	Kitchen roof	Trane, model YHC036A3RHA1EH0COC201A007, S/N 425102109L	Gas/Elec.	Game room	2004	60%
HVAC	Roof top packaged unit, 20 tons cooling, DX, R-22, 10hp supply fan motor, 208-230/3/60, MCA99, 400/324 in/out MBH, 10.2EER, c/w economizer	Kitchen roof	Trane, model YCH241C3H0CA, S/N 426100857D	Gas/Elec.	Cafeteria	2004	60%
Refrigeration	Condensing unit for walk in cooler, 208/3/60, 15 Amps, R-22	Kitchen roof	Heatcraft, model M0S008H23C, S/N T04 03690	Elec.	Kitchen, walk in cooler	2004	60%
Ventilation	Kitchen hood exhaust make up air fan, sheet metal, 1.5hp motor, 3650 cfm, 200/3/60	Kitchen roof	Loren Cook, model 150KSP, S/N 215S79172700/0002201	Elec.	Kitchen	2004	60%
Ventilation	Kitchen hood exhaust fan, sheet metal, 2hp motor, 4750 cfm, 200/3/60	Kitchen roof	Loren Cook, model 245VCRH, S/N 215S79172700/0000701	Elec.	Kitchen	2004	60%
DHW	Domestic hot water circulation pump, 1/25HP, 115/1/60, 0.76A	Boiler room	Taco, model 007-BF5	Elec.	Whole building	2007	77%

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	Bathroom Women	Recessed Parabolic	E	4'T8	10	2	32	Sw	7	345	5	690	1,666	C	Recessed Parabolic	4'T8	E	OS	10	2	32	5	345	5	690	1250	0	417	417
2	3	Bathroom Women	Recessed Parabolic	M	4'T12	1	4	40	Sw	7	345	12	172	415	T8	Recessed Parabolic	4'T8	E	OS	1	4	32	5	345	5	133	241	94	80	174
3	3	Bathroom Women	Ceiling Mounted	S	CFL	1	2	13	Sw	7	345	0	26	63	N/A	Ceiling Mounted	CFL	S	Sw	1	2	13	7	345	0	26	63	0	0	0
4	3	Bathroom Men	Recessed Parabolic	E	4'T8	6	2	32	Sw	7	345	5	414	1,000	C	Recessed Parabolic	4'T8	E	OS	6	2	32	5	345	5	414	750	0	250	250
5	3	Bathroom Men	Recessed Parabolic	M	4'T12	1	4	40	Sw	7	345	12	172	415	T8	Recessed Parabolic	4'T8	E	OS	1	4	32	5	345	5	133	241	94	80	174
6	3	Bathroom Men	Ceiling Mounted	S	CFL	1	2	13	Sw	7	345	0	26	63	N/A	Ceiling Mounted	CFL	S	Sw	1	2	13	7	345	0	26	63	0	0	0
7	3	Hallway	Recessed Parabolic	M	4'T12	13	4	40	Sw	12	345	12	2,236	9,257	T8	Recessed Parabolic	4'T8	E	MS	13	4	32	9	345	5	1729	5369	2099	1790	3888
8	3	Janitor's Closet	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
9	3	Janitor's Closet	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
10	3	Hallway	Exit Sign	S	Fl.	3	1	15	N	24	365	2	50	434	LEDex	Exit Sign	LED	S	N	3	1	5	24	365	1	17	145	289	0	289
11	3	Hallway	Exit Sign	S	LED	3	1	5	N	24	365	1	17	145	N/A	Exit Sign	LED	S	N	3	1	5	24	365	1	17	145	0	0	0
12	3	Classroom (D304)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
13	3	Classroom (D311)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
14	3	Classroom (D306)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
15	3	Classroom (D310)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
16	3	Classroom (D307)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
17	3	Classroom (D309)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
18	3	Storage Rm	Recessed Parabolic	E	4'T8	1	4	32	Sw	1	345	5	133	46	N/A	Recessed Parabolic	4'T8	E	Sw	1	4	32	1	345	5	133	46	0	0	0
19	3	Staircase	Wall Mounted	S	CFL	11	2	13	Sw	12	345	0	286	1,184	C	Wall Mounted	CFL	S	DL	11	2	13	9	345	0	286	888	0	296	296
20	3	Staircase	Exit Sign	E	Fl.	2	2	15	N	24	365	2	63	552	LEDex	Exit Sign	LED	E	N	2	1	5	24	365	1	11	96	456	0	456
21	3	Office (D305)	Recessed Parabolic	M	4'T12	2	4	40	Sw	7	345	12	344	831	T8	Recessed Parabolic	4'T8	E	OS	2	4	32	5	345	5	266	482	188	161	349
22	3	Office (D320)	Recessed Parabolic	M	4'T12	3	4	40	Sw	7	345	12	516	1,246	T8	Recessed Parabolic	4'T8	E	OS	3	4	32	5	345	5	399	723	283	241	523
23	3	Classroom (D312)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
24	3	Office (D318)	Recessed Parabolic	M	4'T12	4	4	40	Sw	7	345	12	688	1,662	T8	Recessed Parabolic	4'T8	E	OS	4	4	32	5	345	5	532	964	377	321	698
25	3	Office (D319)	Recessed Parabolic	M	4'T12	4	4	40	Sw	7	345	12	688	1,662	T8	Recessed Parabolic	4'T8	E	OS	4	4	32	5	345	5	532	964	377	321	698
26	3	Office (D317)	Recessed Parabolic	M	4'T12	4	4	40	Sw	7	345	12	688	1,662	T8	Recessed Parabolic	4'T8	E	OS	4	4	32	5	345	5	532	964	377	321	698
27	3	Office (D313)	Recessed Parabolic	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
28	3	Office (D313)	Recessed Parabolic	E	4'T8	6	3	32	Sw	7	345	5	606	1,463	C	Recessed Parabolic	4'T8	E	OS	6	3	32	5	345	5	606	1098	0	366	366
29	3	Office	Recessed Parabolic	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
30	3	Staircase	Wall Mounted	S	CFL	11	2	13	Sw	12	365	0	286	1,253	C	Wall Mounted	CFL	S	DL	11	2	13	9	365	0	286	940	0	313	313
31	3	Staircase	Exit Sign	E	Fl.	2	2	15	N	24	365	2	63	552	LEDex	Exit Sign	LED	E	N	2	1	5	24	365	1	11	96	456	0	456
32	2	Bathroom Women	Recessed Parabolic	E	4'T8	10	2	32	Sw	7	345	5	690	1,666	C	Recessed Parabolic	4'T8	E	OS	10	2	32	5	345	5	690	1250	0	417	417
33	2	Bathroom Women	Recessed Parabolic	E	4'T8	1	4	32	Sw	7	345	5	133	321	C	Recessed Parabolic	4'T8	E	OS	1	4	32	5	345	5	133	241	0	80	80
34	2	Bathroom Women	Ceiling Mounted	S	CFL	1	2	13	Sw	7	345	0	26	63	N/A	Ceiling Mounted	CFL	S	Sw	1	2	13	7	345	0	26	63	0	0	0
35	2	Bathroom Men	Recessed Parabolic	E	4'T8	6	2	32	Sw	7	345	5	414	1,000	C	Recessed Parabolic	4'T8	E	OS	6	2	32	5	345	5	414	750	0	250	250
36	2	Bathroom Men	Recessed Parabolic	E	4'T8	1	4	32	Sw	7	345	5	133	321	C	Recessed Parabolic	4'T8	E	OS	1	4	32	5	345	5	133	241	0	80	80
37	2	Bathroom Men	Ceiling Mounted	S	CFL	1	2	13	Sw	7	345	0	26	63	N/A	Ceiling Mounted	CFL	S	Sw	1	2	13	7	345	0	26	63	0	0	0
38	2	Hallway	Recessed Parabolic	E	4'T8	13	4	32	Sw	12	345	5	1,729	7,158	C	Recessed Parabolic	4'T8	E	MS	13	4	32	9	345	5	1729	5369	0	1790	1790
39	2	Janitor's Closet	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
40	2	Janitor's Closet	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
41	2	Hallway	Exit Sign	S	Fl.	3	1	15	N	24	365	2	50	434	LEDex	Exit Sign	LED	S	N	3	1	5	24	365	1	17	145	289	0	289
42	2	Hallway	Exit Sign	S	LED	3	1	5	N	24	365	1	17	145	N/A	Exit Sign	LED	S	N	3	1	5	24	365	1	17	145	0	0	0
43	2	Classroom (D210)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
44	2	Classroom (D215)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
45	2	Classroom (D214)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
46	2	Classroom (D213)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
47	2	Classroom (D211)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
48	2	Storage Rm	Recessed Parabolic	E	4'T8	1	4	32	Sw	2	345	5	133	92	N/A	Recessed Parabolic	4'T8	E	Sw	1	4	32	2	345	5	133	92	0	0	0
49	2	Office (D203E)	Recessed Parabolic	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
50	2	Storage Closet (D203A)	Recessed Parabolic	E	4'T8	1	3	32	Sw	1	345	5	101	35	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	1	345	5	101	35	0	0	0
51	2	Classroom (D203)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
52	2	Classroom (D204)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
53	2	Classroom (D209)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
54	2	Classroom (D208)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
55	2	Classroom (D207)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
56	2	Classroom (D205)	Recessed Parabolic	E	4'T8	6	4	32	Sw	6	345	5	798	1,652	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1239	0	413	413
57	2	Storage Rm	Recessed Parabolic	E	4'T8	1	4	32	Sw	1	345	5	133	46	N/A	Recessed Parabolic	4'T8	E	Sw	1	4	32	1	345	5	133	46	0	0	0
58	1	Staircase	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
59	1	Staircase	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
60	1	Lobby	Ceiling Mounted	S	CFL	33	3	13	Sw	12	345	0	1,287	5,328	C	Ceiling Mounted	CFL	S	MS	33	3	13	9	345	0	1287	3996	0	1332	1332
61	1	Lobby	Ceiling Mounted	E	4'T8	12	2	32	Sw	12	345	5	828	3,428	C	Ceiling Mounted	4'T8	E	MS	12	2	32	9	345	5	828	2571	0	857	857
62	1	Lobby	Ceiling Mounted	S	CFL	2	3	13	Sw	12	345	0	78	323	N/A	Ceiling Mounted	CFL	S	Sw	2	3	13	12	345	0	78	323	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)
63	1	Lobby	Recessed	S	CFL	13	2	13	Sw	12	345	0	338	1,399	C	Recessed	CFL	S	MS	13	2	13	9	345	0	338	1049	0	350	350
64	1	Lobby	Recessed Parabolic	E	4'T8	6	2	32	Sw	12	345	5	414	1,714	C	Recessed Parabolic	4'T8	E	MS	6	2	32	9	345	5	414	1285	0	428	428
65	1	Lobby	Recessed	S	CFL	5	2	13	Sw	12	345	0	130	538	C	Recessed	CFL	S	MS	5	2	13	9	345	0	130	404	0	135	135
66	1	Hallway	Recessed Parabolic	E	4'T8	2	4	32	Sw	12	345	5	266	1,101	C	Recessed Parabolic	4'T8	E	MS	2	4	32	9	345	5	266	826	0	275	275
67	1	Hallway	Recessed Parabolic	M	4'T12	7	4	40	Sw	12	345	12	1,204	4,985	T8	Recessed Parabolic	4'T8	E	MS	7	4	32	9	345	5	931	2891	1130	964	2094
68	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
69	1	Lobby	Recessed Parabolic	E	4'T8	1	4	32	Sw	12	345	5	133	551	C	Recessed Parabolic	4'T8	E	MS	1	4	32	9	345	5	133	413	0	138	138
70	1	Lobby	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
71	1	Theatre	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
72	1	Theatre	Recessed	S	Inc	37	1	75	Sw	2	345	0	2,775	1,915	CFL	Recessed	CFL	S	Sw	37	1	25	2	345	0	925	638	1277	0	1277
73	1	Theatre	Recessed	S	Inc	1	2	60	Sw	1	345	0	120	41	CFL	Recessed	CFL	S	Sw	1	2	20	1	345	0	40	14	28	0	28
74	1	Hallway	Recessed Parabolic	E	4'T8	2	4	32	Sw	16	345	5	266	1,468	C	Recessed Parabolic	4'T8	E	MS	2	4	32	12	345	5	266	1101	0	367	367
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	Marketing Office	Recessed Parabolic	E	4'T8	6	4	32	Sw	7	345	5	798	1,927	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1445	0	482	482
77	1	Marketing Office	Recessed Parabolic	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
78	1	Payroll office	Recessed Parabolic	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
79	1	Payroll office	Recessed Parabolic	M	2'T12	1	4	20	Sw	7	345	6	86	208	T8	Recessed Parabolic	2'T8	E	Sw	1	4	17	7	345	2	70	169	39	0	39
80	1	Lounge (D113)	Recessed Parabolic	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
81	1	Office (D110)	Recessed Parabolic	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
82	1	Office	Recessed Parabolic	E	4'T8	6	4	32	Sw	7	345	5	798	1,927	C	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1445	0	482	482
83	1	Office (D110B)	Recessed Parabolic	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
84	1	Office (D110B)	Recessed Parabolic	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
32	1	Bathroom Women	Recessed Parabolic	E	4'T8	10	2	32	Sw	7	345	5	690	1,666	C	Recessed Parabolic	4'T8	E	OS	10	2	32	5	345	5	690	1250	0	417	417
33	1	Bathroom Women	Recessed Parabolic	E	4'T8	1	4	32	Sw	7	345	5	133	321	C	Recessed Parabolic	4'T8	E	OS	1	4	32	5	345	5	133	241	0	80	80
34	1	Bathroom Women	Ceiling Mounted	S	CFL	1	2	13	Sw	7	345	0	26	63	N/A	Ceiling Mounted	CFL	S	Sw	1	2	13	7	345	0	26	63	0	0	0
35	1	Bathroom Men	Recessed Parabolic	E	4'T8	6	2	32	Sw	7	345	5	414	1,000	C	Recessed Parabolic	4'T8	E	OS	6	2	32	5	345	5	414	750	0	250	250
36	1	Bathroom Men	Recessed Parabolic	E	4'T8	1	4	32	Sw	7	345	5	133	321	C	Recessed Parabolic	4'T8	E	OS	1	4	32	5	345	5	133	241	0	80	80
37	1	Bathroom Men	Ceiling Mounted	S	CFL	1	2	13	Sw	7	345	0	26	63	N/A	Ceiling Mounted	CFL	S	Sw	1	2	13	7	345	0	26	63	0	0	0
91	1	Office (D105A)	Recessed Parabolic	M	4'T12	4	4	40	Sw	7	345	12	688	1,662	T8	Recessed Parabolic	4'T8	E	OS	4	4	32	5	345	5	532	964	377	321	698
92	1	Office (D1050)	Recessed	S	CFL	5	2	13	Sw	7	345	0	130	314	C	Recessed	CFL	S	OS	5	2	13	5	345	0	130	235	0	78	78
93	1	Office (D1051)	Recessed Parabolic	M	4'T12	2	4	40	Sw	7	345	12	344	831	T8	Recessed Parabolic	4'T8	E	OS	2	4	32	5	345	5	266	482	188	161	349
94	1	Office (D1052)	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
95	1	Dining room	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
96	1	Dining room	Recessed	S	CFL	6	2	13	Sw	7	345	0	156	377	C	Recessed	CFL	S	OS	6	2	13	5	345	0	156	283	0	94	94
97	1	Dining room	Recessed Parabolic	M	4'T12	6	4	40	Sw	7	345	12	1,032	2,492	T8	Recessed Parabolic	4'T8	E	OS	6	4	32	5	345	5	798	1445	565	482	1047
98	1	Cafeteria	Ceiling Mounted	S	MH	10	1	250	Sw	7	345	70	3,200	7,728	PSMH	Ceiling Mounted	PSMH	S	DL	10	1	150	5	345	30	1800	3260	3381	1087	4468
99	1	Cafeteria	Exit Sign	S	LED	3	1	5	N	24	365	1	17	145	N/A	Exit Sign	LED	S	N	3	1	5	24	365	1	17	145	0	0	0
100	1	Cafeteria	Recessed Parabolic	E	4'T8	3	3	32	Sw	8	345	5	303	836	N/A	Recessed Parabolic	4'T8	E	Sw	3	3	32	8	345	5	303	836	0	0	0
101	1	Game Room	Ceiling Mounted	E	4'T8	12	3	32	Sw	7	345	5	1,212	2,927	C	Ceiling Mounted	4'T8	E	OS	12	3	32	5	345	5	1212	2195	0	732	732
102	1	Kitchen	Ceiling Mounted	E	4'T8	10	3	32	Sw	7	345	5	1,010	2,439	C	Ceiling Mounted	4'T8	E	OS	10	3	32	5	345	5	1010	1829	0	610	610
103	1	Kitchen bath	Recessed Parabolic	E	4'T8	1	3	32	Sw	2	345	5	101	70	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	2	345	5	101	70	0	0	0
104	1	Kitchen	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
105	Bsmt	Mechanical Rm	Ceiling Mounted	M	4'T12	7	2	40	Sw	1	345	12	644	222	T8	Ceiling Mounted	4'T8	E	Sw	7	2	32	1	345	5	483	167	56	0	56
106	Bsmt	Mechanical Rm	Ceiling Suspended	M	4'T12	3	2	40	Sw	1	345	12	276	95	T8	Ceiling Suspended	4'T8	E	Sw	3	2	32	1	345	5	207	71	24	0	24
107	Bsmt	Mechanical Rm	Ceiling Mounted	S	Inc	2	1	75	Sw	1	345	0	150	52	CFL	Ceiling Mounted	CFL	S	Sw	2	1	25	1	345	0	50	17	35	0	35
108	1	Mail Room	Ceiling Mounted	M	4'T12	1	4	40	Sw	1	345	12	172	59	T8	Ceiling Mounted	4'T8	E	Sw	1	4	32	1	345	5	133	46	13	0	13
109	Ext	Exterior	Wall Mounted	S	MH	4	1	400	T	7	345	112	2,048	4,946	PSMH	Wall Mounted	PSMH	S	T	4	1	250	7	345	50	1200	2898	2048	0	2048
110	Ext	Exterior	Wall Mounted	S	CFL	2	1	13	T	7	345	0	26	63	N/A	Wall Mounted	CFL	S	T	2	1	13	7	345	0	26	63	0	0	0
111	Ext	Exterior	Wallpack	S	MH	1	1	150	T	7	345	42	192	464	PSMH	Wallpack	PSMH	S	T	1	1	100	7	345	20	120	290	174	0	174
112	Ext	Exterior	Wallpack	S	CFL	2	1	13	T	7	345	0	26	63	N/A	Wallpack	CFL	S	T	2	1	13	7	345	0	26	63	0	0	0
113	Ext	Exterior	Wallpack	S	MH	2	1	75	T	7	345	21	192	464	PSMH	Wallpack	PSMH	S	T	2	1	50	7	345	10	120	290	174	0	174
114	Bsmt	Mechanical Rm	Ceiling Mounted	E	4'T8	10	2	32	T	2	345	5	690	476	N/A	Ceiling Mounted	4'T8	E	T	10	2	32	2	345	5	690	476	0	0	0
115	1	Elevator	Recessed	M	3'T12	1	4	30	Sw	12	345	8	128	530	T8	Recessed	3'T8	E	Sw	1	4	25	12	345	3	103	426	104	0	104
116	4	Storage Rm	Ceiling Mounted	E	2'T8	1	4	17	Sw	1	345	2	70	24	N/A	Ceiling Mounted	2'T8	E	Sw	1	4	17	1	345	2	70	24	0	0	0
Totals:						532	330	4,008				783	53,659	133,039						532	328	3,335			495	46,637	90,790	15,114	27,135	42,249

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

Proposed Lighting Summary Table			
Total Gross Floor Area (SF)	29,957		
Average Power Cost ($/kWh)	0.1580		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	5,999	3,603	**2,396**
Exterior Power (watts)	2,484	1,492	**992**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	127,041	87,187	**39,853**
Lighting Power (watts)	51,175	45,145	**6,030**
Lighting Power Density (watts/SF)	1.71	1.51	**0.20**
Estimated Cost of Fixture Replacement ($)	26,741		
Estimated Cost of Controls Improvements ($)	13,385		
Total Consumption Cost Savings ($)	**7,820**		

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.

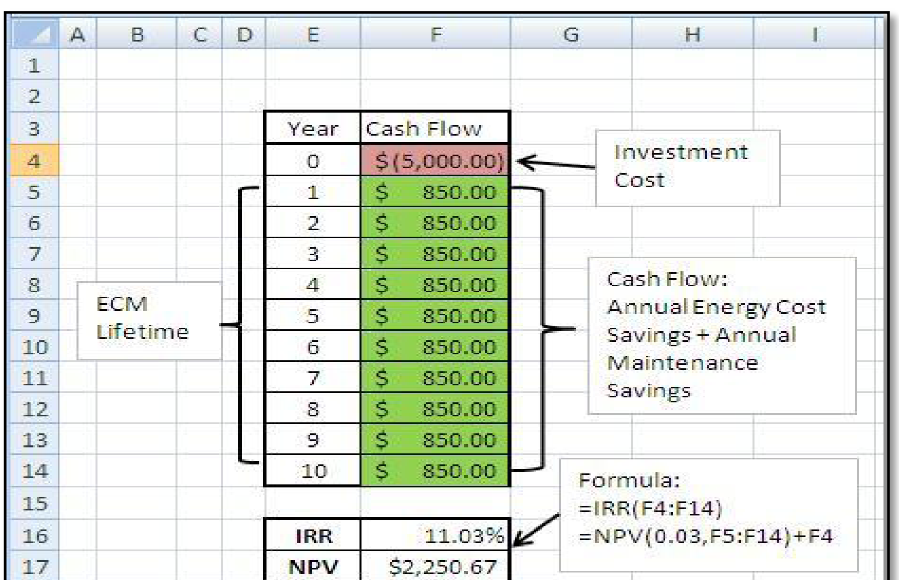
Calculation References

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

ENERGY STAR

STATEMENT OF ENERGY PERFORMANCE
Sussex County Community College - Building D

Building ID: 2473608
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 D
One College Hill Road
Newton, NJ 07860

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1932
Gross Floor Area (ft²): 29,957

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	1,371,957
Natural Gas (kBtu)[4]	2,729,493
Total Energy (kBtu)	4,101,450

Energy Intensity[5]

Site (kBtu/ft²/yr)	137
Source (kBtu/ft²/yr)	248

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	354

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	-11%
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.

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**

Certifying Professional
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.

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

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

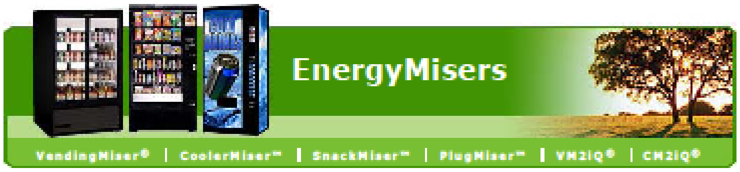
ECM Counter		ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st year cost savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO2 reduced, lbs/yr
1	**0 to 5 Year Payback ECM**	Retrofit 1 existing refrigerated vending machine with VendingMiser™ device	199	0	199	1,612	0.5	0	0.2	0	255	10	2,547	0.8	1,180	118	128	1,952	2,886
2		Retrofit 3 existing refrigerated chillers with CoolerMiser™ devices	597	0	597	4,836	1.5	0	0.6	0	764	10	7,641	0.8	1,180	118	128	5,855	8,659
3		Install 40 new CFL fixtures	392	0	392	1,339	0.4	5	0.2	213	431	5	2,153	0.9	721	144	107	1,568	2,454
4		Retrofit 1 existing vending machine with SnackMiser™ device	99	0	99	387	0.1	0	0.0	0	61	10	611	1.6	518	52	61	417	693
12		Install programmable thermostats for RTUs	2,600	0	2,600	6,950	2.1	474	2.4	0	1,650	15	24,755	1.6	852	57	63	16,819	17,669
5		Install 11 new Motion sensors with incentives	2,420	220	2,200	8,425	2.5	0	1.0	0	1,331	15	19,967	1.7	808	54	60	13,464	15,085
13		Install programmable thermostats for HW boiler	1,800	0	1,800	0	0.0	811	2.7	0	945	15	14,172	1.9	687	46	52	9,318	8,940
6		Install 3 new Daylight sensors with incentives	660	75	585	1,696	0.5	0	0.2	17	285	15	4,275	2.1	674	45	48	2,768	3,037
14		Replace (2) 5HP motors on H/V units with premium efficiency motors	1,140	120	1,020	2,590	0.8	0	0.3	0	409	20	8,184	2.5	702	35	39	4,957	4,637
7		Install 53 new Occupancy sensors with incentives	11,660	1,060	10,600	17,014	5.1	0	1.9	0	2,688	15	40,323	3.9	280	19	23	21,032	30,464
8		Install 10 new LED exit signs with incentives	1,505	200	1,305	1,489	0.4	0	0.2	31	266	15	3,994	4.9	242	16	17	1,828	2,666
		TOTALS	**23,072**	**1,675**	**21,397**	**46,338**	**14**	**1,290**	**9.7**	**261**	**9,085**		**128,622**	**2.4**	-	-	-	**79,979**	**97,189**
9	**5 to 10 Year Payback**	Install 69 new T8 fixtures with incentives	13,679	1,035	12,644	6,510	2.0	0	0.7	827	1,856	15	27,834	6.8	218	15	10	9,191	11,656
15		Replace all four boilers	25,400	1,400	24,000	0	0.0	2,500	8.3	0	2,913	30	87,375	8.2	264	9	6	31,638	27,558
		TOTALS	**39,079**	**2,435**	**36,644**	**6,510**	**2.0**	**2,500**	**9.0**	**827**	**4,768**		**115,209**	**7.7**	-	-	-	**40,829**	**39,214**
11	**> 10 Year Paybakc (End of Life ECM)**	Install heat recovery units	67,000	0	67,000	10,433	3.1	3,117	11.6	0	5,280	30	158,392	12.7	136	5	-1	33,860	53,039
10		Install 17 new Pulse start metal halide fixtures with incentives	12,825	425	12,400	5,777	1.7	1	0.7	57	970	15	14,557	12.8	24	2	-1	-980	10,350
16		Install new Building Management System	100,000	0	100,000	6,950	2.1	3,597	12.8	750	6,039	12	72,463	16.6	-19	-2	-5	-40,603	52,094
17		Replace windows throughout building (approx 138)	276,000	0	276,000	13,386	4.0	4,209	15.6	0	7,018	30	210,554	39.3	-24	-1	n/a	-141,924	70,363
		TOTALS	**455,825**	**425**	**455,400**	**36,546**	**11**	**10,924**	**41**	**807**	**19,307**		**455,966**	**23.6**	-	-	-	**-149,648**	**185,846**

APPENDIX H: VendingMiser™ and SnackMiser™ Energy Savings

USA Technologies :: Energy Management :: Savings Calculator

PRODUCTS & SERVICES | COMPANY INFO

EPORT | ENERGYMISERS | BUSINESS EXPRESS | ESUDS | EPORT CONNECT



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	13978	7530	6448	46%
Cost of Operation	$2,208.46	$1,189.68	$1,018.78	46%
SNACK MACHINES	**Current**	**Projected**	**Total Savings**	**% Savings**
kWh	699	312	387	55%
Cost of Operation	$110.42	$49.30	$61.13	55%

Location's Total Annual Savings

	Current	Projected	Total Savings	% Savings
kWh	14676	7842	6834	47%
Cost of Operation	$2,318.88	$1,238.97	$1,079.91	47%

Total Project Cost	Break Even (Months)
$895	9.95

Estimated Five Year Savings on ALL Machines = $5,399.56

Estimated Five Year Return on Investment = 503%

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

http://www.usatech.com/energy_management/energy_calculator.php[10/12/2010 2:57:51 PM]

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.