



Steven Winter Associates, Inc.
Building Systems Consultants
www.swinter.com

293 Route 18 South, Suite 330
East Brunswick, NJ 08816

Telephone
Facsimile

(866) 676-1972
(203) 852-0741

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**Local Government Energy Program
Energy Audit Final Report**

**Ocean County Vocational Technical School
Marine Academy of Technology & Environmental Science (MATES) Academy
195 Cedar Bridge Road
Manahawkin, NJ 08050**

Project Number: LGEA100



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EXECUTIVE SUMMARY

The Ocean County Vocational Technical School (OCVTS) Marine Academy of Technology and Environmental Sciences (MATES) Academy is a two-story, 54,000 square foot, slab on grade, 9-12 school building built in 2006. The building is made up of three wings; A-wing, B-wing and C-wing. The A-wing first floor contains the fitness center, multi-purpose room, kitchen, and media center. The A-wing section does not have a second floor. The B-wing is the center of the building, housing the oceanography and biology labs, main office, nurse and guidance offices, all located on the first floor. A penthouse level houses the mechanical room and roof access. The second floor houses several classrooms and open spaces overlooking the first floor atrium. The C-wing contains the environmental, chemistry, physics and tech labs, on the first floor. The second floor is made up of 8 classrooms. The following chart provides a comparison of the current building energy usage based on the period from January 2011 through December 2011 with the proposed energy usage resulting from the installation of recommended Energy Conservation Measures (ECMs) excluding any renewable energy:

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)	Source Energy Use Intensity (kBtu/sq ft /yr)	Joint Energy Consumption (MMBtu/yr)
Current	756,654	40,018	\$169,303	121.9	237	6,584
Proposed	582,757	30,663	\$123,258	93.6	182	5,055
Savings	173,897	9,355	\$46,045*	28.3	55	1529
% Savings	23.0%	23.4%	27.2%	23.2%	23.1%	23.2%
*Includes operation and maintenance savings						

SWA has entered energy information about the MATES Academy facility into the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy Benchmarking system. The building has an Energy Star Rating of 19 and a Site Energy Utilization of 122 kBtu/sqft/yr.

Recommendations

Based on the current state of the building and its energy use, SWA recommends implementing the following Energy Conservation Measures:

Table 2: Energy Conservation Measure Recommendations

ECMs	First Year Savings (\$)	Simple Payback Period	Initial Investment (\$)	CO2 Savings (lbs/yr)
0-5 Year	\$34,516	0.7	\$23,366	333,807
5-10 Year	\$11,530	5.6	\$64,332	80,674
>10 year	N/A	N/A	N/A	N/A
Total	\$46,045	1.9	\$87,697	414,481

Energy Conservation Measure Implementation

SWA recommends that OCTVS implement the following Energy Conservation Measures using an appropriate Incentive Program for reduced capital cost:

Recommended ECMs	Incentive Program (APPENDIX I for details)
Retrofit 2 refrigerated vending machines with VendingMiser devices	N/A
Retro-commissioning	N/A
Replace 21 existing indoor Metal Halide fixtures with T5 fixtures	Direct Install, SmartStart
Retrofit 1 vending machine with a SnackMiser device	N/A
Install 48 occupancy sensors	Direct Install, SmartStart
Install 1 daylight sensor	Direct Install, SmartStart
Replace metal halide exterior lighting with 27 new LED fixtures	N/A
Replace 1 incandescent lamp to a CFL	N/A
Install 92 bi-level stairwell fixtures	SmartStart

Appendix J contains an Energy Conservation Measures table

Environmental Benefits

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 30 cars from the roads each year or is equivalent of planting 874 trees to absorb CO₂ from the atmosphere.

In addition to these ECMs, SWA recommends:

- Capital Investment opportunities – measures that would contribute to reducing usage but require significant capital resources as well as long-term financial planning
 - Install demand control ventilation
- Operation and Maintenance (O&M) measures that would contribute to reducing energy usage at low or no cost:
 - Check and adjust timer and time clocks monthly
 - Inspect and replace cracked/ineffective caulk.
 - Inspect and maintain sealants at all windows for airtight performance.
 - Inspect and maintain weather-stripping around all exterior doors and roof hatches.
 - Purchase Energy Star® appliances when available
 - Use smart electric power strips
 - Create an energy educational program

There may be energy procurement opportunities for the OCTVS MATES Academy to reduce annual utility costs, which are \$9,605 higher, when compared to the average estimated NJ commercial utility rates. SWA recommends further evaluation with energy suppliers, listed in Appendix F.

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, town halls, police and fire stations, 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 (BPU's) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 40-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 Marine Academy of Technology & Environmental Science (MATES) Academy at 195 Cedar Bridge Road, Manahawkin, NJ. The process of the audit included facility visits on April 3rd and April 10th, benchmarking and energy bill analysis, assessment of existing conditions, 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 Ocean County Vocational Technical School to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the MATES Academy.

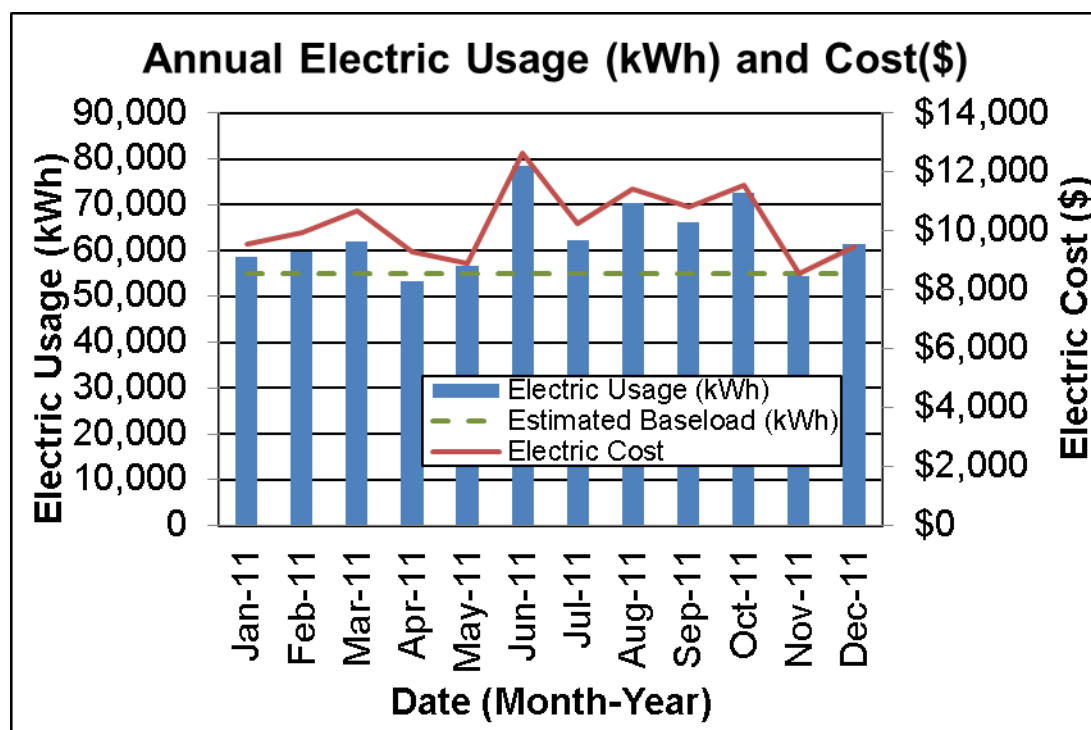
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

SWA reviewed utility bills from January 2011 through December 2011 that were received from the utility companies supplying MATES Academy with electricity and natural gas. A 12 month period of analysis from January 2011 through December 2011 was used for all calculations and for purposes of benchmarking the building.

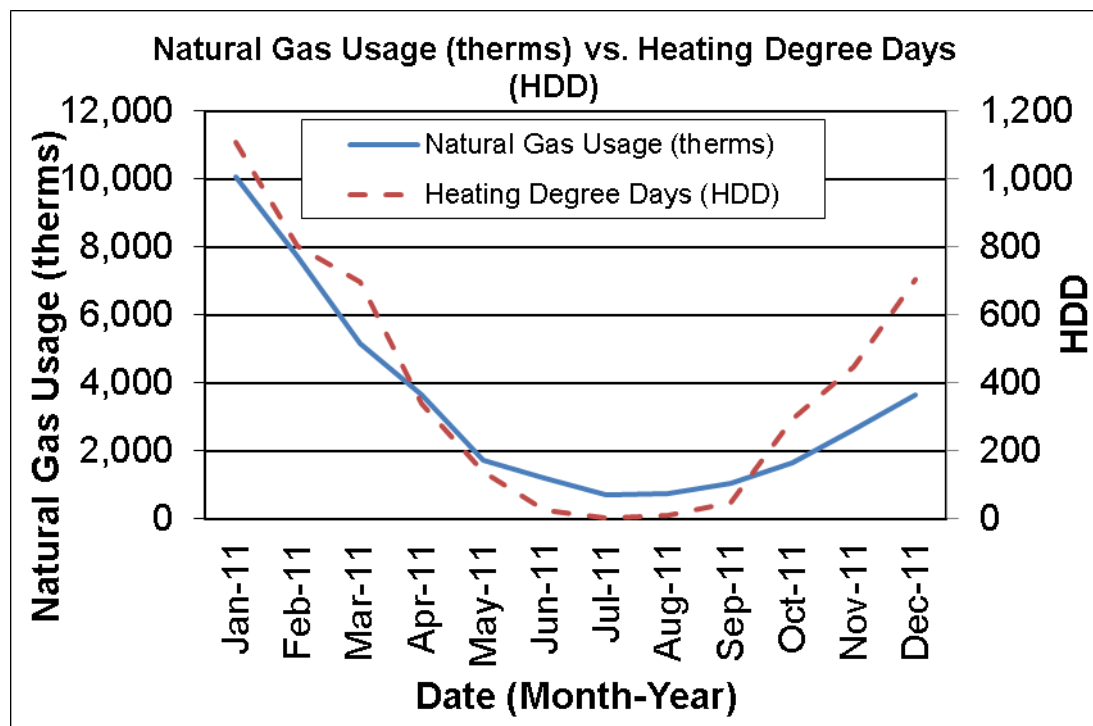
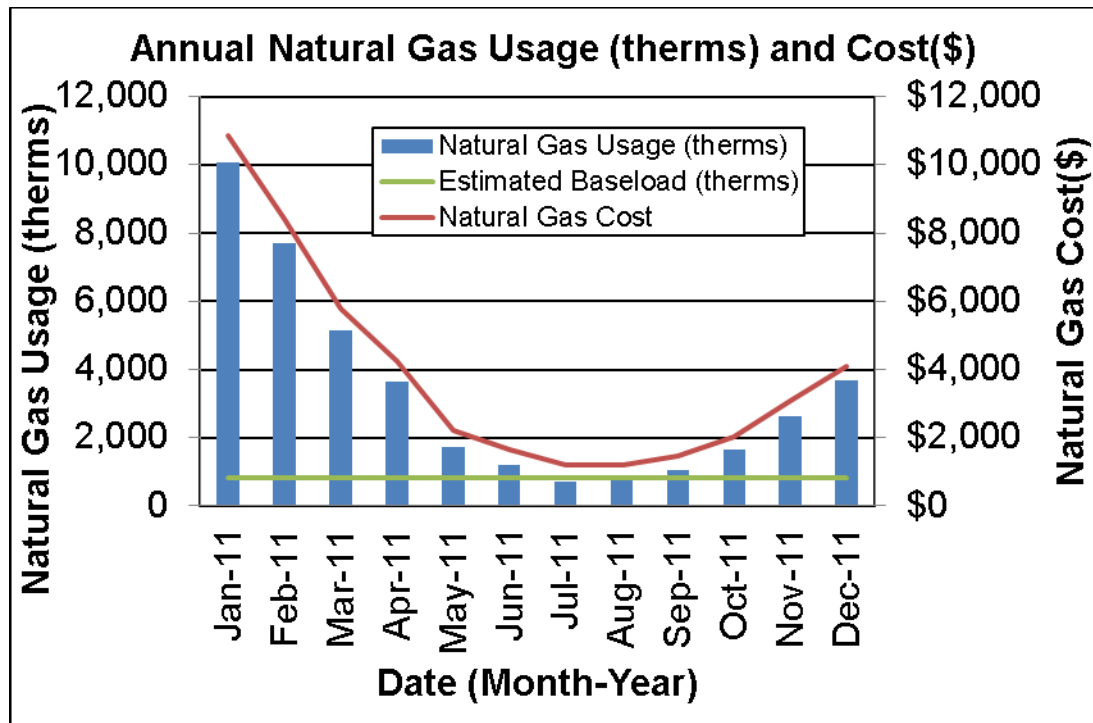
Electricity – MATES Academy is served by one electric meter. The school currently purchases electricity supplied by South Jersey Energy, and transmitted and distributed by Atlantic City Electric. Electricity was purchased at an average aggregated rate of \$0.163/kWh and the school consumed 756,720 kWh, or \$123,114 of electricity.

The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate MATES Academy school. The baseline usage for the school is approximately 54,907 kWh (average of the lowest 3 months of usage). As is typical of most schools, electric usage peaks in June, while the building is using cooling and school is still in session.



Natural gas – The MATES Academy School is served by one meter for natural gas and currently purchases natural gas from New Jersey Natural Gas, which is responsible for transmission and distribution and from Hess which acts as a third party energy supplier. Natural gas was purchased at an average rate of \$1.154/therm and the school consumed 40,018 therms, or \$46,200 of natural gas, during the period of January 2011 through December 2011. The chart below shows the monthly natural gas usage and costs. The green line represents the approximate baseload or minimum natural gas usage required to operate the MATES Academy (average of the lowest 3 months of usage). As is typical of schools of this type, usage peaks in

the winter months in conjunction with the operation of the gas fired hot water boilers. The monthly natural gas costs also peak in the winter months in correlation with the increased natural gas usage.

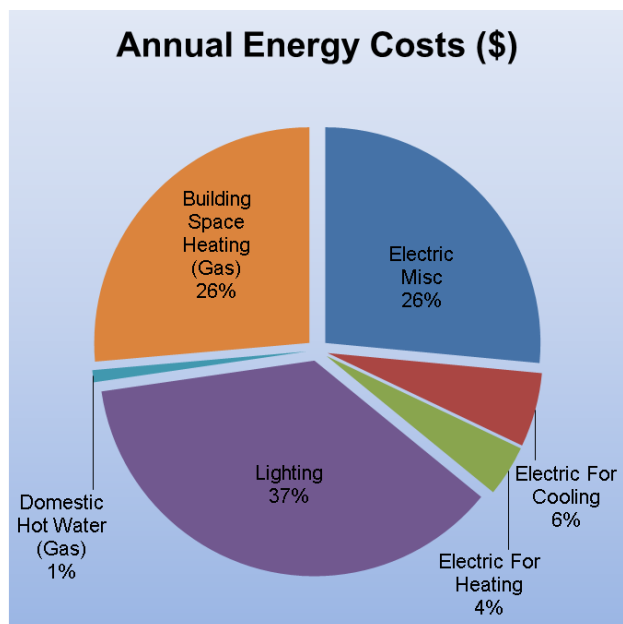
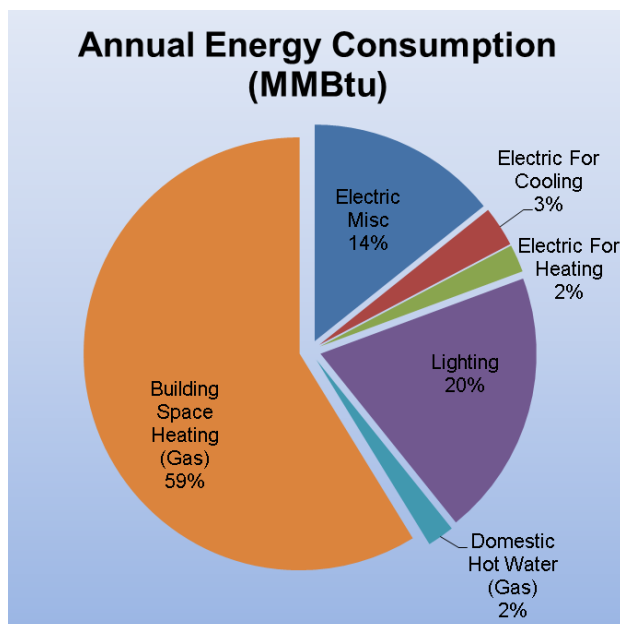


The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base

temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds 65°F temperature. As expected, the natural gas consumption profile follows the HDD curve. The area between the two lines from the period October 2011 through December 2011 represents energy savings.

The following graphs, pie charts, and table show energy use for MATES Academy School based on utility bills for the 12 month period. Note: electrical cost at \$48/MMBtu of energy is 4 times as expensive as natural gas at \$12/MMBtu

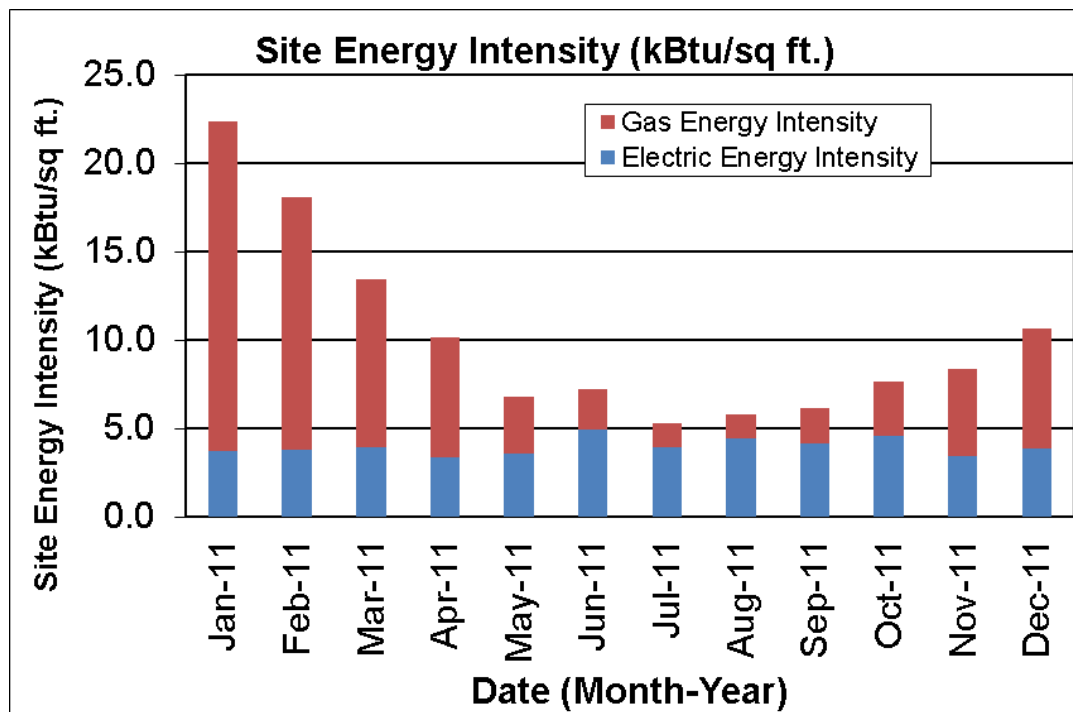
Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	\$	% \$	\$/MMBtu
Electric Misc	941	14%	\$44,847	26%	\$48
Electric For Cooling	198	3%	\$9,418	6%	\$48
Electric For Heating	136	2%	\$6,499	4%	\$48
Lighting	1,307	20%	\$62,339	37%	\$48
Domestic Hot Water (Gas)	133	2%	\$1,530	1%	\$12
Building Space Heating (Gas)	3,869	59%	\$44,670	26%	\$12
Totals	6,584	100%	\$169,303	100%	
Total Electric Usage	2,582	39%	\$123,103	73%	\$48
Total Gas Usage	4,002	61%	\$46,200	27%	\$12
Totals	6,584	100%	\$169,303	100%	



Energy Benchmarking

SWA has entered energy information about MATES Academy School in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager energy benchmarking system. This school facility is categorized as a "K-12 School" space type. Based on the data entered into the Portfolio Manager software, the building has an Energy Performance Rating of 19 out of a possible 100 points. For reference, a score of 69 is required for LEED for Existing Buildings certification and a score of 75 is required for ENERGY STAR® certification. The Site Energy Utilization Intensity (Site EUI) was calculated to be 122 kBtu/sqft/yr compared to the National Median of 91 kBtu/sqft/yr. This is a 31% difference between the buildings intensity and the national median. See the ECM section for guidance on how to further reduce the building's energy intensity.

The ENERGY STAR® Portfolio Manager uses a national survey conducted by the U.S. Energy Information Administration (EIA). This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years, and gathers data on building characteristics and energy use from thousands of buildings across the United States. The Portfolio Manager software uses this data to create a database by building type. By entering the building parameters and utility data into the software, Portfolio Manager is able to generate a performance scale from 1-100 by comparing it to similar office buildings. This 100 point scale determines how well the building performs relative to other buildings across the country, regardless of climate and other differentiating factors. A score of 19 shows the building performs 31% below the national average.



Per the LGEA program requirements, SWA has assisted the OCVTS Public School District to create an ENERGY STAR® Portfolio Manager account and share the MATES Academy information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account information with the OCVTS Public School District (user

name of “OceanCountyBOE” with a password of “ocvtsboe”) and TRC Energy Services (user name of “TRC-LGEA”).

SWA has created the Portfolio Manager information for Ocean County Vocational Technical School Board of Education. This information can be accessed at:

URL: <https://www.energystar.gov/istar/pmpam/>
Username: OceanCountyBOE
Password: ocvtsboe

Tariff analysis

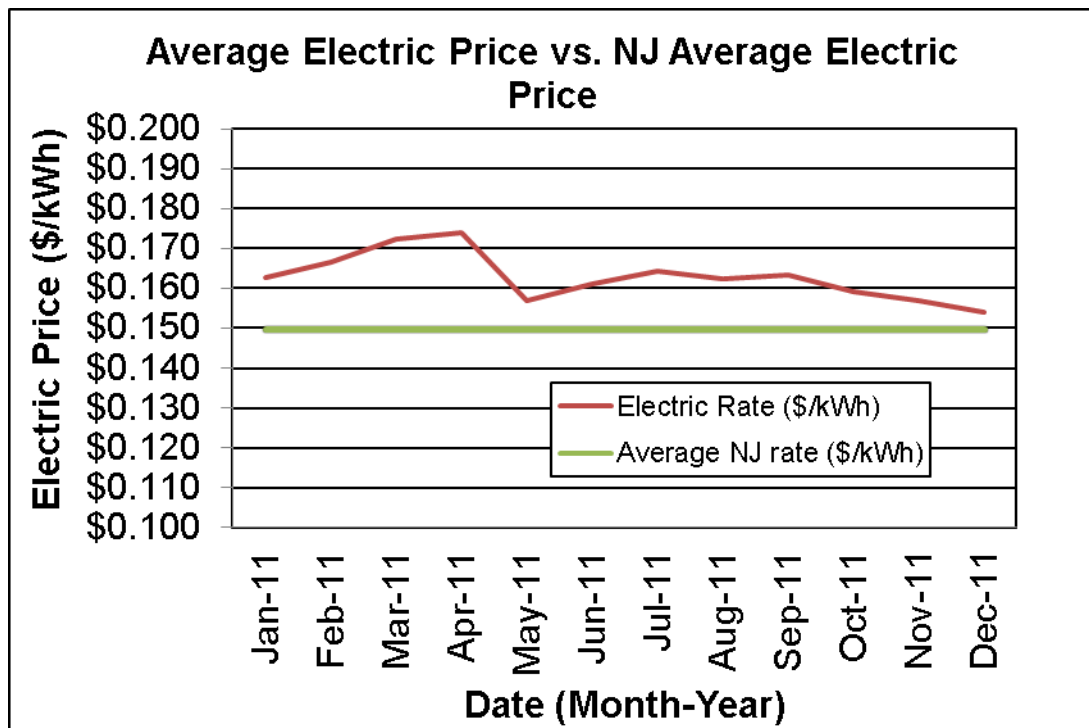
Tariff analysis can help determine if the municipality is paying the lowest rate possible for electric and gas service. Tariffs are typically assigned to buildings based on size and building type. Rate fluctuations are expected during periods of peak usage. Natural gas prices often increase during winter months since large volumes of natural gas is needed for heating equipment. Similarly, electricity prices often increase during the summer months when additional electricity is needed for cooling equipment.

As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs for OCTVS. The MATES Academy School is currently paying a general service rate for natural gas including fixed costs such as meter reading charges. The electric use for the building is direct-metered and purchased at a general service rate with an additional charge for electrical demand factored into each monthly bill. The general service rate is a market-rate based on electric usage and electric demand. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

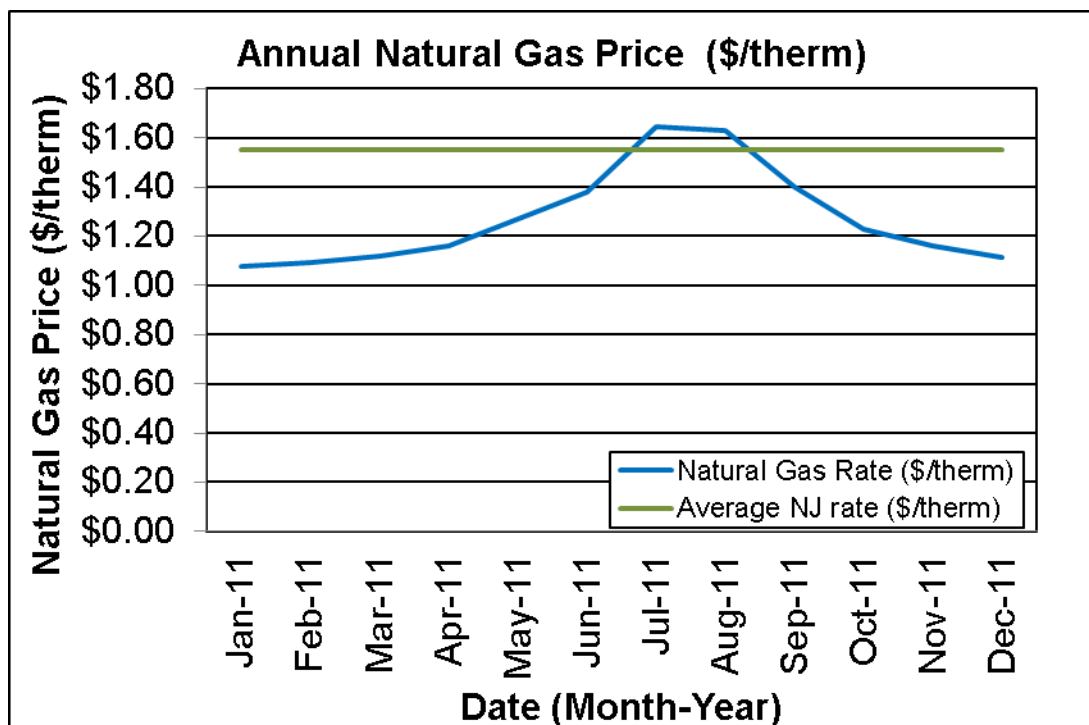
Energy Procurement strategies

Billing analysis was conducted using an average aggregated rate which is estimated based on the total cost divided by the total energy usage for each utility over a 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 MATES Academy pays a rate of \$0.163/kWh. MATES Academy’s annual electric utility costs are \$9,605 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 21% over the most recent 12 month period. Electric rate fluctuations in the winter and spring can be attributed to a combination of demand charges and market rate changes.



The average estimated NJ commercial utility rates for gas are \$1.550/therm, while MATES Academy School pays a rate of \$1.154/therm. MATES Academy School annual natural gas costs are \$15,828 lower, when compared to the average estimated NJ commercial utility rates. Natural gas bill analysis shows fluctuations up to 11% over the most recent 12 month period.



Preceding the expiration of any third-party supplier contract, SWA recommends that the MATES

Academy School explore additional opportunities of purchasing electricity from other third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy. Appendix F contains a complete list of third-party energy suppliers for OCTVS 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 visits from SWA on Tuesday, April 3, 2012, and Tuesday, April 10, 2012 the following data was collected and analyzed.

Building Characteristics

The OCVTS MATES Academy is a two-story, 54,000 square foot, slab on grade, 9-12 school building built in 2006. The building is made up of three wings; A-wing, B-wing and C-wing. The A-wing first floor contains the fitness center, multi-purpose room, kitchen, and media center. The A-wing section does not have a second floor. The B-wing is the center of the building, housing the oceanography and biology labs, main office, nurse and guidance offices, all located on the first floor. A penthouse level houses the mechanical room and roof access. The second floor houses several classrooms and open spaces overlooking the first floor atrium. The C-wing contains the environmental, chemistry, physics and tech labs, on the first floor. The second floor is made up of 8 classrooms.



Northeast Façade – Front Entrance



Southeast Façade



West Façade



Partial North Façade

Building Occupancy Profiles

The school's occupancy is approximately 250 students and 25 faculty members, from 6:00 AM to 10:00 PM Monday through Thursday and 6:00 AM to 3:30 PM on Fridays. The school is closed on the weekends. The school remains open through the summer for summer school and camp programs.

Building Envelope

Due to unfavorable weather conditions, no exterior envelope infrared (IR) images were taken during the field audit. Ideal weather conditions include a minimum indoor/outdoor delta-T of 18°F, and no/low wind.

General Note: All findings and recommendations on the exterior envelope (base, walls, roofs, doors and windows) are based on the energy auditors' experience and expertise, on construction document reviews and on detailed visual analysis, as far as accessibility and weather conditions allowed at the time of the field audit.

Exterior Walls

The exterior wall envelope is mostly constructed of brick veneer over a steel frame with R-19 batt insulation. The interior is predominantly painted gypsum board.

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

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall good condition with no signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all facades.

Roof

The building's roof is predominantly a mansard parapet type over steel decking. The roof on the flat areas is a 3-ply built up type with 2 inches of rigid insulation. Some areas have a light-colored gravel ballast, to weight down the roof. The pitched roof surfaces are made of prefabricated metal panels over steel decking. This roof is original and has not been replaced.

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

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

The following specific roof problem was identified:



Foliage in gutters may lead to poor drainage

Base

The building's base is composed of a slab-on-grade floor with a perimeter footing with poured concrete foundation walls and slab edge/perimeter insulation.

Slab and perimeter insulation levels could not be verified in the field and are based on available drawings.

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 several different types of windows:

1. Combined fixed and awning type windows with low-E double glazing and with interior mini blinds. The windows are located in all classrooms on the first floor, and in the main office.
2. Fixed type windows with low-E coated double glazing and with some interior roller blinds. Other areas are not equipped with interior or exterior shading devices. The windows are located around the main entrance doors, multi-purpose room and fitness center.
3. Awning type window with low-E coated double glazing and interior mini blinds. These

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

Exterior doors

The buildings contain several different types of exterior doors:

1. Aluminum type exterior doors with 1" clear single-pane glass panels and a non-insulated frame. They are located at the front and rear entrances.
2. Fiberglass reinforced polyester type doors with 1" insulated tempered glass. They are located at the emergency exits.
3. Metal roll-up type door. This door is located in the flex lab.

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 good condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific door problem spots were identified:



*Deteriorating weather-stripping on Flex Lab roll-up door (L),
and a main entrance door (R)*

Building air-tightness

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

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

Mechanical Systems

Heating Ventilating Air Conditioning

All spaces in the MATES Academy are mechanically ventilated, heated and cooled. The school contains roof top units (AHUs), unit ventilators, fan coil units, variable air volume (VAV) boxes, and unit heaters to condition various spaces. Ventilation and cooling are provided to the building via unit ventilators in classrooms and rooftop units for other areas

including the multi-purpose room, gymnasium and hallways. During the field visit there was no major comfort issues reported.

Equipment

Heating – MATES Academy School is heated by eight atmospheric, gas-fired boilers, providing hot water to unit ventilators, fan coil units, base boards, and heating coils located in rooftop packaged units. The boilers are Slant/Fin Caravan models, each with a 399 MBH input capacity, and an efficiency of 82%. The boilers were installed in 2005 and are located in the roof top mechanical room.



Slant/Fin Caravan Boilers

Propylene Glycol is mixed with the heating hot water to prevent freezing. The hot water mixture is distributed throughout the building with one constant flow loop, using two 7.5 HP pumps. Air handling units, equipped with hot water coils, are used to provide heating to the multi-purpose room and kitchen, the fitness center, main office, and the 2nd floor classrooms, lavatories and corridors. Unit ventilators are located in the C-wing laboratories and classrooms, as well as B-wing laboratories, which are equipped with hot water coils. Laboratory offices are heated with ceiling mounted fan coil units, also equipped with hot water coils. Baseboards are used for perimeter heating in stairwells, prep rooms and in the multi-purpose room. Four rooftop units are located on the roof. These units provide conditioned air to the kitchen, multi-purpose room, fitness center, 1st floor administration offices, and the 2nd floor B-wing. Variable air volume (VAV) boxes, located throughout the ceiling plenum, are equipped with hot water coils. The VAV boxes are then ducted to offices, classrooms, bathrooms and hallways supplying heating through ceiling diffusers.

Cooling and Ventilation – Cooling is provided by a 190 Ton air cooled chiller located on the roof. Unit ventilators located throughout the first floor C-wing laboratories connect to a chilled water loop served by this chiller. Outside air is provided through the unit ventilators and is exhausted through ceiling registers. Ceiling registers are ducted to exhaust fans located throughout the exterior and roof of the building. C-wing prep rooms and offices, located on the perimeter of the building, are cooled by fan coil units also equipped with chilled water coils.

Supplemental split dx-units are used for the oceanography and biology labs, as well as the server room. The two labs each have two Mitsubishi Mr. Slim units to provide additional cooling, which run continuously for aquatic life preservation. In order to meet specific temperature requirements for marine life and special equipment, the labs are currently over-

cooled then heated to meet room set points. Because heating and cooling are occurring simultaneously, the school consumes more energy than necessary. See ECM #2 for potential energy savings.



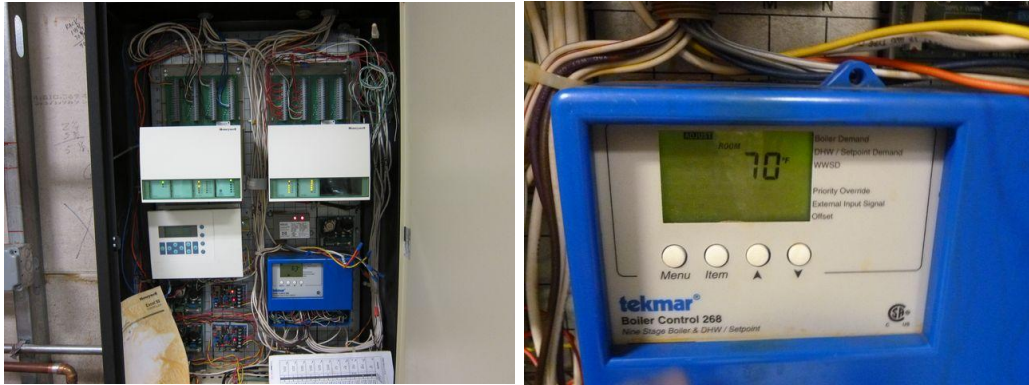
Trane air cooled chiller (L); typical rooftop (R)



Typical classroom unit ventilator (L) and typical baseboard heater (R)

Controls

All HVAC equipment is controlled by a Honeywell building management system. Wall mounted thermostats in each laboratory and classroom allows settings to be adjusted by +/- 2°F from the zone set point. The boilers are controlled by a Tekmar Boiler Control 268, which controls hot water supply temperature via control logic based on outside air temperature and hot water return temperature. The heating system has an outside air temperature cutoff of 80°F. The boilers operate up to this temperature due to over-cooling issues in the labs.



Boiler control panel (L); Tekmar Boiler Control (R)

All unit ventilators and packaged units are controlled by thermostats located in the areas served. Thermostats are generally set for 72°F during the winter and 74°F during the summer; however, occupants are only capable of adjusting the temperature +/- 2°F in either direction from the set point.

Domestic Hot Water

MATES Academy provides domestic hot water (DHW) to bathrooms throughout the building via a DHW system consisting of a 399,000 BTU/HR A.O. Smith gas-fired boiler and three 119 gallon storage tanks. The storage tanks maintain water temperature at 105-110°F. Hot water is supplied to the kitchen by a separate condensing boiler, located in a storage room adjacent to the kitchen. The kitchen boiler is a 60 gallon 125,000 BTU/HR A.O. Smith Cyclone, which supplies the kitchen with DHW at 140°F. The condensing boiler was installed in 2005 and is capable of reaching thermal efficiencies up to 94%.



DHW storage tanks and heater

Electrical systems

Lighting

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

Interior Lighting - The primary interior lighting at the MATES Academy is electronically ballasted T8 lamped fixtures. The hallways currently have T8 lamps, while the classrooms have suspended linear T8 fixtures. The main atrium makes use of a daylight sensor to minimize the use of lights when there is ample daylight from the skylight windows. The hallways on the second floor also receive a great deal of daylight through skylights. Metal halide high bay fixtures are used to light up the cafeteria. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas.



Typical interior classroom T8 lighting (L); and high bay metal halide lighting in the cafeteria (R)

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



Typical old (L) LED exit signs

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a combination of metal halide wall packs and metal halide bollard fixtures. Exterior lighting is controlled by timers.



Typical metal halide parking lot fixtures (L) and a typical bollard fixture (R).

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, fish tank pumps, refrigerators, vending machines and printers 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.

Installed at MATES Academy are several refrigerators for food, beverages and laboratory purposes. The school also has several beverage and snack vending machines, as well as commercial grade refrigerators and freezers located in the kitchen.



Walk-in refrigerator and freezer



Typical refrigerators



Beverage and snack vending machines



Typical water tanks and equipment for water creatures

Elevators

MATES Academy has one hydraulic elevator providing access between the first and second floors. The elevator is limited to handicapped students and faculty.

Other electrical systems

There are not currently any other significant energy-impacting electrical systems installed at MATES Academy other than a 200 kW natural gas Emergency Generator. This Kohler emergency generator is operated once per week as a functional test for 30 minutes.

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 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. Solar photovoltaic panels and wind turbines use natural resources to generate electricity. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Cogeneration or Combined Heat and Power (CHP) allows for heat recovery during electricity generation.

Existing systems

Currently there are no renewable energy systems installed in the building.

Evaluated Systems

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. Electricity generated from photovoltaic panels is generally 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, there are incentives available called 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.

Based on utility analysis and a study of roof conditions, the OCTVS MATES Academy is not a good candidate for a photovoltaic installation. The mansard parapet roof construction and surrounding trees are not ideal conditions for a PV installation.

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

MATES Academy is not a good candidate for wind power generation due to insufficient wind conditions in this area of New Jersey.

Geothermal

MATES Academy is not a good candidate for geothermal installation since it would require replacement of the entire existing HVAC system, as well as extensive installation of geothermal wells and pumping equipment.

Combined Heat and Power

MATES Academy is not a good candidate for 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 constant electrical baseload to accommodate the electricity generated, as well as a means for using waste heat generated. Additionally, the seasonal occupancy schedule of the MATES Academy is not well suited for a CHP installation.

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

#	Energy Conservation Measures
ECM 1	Retrofit 2 refrigerated vending machines with VendingMiser™ Devices
ECM 2	Retro-commissioning
ECM 3	Replace 21 existing indoor Metal Halide fixtures with T5 fixtures
ECM 4	Retrofit 1 snack vending machine with a SnackMiser™ Device
ECM 5	Install 48 new occupancy sensors
ECM 6	Install 1 Daylight Sensors
ECM 7	Replace metal halide exterior lighting with 27 new LED fixtures
ECM 8	Replace 1 incandescent lamp with a compact fluorescent lamp (CFL)
ECM 9	Install 92 new bi-level fixtures in stairwells

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 2 refrigerated vending machines with VendingMiser™ Devices

The school currently has several beverage and snack vending machines which are located in the hallways and in the multi-purpose room. VendingMiser devices are available for conserving energy used by beverage vending machines and coolers. Purchasing new machines is not necessary to reduce operating costs and greenhouse gas emissions. When equipped with the VendingMiser devices, refrigerated beverage vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines. VendingMiser 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. The school should request permission to install the devices if the machines are leased.

Installation cost:

Estimated installed cost: \$398 (includes \$40 of labor)

Source of cost estimate: www.usatech.com and established costs

Economics:

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	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
\$398	3,293	0	0	0	\$537	\$1,073	12	\$12,871	0.4	3,134%	261%	269%	\$9,837	5,896

Assumptions: SWA calculated the savings for this measure using measurements taken on the day of the field visit and using the billing analysis. SWA determined energy savings based on modeling calculator found at www.usatech.com or http://www.usatech.com/energy_management/energy_calculator.php. See APPENDIX D for savings calculations.

Rebates/financial incentives:

- This measure does not qualify for a rebate or other financial incentives at this time.

Please see APPENDIX I for more information on Incentive Programs.

ECM #2: Retro-commissioning

Retro-commissioning, or existing building commissioning, is a systematic building investigation process for improving and optimizing a building's operation and maintenance. The process focuses on the building's energy consumption by analyzing equipment such as the HVAC mechanical equipment, related controls and consumption patterns derived from utility and other usage information. Retro-commissioning may not necessarily emphasize bringing the building back to its original intended design specifications if the retro-commissioning team finds that the original specifications no longer apply to existing equipment or building needs. The process may result in recommendations for capital improvements, but its primary intent is to optimize the building systems by equipment tune-up, improved operation and maintenance, and diagnostic testing.

The retro-commissioning process involves obtaining documentation about the facility equipment and its current operation as well as multiple site visits for further review of operating parameters and conditions with the maintenance staff. All major energy consuming systems are diagnosed to determine system operation. The retro-commissioning process can also identify potential capital intensive improvements that can be made to further reduce energy usage and utility cost. Often, the savings associated with the low cost improvements can be used to lower the implementation cost associated with the capital-intensive measures and make the overall package more economically viable.

The goals of RCx include:

- Finding opportunities to reduce energy costs through readily implemented changes to the operation of the building.
- Evaluating set points of equipment and systems with the intent of bringing them to a proper operational state.
- Improving indoor environmental quality (IEQ) thereby reducing occupant complaints and reducing staff time spent on complaint calls.
- Improving equipment reliability through enhanced operation and maintenance procedures.

Installation cost:

Estimated installed cost: \$10,800

Source of cost estimate: Similar projects

Economics:

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	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
\$10,800	66,382	0	9,355	22	\$0	\$21,600	3	\$64,800	0.5	500%	167%	192%	\$48,511	221,976

Assumptions: SWA calculated the estimated ECM cost at \$0.20/sqft, which is typical of buildings of this size and type.

Rebates/financial incentives:

- There currently are no incentives for this measure at this time.

Please see APPENDIX I for more information on Incentive Programs.

ECM #3: Replace existing indoor Metal Halide fixtures with T5 fixtures

The existing MATES Academy lighting consists of standard probe start Metal Halide (MH) lamps. SWA recommends replacing the interior higher wattage MH fixtures with T5 lamps and electronic ballasts 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: \$2,535 (includes \$1,995 of labor)

Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program

Economics:

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	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
\$2,914	19,511	4	0	1	\$2,135	\$5,315	15	\$79,727	0.5	2,636%	176%	182%	\$57,781	34,934

Assumptions: SWA calculated the savings for this measure using measurements taken on the day of the field visit and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – SmartStart – High Bay T5 fixtures with electronic ballasts (\$16 per fixture or up to \$336)

Please see APPENDIX I for more information on Incentive Programs.

ECM #4: Retrofit 1 snack vending machine with a SnackMiser™ Device

SnackMiser devices are now available for conserving energy used by vending machines. Purchasing newer equipment is not necessary to reduce operating costs and greenhouse gas emissions. When equipped with the snack miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines. SnackMiser 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. The school should request permission to install the devices if the machines are leased.

Installation cost:

Estimated installed cost: \$179 (includes \$20 of labor)

Source of cost estimate: www.usatech.com and established costs

Economics:

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	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
\$179	395	0	0	0	\$64	\$129	12	\$1,544	1.4	763%	64%	72%	\$1,053	707

Assumptions: SWA calculated the savings for this measure using measurements taken on the day of the field visit 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. See APPENDIX D for savings calculations.

Rebates/financial incentives:

- This measure does not qualify for a rebate or other financial incentives at this time.

Please see APPENDIX I for more information on Incentive Programs.

ECM #5: Install 48 new occupancy sensors

The building contains several areas that could benefit from the installation of occupancy sensors. These areas consisted of various storage rooms, bathrooms and offices that are used sporadically throughout the day and could show energy savings by having the lights turn off after a period of no occupancy. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advanced ultra-sonic lighting sensors include sound detection as a means to controlling lighting operation.

Installation cost:

Estimated installed cost: \$8,880 (includes \$2,880 of labor)

Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

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	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
\$8,880	38,773	0	0	2	\$0	\$6,320	15	\$94,800	1.4	968%	65%	71%	\$63,457	69,423

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 – SmartStart – Wall-mounted Occupancy Sensors (\$20 per control)
 - Maximum Incentive Amount: \$960
- NJ Clean Energy – Direct Install (Up to 70% of installed costs)

Please see APPENDIX I for more information on Incentive Programs.

ECM #6: Install 1 Daylight Sensor

At the time of the visit SWA found two areas that could benefit from the installation of daylight dimming control in the main entrance vestibule. Daylight sensors are a type of lighting control that automatically maintain a specified light level based on the amount of daylight coming into the building. As daylight increases, the light fixtures are dimmed thus reducing electric consumption. The use of daylight controls help maintain a minimum required light level, without over lighting a space or area. SWA recommends installing daylight sensors in areas that use light fixtures and building openings (i.e. windows) to illuminate the space. Such spaces include vestibules and perimeter offices.

Installation cost:

Estimated installed cost: \$195 (includes \$60 of labor)

Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program

Economics:

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	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
\$195	486	0	0	0	\$0	\$79	15	\$1,189	2.5	510%	34%	40%	\$715	871

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. Existing light fixtures are assumed to have dimming capabilities.

Rebates/financial incentives:

- NJ Clean Energy – Smart Start - \$25 per fixture

Please see APPENDIX I for more information on Incentive Programs.

ECM #7: Replace metal halide exterior lighting with 27 new LED fixtures

The exterior lighting is made up of inefficient metal halide fixtures. Aside from having higher energy consumption, these fixtures require frequent lamp and ballast replacements. SWA is recommending LED lamps replacement lamps. For the proposed retrofit, the scope of work involves removing the existing light and ballast and replacing with an LED lamp and ballast. The existing poles and fixtures would be left in tact at the same quantity and height. By retrofitting the existing fixtures, the cost of materials and labor can be reduced. LED technology has advanced greatly in the past 10 years and has long operating lifespans. LED lighting uses considerably less energy than metal halide lights.

Installation cost:

Estimated installed cost: \$51,018 (includes \$5,517.72 of labor)

Source of cost estimate: RS Means; *Published and established costs, NJ Clean Energy Program*

Economics:

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	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
\$51,018	30,949	7	0	\$2	\$4,185	\$9,230	5	\$46,149	5.5	-10	-2	-3	-\$8,710	55,414

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

Rebates/financial incentives:

There are currently no incentives for this measure

Please see APPENDIX I for more information on Incentive Programs.

ECM #8: Upgrade 1 incandescent lamp with a compact fluorescent lamp (CFL)

The building is equipped with a fixture containing an inefficient incandescent lamp. SWA recommends that the incandescent lamp be 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: \$9 (includes \$4 of labor)

Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

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	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
\$9	8	0	0	0	\$0	\$2	5	\$8	5.7	-13%	-3%	-4%	-\$2	14

Assumptions: SWA calculated the savings for this measure using measurements taken on the day of the field visit and using the billing analysis.

Rebates/financial incentives:

- There currently are no incentives for this measure at this time.

Please see APPENDIX I for more information on Incentive Programs.

ECM #9: Install 92 new bi-level fixtures in stairwells

The school currently contains T8 fluorescent lighting fixtures that are operated 24 hours per day in stairwells. Technology called bi-level lighting, combines fluorescent lighting fixtures with an occupancy sensor. These efficient light fixtures operate at a minimal light level in order to meet code and safety requirements and power up to a higher level when any motion is detected in the stairwells. The building would be an appropriate application for these fixtures since there are large periods of time when the stairwells should be unoccupied.

Installation cost:

Estimated installed cost: \$13,305 (includes \$8,740 of labor)

Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

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	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
\$13,305	14,100	0	0	1	\$0	\$2,298	15	\$34,474	5.8	159%	11%	15%	\$13,313	25,246

Assumptions: SWA calculated the savings for this measure using measurements taken on the day of the field visit and using the billing analysis. SWA also assumed 2 hours/day to replace aging burnt out lamps.

Rebates/financial incentives:

- NJ Clean Energy – SmartStart – Occupancy controlled hi-low fluorescent controls (\$25 per control)
- NJ Clean Energy – Direct Install (Up to 70% of installed cost)

Please see APPENDIX I 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. Capital improvements may also constitute equipment that is currently being operated beyond its useful lifetime. 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 OCVTS Mates Academy.

- Demand control ventilation (DCV) – The school had several pieces of HVAC equipment operating during a holiday. At the time, the school was occupied by four people, while the HVAC equipment was conditioning unoccupied spaces. SWA recommends installing DCV so that HVAC equipment reduces or cuts off outdoor air supply during times of low or no occupancy, especially on holidays and weekends. Retro-commissioning can help identify the feasibility of installing DCV with existing equipment.

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 and/or maintenance costs.

- Check and adjust timers and time clocks monthly – Low voltage time clocks are used to control the parking lot lights. Time clocks are subject to schedule errors especially during power outages and seasonal changes. SWA recommends routinely checking the time clocks for proper scheduling and programming. Additionally, operation schedules should be adjusted for holidays and weekends, so that HVAC equipment is shut off.
- Inspect and replace cracked/ineffective caulk.
- Inspect and maintain sealants at all windows for airtight performance.
- Inspect and maintain weather-stripping around all exterior doors and roof hatches.
- 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/>.

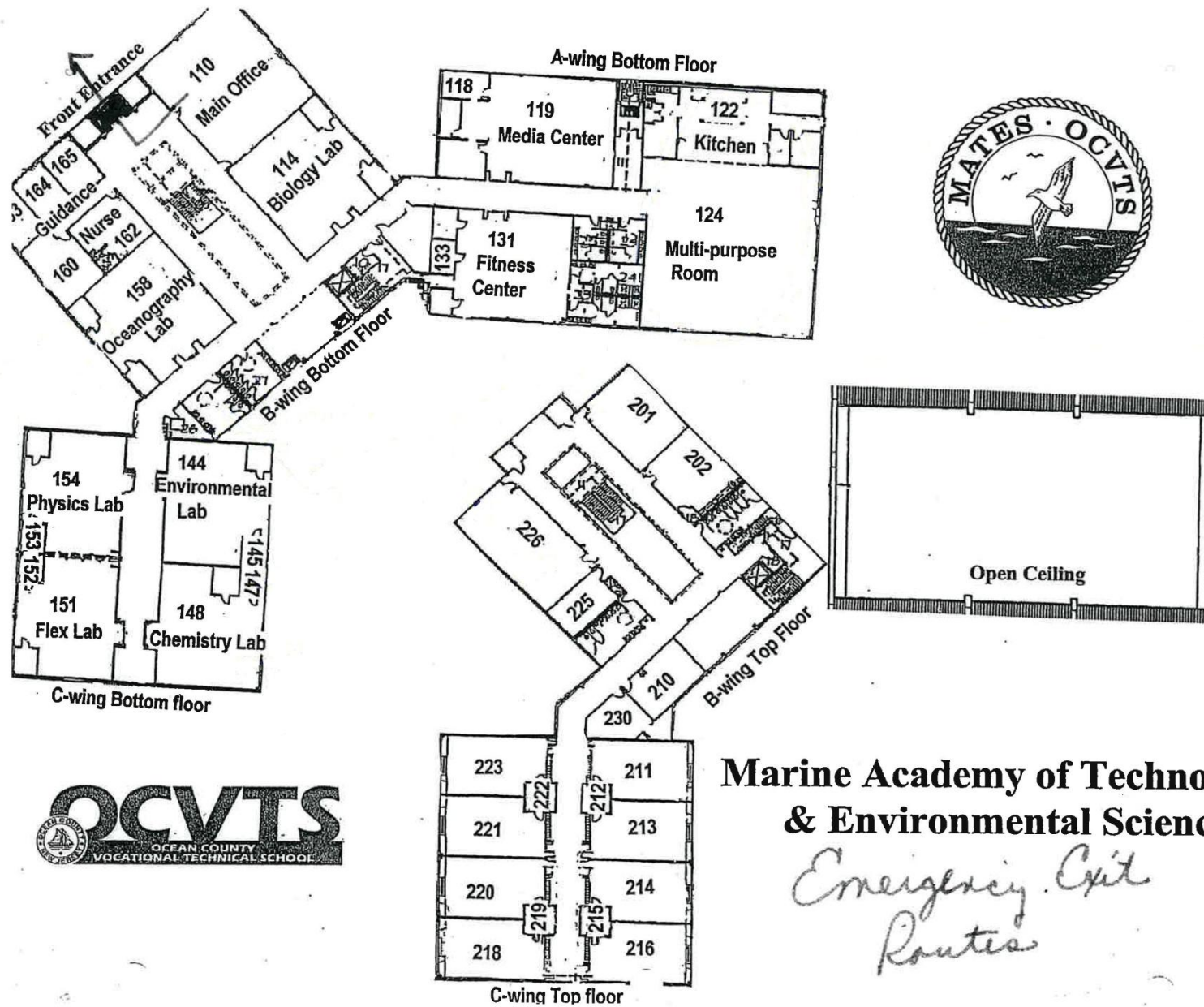
APPENDIX A: EQUIPMENT LIST

TAG	Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
AHU-1	Heating/ Cooling	Propylene Glycol, 517 MBH total cooling, 590 MBH total heating, 16,000 Total CFM, 15 HP Fan	Roof	Trane T-Series Climate Changer, Model TSCB035U0C000000000A 00A174.5, S/N #K05J13053A	Electric	Kitchen/ Multi Purpose Room	2006	60%
AHU-2	Heating/ Cooling	Propylene Glycol, 355 MBH total cooling, 265 MBH total heating, 11,000 Total CFM, 10 HP Fan	Roof	Trane T-Series Climate Changer, Model TSCB025U0C000000000A 00A151.8, S/N #K05J12734A	Electric	Fitness Center	2006	60%
AHU-3	Heating/ Cooling	Propylene Glycol, 375 MBH total cooling, 273 MBH total heating, 12,115 Total CFM, 15 HP Fan	Roof	Trane T-Series Climate Changer, Model TSCB025U0C000000000A 00A172.8, S/N #K05J12726A	Electric	1st Floor Admin.	2006	60%
AHU-4	Heating/ Cooling	Propylene Glycol, 334 MBH total cooling, 243 MBH total heating, 10,145 Total CFM, 10 HP Fan	Roof	Trane T-Series Climate Changer, Model TSCB021U0C000000000A 00A166.0, S/N #K05J12719A	Electric	2nd Floor	2006	60%
CH-1	Cooling	Air Cooled, 190.1 Nominal Tons, EER 9.3, 2 Compressors, 12 fans, 1.2 HP/Fan, R-134a	Roof	Trane Model RTAC 2004 UKON UAFN N1WX 1DDL NNOE N10N NOEX N, S/N # U05L04184	Electric	Whole Building	2004	47%
	Cooling	Condensing Unit, R-22, 1/8 HP	Roof	EMI, Model SCC18DF000AAA0B, S/N # 1-05-H-7365-34	Electric	Server Room	2006	60%
CHWP-1	Cooling	Baldor, Chilled Water Pump, 15 HP, 1750 RPM, NEMA Nom. Eff. 91%	Mechanical Room	Baldor Cat. #M2513T, Spec. #37F599T867H1	Electric	Whole Building	2006	70%
CHWP-2	Cooling	Baldor, Chilled Water Pump, 15 HP, 1750 RPM, NEMA Nom. Eff. 91%	Mechanical Room	Baldor Cat. #M2513T, Spec. #37F599T867H1	Electric	Whole Building	2006	70%
HWP-1	Heating	7.5 HP, 1750 RPM, 213T Frame, NEMA Nom. Eff. 88.5%, P.F. 79%	Mechanical Room	Baldor, Cat. No. M3311T, S/N #F0503012823	Electric	Whole Building	2005	53%
HWP-2	Heating	7.5 HP, 1750 RPM, 213T Frame, NEMA Nom. Eff. 88.5%, P.F. 79%	Mechanical Room	Baldor, Cat. No. M3311T, S/N #F0504081269	Electric	Whole Building	2005	53%
	Cooling	Split-DX Condensing Unit, R-410A, 1 Compressor, 1 Fan	Ground	Mitsubishi Mr. Slim, Model PUY-A24NHA3, S/N #92UO1931B	Electric	Laboratory	2006	60%
	Cooling	Split-DX Condensing Unit, R-410A, 1 Compressor, 1 Fan	Ground	Mitsubishi Mr. Slim, Model PUY-A36NHA3, S/N #04U02351C	Electric	Laboratory	2006	60%
Boiler 1	Heating	Gas Fired Atmospheric Boiler, 399 MBH,	Mechanical Room	Slant/Fin Galaxy Caravan Model GGHT-3200, S/N #G0054941	Gas	Whole Building	2005	53%
Boiler 2	Heating	Gas Fired Atmospheric Boiler, 399 MBH,	Mechanical Room	Slant/Fin Galaxy Caravan Model GGHT-3200, S/N #G0054942	Gas	Whole Building	2005	53%
Boiler 3	Heating	Gas Fired Atmospheric Boiler, 399 MBH,	Mechanical Room	Slant/Fin Galaxy Caravan Model GGHT-3200, S/N #G0054943	Gas	Whole Building	2005	53%
Boiler 4	Heating	Gas Fired Atmospheric Boiler, 399 MBH,	Mechanical Room	Slant/Fin Galaxy Caravan Model GGHT-3200, S/N #G0054944	Gas	Whole Building	2005	53%

Boiler 5	Heating	Gas Fired Atmospheric Boiler, 399 MBH,	Mechanical Room	Slant/Fin Galaxy Caravan Model GGHT-3200, S/N #G0054945	Gas	Whole Building	2005	53%
Boiler 6	Heating	Gas Fired Atmospheric Boiler, 399 MBH,	Mechanical Room	Slant/Fin Galaxy Caravan Model GGHT-3200, S/N #G0054946	Gas	Whole Building	2005	53%
Boiler 7	Heating	Gas Fired Atmospheric Boiler, 399 MBH,	Mechanical Room	Slant/Fin Galaxy Caravan Model GGHT-3200, S/N #G0054947	Gas	Whole Building	2005	53%
Boiler 8	Heating	Gas Fired Atmospheric Boiler, 399 MBH,	Mechanical Room	Slant/Fin Galaxy Caravan Model GGHT-3200, S/N #G0054948	Gas	Whole Building	2005	53%
	Domestic Hot Water	A.O. Smith Custom Storage Tank, 119.0 gallon capacity	Mechanical Room	A.O. Smith Custom Model #TJV 120A 000, Serial #L05M001221	Gas	Whole Building	2005	53%
	Domestic Hot Water	A.O. Smith Custom Storage Tank, 119.0 gallon capacity	Mechanical Room	A.O. Smith Custom Model #TJV 120A 000, Serial #L05M001219	Gas	Whole Building	2005	53%
	Domestic Hot Water	A.O. Smith Custom Storage Tank, 119.0 gallon capacity	Mechanical Room	A.O. Smith Custom Model #TJV 120A 000, Serial #L05M001222	Gas	Whole Building	2005	53%
	Domestic Hot Water	A.O. Smith Burkay Copper Coil Boiler, Hot Water Heater, Input Capacity 399 MBH	Mechanical Room	A.O. Smith Model # HW 399 974, Serial #J 04 04970	Gas	Whole Building	2005	53%
	Domestic Hot Water	Taco, Cartridge Circulator Pump, 1/8 HP, 3250 RPM, Max. Water Temp. 230°F	Mechanical Room	Taco, Model #0012-BF4-1	Electric	Whole Building	2006	70%
	Domestic Hot Water	A.O. Cyclone Condensing Boiler, Input Capacity 125 MBH, 60 gallons	Kitchen Storage Room	A.O. Smith Cyclone XHE, Model #BTH 120 970, Serial #L05M000688	Gas	Kitchen	2005	53%
	Domestic Hot Water	Taco, Cartridge Circulator Pump, 1/40 HP, 3250 RPM, Max. Water Temp. 220°F	Kitchen Storage Room	Taco, Model #006-BC4	Electric	Whole Building	2006	70%

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: MATES Academy Floor Plan



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Appendix C: 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	2	Classroom (218)	Pendant	E	4'T8	18	3	32	Sw	14	240	15	1,998	6,713	C	Pendant	4'T8	E	OS	18	3	32	11	240	15	1,998	5035	0	1678	1678
2	2	Classroom (216)	Pendant	E	4'T8	18	3	32	Sw	14	240	15	1,998	6,713	C	Pendant	4'T8	E	OS	18	3	32	11	240	15	1,998	5035	0	1678	1678
3	2	Classroom (214)	Pendant	E	4'T8	18	3	32	Sw	14	240	15	1,998	6,713	C	Pendant	4'T8	E	OS	18	3	32	11	240	15	1,998	5035	0	1678	1678
4	2	Classroom (213)	Pendant	E	4'T8	18	3	32	Sw	14	240	15	1,998	6,713	C	Pendant	4'T8	E	OS	18	3	32	11	240	15	1,998	5035	0	1678	1678
5	2	Classroom (211)	Pendant	E	4'T8	18	3	32	Sw	14	240	15	1,998	6,713	C	Pendant	4'T8	E	OS	18	3	32	11	240	15	1,998	5035	0	1678	1678
6	2	Classroom (220)	Pendant	E	4'T8	18	3	32	Sw	14	240	15	1,998	6,713	C	Pendant	4'T8	E	OS	18	3	32	11	240	15	1,998	5035	0	1678	1678
7	2	Classroom (221)	Pendant	E	4'T8	18	3	32	Sw	14	240	15	1,998	6,713	C	Pendant	4'T8	E	OS	18	3	32	11	240	15	1,998	5035	0	1678	1678
8	2	Classroom (223)	Pendant	E	4'T8	18	3	32	Sw	14	240	15	1,998	6,713	C	Pendant	4'T8	E	OS	18	3	32	11	240	15	1,998	5035	0	1678	1678
9	2	Office (219)	Recessed Parabolic	E	4'T8	2	4	32	Sw	14	240	20	296	995	C	Recessed Parabolic	4'T8	E	OS	2	4	32	11	240	20	296	746	0	249	249
10	2	Office (215)	Recessed Parabolic	E	4'T8	2	4	32	Sw	14	240	20	296	995	C	Recessed Parabolic	4'T8	E	OS	2	4	32	11	240	20	296	746	0	249	249
11	2	Office (212)	Recessed Parabolic	E	4'T8	2	4	32	Sw	14	240	20	296	995	C	Recessed Parabolic	4'T8	E	OS	2	4	32	11	240	20	296	746	0	249	249
12	2	Office (222)	Recessed Parabolic	E	4'T8	2	4	32	Sw	14	240	20	296	995	C	Recessed Parabolic	4'T8	E	OS	2	4	32	11	240	20	296	746	0	249	249
13	2	C-Wing Hallway (XXX)	Recessed Parabolic	E	4'T8	5	2	32	N	14	240	10	370	1,243	N/A	Recessed Parabolic	4'T8	E	Sw	5	2	32	14	240	10	370	1243	0	0	0
14	2	C-Wing Hallway (XXX)	Recessed Parabolic	E	4'T8	5	2	32	N	24	365	10	370	1,241	N/A	Recessed Parabolic	4'T8	E	N	5	2	32	24	365	10	370	3241	0	0	0
15	2	Hallway (XXX)	Wall Mounted	E	4'T8	16	1	32	Sw	16	240	5	592	2,273	N/A	Wall Mounted	4'T8	E	Sw	16	1	32	16	240	5	592	2273	0	0	0
16	2	Lobby (200)	Wall Mounted	E	4'T8	28	1	32	DL	16	240	5	1,036	3,978	N/A	Wall Mounted	4'T8	E	DL	28	1	32	16	240	5	1,036	3978	0	0	0
17	2	Corridor (209)	Recessed Parabolic	E	4'T8 U-Shaped	38	2	32	Sw	8	240	10	2,812	5,399	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	38	2	32	8	240	10	2,812	5399	0	0	0
18	2	Corridor (209)	Recessed Parabolic	E	4'T8 U-Shaped	14	2	32	N	24	365	10	1,036	9,075	N/A	Recessed Parabolic	4'T8 U-Shaped	E	N	14	2	32	24	365	10	1,036	9075	0	0	0
19	2	Classroom (226)	Pendant	E	4'T8	24	3	32	Sw	14	240	15	2,664	8,951	C	Pendant	4'T8	E	OS	24	3	32	11	240	15	2,664	6713	0	2238	2238
20	2	Classroom (201)	Recessed Parabolic	E	4'T8	12	3	32	Sw	14	240	15	1,332	4,476	C	Recessed Parabolic	4'T8	E	OS	12	3	32	11	240	15	1,332	3357	0	1119	1119
21	2	Classroom (202)	Recessed Parabolic	E	4'T8	9	3	32	Sw	14	240	15	999	3,357	C	Recessed Parabolic	4'T8	E	OS	9	3	32	11	240	15	999	2517	0	839	839
22	2	Classroom (225)	Recessed Parabolic	E	4'T8	5	3	32	Sw	14	240	15	555	1,865	C	Recessed Parabolic	4'T8	E	OS	5	3	32	11	240	15	555	1399	0	466	466
23	2	Classroom (226)	Recessed Parabolic	E	4'T8 U-Shaped	6	2	32	Sw	14	240	10	444	1,492	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	6	2	32	14	240	10	444	1492	0	0	0
24	2	Mens Bathroom (224)	Recessed Parabolic	E	4'T8 U-Shaped	6	2	32	Sw	14	240	10	444	1,492	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	6	2	32	11	240	10	444	1119	0	373	373
25	2	Mens Bathroom (224)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	N	24	365	10	148	1,296	N/A	Recessed Parabolic	4'T8 U-Shaped	E	N	2	2	32	24	365	10	148	1296	0	0	0
26	2	Womens Bathroom (205)	Recessed Parabolic	E	4'T8 U-Shaped	6	2	32	Sw	14	240	10	444	1,492	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	6	2	32	11	240	10	444	1119	0	373	373
27	2	Womens Bathroom (205)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	N	24	365	10	148	1,296	N/A	Recessed Parabolic	4'T8 U-Shaped	E	N	2	2	32	24	365	10	148	1296	0	0	0
28	2	Storage (203)	Recessed Parabolic	E	4'T8 U-Shaped	1	2	32	Sw	1	190	10	74	14	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	1	2	32	1	190	10	74	14	0	0	0
29	2	Lavatory (202)	Recessed Parabolic	E	4'T8 U-Shaped	8	2	32	N	24	365	10	592	5,186	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	8	2	32	18	365	10	592	3889	0	1296	1296
30	2	Cust/Storage (210)	Recessed Parabolic	E	4'T8	8	2	32	Sw	9	240	10	592	1,279	C	Recessed Parabolic	4'T8	E	OS	8	2	32	7	240	10	592	959	0	320	320
31	1	Flex Lab (151)	Pendant	E	4'T8	24	3	32	Sw	14	240	15	2,664	8,951	C	Pendant	4'T8	E	OS	24	3	32	11	240	15	2,664	6713	0	2238	2238
32	1	Flex Lab (151)	Pendant	E	4'T8	2	3	32	Sw	24	365	15	222	1,945	N/A	Pendant	4'T8	E	Sw	2	3	32	24	365	15	222	1945	0	0	0
33	1	Prep (150)	Recessed Parabolic	E	4'T8	2	3	32	Sw	14	240	15	222	746	C	Recessed Parabolic	4'T8	E	OS	2	3	32	11	240	15	222	559	0	186	186
34	1	Flex Lab (151)	Recessed Parabolic	E	4'T8	3	4	32	Sw	14	240	20	444	1,492	N/A	Recessed Parabolic	4'T8	E	Sw	3	4	32	14	240	20	444	1492	0	0	0
35	1	Office (152)	Recessed Parabolic	E	4'T8	2	3	32	Sw	9	240	15	222	480	C	Recessed Parabolic	4'T8	E	OS	2	3	32	7	240	15	222	360	0	120	120
36	1	Office (153)	Recessed Parabolic	E	4'T8	2	3	32	Sw	9	240	15	222	480	C	Recessed Parabolic	4'T8	E	OS	2	3	32	7	240	15	222	360	0	120	120
37	1	Office (145)	Recessed Parabolic	E	4'T8	2	3	32	Sw	9	240	15	222	480	C	Recessed Parabolic	4'T8	E	OS	2	3	32	7	240	15	222	360	0	120	120
38	1	Office (147)	Recessed Parabolic	E	4'T8	4	3	32	Sw	9	240	15	444	959	C	Recessed Parabolic	4'T8	E	OS	4	3	32	7	240	15	444	719	0	240	240
39	1	Physics Lab (154)	Pendant	E	4'T8	22	3	32	Sw	14	240	15	2,442	8,205	C	Pendant	4'T8	E	OS	22	3	32	11	240	15	2,442	6154	0	2051	2051
40	1	Physics Lab (154)	Pendant	E	4'T8	2	3	32	Sw	24	365	15	222	1,945	N/A	Pendant	4'T8	E	Sw	2	3	32	24	365	15	222	1945	0	0	0
41	1	Prep (155)	Recessed Parabolic	E	4'T8	2	3	32	Sw	2	240	15	222	107	C	Recessed Parabolic	4'T8	E	OS	2	3	32	2	240	15	222	80	0	27	27
42	1	Physics Lab (154)	Recessed Parabolic	E	4'T8	3	4	32	Sw	14	240	20	444	1,492	N/A	Recessed Parabolic	4'T8	E	Sw	3	4	32	14	240	20	444	1492	0	0	0
43	1	Ecology Lab (144)	Pendant	E	4'T8	24	3	32	Sw	14	240	15	2,664	8,951	C	Pendant	4'T8	E	OS	24	3	32	11	240	15	2,664	6713	0	2238	2238
44	1	Prep (143)	Recessed Parabolic	E	4'T8	2	3	32	Sw	14	240	15	222	746	N/A	Recessed Parabolic	4'T8	E	Sw	2	3	32	14	240	15	222	746	0	0	0
45	1	Ecology Lab (144)	Recessed Parabolic	E	4'T8	3	4	32	Sw	14	240	20	444	1,492	N/A	Recessed Parabolic	4'T8	E	Sw	3	4	32	14	240	20	444	1492	0	0	0
46	1	Chemistry Lab (148)	Pendant	E	4'T8	21	3	32	BL	14	240	15	2,331	7,832	N/A	Pendant	4'T8	E	BL	21	3	32	8	240	15	2,331	4530	0	3302	3302
47	1	Chemistry Lab (148)	Recessed Parabolic	E	4'T8	3	4	32	Sw	14	240	20	444	1,492	N/A	Recessed Parabolic	4'T8	E	Sw	3	4	32	14	240	20	444	1492	0	0	0
48	1	Prep (146)	Recessed Parabolic	E	4'T8	2	3	32	Sw	14	240	15	222	746	N/A	Recessed Parabolic	4'T8	E	Sw	2	3	32	14	240	15	222	746	0	0	0
49	3	Boiler Room	Ceiling Mounted	E	4'T8	5	2	32	Sw	2	240	10	370	178	N/A	Ceiling Mounted	4'T8	E	Sw	5	2	32	2	240	10	370	178	0	0	0
50	3	Boiler Room	Ceiling Mounted	E	4'T8	4	2	32	N	24	365	10	296	2,593	C	Ceiling Mounted	4'T8	E	OS	4	2	32	18	365	10	296	1945	0	648	648
51	1	Office (133)	Recessed Parabolic	E	4'T8	2	3	32	Sw	9	240	15	222	480	C	Recessed Parabolic	4'T8	E	OS	2	3	32	7	240	15	222	360	0	120	120
52	1	Office (134)	Recessed Parabolic	E	4'T8	2	3	32	Sw	9	240	15	222	480	C	Recessed Parabolic	4'T8	E												

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)	
70	1	Kitchen (122)	Recessed Parabolic	E	4'T8	9	3	32	Sw	10	190	15	999	1,898	N/A	Recessed Parabolic	4'T8	E	Sw	9	3	32	10	190	15	999	1898	0	0	0	
71	1	Kitchen (122)	Recessed Parabolic	E	4'T8	3	3	32	N	24	365	15	333	2,917	N/A	Recessed Parabolic	4'T8	E	N	3	3	32	24	365	15	333	2,917	0	0	0	
72	1	Storage (129)	Recessed Parabolic	E	4'T8 U-Shaped	4	2	32	Sw	2	190	10	296	112	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	4	2	32	2	190	10	296	84	0	28	28	
73	1	Storage (129)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	2	190	10	148	56	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	2	2	32	2	190	10	148	42	0	14	14	
74	1	Media Center (119)	Pendant	E	4'T8	28	3	32	Sw	14	240	15	3,108	10,443	N/A	Pendant	4'T8	E	Sw	28	3	32	14	240	15	3,108	10,443	0	0	0	
75	1	Media Center (119)	Pendant	E	4'T8	3	3	32	N	24	365	15	333	2,917	C	Pendant	4'T8	E	Sw	3	3	32	24	365	15	333	2,917	0	0	0	
76	1	Media Center (119)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	14	240	10	148	497	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	2	2	32	14	240	10	148	497	0	0	0	
77	1	Media Center (119)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	N	24	365	10	148	1,296	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	2	2	32	18	365	10	148	972	0	324	324	
78	1	Storage (117)	Recessed Parabolic	E	4'T8	2	2	32	Sw	2	240	10	148	71	C	Recessed Parabolic	4'T8	E	OS	2	2	32	2	240	10	148	53	0	18	18	
79	1	Office (116)	Recessed Parabolic	E	4'T8	4	3	32	Sw	9	240	15	444	959	N/A	Recessed Parabolic	4'T8	E	Sw	4	3	32	9	240	15	444	959	0	0	0	
80	1	Office (118)	Recessed Parabolic	E	4'T8	3	4	32	Sw	9	240	20	444	959	N/A	Recessed Parabolic	4'T8	E	Sw	3	4	32	9	240	20	444	959	0	0	0	
81	1	A-Wing Hallway (130)	Recessed Parabolic	E	4'T8	6	2	32	Sw	14	240	10	444	1,492	C	Recessed Parabolic	4'T8	E	DL	6	2	32	11	240	10	444	1,119	0	373	373	
82	1	A-Wing Hallway (130)	Recessed Parabolic	E	4'T8	3	2	32	N	24	365	10	222	1,945	N/A	Recessed Parabolic	4'T8	E	N	3	2	32	24	365	10	222	1,945	0	0	0	
83	1	Vestibule (120)	Recessed Parabolic	E	4'T8	1	2	32	N	24	365	10	74	648	N/A	Recessed Parabolic	4'T8	E	N	1	2	32	24	365	10	74	648	0	0	0	
84	1	Storage (121)	Recessed	S	Inc	1	1	60	Sw	1	190	0	60	11	N/A	Recessed	CFL	S	Sw	1	1	60	1	190	0	60	11	0	0	0	
85	1	B-Wing Hallway (134)	Recessed Parabolic	E	4'T8 U-Shaped	63	2	32	Sw	14	240	10	4,662	15,664	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	63	2	32	11	240	10	4,662	11,748	0	3,916	3,916	
86	1	B-Wing Hallway (134)	Recessed Parabolic	E	4'T8 U-Shaped	14	2	32	N	24	365	10	1,036	9,075	N/A	Recessed Parabolic	4'T8 U-Shaped	E	N	14	2	32	24	365	10	1,036	9,075	0	0	0	
87	1	Mens Bathroom (140)	Recessed Parabolic	E	4'T8 U-Shaped	5	2	32	Sw	14	240	10	370	1,243	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	5	2	32	14	240	10	370	1,243	0	0	0	
88	1	Mens Bathroom (140)	Recessed Parabolic	E	4'T8 U-Shaped	1	2	32	N	24	365	10	74	648	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	1	2	32	18	365	10	74	486	0	162	162	
89	1	Womens Bathroom (139)	Recessed Parabolic	E	4'T8 U-Shaped	5	2	32	Sw	14	240	10	370	1,243	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	5	2	32	14	240	10	370	1,243	0	0	0	
90	1	Womens Bathroom (139)	Recessed Parabolic	E	4'T8 U-Shaped	1	2	32	N	24	365	10	74	648	N/A	Recessed Parabolic	4'T8 U-Shaped	E	N	1	2	32	24	365	10	74	648	0	0	0	
91	1	Janitor's Closet (141)	Ceiling Mounted	E	4'T8	1	2	32	Sw	2	240	10	74	36	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	2	240	10	74	36	0	0	0	
92	1	Janitor's Closet (141)	Ceiling Mounted	E	4'T8	1	2	32	N	24	365	10	74	648	N/A	Ceiling Mounted	4'T8	E	N	1	2	32	24	365	10	74	648	0	0	0	
93	1	Oceanography Lab (158)	Pendant	E	4'T8	32	3	32	BL	14	240	15	3,552	11,935	C	Pendant	4'T8	E	OS	32	3	32	11	240	15	3,552	8,951	0	2,984	2,984	
94	1	Oceanography Lab (158)	Recessed Parabolic	E	4'T8	3	4	32	Sw	14	240	20	444	1,492	C	Recessed Parabolic	4'T8	E	OS	3	4	32	11	240	20	444	1,119	0	373	373	
95	1	Office (158)	Recessed Parabolic	E	4'T8	2	3	32	Sw	9	240	15	222	480	C	Recessed Parabolic	4'T8	E	OS	2	3	32	7	240	15	222	360	0	120	120	
96	1	Office (158)	Recessed Parabolic	E	4'T8	2	3	32	Sw	9	240	15	222	480	C	Recessed Parabolic	4'T8	E	OS	2	3	32	7	240	15	222	360	0	120	120	
97	1	Nurse (162)	Recessed Parabolic	E	4'T8	7	4	32	Sw	9	240	20	1,036	2,238	C	Recessed Parabolic	4'T8	E	OS	7	4	32	7	240	20	1,036	1,678	0	559	559	
98	1	Guidance (160)	Recessed Parabolic	E	4'T8	9	3	32	Sw	9	240	15	999	2,158	C	Recessed Parabolic	4'T8	E	OS	9	3	32	7	240	15	999	1,618	0	539	539	
99	1	Guidance (163)	Recessed Parabolic	E	4'T8	6	3	32	Sw	9	240	15	666	1,439	C	Recessed Parabolic	4'T8	E	OS	6	3	32	7	240	15	666	1,079	0	360	360	
100	1	Guidance (164)	Recessed Parabolic	E	4'T8	8	3	32	Sw	9	240	15	888	1,918	N/A	Recessed Parabolic	4'T8	E	Sw	8	3	32	9	240	15	888	1,918	0	0	0	
101	1	Guidance (165)	Recessed Parabolic	E	4'T8	6	3	32	Sw	9	240	15	666	1,439	N/A	Recessed Parabolic	4'T8	E	Sw	6	3	32	9	240	15	666	1,439	0	0	0	
102	1	Main Office (110)	Recessed Parabolic	E	4'T8	12	3	32	Sw	14	240	15	1,332	4,476	C	Recessed Parabolic	4'T8	E	OS	12	3	32	11	240	15	1,332	3,357	0	1,119	1,119	
103	1	Main Office (110)	Recessed Parabolic	E	4'T8 U-Shaped	18	2	32	Sw	14	240	10	1,332	4,476	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	18	2	32	14	240	10	1,332	4,476	0	0	0	
104	1	Main Office (110)	Recessed Parabolic	E	4'T8	4	3	32	Sw	14	240	15	444	1,492	N/A	Recessed Parabolic	4'T8	E	Sw	4	3	32	14	240	15	444	1,492	0	0	0	
105	1	Biology Lab (114)	Pendant	E	4'T8	32	3	32	BL	14	240	15	3,552	11,935	N/A	Pendant	4'T8	E	BL	32	3	32	8	240	15	3,552	6,903	0	5,032	5,032	
106	1	Biology Lab (114)	Recessed Parabolic	E	4'T8	3	4	32	Sw	14	240	20	444	1,492	N/A	Recessed Parabolic	4'T8	E	Sw	3	4	32	14	240	20	444	1,492	0	0	0	
107	1	Biology Lab (114)	Recessed Parabolic	E	4'T8	2	3	32	Sw	14	240	15	222	746	N/A	Recessed Parabolic	4'T8	E	Sw	2	3	32	14	240	15	222	746	0	0	0	
108	1	Biology Lab (114)	Recessed Parabolic	E	4'T8	2	3	32	Sw	14	240	15	222	746	N/A	Recessed Parabolic	4'T8	E	Sw	2	3	32	14	240	15	222	746	0	0	0	
109	1	Elevator Room	Ceiling Mounted	E	4'T8	2	2	32	Sw	1	240	10	148	36	T8-BL	Ceiling Mounted	4'T8	E	BL	2	2	32	1	240	10	148	21	0	15	15	
110	1	B-Wing Stairwell	Ceiling Mounted	E	4'T8	5	2	32	Sw	14	240	10	370	1,243	N/A	Ceiling Mounted	4'T8	E	Sw	5	2	32	14	240	10	370	1,243	0	0	0	
111	1	B-Wing Stairwell	Recessed Parabolic	E	4'T8	8	2	32	Sw	14	240	10	592	1,989	N/A	Recessed Parabolic	4'T8	E	Sw	8	2	32	14	240	10	592	1,989	0	0	0	
112	1	MER	Ceiling Mounted	E	4'T8	5	2	32	Sw	2	240	10	370	178	N/A	Ceiling Mounted	4'T8	E	Sw	5	2	32	2	240	10	370	178	0	0	0	
113	1	MER	Ceiling Mounted	E	4'T8	2	2	32	Sw	2	240	10	148	71	N/A	Ceiling Mounted	4'T8	E	Sw	2	2	32	2	240	10	148	71	0	0	0	
114	1	C-Wing Stairwell (149)	Ceiling Mounted	E	4'T8	2	2	32	Sw	14	240	10	148	497	T8-BL	Ceiling Mounted	4'T8	E	BL	2	2	32	8	240	10	148	288	0	210	210	
115	1	C-Wing Stairwell (149)	Recessed Parabolic	E	4'T8	2	2	32	Sw	14	240	10	148	497	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	14	240	10	148	497	0	0	0	
116	1	C-Wing Stairwell (149)	Recessed Parabolic	E	4'T8	8	4	32	Sw	14	240	20	1,184	3,978	N/A	Recessed Parabolic	4'T8	E	Sw	8	4	32	14	240	20						

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

Proposed Lighting Summary Table			
Total Gross Floor Area (SF)	54,000		
Average Power Cost (\$/kWh)	0.1630		
Exterior Lighting	Existing	Proposed	Savings
Exterior Annual Consumption (kWh)	48,776	17,827	30,949
Exterior Power (watts)	11,136	4,070	7,066
Total Interior Lighting	Existing	Proposed	Savings
Annual Consumption (kWh)	334,393	274,481	59,911
Lighting Power (watts)	92,179	89,499	2,680
Lighting Power Density (watts/SF)	1.71	1.66	0.05
Estimated Cost of Fixture Replacement (\$)	52,410		
Estimated Cost of Controls Improvements (\$)	17,320		
Total Consumption Cost Savings (\$)	19,703		

LEGEND			
Lamp Type		Controls	
CFL	Compact Fluorescent	T	Autom. Timer
Inc	Incandescent	BL	Bi-Level
LED	Light Emitting Diode	Ct	Contact
MH	Metal Halide	M	Daylight & Motion
MV	Mercury Vapor	DLSw	Daylight & Switch
PSMH	Pulse Start Metal Halide	DL	Daylight Sensor
HPS	High Pressure Sodium	DSw	Delay Switch
LPS	Low Pressure Sodium	D	Dimmer
FI	Fluorescent	MS	Motion Sensor
4'T8	4 Feet long T8 Linear Lamp	MSw	Motion& Switch
4'T8 U-shaped	4 Feet long T8 U-shaped Lamp	N	None
4'T5	4 Feet long T5 Linear Lamp	OS	Occupancy Sensor
Ballast Type		OSCM	Occupancy Sensor Ceiling Mounted
E	Electronic	PC	Photocell
M	Magnetic	Sw	Switch
S	Self		

APPENDIX D: EnergyMisers



EnergyMisers

[VendingMiser®](#)

[CoolerMiser™](#)

[SnackMiser™](#)

[PlugMiser™](#)

[VM2iO®](#)

[CM2iO®](#)

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)	\$0.163
Facility Occupied Hours per Week	73
Number of Cold Drink Vending Machines	2
Number of Non-refrigerated Snack Machines	1
Power Requirements of Cold Drink Machine (Watts; 400 typical)	400
Power Requirements of Snack Machine (Watts; 80 typical)	80
VendingMiser® VM150 Price (for cold drink machines)	\$199.00
SnackMiser™ SM150 Price (for snack machines)	\$180.00

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

COLD DRINK MACHINES Current Projected Total Savings % Savings

kWh	6989	3695	3293	47%
Cost of Operation	\$1,139.17	\$602.35	\$536.81	47%

SNACK MACHINES Current Projected Total Savings % Savings

kWh	699	304	395	57%
Cost of Operation	\$113.92	\$49.50	\$64.42	57%

Location's Total Annual Savings

	Current	Projected	Total Savings	% Savings
kWh	7688	3999	3689	48%
Cost of Operation	\$1,253.09	\$651.86	\$601.23	48%

Total Project Cost Break Even (Months)

\$578	11.54
-------	-------

Estimated Five Year Savings on ALL Machines = \$3,006.15

Estimated Five Year Return on Investment = 420%

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APPENDIX E: UPCOMING EQUIPMENT PHASEOUTS

LIGHTING:

- As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps are no longer being produced for commercial and industrial applications.
- As of **January 1, 2012** 100 watt incandescent bulbs have been phased out in accordance with the Energy Independence and Security Act of 2007.
- Starting **July 2012** many non energy saver model T12 lamps will be phased out of production.
- As of **January 1, 2013** 75 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.
- As of **January 1, 2014** 60 and 40 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.
- Energy Independence and Security Act of 2007 incandescent lamp phase-out exclusions:
 1. Appliance lamp (e.g. refrigerator or oven light)
 2. Black light lamp
 3. Bug lamp
 4. Colored lamp
 5. Infrared lamp
 6. Left-hand thread lamp
 7. Marine lamp
 8. Marine signal service lamp
 9. Mine service lamp
 10. Plant light lamp
 11. Reflector lamp
 12. Rough service lamp
 13. Shatter-resistant lamp (including a shatter-proof lamp and a shatter-protected lamp)
 14. Sign service lamp
 15. Silver bowl lamp
 16. Showcase lamp
 17. 3-way incandescent lamp
 18. Traffic signal lamp
 19. Vibration service lamp
 20. Globe shaped "G" lamp (as defined in ANSI C78.20-2003 and C79.1-2002 with a diameter of 5 inches or more)
 21. T shape lamp (as defined in ANSI C78.20-2003 and C79.1-2002) and that uses not more than 40 watts or has a length of more than 10 inches
 22. A B, BA, CA, F, G16-1/2, G-25, G30, S, or M-14 lamp (as defined in ANSI C79.1-2002 and ANSI C78.20-2003) of 40 watts or less
 23. Candelabra incandescent and other lights not having a medium Edison screw base.
- When installing compact fluorescent lamps (CFLs), be advised that they contain a very small amount of mercury sealed within the glass tubing and EPA guidelines concerning

cleanup and safe disposal of compact fluorescent light bulbs should be followed. Additionally, all lamps to be disposed should be recycled in accordance with EPA guidelines through state or local government collection or exchange programs instead.

HCFC (Hydrochlorofluorocarbons):

- As of **January 1, 2010**, no production and no importing of R-142b and R-22, except for use in equipment manufactured before January 1, 2010, in accordance with adherence to the Montreal Protocol.
- As of **January 1, 2015**, No production and no importing of any HCFCs, except for use as refrigerants in equipment manufactured before January 1, 2010.
- As of **January 1, 2020** No production and no importing of R-142b and R-22.

APPENDIX F: THIRD PARTY ENERGY SUPPLIERS

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

Third Party Electric Suppliers for Atlantic City Electric Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.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
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.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
Integrus Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrusenergy.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
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.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 NJNG 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
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
NJ Gas & Electric 1 Bridge Plaza, Fl. 2 Fort Lee, NJ 07024	(866) 568-0290 www.NewJerseyGasElectric.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 G: 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 measures (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 expressed as 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:

	A	B	C	D	E	F	G	H	I
1									
2									
3									
4					Year	Cash Flow			
5					0	\$ (5,000.00)			Investment Cost
6					1	\$ 850.00			
7					2	\$ 850.00			
8					3	\$ 850.00			
9					4	\$ 850.00			
10					5	\$ 850.00			
11					6	\$ 850.00			
12					7	\$ 850.00			
13					8	\$ 850.00			
14					9	\$ 850.00			
15					10	\$ 850.00			
16					IRR	11.03%			
17					NPV	\$2,250.67			

ECM Lifetime: 10 years (rows 5-14)

Cash Flow: Annual Energy Cost Savings + Annual Maintenance Savings

Formula:
 =IRR(F4:F14)
 =NPV(0.03,F5:F14)+F4

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 Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume \$608/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 + \$608/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 Equipment Life Span

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 H: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347



STATEMENT OF ENERGY PERFORMANCE OCTVS-MATES

Building ID: 3109689
For 12-month Period Ending: December 31, 2011¹
Date SEP becomes ineligible: N/A

Date SEP Generated: May 29, 2012

Facility
OCTVS-MATES
195 Cedar Bridge Road
Manahawkin, NJ 08733

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 2006
Gross Floor Area (ft²): 54,000

Energy Performance Rating² (1-100) 19

Site Energy Use Summary³

Electricity - Grid Purchase (kBtu)	2,581,929
Natural Gas (kBtu) ⁴	4,001,800
Total Energy (kBtu)	6,583,729

Energy Intensity⁴

Site (kBtu/ft²/yr)	122
Source (kBtu/ft²/yr)	237

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	579
---	-----

Electric Distribution Utility

Jersey Central Power & Light Co [FirstEnergy Corp]

National Median Comparison

National Median Site EUI	91
National Median Source EUI	177
% Difference from National Median Source EUI	34%
Building Type	K-12 School

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 Standards⁵ 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. Values represent energy intensity, annualized to a 12 month period.
5. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

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

EPA Form 5900-16

APPENDIX I: 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.

Energy Provider Incentives

- **South Jersey Gas** - Offers financing up to \$100,000 on the customer's portion of project cost through private lender. In addition to available financing, it provides matching incentive on gas P4P incentives #2 and #3 up to \$100,000 (not to exceed total project cost).

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

Direct Install 2011 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 70%** of the retrofit costs, including equipment cost and installation costs. Each project is limited to \$75,000 in incentives.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 150 kW** within 12 months of applying (the 150 kW peak demand threshold has been waived for local government entities who receive and utilize their Energy Efficiency and Conservation Block Grant in conjunction with Direct Install)
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies

Energy Provider Incentives

- **South Jersey Gas** – Program offers financing up to \$25,000 on customer's 40% portion of the project and combines financing rate based on portion of the project devoted to gas

and electric measures. All gas measures financed at 0%, all electric measures financed at normal rate. Does not offer financing on projects that only include electric measures.

- **Atlantic City Electric** – Provides a free audit, and additional incentives up to 20% of the current incentive up to a maximum of \$5,000 per customer.

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> or visit the utility web sites.

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.

Energy Provider Incentives

- **South Jersey Gas** – Program to finance projects up to \$25,000 not covered by incentive
- **New Jersey Natural Gas** – Will match SSB incentives on gas equipment
- **PSE&G** - Provides funding for site-specific uses of emerging technology. The incentives are determined on a case by case basis.

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>.

Combined Heat and Power (CHP)

Energy Provider Incentives

- South Jersey Gas - Provides additional incentive of \$1.00/watt up to \$1,000,000 on top of NJCEP incentive.

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 J: ENERGY CONSERVATION MEASURES

ECM #	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 yr 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, \$	CO ₂ reduced, lbs/yr
1	Retrofit 2 refrigerated vending machines with VendingMiser™ devices	398	0	398	3,293	0	0	0.2	537	1,073	12	12,871	0.4	3,134	261	269	9,837	5,896
2	Retro-commissioning	10,800	none at this time	10,800	66,382	0	9,355	21.5	0	21,600	3	64,800	0.5	500	167	192	48,511	221,976
3	Replace 21 existing metal halide fixtures with T5 fixtures	4,564	1,650	2,914	19,511	4	0	1.2	2,135	5,315	15	79,727	0.5	2,636	176	182	57,781	34,934
4	Retrofit 1 vending machine with a SnackMiser™ device	179	0	179	395	0	0	0.0	64	129	12	1,544	1.4	763	64	72	1,053	707
5	Install 48 occupancy sensors	10,560	1,680	8,880	38,773	0	0	2.4	0	6,320	15	94,800	1.4	968	65	71	63,457	69,423
6	Install 1 daylight sensor	220	25	195	486	0	0	0.0	0	79	15	1,189	2.5	510	34	40	715	871
7	27 New LED fixtures to be installed with incentives	51,018	0	51,018	30,949	7	0	2.0	4,185	9,230	5	46,149	5.5	-10	-2	-3	-8,710	55,414
8	Install 92 new bi-level fixtures in stairwells	9	0	9	8	0	0	0.0	0	2	5	8	5.7	-13	-3	-4	-2	14
9	92 New T8 fixtures to be installed with incentives	15,605	2,300	13,305	14,100	0	0	0.9	0	2,298	15	34,474	5.8	159	11	15	13,313	25,246

Assumptions:

Discount Rate: 3.2%; Energy Price Escalation Rate: 0%

Note:

low/negligible

A 0.0 electrical demand reduction/month indicates that it is very

APPENDIX K: METHOD OF ANALYSIS

Assumptions and tools

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.