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

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

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

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Local Government Energy Program
Energy Audit Final Report

Ocean County Vocational Technical School

Joint Base at Lakehurst – Hangar 1
Route 547
Lakehurst, NJ 08733

Project Number: LGEA100

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EXECUTIVE SUMMARY

The Ocean County Vocational Technical School (OCVTS) Hangar 1 is a two-story, 57,000 square foot, slab on grade, 9-12 school building built in 1994. It is a rectangular shaped building that was built inside the previously existing U.S. Navy Hangar 1. On one side, the building overlooks another Navy Hangar and a street; on the other side the building overlooks the interior of the Navy Hangar facility. This building houses classrooms, faculty offices, a computer lab and a multi-purpose room. 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	823,428	15,029	$143,466	75.7	192	4,313
Proposed	743,057	13,701	$122,972	68.5	174	3,906
Savings	80,371	1,328	$20,494*	7.1	19	407
% Savings	9.8%	8.8%	14.3%	9.4%	9.6%	9.4%
*Includes operation and maintenance savings; **Includes SRECS						

SWA has entered energy information about the Hangar 1 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 4 and a Site Energy Utilization of 63 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	$16,378	1.6	$26,892	145,387
5-10 Year	$299	6.1	$1,811	2,019
>10 year	$3,817	10.2	$39,087	11,136
Total	$20,494	3.3	$67,789	158,543

Energy Conservation Measure Implementation

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

Recommended ECMs	Incentive Program (APPENDIX J for details)
Retrofit 2 refrigerated vending machines with VendingMiser™ Devices	N/A
Retro-commissioning	N/A
Replace 5 exterior metal halide fixtures with CFL fixtures	N/A
Retrofit 1 snack vending machines with SnackMiser™ Devices	N/A
Replace existing indoor Metal Halide fixtures with T5 fixtures	Smart Start, Direct Install
Install 44 new occupancy sensors	Smart Start, Direct Install
Replace old domestic hot water heater with an Energy Star condensing model	Smart Start, Direct Install
Retrofit 15 T12 fixtures with electronic ballasts and T8 lamps	Smart Start, Direct Install
Replace magnetic ballasts with electronic ballasts	N/A
Replace 18 u-shaped T12 fixtures withT8 models	Smart Start, Direct Install
Install 13 new bi-level fixtures in stairwells	Smart Start, Direct Install

Appendix K contains an Energy Conservation Measures table

In addition to these ECMs, SWA recommends

- Operation and Maintenance (O&M) measures that would contribute to reducing energy usage at low or no cost:
    - Check and adjust timers and thermostats monthly
    - Replace motors with NEMA premium efficiency models
    - Unclog and maintain all roof drains/scuppers.
    - Provide water-efficient fixtures and controls
    - 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 power electric strips
    - Create an energy educational program

There may be energy procurement opportunities for the OCVTS Public School District to reduce annual utility costs. When compared to the average estimated NJ commercial utility rates, the school is $790 higher per year. Third party electric procurement opportunities may not be available for electricity due to the sub-metering contract with the Joint-Base. However, third party natural gas opportunities may be available. Please see Appendix G for more information.

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 (BPUs) 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 Joint Base McGuire, Dix, Lakehurst Hangar 1 at Route 547, Lakehurst, NJ. The process of the audit included a facility visit on April 11th, 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 Vocation Technical School to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Joint Base Hangar 1 facility.

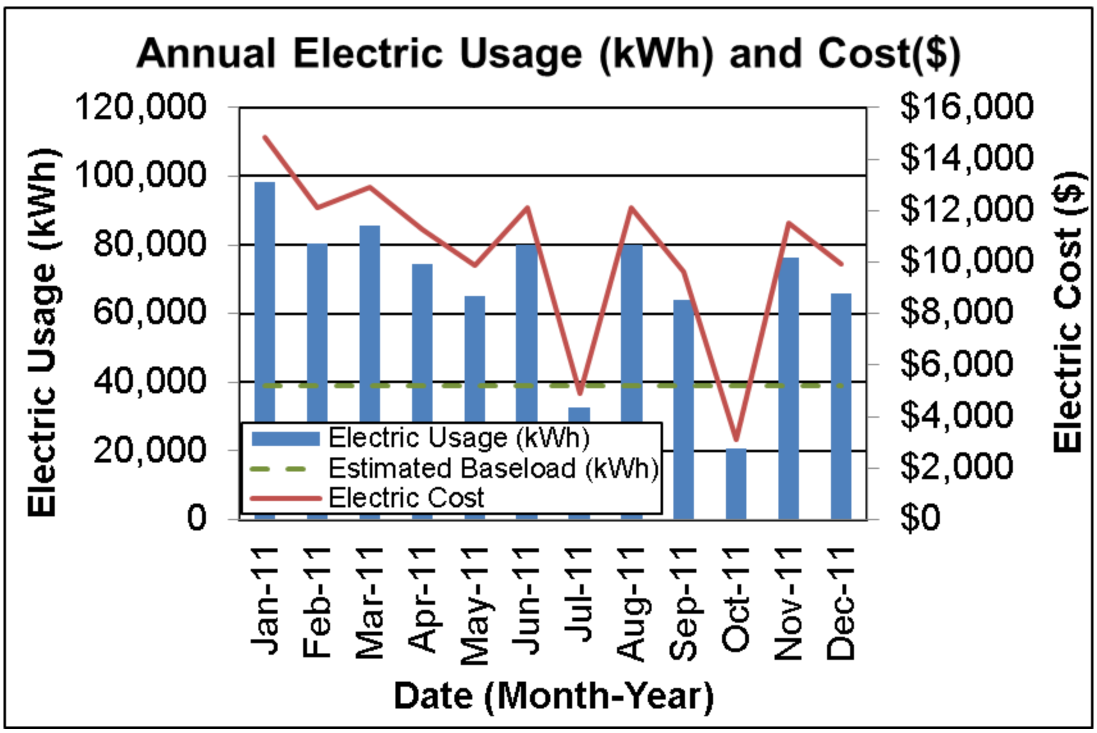
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

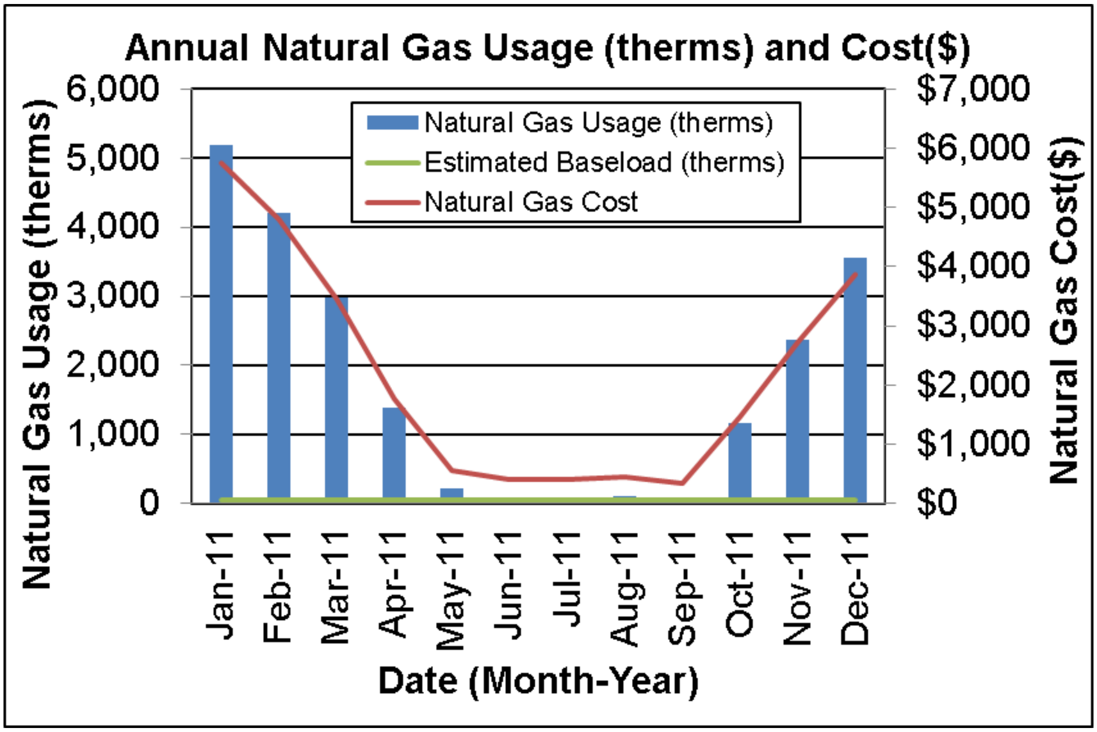
SWA reviewed utility information from January 2011 through December 2011 that was received from OCVTS. The facility is supplied with electricity and natural gas. A 12 month period of analysis from January 2011 through December 2011 was used for all calculations and for purposes of benchmarking the building.

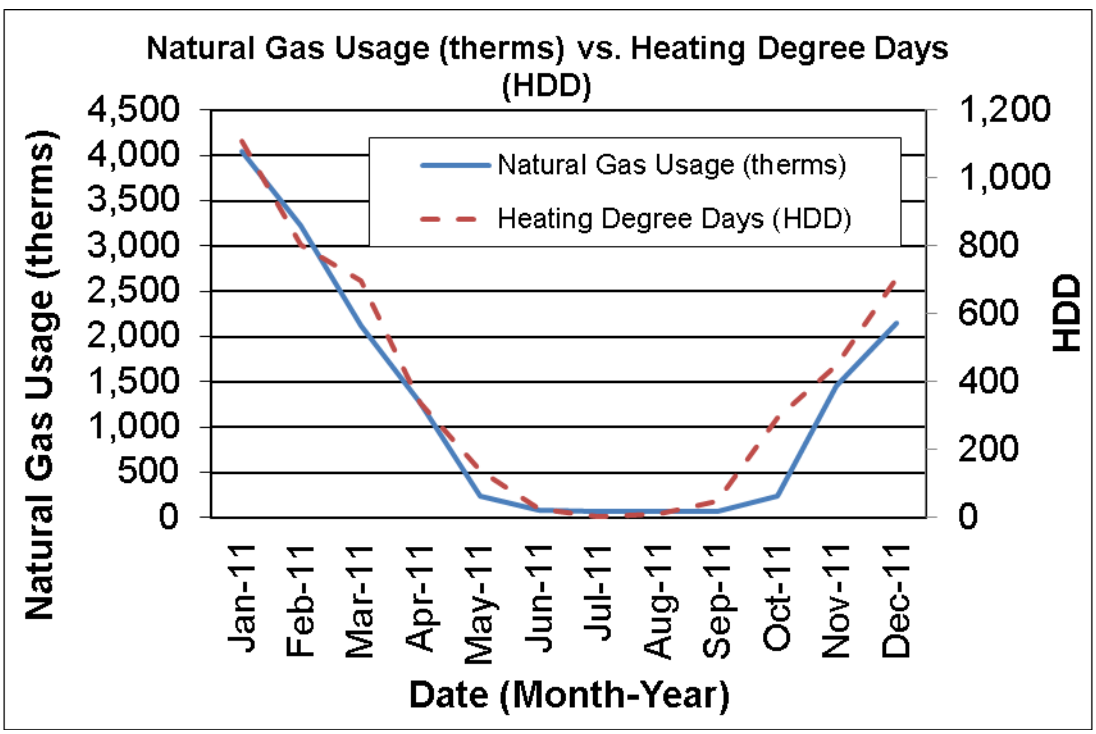
Electricity – Hangar 1 is currently served by one electric meter. The school currently purchases electricity from the Navy Joint Base McGuire-Dix-Lakehurst which supplies the school electricity. Electricity was purchased at an average aggregated rate of $0.151/kWh and the school consumed approximately 345,711 kWh, or $124,304 of electricity, in the previous year.

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 Hangar 1 Vocational & Technical School. The baseline usage for the Elementary School is approximately 34,000 kWh (based on average use for the 3 lowest consumption months). As is atypical in schools, the electric usage is highest in January due to the electric baseboard heating system. The high usage for June and August, and the low usage for October show irregular usage trends and should be investigated further.



Natural gas – Hangar 1 Vocational & Technical 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 aggregated rate of $1.275/therm and the school consumed approximately 15,029 therms, or $19,162 of natural gas. 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 Hangar 1 Vocational & Technical School (based on average use for the 3 lowest consumption months). The natural gas baseload for the school is approximately 70 therms. As expected usage peaks in the winter months in conjunction with the operation of the gas fired heating hot water boilers.

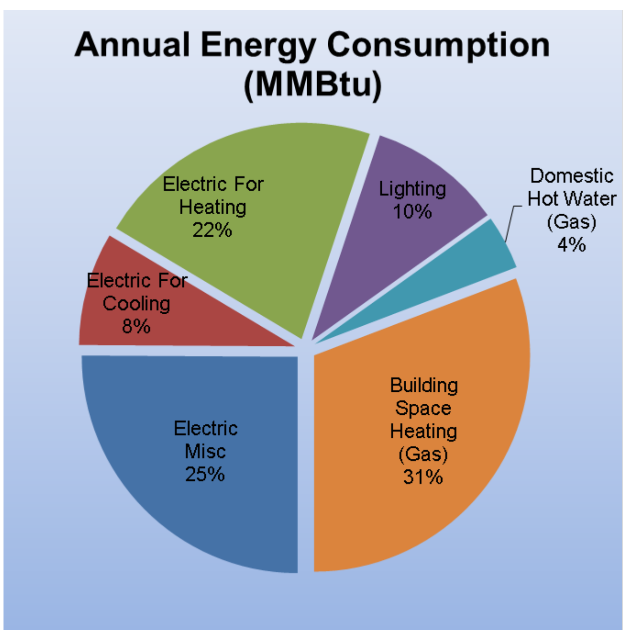


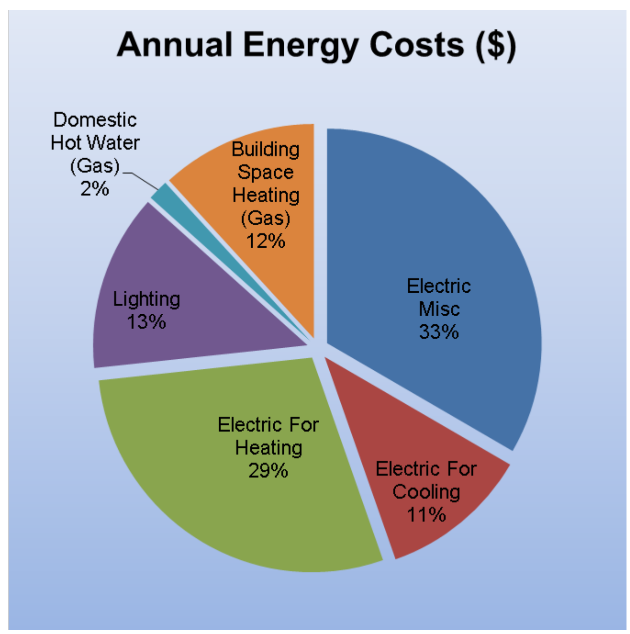


The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature of 65°F, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the 65°F temperature. The natural gas consumption profile follows the HDD curve. The difference between gas usage and HDD from September to December shows low gas usage, which represents energy savings.

The following graphs, pie charts, and table show energy use for Hangar 1 Vocational & Technical School based on utility bills for the 12 month period. Note: electrical cost at $44/MMBtu of energy is more than 3 times as expensive as natural gas at $13/MMBtu

Annual Energy Consumption / Costs					
	MMBtu	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Electric Misc	1,082	25%	$47,881	33%	$44
Electric For Cooling	365	8%	$16,151	11%	$44
Electric For Heating	930	22%	$41,138	29%	$44
Lighting	433	10%	$19,134	13%	$44
Domestic Hot Water (Gas)	175	4%	$2,230	2%	$13
Building Space Heating (Gas)	1,328	31%	$16,932	12%	$13
Totals	4,313	100%	$143,466	100%	
Total Electric Usage	2,810	65%	$124,304	87%	$44
Total Gas Usage	1,503	35%	$19,162	13%	$13
Totals	4,313	100%	$143,466	100%	

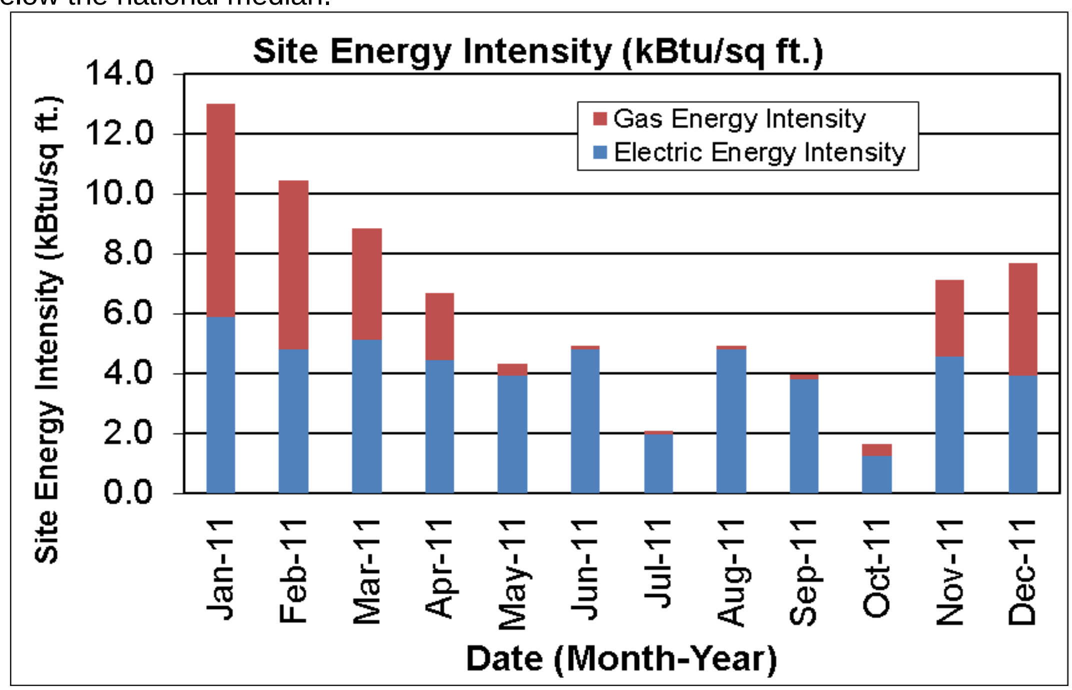




Energy Benchmarking

SWA has entered energy information about Hangar 1 Vocational & Technical 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 4 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 Use Intensity is 76 kBtu/sqft/yr compared to the national median of a "K-12 School" building consuming 43 kBtu/sqft/yr. This is a 56% difference between the buildings intensity and the national median. See the recommendations presented in this report for guidance on how to improve the building's rating.

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 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 4 shows the building performs 46% below the national median.



Per the LGEA program requirements, SWA has assisted the OCVTS Public School District to create an ENERGY STAR® Portfolio Manager account and share the Hangar 1 Vocational & Technical School 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

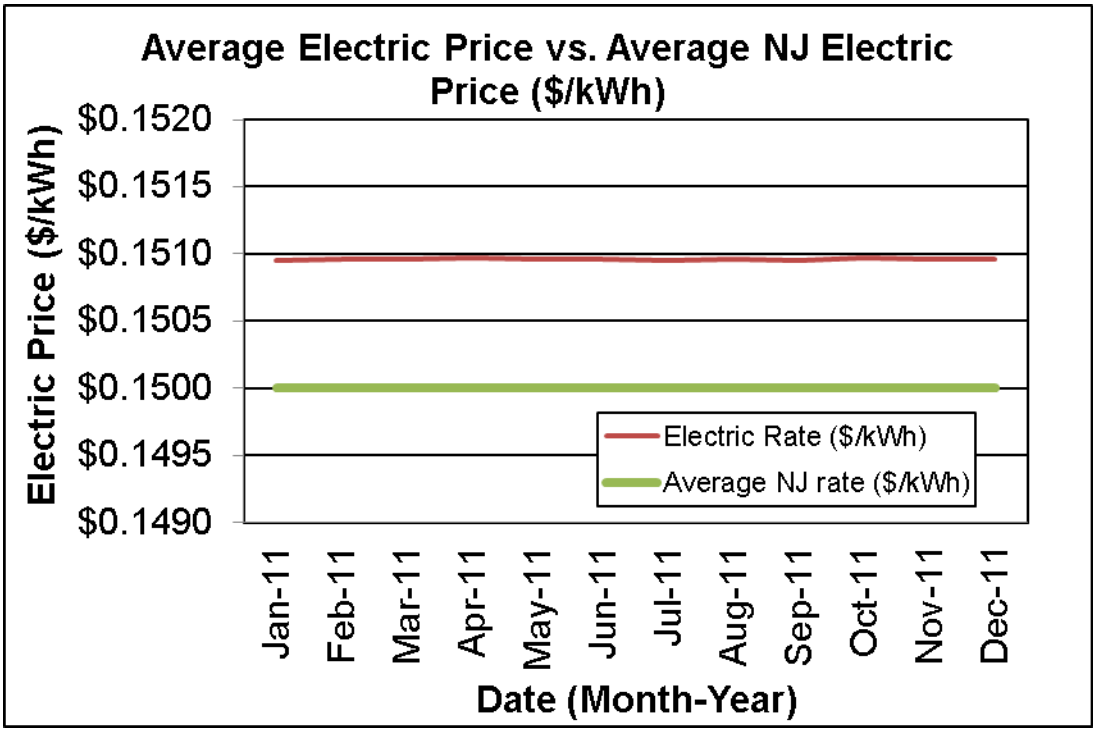
Tariff analysis can help determine if the municipality is paying the lowest rate possible for electric and gas service. Tariffs are typically assigned to buildings based on size and building type. Rate fluctuations are expected during periods of peak usage. Natural gas prices often increase during winter 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 analysis, SWA evaluated the current utility rates and tariffs. Hangar 1 Vocational & Technical School is currently paying a general service rate for natural gas including fixed costs such as meter reading charges. Electricity is purchased from the Joint Base and a tariff analysis is not applicable.

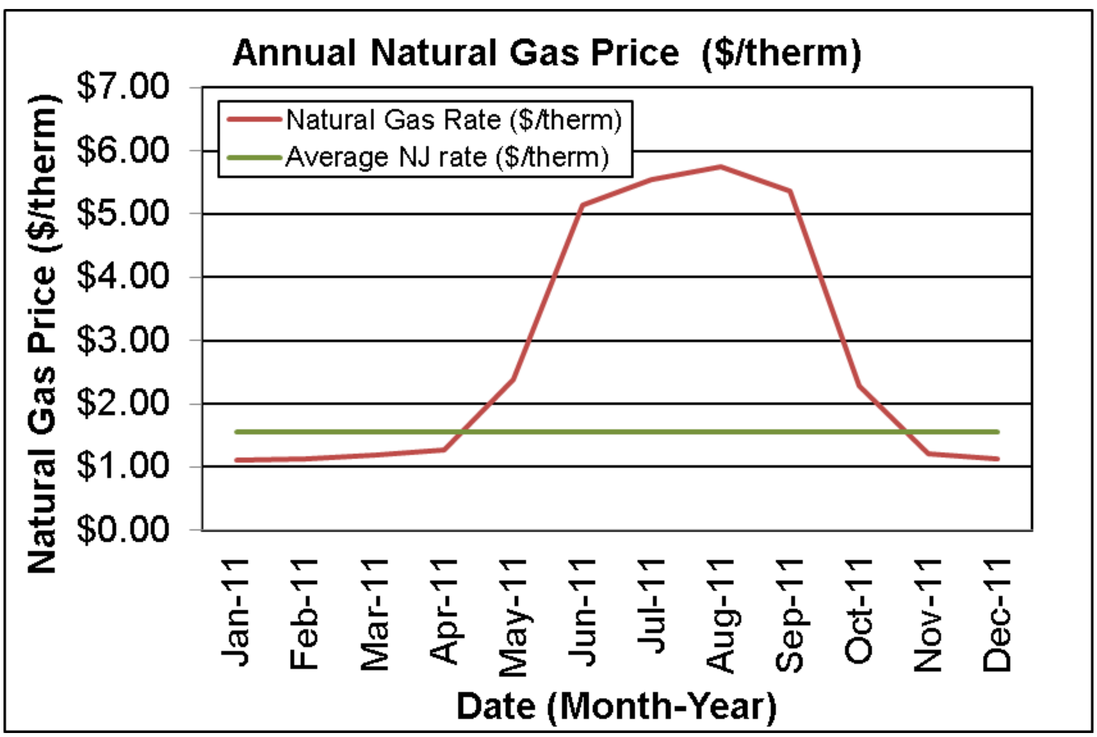
Energy Procurement strategies

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 Hangar 1 Vocational & Technical School pays a rate of $0.151/kWh. Hangar 1 Vocational & Technical School annual electric utility costs are $790 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows 0% fluctuations in the electric rate over the most recent 12 month period.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while Hangar 1 Vocational & Technical School pays a rate of $1.275/therm. Hangar 1 Vocational & Technical School annual natural gas costs are $4,133 lower, when compared to the average estimated NJ commercial utility rates. Natural gas bill analysis shows fluctuations up to 81% over the most recent 12 month period. Utility rate fluctuations in the spring and summer months may have been caused by a combination of low usage and the assessment of fixed fees and costs.



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 Wednesday, April 11, 2012, the following data was collected and analyzed.

Building Characteristics

The OCVTS Hangar 1 is a two-story, 57,000 square foot, slab on grade, 9-12 school building built in 1994. Originally known as the Career and Technical Institute, it is a rectangular shaped building that was constructed within the existing U.S. Navy Hangar 1. The schools structure was built inside the large military airplane/storage hangar. On one side, the building overlooks another Navy Hangar and a street; on the other side, the building overlooks the interior of the Navy Hangar facility. The first floor has staff rooms and offices, a multi-purpose room, a mechanical room, and a computer lab in addition to classrooms. The second floor consists of 11 classrooms and a few staff offices. The facility received some renovations in 1999 and 2001, with additional classrooms being built on the west wing. Other renovations include classroom alterations and new mechanical equipment.

South Façade

South Façade

North Façade (inside Hangar 1)

North Façade (inside Hangar 1)

Building Occupancy Profiles

The school's occupancy is approximately 300 students and faculty from 9:30 AM to 3:30 PM Monday through Friday. Building operations personnel are present from 6:00 AM to 4:00 PM Monday through Friday and during the nighttime cleaning hours of 3:00 PM to 11:00 PM Monday through Friday. The school is closed for the summer months of June, July, and August.

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 school was constructed inside of the U.S. Navy hangar structure and therefore shares the same steel ribbed panel façade. The schools structure was constructed with concrete block and a steel superstructure. The interior walls are a combination of painted ½" gypsum board and painted CMU (Concrete Masonry Units), with approximately 3 ½" of R-13 batt insulation.

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

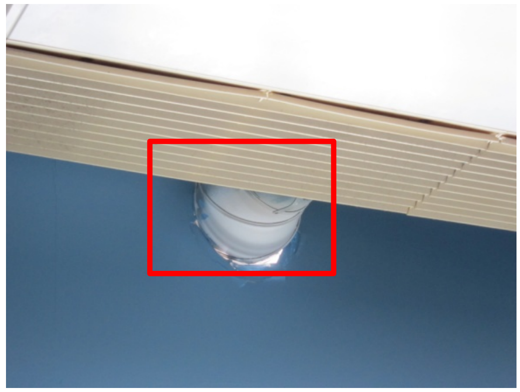
Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall fair condition with no visible signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all facades.

Roof

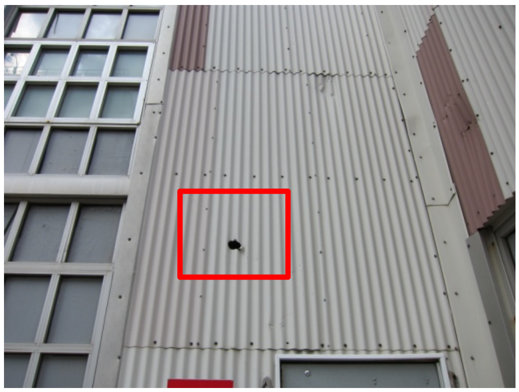
The school is essentially a building within another building; the roof is partially part of the Navy's Hangar 1 exterior wall and partially inside the hangar, where it is not exposed to exterior weather conditions.

The exterior roof section of the building shares the same steel panel and steel superstructure as the Navy Hangar. The interior section of the roof consists of ribbed metal decking. There is an unconfirmed amount of batt insulation for the roofing and ceiling thermal boundaries of the building.

Note: Roof insulation levels for the old building could not be visually verified in the field by non-destructive methods.

Poorly sealed wall penetration



Unsealed wall opening

The roofs were unavailable for inspection during the field audit. They were reported to be in overall fair condition, with no visible signs of uncontrolled moisture, air-leakage or other energy-compromising issues on any roof areas.

Base

The building's base is composed of a concrete slab on top of the original hangar slab. The original hangar has a concrete slab-on-grade, perimeter footing, concrete block foundation walls and no detectable slab edge/perimeter insulation.

Note: Slab and perimeter insulation levels could not be verified in the field or on construction plans, and are based upon similar wall types and time of construction.

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 fair 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. Fixed type windows with a non-insulated frame, single glazing and with an interior or exterior shading devices. The windows are located on the exterior walls of the building.

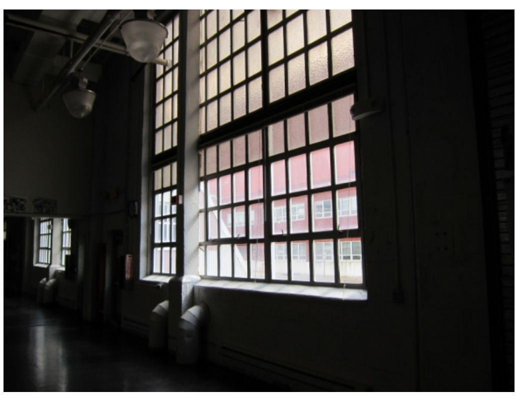
2. Fixed and awning type windows with a non-insulated frame, single glazing and with no interior or exterior shading devices. The windows are located on the exterior walls of the building.

3. Fixed type windows with a non-insulated frame, double glazing and with interior or exterior shading devices. The windows are located around the main entrance doors.

4. Fixed type windows with a non-insulated frame single pane, wire-mesh and aluminum frames. The windows are located on the side of the building that faces the interior of the hangar.

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 fair age appropriate condition, with no visible signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific window problem areas were identified:




Single pane windows located in the dance studios

Exterior doors

The buildings contain several different types of exterior doors:

1. Aluminum type exterior panel type doors with single-pane glass on the top panel with a non-insulated frame. This door type is located at the main school entrance.

2. Aluminum type exterior glass panel type doors with single-pane glass with a non-insulated frame. This door type is located at the main school entrance.

3. Non-insulated aluminum frames. They are located in the hangar's interior entrances.

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

The following specific door problem spots were identified:

Metal doors have non-insulated door frames, and outside light shining through is a sign of no or deteriorating weather-stripping

Building air-tightness

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

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

Mechanical Systems

Heating Ventilation Air Conditioning

All spaces in Ocean County Vocational & Technical School Hangar 1 are mechanically ventilated, heated and cooled. The school contains 30% Glycol water loop, which is pumped to heat pumps. Ventilation and cooling are provided by split direct expansion (DX) cooling systems and numerous exhaust fans. During the field visit there were no major comfort issues reported.

Equipment

Heating –The OCVTS Hangar 1 is heated by water source heat pumps, electric baseboard heaters and unit heaters. The school has 25 Climate Master heat pumps of varying capacities. The building uses a two pipe glycol water loop which contains 30% glycol to provide heat to the heat pumps. During the heating season, hot water is provided to the heat pumps via two direct-vented Weil-McLain CGi-8 boilers. The boilers have an input capacity of 233 MBH and have an annual fuel utilization efficiency (AFUE) of 82.7%. The heat pumps are then ducted to various rooms. Some are dedicated to large rooms, while others serve multiple smaller rooms and/or the corridor. Additionally, perimeter rooms are equipped with electric baseboards for supplemental heating. Several unit heaters are used to heat the stairwells, mechanical room and vestibules.

The facility also has 14 Trane and 3 York direct gas-fired furnaces which provide heat to the west wing. The west wing includes a dance studio, an audio storage room and several classrooms. The furnaces range from 3 to 5 tons, have an AFUE of 90%, and are controlled by programmable thermostats. The furnaces were installed in 2001 and are located within the spaces they serve. In 2009, an outdoor packaged air handling unit (AHU) was installed serving the dance studios. The AHU has an input capacity of 200 MBH and a thermal efficiency of 80%.

Two 233 MBH Weil-McLain Boilers (L), typical cabinet unit heater (R)

Typical electric baseboard heater

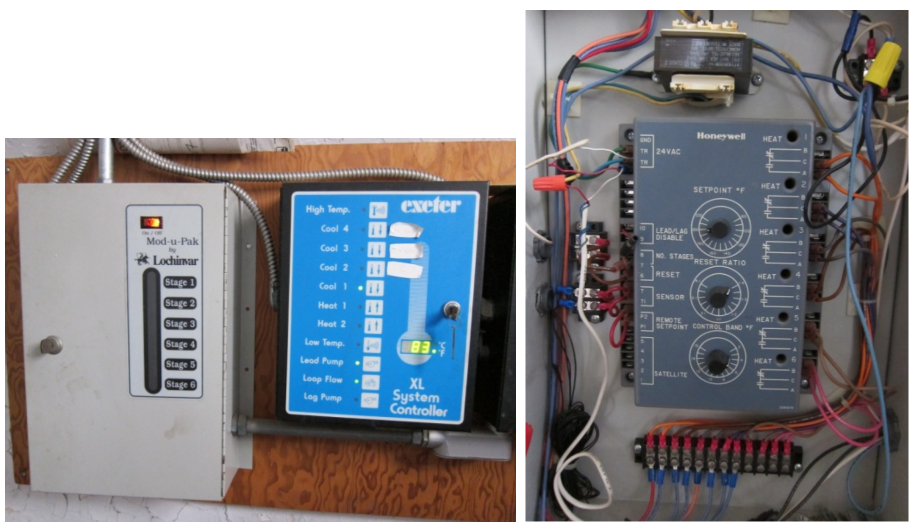
The building has two 15 HP pumps to distribute the glycol water to the heat pumps. One pump is used to distribute the glycol water throughout the building, while the other pump remains on standby.

Cooling and Ventilation – The heat pumps used for heating are also used to cool the building. An Evapco cooling tower located outside of the mechanical room is used to reject heat from the same glycol water loop. Additional cooling is provided by supplemental split direct expansion (DX) units. Several condensing units are located on the exterior and roof areas of the building. Several large outdoor air ducts are connected to numerous heat pumps to provide outdoor air. The same Trane AHU used for heating the dance studios is also used to provide outside air and cooling to the space.

Evapco cooling tower (L); Trane outdoor packaged unit (R)

Controls

All building equipment are individually controlled by programmable thermostats or built in unit controls. The boilers are controlled by a Lochnivar Mod-u-Pak. Heat pumps are controlled by programmable Honeywell thermostats. One thermostat is dedicated to each heat pump, even though the heat pumps serve multiple rooms. Programmable thermostats are also used to control operation time and zone temperatures in the spaces equipped with furnaces. Thermostats are generally set for 65-72°F during the winter and 72-78°F during the summer.

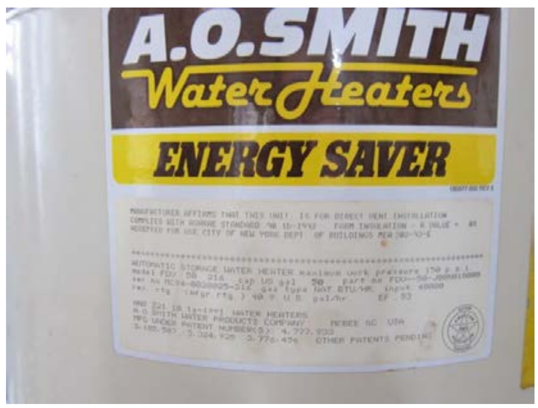


Boiler controls

Typical thermostats

Domestic Hot Water

Hangar 1 provides domestic hot water (DHW) to bathrooms throughout the building via a central gas-fired DHW heater located in the boiler room. This A.O. Smith Energy Saver water heater was installed in 1991 and has a heating input of 40,000 BTUH and a capacity of 50 gallons. DHW is circulated throughout the building with a 1/12 HP Bell & Gossett pump.



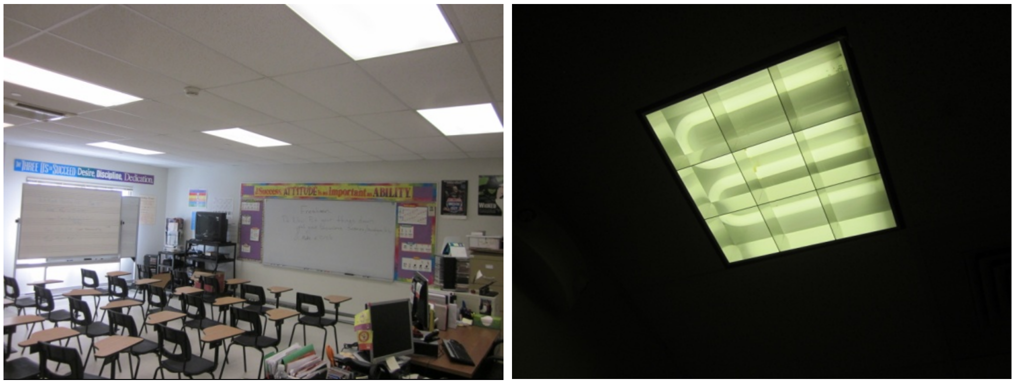
A.O. Smith Energy Saver water heater

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 Hangar 1 Vocational & Technical School is a combination of electronically and magnetically ballasted T8 lamped fixtures. The hallways currently have linear T8 lamps, while the classrooms have recessed parabolic linear T8 and u-shaped T8 fixtures.

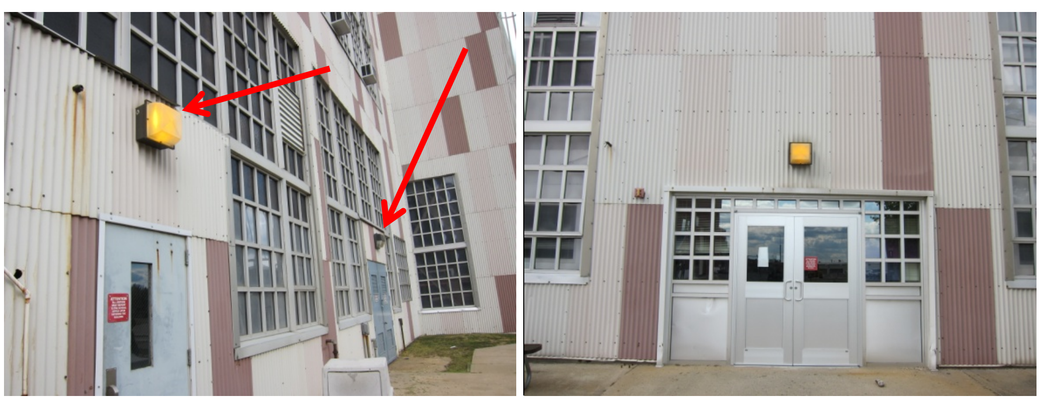


Typical interior T8 lighting (L); and typical T12 U-shaped lighting (R)

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

Typical LED exit sign

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be high pressure sodium wall pack lighting. Exterior lighting is controlled by a timer.



Typical high pressure sodium wall pack fixtures. Note: Some of the fixtures are operating during daytime hours

Appliances and process

SWA has conducted a general survey of larger, installed equipment. Appliances and other miscellaneous equipment account for a significant portion of electrical usage within the building. Typically, appliances are referred to as “plug-load” equipment, since they are not inherent to the building's systems, but rather plug into an electrical outlet. Equipment such as process motors, computers, computer servers, radio and dispatch equipment, refrigerators, vending machines 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 Hangar 1 Vocational & Technical School are refrigerators, beverage and snack vending machines, and classroom computers.

Typical refrigerators

Beverage vending machines

Elevators

The OCVTS Hangar 1 is two-stories and has one hydraulic elevator. The elevator was not accessible during the time of the visit.

Other electrical systems

There are not currently any other significant energy-impacting electrical systems installed at Hangar 1 Vocational & Technical School.

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 building site conditions, the OCVTS Hangar 1 facility is not a good candidate for a photovoltaic installation. A PV installation is not recommended because the roof of the hangar is not shaped for an ideal installation. Additionally, the building site is surrounded by many trees which can reduce sun exposure.

Solar Thermal Collectors

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

Wind

The OCVTS Hangar 1 is not a good candidate for wind power generation due to insufficient wind conditions in this area of New Jersey.

Geothermal

The OCVTS Hangar 1 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

The OCVTS Hangar 1 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 Elementary School 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 5 exterior metal halide fixtures with CFL fixtures
ECM 4	Retrofit 1 snack vending machines with SnackMiser™ Devices
ECM 5	Replace existing indoor Metal Halide fixtures with T5 fixtures
ECM 6	Install 44 new occupancy sensors
ECM 7	Replace old domestic hot water heater with an Energy Star condensing model
ECM 8	Retrofit 15 T12 fixtures with electronic ballasts and T8 lamps
ECM 9	Replace magnetic ballasts with electronic ballasts
ECM 10	Replace 18 u-shaped T12 fixtures withT8 models
ECM 11	Install 13 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 two beverage machines which are located in East Wing corridor. 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	4,091	0	0	0.2	$0	$618	12	$7,411	0.6	1,762%	147%	155%	$5,501	7,325

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 J 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.

Project cost:

Estimated project cost: $11,400
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
$11,400	50,301	0	1,328	5.3	$1,820	$11,107	3	$33,320	1.0	192%	64%	81%	$19,279	104,703

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 J for more information on Incentive Programs.

ECM #3: Replace 5 exterior metal halide fixtures with CFL fixtures

During the field audit, SWA completed a building lighting inventory (see Appendix C). The existing lighting also contains inefficient metal halide wall pack fixtures. SWA recommends that each metal halide fixture is replaced with a more efficient, Compact Fluorescent Lamp (CFL) fixture. CFLs are capable of providing equivalent output while using less power when compared to incandescent, halogen and Metal Halide fixtures. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:

Estimated installed cost: $880 (includes $76 of labor)
Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program, http://lwd.dol.state.nj.us/labor/forms_pdfs/lsse/mercer.pdf

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
$880	1,380	0	0	0.1	$473	$682	5	$3,408	1.3	287	57	72	$2,155	2,470

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

Rebates/financial incentives:

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

Please see APPENDIX J for more information on Incentive Programs.

ECM #4: Retrofit 1 snack vending machines with SnackMiser™ Devices

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: $180 (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
$180	491	0	0	0.0	$0	$74	12	$889	2.4	394%	33%	40	$532	879

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 J for more information on Incentive Programs.

ECM #5: Replace existing indoor Metal Halide fixtures with T5 fixtures

The existing lighting consists of standard probe start Metal Halide (MH) lamps. SWA recommends replacing the interior higher wattage MH fixtures with T5 fixtures 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: $5,234 (includes $2,470 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
$5,234	4,659	3	0	0.3	$1,380	$2,083	15	$31,245	2.5	497%	33%	40%	$18,679	8,342

Assumptions: SWA calculated the savings for this measure using measurements taken on the day of the field visit and using the billing analysis. Existing metal halides are to be replaced with high output T5 fixtures.

Rebates/financial incentives:

- NJ Clean Energy – SmartStart – High Bay T5 fixtures with electronic ballasts ($16 per fixture or up to $416)

Please see APPENDIX J for more information on Incentive Programs.

ECM #6: Install 44 new occupancy sensors

On the days of the site visits, SWA completed a lighting inventory of Hangar 1 Vocational & Technical School (see Appendix C). 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: $8,800 (includes $2,640 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
$8,800	12,102	3	0	4.1	$0	$1,815	15	$27,228	4.8	209%	14%	19%	$12,170	21,668

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: $880
- NJ Clean Energy – Direct Install (Up to 70% of installed costs)

Please see APPENDIX J for more information on Incentive Programs.

ECM #7: Replace old domestic hot water heater with an Energy Star condensing model

During the field audit, SWA inspected the existing Domestic Hot Water (DHW) heater. There is currently one natural gas heater that produces DHW for the entire building. The expected service life of a DHW heater is 10-13 years. Consideration should be given to replace the heater with more efficient type and tank as part of a capital improvement plan. The associated pump appears to be operating adequately and has fractional horsepower, so replacement would not yield significant energy savings.

New energy-efficient gas-fired storage water heaters are a good, cost-effective replacement option for old water heaters if a gas line is in your building. They have higher levels of insulation around the tank and one-way valves where pipes connect to the tank, substantially reducing standby heat loss. Newer super-efficient "condensing" and "near-condensing" gas water heaters save much more energy compared to traditional models. For safety as well as energy efficiency, fuel-burning water heaters should be installed with sealed combustion ("direct-vented" or "power-vented). Sealed combustion means that outside air is brought in directly to the water heater and exhaust gases are vented directly outside, keeping combustion totally separate from the house air.

Installation cost:

Estimated installed cost: $4,899 (includes $2,395 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
$4,899	0	0	719	1.3	$0	$917	12	$11,001	5.3	125%	10%	15%	$3,990	7,926

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA assumed annual labor and parts for existing DHW heater. SWA estimated that the annual natural gas usage for the DHW heating system is approximately 1,749 therms. The efficiency of the existing DHW is in the 53% range, based on nameplate information, and a new high efficiency DHW heater would operate with an efficiency of approximately 90%.

Rebates/financial incentives:

- NJ Clean Energy – Smart Start - $50 per water heater (≤ 50 gallons)
- NJ Clean Energy – Direct Install (Up to 70% of installed cost)

Please see APPENDIX J for more information on Incentive Programs.

ECM #8: Retrofit 15 T12 fixtures with electronic ballasts and T8 lamps

The existing lighting contains inefficient T12 fluorescent fixtures with magnetic ballasts throughout the school. SWA recommends retrofitting each existing fixture with more efficient, T8 fluorescent fixtures with electronic ballasts. T8 fixtures with electronic ballasts provide equivalent or better light output while reducing energy consumption by 30% when compared to T12 fixtures with magnetic ballasts. T8 fixtures also provide better lumens for less wattage when compared to incandescent, halogen and Metal Halide fixtures. Retrofitting existing fixtures allows the school to keep the existing reflectors and diffusers, and only replaces the electronic components suitable for T8 lamps. 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: $811
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
$1,811	1,128	0	0	0.1	$129	$299	15	$4,482	6.1	148%	10%	14%	$1,652	2,019

Assumptions: SWA calculated the savings for this measure using measurements taken on the day of the field visit and using the billing analysis. Existing T12 fixtures have 34 watt lamps and are to be replaced with 32 watt T8 lamps, along with a ballast replacement.

Rebates/financial incentives:

- NJ Clean Energy – Direct Install program (Up to 70% of installed costs)
- NJ Clean Energy – SmartStart program – T8 fixtures with electronic ballasts ($10 per fixture – Maximum incentive amount is $150

Please see APPENDIX J for more information on Incentive Programs.

ECM #9: Replace magnetic ballasts with electronic ballasts

The existing lighting contains efficient T8 fluorescent fixtures with magnetic ballasts scattered throughout the school. SWA recommends replacing the magnetic ballasts with more efficient electronic ballasts. T8 fixtures with electronic ballasts provide equivalent or better light output when compared to T18 fixtures with magnetic ballasts. By replacing the ballasts, the T8 lamps will operate at a higher frequency, which allows the lamps to output more light per watt and reduces the frequency of burnt lamps. 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: $35,341 (includes $16,936 of labor)
Source of cost estimate: RS *Means*

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
$35,341	4,245	0	0	0.3	$2,868	$3,509	15	$52,636	10.1	49%	3%	5%	$5,766	7,601

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:

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

Please see APPENDIX J for more information on Incentive Programs.

ECM #10: Replace 18 u-shaped T12 fixtures withT8 models

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

Installation cost:

Estimated installed cost: $2,326 (includes $1,710 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
$1,926	1,128	0	0	0.1	$10	$181	15	$2,710	10.7	41%	3%	5%	$194	2,019

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 - T8 fixtures with electronic ballasts ($10 per fixture) - Maximum incentive amount is $180

Please see APPENDIX J for more information on Incentive Programs.

ECM #11: Install 13 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 would be unoccupied.

Installation cost:

Estimated installed cost: $1,820 (includes $780 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
$1,820	847	0	0	0.3	$0	$127	15	$1,906	14.3	5%	0%	1%	-$315	1,516

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

Please see APPENDIX J 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 Hangar 1.

- [*There are no capital improvements recommended for this building*]

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 operation costs.

- Check and adjust timers and time clocks monthly – During the site visit, several exterior lights were observed to be left on during the day due to incorrect timer settings. In addition to exterior lights, several thermostats that control HVAC equipment were also left on due to incorrect time settings. During power surges or outages, digital clocks are reset and require setting to ensure that timers remain accurate.

- Replace motors with NEMA premium efficiency models – SWA observed several motors, in the mechanical room, that are not NEMA premium efficiency models and are beyond their useful lifetime. Since these motors have been maintained well, SWA recommends replacing them with high efficiency models as part of routine O&M the next time that they fail.

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

- 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 students and staff how to minimize energy use. An educational program may be incorporated into school curricula to increase students’ environmental awareness. 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

Inventory

RTU TAG	Building System	Description	Location	Model #	Fuel	Space served	Year Equip Installed	Remaining useful life %
	Cooling	Condenser Unit, R-22, 230/3/60, .04 HP, 2 Ton, 15 SEER	Exterior	Carrier, Model #38QR024C331, Serial #803-829654	Electric	Classroom	1999	13%
	Cooling	Condenser Unit, R-22, 460/3/60, 1/8 HP, 3 Ton, 12 SEER	Exterior	Trane, Model #2TTA2036A4000AA, Serial #234654P3F	Electric	Office	2002	33%
	Cooling	Condenser Unit, R-22, 460/3/60, .1 HP, 5 Ton	Exterior	Carrier, Model #38QR060C611, Serial #2602X27667	Electric	Theater	1999	13%
	Cooling	Condenser Unit, R-22, 460/3/60, .1 HP, 5 Ton	Exterior	Carrier, Model #38QR060C611, Serial #2602X27669	Electric	Theater	1999	13%
	Cooling	Condenser Unit, R-22, 460/3/60, .1 HP, 5 Ton	Exterior	Carrier, Model #38QR060C611, Serial #2702X28466	Electric	Theater	1999	13%
	Cooling	Condenser Unit, R-22, 460/3/60, 1/4 HP, 4 Ton	Exterior	York, Model #H4DB048S46A, Serial #(S)EEJM257651	Electric	Control Room	1999	13%
	Cooling	Condenser Unit, R-22, 460/3/60, 1/4 HP, 3 Ton	Exterior	York, Model #H4DB036S46A, Serial #(S)EBJM179997	Electric	Control Room	1999	13%
	Cooling	Condenser Unit, R-22, 460/3/60, 1/4 HP, 4 Ton	Exterior	York, Model #H4DB048S46A, Serial #(S)EN--------	Electric	Control Room	1999	13%
	Cooling	Condenser Unit, R-410A, 230/1/60, 29,800 BTU/H, 15 SEER	Exterior	Sanyo, Model #C3072R, Serial #0014972	Electric	Studio	2002	33%
	Cooling	Condenser Unit, R-410A, 230/1/60, 17,500 BTU/H	Exterior	Sanyo, Model #CH1872, Serial #0087064	Electric	Studio	2006	60%
	Cooling	Condenser Unit, R-22, 460/3/60, 1/4 HP, 3 Ton	Exterior	York, Model #H4DB036S46A, Serial #(S)EGJM351132	Electric	Dance	1999	13%
	Cooling	Condenser Unit, R-22, 460/3/60, 1/4 HP, 5 Ton	Exterior	York, Model #H4DB060S46A, Serial #WHMM007036	Electric	Dance	1999	13%
	Heating/Cooling	Packaged air handling unit, R-22, 200 MBH, 460/3/60, 2 compressors	Exterior	Trane - YHC092A4RHA32H0A0A1B000A0, Serial #9221001601	Electric	Dance	2009	80%
	Cooling	Condenser Unit, R-410A, 115/1/60	Exterior	Sanyo, Model #CH1271, Serial #00053661	Electric	Principal's Office	2006	60%
	Cooling	Indoor Unit, R-410A	Principal's Office	Sanyo, Model #KHS1271, Serial #000196	Electric	Principal's Office	2006	60%
	Condenser Unit	Condenser Unit, R-410A, 230/1/60	Exterior	Sanyo, Model #CH3072R, Serial #0006962	Electric	Faculty Room	1999	13%
HP-1	Heating/Cooling	Heat Pumps, 1400 CFM, 12 GPM, 42 Cooling MBH, 55 Heating MBH	Roof	Climate Master - HL-048	Electric	East Corridor, Faculty Room	1994	0%

HP-2	Heating/Cooling	Heat Pumps, 1700 CFM, 16 GPM, 55 Cooling MBH, 73 Heating MBH	Roof	Climate Master - HL-060	Electric	CAD Classroom	1994	0%
HP-3	Heating/Cooling	Heat Pumps, 1700 CFM, 16 GPM, 55 Cooling MBH, 73 Heating MBH	Roof	Climate Master - HL-060	Electric	CAD Classroom	1994	0%
HP-4	Heating/Cooling	Heat Pumps, 1800 CFM, 14 GPM, 55 Cooling MBH, 72 Heating MBH	Roof	Climate Master - HL-060	Electric	Kitchenette, Main Office,	1994	0%
HP-5	Heating/Cooling	Heat Pumps, 1400 CFM, 12 GPM, 42 Cooling MBH, 55 Heating MBH	Roof	Climate Master - HL-048	Electric	Corridor, Main offices, Nurse's office,	1994	0%
HP-6	Heating/Cooling	Heat Pumps, 700 CFM, 5 GPM, 43 Cooling MBH, 57 Heating MBH	Roof	Climate Master - HL-024	Electric	Principal's Office	1994	0%
HP-7	Heating/Cooling	Heat Pumps, 1700 CFM, 16 GPM, 55 Cooling MBH, 73 Heating MBH	Roof	Climate Master - HL-060	Electric	Library	1994	0%
HP-8	Heating/Cooling	Heat Pumps, 1700 CFM, 16 GPM, 55 Cooling MBH, 73 Heating MBH	Roof	Climate Master - HL-060	Electric	Classroom	1994	0%
HP-9	Heating/Cooling	Heat Pumps, 1080 CFM, 10 GPM, 36 Cooling MBH, 51 Heating MBH	Roof	Climate Master - HL-042	Electric	1st Floor East Restrooms	1994	0%
HP-10	Heating/Cooling	Heat Pumps, 1700 CFM, 16 GPM, 55 Cooling MBH, 73 Heating MBH	Roof	Climate Master - HL-060	Electric	API Classroom	1994	0%
HP-11	Heating/Cooling	Heat Pumps, 1800 CFM, 14 GPM, 55 Cooling MBH, 72 Heating MBH	Roof	Climate Master - HL-060	Electric	Corridor, AP Classroom	1994	0%
HP-12	Heating/Cooling	Heat Pumps, 450 CFM, 3 GPM, 12 Cooling MBH, 17 Heating MBH	Roof	Climate Master - HL-015	Electric	Tool Room, Stockroom	1994	0%
HP-13	Heating/Cooling	Heat Pumps, 780 CFM, 7.5 GPM, 25 Cooling MBH, 36 Heating MBH	Roof	Climate Master - HL-030	Electric	Shop Expansion	1994	0%
HP-14	Heating/Cooling	Heat Pumps, 3000 CFM, 23 GPM, 84 Cooling MBH, 110 Heating MBH	Roof	Climate Master - HL-096	Electric	Dance Studio	1994	0%
HP-15	Heating/Cooling	Heat Pumps, 3000 CFM, 23 GPM, 84 Cooling MBH, 110 Heating MBH	Roof	Climate Master - HL-096	Electric	Dance Studio	1994	0%
HP-16	Heating/Cooling	Heat Pumps, 3000 CFM, 23 GPM, 84 Cooling MBH, 110 Heating MBH	Roof	Climate Master - HL-096	Electric	Dance Studio	1994	0%
HP-17	Heating/Cooling	Heat Pumps, 1700 CFM, 16 GPM, 55 Cooling MBH, 73 Heating MBH	Roof	Climate Master - HL-60	Electric	Mezzanine Electronics Classroom	1994	0%
HP-18	Heating/Cooling	Heat Pumps, 615 CFM, 12 GPM, 5 Cooling MBH, 22 Heating MBH	Roof	Climate Master - HL-019	Electric	Mechanical Room	1994	0%

HP-19	Heating/Cooling	Heat Pumps, 1800 CFM, 14 GPM, 55 Cooling MBH, 72 Heating MBH	Roof	Climate Master - HL-060	Electric	Electronics Lab	1994	0%
HP-20	Heating/Cooling	Heat Pumps, 570 CFM, 4.5 GPM, 18 Cooling MBH, 22 Heating MBH	Roof	Climate Master - HL-019	Electric	Corridor	1994	0%
HP-21	Heating/Cooling	Heat Pumps, 365 CFM, 3 GPM, 10 Cooling MBH, 15 Heating MBH	Roof	Climate Master - HL-012	Electric	Corridor	1994	0%
HP-22	Heating/Cooling	Heat Pumps, 1520 CFM, 12 GPM, 43 Cooling MBH, 56 Heating MBH	Roof	Climate Master - HL-048	Electric	Amonics	1994	0%
HP-23	Heating/Cooling	Horizontal Heat Pump, 1800 CFM, 16.2 GPM, dual temperature heating and cooling coil	Ceiling	Climate Master, Model #HL-060	Electric	Dance room?	1999	13%
HP-24	Heating/Cooling	Horizontal Heat Pump, 1800 CFM, 16.2 GPM, dual temperature heating and cooling coil	Ceiling	Climate Master, Model #HL-060	Electric	Dance room?	1999	13%
HP-25	Heating/Cooling	Horizontal Heat Pump, 1800 CFM, 16.2 GPM, dual temperature heating and cooling coil	Ceiling	Climate Master, Model #HL-060	Electric	Corridor	1999	13%
CUH-1	Heating	Cabinet Unit Heater - 200 CFM, 12.75 MBH, 460V/3PH, 3.75 KW	Stair #2 First Floor	Trane, Model #B12E002	Gas	Stair #2 First Floor	1994	0%
CUH-2	Heating	Cabinet Unit Heater - 300 CFM, 19.1 MBH, 460V/3PH, 5.62 KW	Main Entrance	Trane, Model #B12E003	Gas	East Wing Corridor	1994	0%
CUH-3	Heating	Cabinet Unit Heater - 200 CFM, 12.75 MBH, 460V/3PH, 3.75 KW	Stair #1 First Floor	Trane, Model #B12E002	Gas	Stair #1 First Floor	1994	0%
CUH-4	Heating	Cabinet Unit Heater - 300 CFM, 19.1 MBH, 460V/3PH, 5.62 KW	West Wing Corridor Entrance	Trane, Model #B12E003	Gas	West Wing Corridor Entrance	1994	0%
CUH-5	Heating	Cabinet Unit Heater - 200 CFM, 12.75 MBH, 460V/3PH, 3.75 KW	Stair #2 2nd Floor	Trane, Model #B12E002	Gas	Stair #2 2nd Floor	1994	0%
CUH-6	Heating	Cabinet Unit Heater - 200 CFM, 12.75 MBH, 460V/3PH, 3.75 KW	Stair #1 Second Floor	Trane, Model #B12E002	Gas	Stair #1 Second Floor	1994	0%
UH-1	Heating	Unit Heaters - 400 CFM, 11.2 MBH, 460/3, 3.3. KW	Maintenance Office	Trane, Model #UHEC-033DOBO	Gas	Maintenance Office	1994	0%
UH-2	Heating	Unit Heaters - 400 CFM, 11.2 MBH,	Electric Vault	Trane, Model #UHEC-033DOBO	Gas	Electric Vault	1994	0%

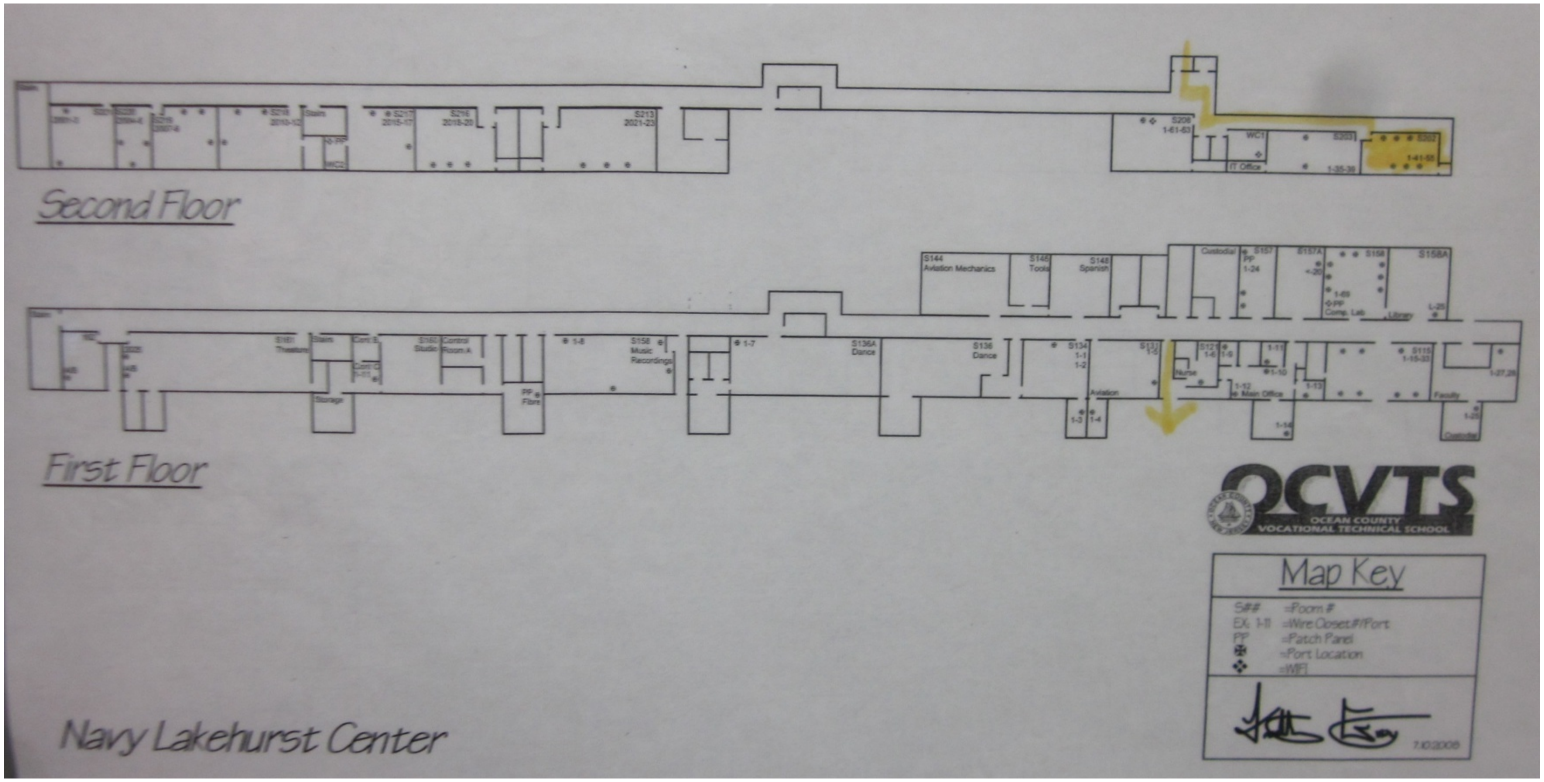
		460/3, 3.3. KW						
UH-3	Heating	Unit Heaters - 400 CFM, 11.2 MBH, 460/3, 3.3. KW	Electrical Room	Trane, Model #UHEC-033DOBO	Gas	Electrical Room	1994	0%
UH-4	Heating	Unit Heaters - 400 CFM, 11.2 MBH, 460/3, 3.3. KW	Electrical Room	Trane, Model #UHEC-033DOBO	Gas	Electrical Room	1994	0%
UH-5	Heating	Unit Heaters - 700 CFM, 25.6 MBH, 460/3, 7.5. KW	Boiler Room	Trane, Model #UHEC-073DOBO	Gas	Boiler Room	1994	0%
B-1	Heating	Boiler, 233 MBH Input,, AFUE 82.7%	1st Floor MER	Weil-McClain, Model #Cgi-8 S2	Natural Gas	Heat Pumps	1999	13%
B-2	Heating	Boiler, 233 MBH Input, AFUE 82.7%	1st Floor MER	Weil-McClain, Model #Cgi-8 S2	Natural Gas	Heat Pumps	1999	13%
Cooling Tower	Cooling	EVAPCO, 23,800 CFM, 4 fans, 15 HP	Exterior	EVAPCO, Model #LSWA-41A, Serial #940576	Electric	Whole Building	1994	0%
DHW-1	Heating	DHW, 40,000 BTU/HR input, 53% Efficiency, 50 Gallons	1st Floor MER	A.O. Smith, Model #FDV 50 216, Serial #MC94-0028025-216	Natural Gas	Whole Building	1994	0%
	Domestic Hot Water	Bell & Gosset hot water return pump, 5 GPM, 1/12 HP	1st Floor MER	Bell & Gosset, Model # LR-158	Electric	DHW	1994	0%
P-1	Cooling	A.O. Smith pump motor, 245 GPM, 15 HP, 1760 RPM, NEMA Nom. Eff. 91.7%	1st Floor MER	A.O. Smith, Part #7-850008-01-OJ, Type MOGB, Serial Code BX06	Electric	Whole Building	1999	35%
P-2	Cooling	Marathon Electric pump, 245 GPM, 15 HP, 1760 RPM, NEMA Nom. Eff. 91.0%	1st Floor MER	Marathon Electric, Model #IVB 254TTDR4026AR L	Electric	Whole Building	2006	70%
P-3	Heating	U.S. Electric Motors pump motor, 90 GPM, 2 HP, 1735 RPM, NEMA Nom. Eff. 86.0%	1st Floor MER	U.S. Electric Motors, Model # G154	Electric	Whole Building	1999	35%
	Cooling	Glycol pump motor, 1.5 HP, 1740 RPM, NEMA Nom. Eff. 86.5%	Exterior	Baldor Super-E, Cat.#EJMM31541, SPEC. 3515098094	Electric	Whole Building	1999	35%
	Heating	Single stage gas fired furnace, direct vented upflow, 3 Ton, 90% Annual Fuel Utilization Efficiency	Black Box Stairway	Trane XE90, Model #TUX060C936C3, Serial #2153RPW7G	Natural Gas	Black Box Stairway	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 5 Ton, 90% Annual Fuel Utilization Efficiency	Music Room Closet	Trane XE90, Model #TUX120960C3, Serial #2082J587G	Natural Gas	220 & 221	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 4 Ton, 90% Annual Fuel Utilization Efficiency	English Classroom	Trane XE90, Model #TUX100C948C3, Serial #2511REN7G	Natural Gas	219	2001	45%

	Heating	Single stage gas fired furnace, direct vented upflow, 4 Ton, 90% Annual Fuel Utilization Efficiency	Math Classroom	Trane XE90, Model #TUX100X948C3, Serial #2445NK7G	Natural Gas	218	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 4 Ton, 90% Annual Fuel Utilization Efficiency	History Classroom	Trane XE90, Model #TUX100C948C3, Serial #2505RWJ7G	Natural Gas	217	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 4 Ton, 90% Annual Fuel Utilization Efficiency	History Classroom	Trane XE90, Model #TUX100C948C3, Serial #2505RUY7G	Natural Gas	217	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 4 Ton, 90% Annual Fuel Utilization Efficiency	History Classroom	Trane XE90, Model #TUX100C948C3, Serial #2445NK67G	Natural Gas	216	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 3 Ton, 90% Annual Fuel Utilization Efficiency	History Classroom	Trane XE90, Model #TUX060936C3, Serial #2102M187G	Natural Gas	216	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 5 Ton, 90% Annual Fuel Utilization Efficiency	Science Classroom	Trane XE90, Model #TUX120C960D0, Serial #2242X8H7G	Natural Gas	213	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 3 Ton, 90% Annual Fuel Utilization Efficiency	Science Classroom	Trane XE90, Model #TUX060C936C3, Serial #2102M1P7G	Natural Gas	213	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 3 Ton, 90% Annual Fuel Utilization Efficiency	Science Classroom	Trane XE90, Model #TUX060C936C3, Serial #2102N2K7G	Natural Gas	213	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 5 Ton, 90% Annual Fuel Utilization Efficiency	Science Classroom	Trane XE90, Model #TUX120C960D0, Serial #2242X8N7G	Natural Gas	213	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 5 Ton, 90% Annual Fuel Utilization Efficiency	Science Office Closet	Trane XR90, Model #TUX120C960D0, Serial #2242X8R7G	Natural Gas	Science Office Closet	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 5 Ton, 90% Annual Fuel Utilization Efficiency	Custodian Closet Upstairs	Trane XE90, Model #TUX120C960C3, Serial #2082KCA7G	Natural Gas	Custodian Closet Upstairs	2001	45%

	Heating	Single stage gas fired furnace, direct vented upflow, 140 MBH input, 130 MBH output, 92% Annual Fuel Utilization Efficiency, 1 HP	Dance Studio	York Diamond (90), Model #P3URD20N 1300 1F, Serial #WHMMO-15846	Natural Gas	Dance Studio	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 100 MBH input, 94 MBH output, 92% Annual Fuel Utilization Efficiency, 1 HP	Audio Storage Room	York Diamond (90), Model #P3URC20N09501D, Serial #EHJM392858	Natural Gas	Audio Storage Room	2001	45%
	Heating	Single stage gas fired furnace, direct vented upflow, 80 MBH input, 74 MBH output, 92% Annual Fuel Utilization Efficiency, ½ HP	Audio Storage Room	York Diamond (90), Model #P3URB12N07501D, Serial #EHJM400971	Natural Gas	Audio Storage Room	2001	45%

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: OCVTS Lakehurst Hangar 1 Floor Plan



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 (202)	Parabolic Ceiling Mounted	M	4'T8	4	3	32	Sw	8	261	29	499	1,042	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	4	3	32	8	261	15	444	927	115	0	115
2	2	Classroom (203)	Parabolic Ceiling Mounted	M	4'T8	5	3	32	Sw	8	261	29	624	1,303	N/A	Parabolic Ceiling Mounted	4'T8	E	SW	5	3	32	8	261	15	555	1159	144	0	144
3	2	Classroom (208)	Parabolic Ceiling Mounted	M	4'T8	15	3	32	Sw	8	261	29	1,872	3,909	C	Parabolic Ceiling Mounted	4'T8	E	OS	15	3	32	6	261	15	1665	2607	432	869	1301
4	2	Office (O208)	Parabolic Ceiling Mounted	M	4'T8	2	2	32	Sw	8	261	19	166	347	C	Parabolic Ceiling Mounted	4'T8	E	OS	2	2	32	6	261	10	148	232	38	77	116
5	2	Classroom (221)	Parabolic Ceiling Mounted	M	4'T8	9	3	32	Sw	8	261	29	1,123	2,345	C	Parabolic Ceiling Mounted	4'T8	E	OS	9	3	32	6	261	15	999	1564	259	521	781
6	2	Classroom (220)	Parabolic Ceiling Mounted	M	4'T8	4	2	32	Sw	8	261	19	333	695	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	4	2	32	8	261	10	296	618	77	0	77
7	2	Classroom (219)	Parabolic Ceiling Mounted	M	4'T8	9	3	32	Sw	8	261	29	1,123	2,345	C	Parabolic Ceiling Mounted	4'T8	E	OS	9	3	32	6	261	15	999	1564	259	521	781
8	2	Classroom (A219)	Parabolic Ceiling Mounted	M	4'T8	2	1	32	Sw	8	261	10	83	174	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	2	1	32	8	261	5	74	155	19	0	19
9	2	Classroom (218)	Parabolic Ceiling Mounted	M	4'T8	9	3	32	Sw	8	261	29	1,123	2,345	C	Parabolic Ceiling Mounted	4'T8	E	OS	9	3	32	6	261	15	999	1564	259	521	781
10	2	Classroom (A218)	Parabolic Ceiling Mounted	M	4'T8	2	1	32	Sw	8	261	10	83	174	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	2	1	32	8	261	5	74	155	19	0	19
11	2	Classroom (217)	Parabolic Ceiling Mounted	M	4'T8	9	3	32	Sw	8	261	29	1,123	2,345	C	Parabolic Ceiling Mounted	4'T8	E	OS	9	3	32	6	261	15	999	1564	259	521	781
12	2	Classroom (A217)	Parabolic Ceiling Mounted	M	4'T8	2	1	32	Sw	8	261	10	83	174	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	2	1	32	8	261	5	74	155	19	0	19
13	2	Classroom (216)	Parabolic Ceiling Mounted	M	4'T8	8	3	32	Sw	8	261	29	998	2,085	C	Parabolic Ceiling Mounted	4'T8	E	OS	8	3	32	6	261	15	888	1391	231	464	694
14	2	Classroom (A216)	Parabolic Ceiling Mounted	M	4'T8	2	1	32	Sw	8	261	10	83	174	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	2	1	32	8	261	5	74	155	19	0	19
15	2	Classroom (213)	Parabolic Ceiling Mounted	M	4'T8	17	3	32	Sw	8	261	29	2,122	4,430	C	Parabolic Ceiling Mounted	4'T8	E	OS	17	3	32	6	261	15	1887	2955	490	985	1475
16	2	Classroom (A213)	Parabolic Ceiling Mounted	M	4'T8	2	1	32	Sw	8	261	10	83	174	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	2	1	32	8	261	5	74	155	19	0	19
17	2	Office (212)	Parabolic Ceiling Mounted	M	4'T8	4	3	32	Sw	8	261	29	499	1,042	C	Parabolic Ceiling Mounted	4'T8	E	OS	4	3	32	6	261	15	444	695	115	232	347
18	2	Classroom (A202)	Parabolic Ceiling Mounted	M	4'T12 U-Shaped	8	2	40	Sw	8	261	24	832	1,737	T8	Parabolic Ceiling Mounted	4'T8 U-Shaped	E	OS	8	2	32	6	261	10	592	927	501	309	810
19	2	Classroom (A203)	Parabolic Ceiling Mounted	M	4'T12 U-Shaped	9	2	40	Sw	8	261	24	936	1,954	T8	Parabolic Ceiling Mounted	4'T8 U-Shaped	E	OS	9	2	32	6	261	10	666	1043	564	348	911
20	2	Bathroom (1)	Parabolic Ceiling Mounted	M	4'T8	1	2	32	Sw	8	261	19	83	174	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	1	2	32	8	261	10	74	155	19	0	19
21	2	Bathroom (3)	Parabolic Ceiling Mounted	M	4'T8	2	3	32	Sw	8	261	29	250	521	C	Parabolic Ceiling Mounted	4'T8	E	OS	2	3	32	6	261	15	222	348	58	116	174
22	2	Bathroom (2)	Parabolic Ceiling Mounted	M	4'T8	2	3	32	Sw	8	261	29	250	521	C	Parabolic Ceiling Mounted	4'T8	E	OS	2	3	32	6	261	15	222	348	58	116	174
23	2	Bathroom (A2)	Parabolic Ceiling Mounted	M	4'T8	1	2	32	Sw	8	261	19	83	174	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	1	2	32	8	261	10	74	155	19	0	19
24	2	Bathroom (A3)	Parabolic Ceiling Mounted	M	4'T8	1	2	32	Sw	8	261	19	83	174	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	1	2	32	8	261	10	74	155	19	0	19
25	1	Lunch Rm (A)	Recessed Parabolic	M	4'T8	4	3	32	Sw	8	261	15	444	927	C	Recessed Parabolic	4'T8	E	OS	4	3	32	6	261	15	444	695	0	232	232
26	1	Lunch Rm (B)	Recessed Parabolic	M	4'T8	1	3	32	Sw	8	261	29	125	261	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	8	261	15	111	232	29	0	29
27	1	Office (C)	Ceiling Suspended	M	4'T8	2	2	32	Sw	8	261	19	166	347	C	Ceiling Suspended	4'T8	E	OS	2	2	32	6	261	10	148	232	38	77	116
28	1	Office (D)	Ceiling Suspended	M	4'T12	1	2	40	Sw	8	261	24	104	217	T8 Kit	Ceiling Suspended	4'T8	E	OS	1	2	32	6	261	10	74	116	63	39	101
29	1	Corridor (E)	Ceiling Suspended	E	4'T8 U-Shaped	4	2	32	Sw	8	261	10	296	618	N/A	Ceiling Suspended	4'T8 U-Shaped	E	Sw	4	2	32	8	261	10	296	618	0	0	0
30	1	Corridor (F)	Recessed Parabolic	E	4'T8 U-Shaped	1	2	32	Sw	8	261	10	74	155	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	1	2	32	8	261	10	74	155	0	0	0
31	1	Hallway (G)	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	261	15	222	464	N/A	Recessed Parabolic	4'T8	E	Sw	2	3	32	8	261	15	222	464	0	0	0
32	1	Hallway (H)	Recessed Parabolic	E	4'T8	13	3	32	Sw	24	365	15	1,443	12,641	N/A	Recessed Parabolic	4'T8	E	Sw	13	3	32	24	365	15	1443	12641	0	0	0
33	1	Hallway (I)	Exit Sign	S	LED	2	1	5	Sw	24	365	1	11	96	N/A	Exit Sign	LED	S	Sw	2	1	5	24	365	1	11	96	0	0	0
34	1	Library (S158)	Recessed Parabolic	M	4'T8	7	3	32	Sw	8	261	29	874	1,824	C	Recessed Parabolic	4'T8	E	OS	7	3	32	6	261	15	777	1217	202	406	607
35	1	Library (S158)	Recessed Parabolic	M	4'T8	1	3	32	Sw	8	261	29	125	261	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	8	261	15	111	232	29	0	29
36	1	Library (S158)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	8	261	10	148	309	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	2	2	32	8	261	10	148	309	0	0	0
37	1	Library (S158)	Recessed Parabolic	M	4'T8 U-Shaped	2	2	32	Sw	8	261	19	166	347	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	2	2	32	8	261	10	148	309	38	0	38
38	1	Computer Lab (S158)	Recessed Parabolic	M	4'T8	6	3	32	Sw	8	261	29	749	1,563	C	Recessed Parabolic	4'T8	E	OS	6	3	32	6	261	15	666	1043	173	348	521
39	1	Computer Lab (S158)	Recessed Parabolic	M	4'T8 U-Shaped	3	2	32	Sw	8	261	19	250	521	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	3	2	32	8	261	10	222	464	58	0	58
40	1	Health/Phys Edu. (115)	Recessed Parabolic	M	4'T8	10	3	32	Sw	8	261	29	1,248	2,606	C	Recessed Parabolic	4'T8	E	OS	10	3	32	6	261	15	1110	1738	288	579	868
41	1	Health/Phys Edu. (115)	Recessed Parabolic	E	4'T8	8	3	32	Sw	8	261	15	888	1,854	N/A	Recessed Parabolic	4'T8	E	Sw	8	3	32	8	261	15	888	1854	0	0	0
42	1	Health/Phys Edu. (115)	Exit Sign	S	LED	1	1	5	Sw	24	365	1	6	48	N/A	Exit Sign	LED	S	Sw	1	1	5	24	365	1	6	48	0	0	0
43	1	Storage (115)	Recessed Parabolic	M	4'T8 U-Shaped	2	2	32	Sw	8	261	19	166	347	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	2	2	32	8	261	10	148	309	38	0	38
44	1	Classroom (157A)	Recessed Parabolic	E	4'T8	6	3	32	Sw	8	261	15	666	1,391	C	Recessed Parabolic	4'T8	E	OS	6	3	32	6	261	15	666	1043	0	348	348
45	1	Classroom (157A)	Recessed Parabolic	E	4'T8 U-Shaped	3	2	32	Sw	8	261	10	222	464	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	3	2	32	8	261	10	222	464	0	0	0
46	1	Kitchen (120)	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	261	15	222	464	N/A	Recessed Parabolic	4'T8	E	Sw	2	3	32	8	261	15	222	464	0	0	0
47	1	Main Office (120)	Recessed Parabolic	E	4'T8	4	3	32	Sw	8	261	15	444	927	C	Recessed Parabolic	4'T8	E	OS	4	3	32	6	261	15	444	695	0	232	232
48	1	Main Office (120)	Recessed Parabolic	E	4'T8 U-Shaped	5	2	32	Sw	8	261	10	370	773	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	5	2	32	8	261	10	370	773	0	0	0
49	1	Guidance Counsler (120)	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	261	15	222	464	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	261	15	222	348	0	116	116
50	1	Supervisor (120)	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	261	15	222	464	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	261	15	222	348	0	116	116
51	1	Principal (120)	Recessed Parabolic	E	4'T8	3	3	32	Sw	8	261	15	333	695	C	Recessed Parabolic	4'T8	E	OS	3	3	32	6	261	15	333	521	0	174	174
52	1	Copy Room (120)	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	261	15	222	464	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	261	15	222	348	0	116	116
53	1	Guidance Counsler (120)	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	261	15	222	464	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	261	15	222	348	0	116	116
54	1	Sign In (120)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	8	261	10	148	309	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	2	2	32	6	261	10	148	232	0	77	77
55	1	Nurse (120)	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	261	15	222	464	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	261	15	222	348	0	116	116
56	1	Bathroom (120)	Recessed Parabolic	E	4'T8 U-Shaped	1	2	32	Sw	2	261	10	74	39	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	1	2	32	2	261	10	74	39	0	0	0
57	1	Bathroom (120)	Recessed Parabolic	E	4'T8	2	3	32	Sw	2	261	15	222	116	C	Recessed Parabolic	4'T8	E	OS	2	3	32	2	261	15	222	87	0	29	29
58	1	Main Entrance (120)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	8	261	10	148	309	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	2	2	32	8	261	10	148	309	0	0	0
59	1	Corridor (120)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	8	261	10	148	309	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	2	2	32	8	261	10	148	309	0	0	0
60	1	Corridor (120)	Exit Sign	S	LED	2	0	5	Sw	24	261	0	0	0	N/A	Exit Sign	LED	S	Sw	2	0	5	24	261	0	0	0	0	0	0
61	1	Classroom (157)	Recessed Parabolic	E	4'T8	4	3	32	Sw	8	261	15	444	927	C	Recessed Parabolic	4'T8	E	OS	4	3	32	6	261	15	444	695	0	232	232
62	1	Classroom (157)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	8	261	10	148	309	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	2	2	32	8	261	10	148	309	0	0	0
63	1	Electric Room	Recessed Parabolic	E	4'T8	5	2	32	Sw	8	261	10	370	773	N/A	Recessed Parabolic	4'T8	E	Sw	5	2	32	8	261	10	370	773	0	0	0
64	1	Corridor	Recessed Parabolic	E	4'T8	1	4	32	Sw	8	261	20	148	309	N/A	Recessed Parabolic	4'T8	E	Sw	1	4	32	8	261	20	148	309	0	0	0
65	1	Corridor	Recessed Parabolic	E	4'T8	2	2	32	Sw	8	261	10	148	309	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	8	261	10	148	309	0	0	0
66	1	Corridor	Exit Sign	S	LED	1	0	5	Sw	8	261	0	0	0	N/A	Exit Sign	LED	S	Sw	1	0	5	8	261	0	0	0	0	0	0
67	1	East Hallway	Recessed Parabolic	E	4'T8	8	2	32	Sw	8	261	10	592	1,236	N/A	Recessed Parabolic	4'T8	E	Sw	8	2	32	8	261	10	592	1236	0	0	0
68	1	Mens Bathhroom	Recessed Parabolic	M	4'T8 U-Shaped	2	2	32	Sw	8	261	19	166	347	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	2	2	32	6	261	10	148	232	38	77	116
69	1	Mens Bathhroom	Recessed Parabolic	E	4'T8	1	2	32	Sw	8	261	10	74	155	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	8	261	10	74	155	0	0	0
70	1	Womens Bathroom	Recessed Parabolic	M	4'T8 U-Shaped	2	2	32	Sw	8	261	19	166	347	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	2	2	32	6	261	10	148	232	38	77	116

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)
71	1	Womens Bathroom	Wall Mounted	M	4'T12	1	2	40	Sw	8	261	24	104	217	T8 Kit	Wall Mounted	4'T8	E	Sw	1	2	32	8	261	10	74	155	63	0	63
72	1	Aviation and Audio Tech	Recessed Parabolic	M	4'T12	6	3	40	Sw	8	261	36	936	1,954	T8 Kit	Recessed Parabolic	4'T8	E	OS	6	3	32	6	261	15	666	1043	564	348	911
73	1	Aviation and Audio Tech	Recessed Parabolic	M	4'T8	6	3	32	Sw	8	261	15	666	1,391	N/A	Recessed Parabolic	4'T8	E	Sw	6	3	32	8	261	15	666	1391	0	0	0
74	1	Spanish	Recessed Parabolic	E	4'T8	1	3	32	Sw	8	261	15	111	232	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	8	261	15	111	232	0	0	0
75	1	Spanish	Recessed Parabolic	M	4'T8	11	3	32	Sw	8	261	29	1,373	2,866	C	Recessed Parabolic	4'T8	E	OS	11	3	32	6	261	15	1221	1912	317	637	954
76	1	East Hall	Exit Sign	S	LED	1	0	5	N	24	365	0	0	0	N/A	Exit Sign	LED	S	N	1	0	5	24	365	0	0	0	0	0	0
77	1	East Wing Hall	Recessed Parabolic	E	4'T8	4	2	32	Sw	8	261	10	296	618	N/A	Recessed Parabolic	4'T8	E	Sw	4	2	32	8	261	10	296	618	0	0	0
78	1	Mechanics (144)	Recessed Parabolic	E	4'T5	21	2	28	Sw	8	261	8	1,344	2,806	C	Recessed Parabolic	4'T5	E	OS	21	2	28	6	261	8	1344	2104	0	701	701
79	1	Storage (148)	Ceiling Suspended	M	4'T12	3	2	40	Sw	8	261	24	312	651	T8 Kit	Ceiling Suspended	4'T8	E	Sw	3	2	32	8	261	10	222	464	188	0	188
80	1	Dance Studio	High Bay	S	MH	15	1	250	Sw	4	261	70	4,800	5,011	T5	High Bay	4'T5	E	OS	12	4	54	3	261	31	2962	2319	1919	773	2692
81	1	Dance Locker	Ceiling Suspended	M	4'T12	4	2	40	Sw	8	261	24	416	869	T8 Kit	Ceiling Suspended	4'T8	E	Sw	4	2	32	8	261	10	296	618	251	0	251
82	1	Hallway	Recessed Parabolic	E	4'T8	19	3	32	Sw	8	261	15	2,109	4,404	N/A	Recessed Parabolic	4'T8	E	Sw	19	3	32	8	261	15	2109	4404	0	0	0
83	1	Hallway	Exit Sign	S	LED	3	0	5	N	24	365	0	0	0	N/A	Exit Sign	LED	S	N	3	0	5	24	365	0	0	0	0	0	0
84	1	Audio Recording Hallway	Recessed Parabolic	E	4'T8	3	2	32	Sw	8	261	10	222	464	N/A	Recessed Parabolic	4'T8	E	Sw	3	2	32	8	261	10	222	464	0	0	0
85	1	Audio Recording Hallway	Exit Sign	S	LED	1	0	5	Sw	24	365	0	0	0	N/A	Exit Sign	LED	S	Sw	1	0	5	24	365	0	0	0	0	0	0
86	1	Audio	Recessed Parabolic	E	4'T8	8	2	32	Sw	8	261	10	592	1,236	C	Recessed Parabolic	4'T8	E	OS	8	2	32	6	261	10	592	927	0	309	309
87	1	Audio	Recessed Parabolic	E	4'T8	11	2	32	Sw	0	261	10	814	0	N/A	Recessed Parabolic	4'T8	E	Sw	11	2	32	0	261	10	814	0	0	0	0
88	1	Audio	Exit Sign	S	LED	2	3	5	N	24	365	2	33	289	N/A	Exit Sign	LED	S	N	2	3	5	24	365	2	33	289	0	0	0
89	1	Womens Bathroom	Recessed Parabolic	E	4'T8	3	3	32	Sw	8	261	15	333	695	C	Recessed Parabolic	4'T8	E	OS	3	3	32	6	261	15	333	521	0	174	174
90	1	Mens Bathhroom	Recessed Parabolic	E	4'T8	3	3	32	Sw	8	261	15	333	695	C	Recessed Parabolic	4'T8	E	OS	3	3	32	6	261	15	333	521	0	174	174
91	1	Acting Studio	Ceiling Suspended	E	4'T8	24	2	32	Sw	0	261	10	1,776	0	C	Ceiling Suspended	4'T8	E	OS	24	2	32	0	261	10	1776	0	0	0	0
92	1	Acting Studio	Exit Sign	S	LED	2	0	5	N	24	365	0	0	0	N/A	Exit Sign	LED	S	N	2	0	5	24	365	0	0	0	0	0	0
93	1	Props	Recessed Parabolic	E	4'T8	1	3	32	Sw	8	261	15	111	232	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	8	261	15	111	232	0	0	0
94	1	Hallway West	Recessed Parabolic	E	4'T8	10	3	32	Sw	8	261	15	1,110	2,318	N/A	Recessed Parabolic	4'T8	E	Sw	10	3	32	8	261	15	1110	2318	0	0	0
95	1	Hallway West Exit	Recessed Parabolic	E	4'T8	3	3	32	Sw	8	261	15	333	695	N/A	Recessed Parabolic	4'T8	E	Sw	3	3	32	8	261	15	333	695	0	0	0
96	1	Classroom (162)	Recessed Parabolic	E	4'T8	6	3	32	Sw	8	261	15	666	1,391	C	Recessed Parabolic	4'T8	E	OS	6	3	32	6	261	15	666	1043	0	348	348
97	1	Classroom (162)	Wall Mounted	E	4'T8	2	2	32	Sw	8	261	10	148	309	C	Wall Mounted	4'T8	E	OS	2	2	32	6	261	10	148	232	0	77	77
98	1	Hallway West Exit	Exit Sign	S	LED	1	0	5	N	24	365	0	0	0	N/A	Exit Sign	LED	S	N	1	0	5	24	365	0	0	0	0	0	0
99	1	Dance Bathroom	Wall Mounted	M	4'T8	1	2	32	Sw	2	261	19	83	43	C	Wall Mounted	4'T8	E	OS	1	2	32	2	261	10	74	29	5	10	14
100	1	Dance Bathroom	Wall Mounted	M	4'T8	1	2	32	Sw	2	261	19	83	43	C	Wall Mounted	4'T8	E	OS	1	2	32	2	261	10	74	29	5	10	14
101	1	Dance Lockers	Recessed Parabolic	M	4'T8	1	2	32	Sw	8	261	10	74	155	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	8	261	10	74	155	0	0	0
102	1	Dance Lockers	Wall Mounted	E	4'T8	1	2	32	Sw	8	261	10	74	155	N/A	Wall Mounted	4'T8	E	Sw	1	2	32	8	261	10	74	155	0	0	0
103	1	Dance Studio	High Bay	S	MH	19	1	250	Sw	4	261	70	6,080	6,348	T5	High Bay	4'T5	E	Sw	14	4	54	4	261	31	3456	3608	2740	0	2740
104	1	Vending	Exit Sign	S	LED	2	0	5	N	24	365	0	0	0	N/A	Exit Sign	LED	S	N	2	0	5	24	365	0	0	0	0	0	0
105	2	East Staircase	Wall Mounted	M	4'T12	7	2	40	Sw	8	261	24	728	1,520	T8-BL	Wall Mounted	4'T8	E	BL	7	2	32	5	261	10	518	626	438	456	894
106	2	East Staircase	Exit Sign	S	LED	2	0	5	N	24	365	0	0	0	N/A	Exit Sign	LED	S	N	2	0	5	24	365	0	0	0	0	0	0
107	2	East Hallway	Recessed Parabolic	E	4'T8	11	3	32	Sw	8	261	15	1,221	2,549	N/A	Recessed Parabolic	4'T8	E	Sw	11	3	32	8	261	15	1221	2549	0	0	0
108	2	East Hallway	Recessed Parabolic	E	4'T8 U-Shaped	5	2	32	Sw	8	261	10	370	773	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	5	2	32	8	261	10	370	773	0	0	0
109	2	East Hallway	Exit Sign	S	LED	2	0	5	N	24	365	0	0	0	N/A	Exit Sign	LED	S	N	2	0	5	24	365	0	0	0	0	0	0
110	2	East Wing Central Staircase	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	8	261	10	148	309	T8-BL	Recessed Parabolic	4'T8 U-Shaped	E	BL	2	2	32	5	261	10	148	179	0	130	130
111	2	East Wing Central Staircase	Recessed Parabolic	M	4'T12	1	2	40	Sw	8	261	24	104	217	T8	Recessed Parabolic	4'T8	E	Sw	1	2	32	8	261	10	74	155	63	0	63
112	2	Central Hallway	Recessed Parabolic	E	4'T8	24	3	32	Sw	8	261	15	2,664	5,562	N/A	Recessed Parabolic	4'T8	E	Sw	24	3	32	8	261	15	2664	5562	0	0	0
113	2	Central Hallway	Exit Sign	S	LED	4	0	5	N	24	365	0	0	0	N/A	Exit Sign	LED	S	N	4	0	5	24	365	0	0	0	0	0	0
114	2	West Wing Hallway	Recessed Parabolic	E	4'T8	32	3	32	Sw	8	261	15	3,552	7,417	N/A	Recessed Parabolic	4'T8	E	Sw	32	3	32	8	261	15	3552	7417	0	0	0
115	2	West Wing Hallway	Exit Sign	S	LED	6	0	5	N	24	365	0	0	0	N/A	Exit Sign	LED	S	N	6	0	5	24	365	0	0	0	0	0	0
116	2	West Staircase	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	8	261	10	148	309	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	2	2	32	8	261	10	148	309	0	0	0
117	2	West Staircase	Recessed Parabolic	E	4'T8	4	2	32	Sw	8	261	10	296	618	T8-BL	Recessed Parabolic	4'T8	E	BL	4	2	32	5	261	10	296	357	0	261	261
118	2	West Staircase	Exit Sign	S	LED	2	0	5	N	24	365	0	0	0	N/A	Exit Sign	LED	S	N	2	0	5	24	365	0	0	0	0	0	0
119	Ext	Exterior	Wallpack	E	MH	5	1	100	T	12	365	28	640	2,803	CFL	Wallpack	CFL	E	T	5	1	65	12	365	0	325	1424	1380	0	1380
Totals:						**579**	**247**	**3,884**				**1,878**	**63,370**	**126,250**						**571**	**253**	**3,385**			**1,257**	**55,274**	**99,875**	**12,939**	**13,437**	**26,376**
Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space																														

Proposed Lighting Summary Table			
Total Gross Floor Area (SF)	57,000		
Average Power Cost ($/kWh)	0.1510		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	2,803	1,424	**1,380**
Exterior Power (watts)	640	325	**315**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	123,949	98,838	**25,112**
Lighting Power (watts)	62,970	55,171	**7,800**
Lighting Power Density (watts/SF)	1.10	0.97	**0.14**
Estimated Cost of Fixture Replacement ($)	8,040		
Estimated Cost of Controls Improvements ($)	10,620		
Total Consumption Cost Savings ($)	**8,794**		

LEGEND			
Lamp Type		**Controls**	
CFL	Compact Fluorescent	T	Autom. Timer
Inc	Incadescent	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
Fl	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: EnergyMiser Calculations

EnergyMisers

VendingMiser® CoolerMiser™ SnackMiser™ PlugMiser™ VM2iQ® CM2iQ®

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)	$0.151
Facility Occupied Hours per Week	50
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

Calculate Savings!

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

COLD DRINK MACHINES	Current	Projected	Total Savings	% Savings
kWh	6989	2898	4091	59%
Cost of Operation	$1,055.31	$437.62	$617.69	59%

SNACK MACHINES	Current	Projected	Total Savings	% Savings
kWh	699	208	491	70%
Cost of Operation	$105.53	$31.41	$74.12	70%

Location's Total Annual Savings

	Current	Projected	Total Savings	% Savings
kWh	7688	3106	4582	60%
Cost of Operation	$1,160.84	$469.03	$691.81	60%

Total Project Cost	Break Even (Months)
$578	10.03

Estimated Five Year Savings on ALL Machines = $3,459.07

Estimated Five Year Return on Investment = 498%

APPENDIX E: COST WORKS COST ESTIMATES

Route 547
Lakehurst,
New Jersey, 08733
Year 2012 Quarter 2

Date: 6-Jun-12

Unit Detail Report

Cost Estimate Report
CostWorks®
RSMeans

Prepared By:
Dan Carmichael
Steven Winter Associates Inc

OCVTS-Hangar 1

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 23 Heating, Ventilating, and Air Conditioning (HVAC)							
235216240220			Condensing boilers, cast iron, gas fired, natural or LP, packaged, DOE MBH output, 194 MBH, (82.7%) AFUE, includes standard controls, circulator, trim	1.00	Ea.	$4,949.25	$4,949.25
Division 23 Subtotal							**$4,949.25**
Division 26 Electrical							
265113507630			Electronic ballast, replacement, interior lighting fixtures, for two tubes, to 15' high	239.00	Ea.	$147.87	$35,340.93
266123100517			Fluorescent lamp, high output, energy saver, 54 watt, 4' long, T5	34.00	C	$2,986.16	$101,529.44
Division 26 Subtotal							**$136,870.37**

APPENDIX F: 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 will be 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 G: 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
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com

Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
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	(866) 568-0290 www.NewJerseyGasElectric.com

Fort Lee, NJ 07024	
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 H: 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 expresses the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

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

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

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

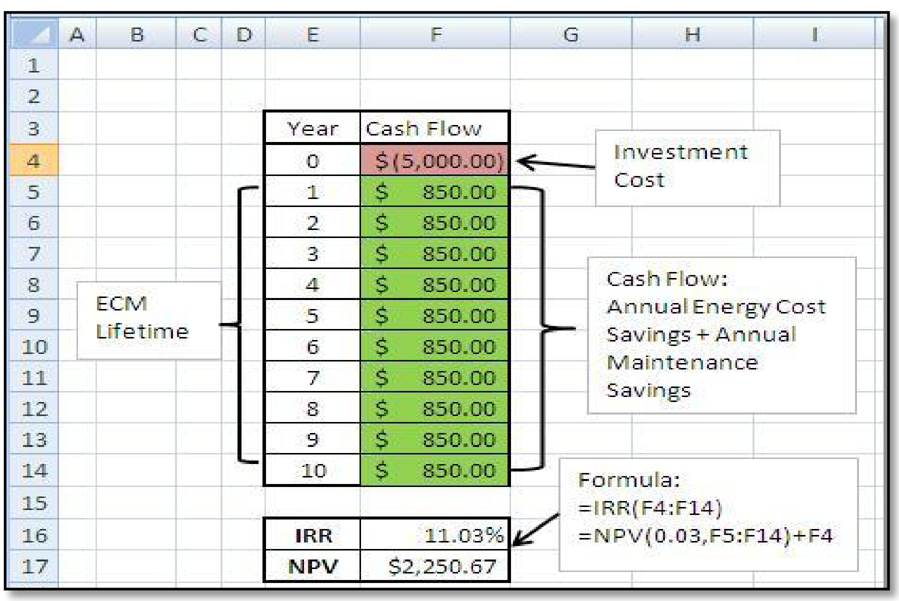
Calculation References

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

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

Excel NPV and IRR Calculation

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



Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years 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 I: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
OCTVS - Joint Base, Hangar 1

Building ID: 3130386
For 12-month Period Ending: December 31, 2011[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: May 24, 2012

Facility
OCTVS - Joint Base, Hangar 1
Hangar 1, Route 547
Lakehurst, NJ 08733

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1999
Gross Floor Area (ft²): 57,000

Energy Performance Rating[2] (1-100) 4

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	2,809,782
Natural Gas (kBtu)[4]	1,502,900
Total Energy (kBtu)	4,312,682
Energy Intensity[4]	
Site (kBtu/ft²/yr)	76
Source (kBtu/ft²/yr)	192
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	478
Electric Distribution Utility	
Jersey Central Power & Light Co [FirstEnergy Corp]	
National Median Comparison	
National Median Site EUI	43
National Median Source EUI	110
% Difference from National Median Source EUI	74%
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 Standards[5] 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 J: 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 K: 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	none at this time	398	4,091	0	0	0.2	0	618	12	7,411	0.6	1,762	147	155	5,501	7,325
2	Retro-commissioning	11,400	none at this time	11,400	50,301	0	1,328	5.3	1,820	11,107	3	33,320	1.0	192	64	81	19,279	104,703
3	Retrofit 1 vending machine with a SnackMiser™ device	180	none at this time	180	491	0	0	0.0	0	74	12	889	2.4	394	33	40	532	879
4	New T5 fixtures to be installed with incentives	5,650	416	5,234	4,659	3	0	0.3	1,380	2,083	15	31,245	2.5	497	33	40	18,679	8,342
5	Install 44 occupancy sensors	9,680	880	8,800	12,102	3	0	4.1	0	1,815	15	27,228	4.8	209	14	19	12,170	21,668
6	Replace 1 Standard Efficiency Natural Gas DHW Heater with an Energy Star Natural Gas Condensing Type	4,949	50	4,899	0	0	719	1.3	0	917	12	11,001	5.3	125	10	15	3,990	7,926
7	Retrofit 15 T12 fixtures with electronic ballasts and T8 lamps	1,961	150	1,811	1,128	0	0	0.1	129	299	15	4,482	6.1	148	10	14	1,652	2,019
8	Replace magnetic ballast with electronic ballasts	35,341	0	35,341	4,245	0	0	0.3	2,868	3,509	15	52,636	10.1	49	3	5	5,766	7,601
9	Replace 18 u-shaped T12 fixtures with new T8 fixtures	2,326	400	1,926	1,128	0	0	0.1	10	181	15	2,710	10.7	41	3	5	194	2,019
10	Install 13 bi-level fixtures	2,145	325	1,820	847	0	0	0.3	0	127	15	1,906	14.3	5	0	1	-315	1,516

Assumptions: Discount Rate: 3.2%; Energy Price Escalation Rate: 0%
Note: A 0.0 electrical demand reduction/month indicates that it is very low/negligible

APPENDIX L: 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.