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April 16, 2010

Local Government Energy Program
Energy Audit Report
FINAL

Ocean County Vocational Technical School

Brick, NJ 08723

Project Number: LGEA38

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INTRODUCTION

On January 22nd Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment for the Ocean County Vocational Technical School building. The building is located at 350 Chambers Bridge Rd, Brick, NJ 08723, in Ocean County. The current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

The two stories Ocean County Vocational Technical School building was originally built in 1971, and approximated 44,000 sq ft. In 1981 the school was doubled in size to 88,000 sq ft, and in 2007 a 4,000 sq ft addition was built. Today, the building consists of 92,000 square feet of conditioned spaces. The building includes various types of classrooms serving various technologies including construction, automotive, graphic design, HVAC, computer technology and service occupations and life skills. The building also includes administrative offices, culinary arts, a bakery and kitchen, child care, an auditorium, student services, and boiler and utility rooms. The building is occupied on weekdays by 54 faculty / staff employees and 800 students from 6am to 10pm. There are two school sessions, each with approximately 400 students, that run Monday through Thursday from 6am to 2:30pm and 6pm to 10pm. On Fridays, there is just the first session and no evening classes.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Ocean County Vocational Technical School to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the Ocean County Vocational Technical School building.

Launched in 2008, the 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 75% of the cost of the audit. If the net cost of the installed measures recommended by the audit exceeds the remaining cost of the audit, then that additional 25% will also be paid by the program. The Board of Public Utilities (BPUs) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Ocean County Vocational Technical School building located at 350 Chambers Bridge Rd, Brick, NJ. The Ocean County Vocational Technical School building is a two story building with a floor area of 92,000 square feet. The original structure was built in 1971 with additions in 1981 and 2007.

Based on the field visits performed by the SWA staff on January 22nd and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work.

From September 2008 to August 2009 the Ocean County Vocational Technical School building consumed 1,032,400 kWh or $166,719 worth of electricity at an approximate rate of $0.161/kWh and 70,197 therms or $90,956 worth of natural gas at an approximate rate of $1,296/therm. The joint energy consumption for the building, including both electricity and natural gas, was 10,534 MMBtu of energy that cost a total of $257,675.

SWA entered energy information about the Ocean County Vocational Technical School building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The building performance rating received a score of 6 when compared to other buildings of its kind. Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). SWA encourages the OCVTS Board of Education to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time.

The Site Energy Use Intensity is 115.0 kBtu/ft^{2}yr compared to the national average of a school building consuming 68.0 kBtu/ft^{2}yr. Implementing the recommendations included in this report will reduce the building energy consumption by approximately 20.8 kBtu/ft^{2}yr. There may be electricity procurement opportunities for the Ocean County Vocational Technical School to reduce annual costs, which are $11,859 higher when compared to the average estimated NJ commercial electric rates.

Based on the assessment of the Ocean County Vocational Technical School building, SWA has separated the recommendations into three categories (See Section 4 for more details). These are summarized as follows:

Category I Recommendations: Capital Improvement Measures

- Replace heating boilers installed in 1971
- Upgrade Building Management System (BMS)
- Install heat tracing on chilled water pipes
- Replace exhaust fans past service life
- Replace roof top package units
- Replace chiller
- Replace air handling units, unit ventilators and H/V units
- Install premium motors when replacements are required

Category II Recommendations: Operations and Maintenance

- Boiler room piping insulation

- Shut down kitchen hood fans during unoccupied hours
- Check outside air dampers
- Inspect and replace gaskets around kitchen walk-in refrigeration box doors
- Use Energy Star labeled appliances
- Maintain roofs
- Maintain downspouts
- Provide weather stripping / air sealing
- Repair / seal wall cracks and penetrations
- Provide water efficient fixtures and controls
- Use smart power electric strips
- Create an energy educational program

Category III Recommendations: Energy Conservation Measures - Upgrades with associated energy savings

At this time, SWA highly recommends a total of **6** Energy Conservation Measures (ECMs) for the Ocean County Vocational Technical School building that are summarized in the following Table 1. The total investment cost for these ECMs without incentives is **$31,543**. SWA estimates a first year savings of **$16,598** with a simple payback of **1.8 years**. SWA estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the Ocean County Vocational Technical School building by **142,417 lbs of CO_2**, which is equivalent to removing approximately 12 cars from the roads each year or avoiding the need of 347 trees to absorb the annual CO_2 generated. SWA also recommends **7** ECMs with a total first year savings of **$5,265** that is summarized in Table 2 and **2** End of Life Cycle ECMs with a total first year savings of **$13,211** that are summarized in Table 3.

There are various incentives that the Ocean County Vocational Technical School Board of Education could apply for that could also help lower the cost of installing the ECMs, such as enroll in the NJ SmartStart program through the New Jersey Office of Clean Energy. This incentive program can help provide technical assistance for the building in the implementation phase of any energy conservation project. A new NJ Clean Power program, Direct Install, could also assist to cover 80% of the capital investment.

Institutional buildings with an average annual peak demand over 200 kW (Ocean County Vocational Technical School is about 271 kW) are eligible to participate in the NJ Clean Energy Pay for Performance program. Incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum performance threshold of 15% savings has been achieved. To participate, select a Program Partner from an approved partner list and submit Application Package with your Partner's assistance. Reducing 15% of the energy use at Ocean County Vocational Technical School is possible by undertaking some capital improvement measures along with SWA recommendations. A more thorough analysis will be required to identify capital improvement projects for participation in this program; SWA highly recommends OCVTS to contact an approved partner.

Renewable ECMs require application approval and negotiations with the utility and proof of performance. There is also a utility-sponsored loan program through NJNG that would allow the building to pay for the installation of the PV system through a loan issued by the utility. Ocean County Vocational Technical School Board of Education should seek advice from their electric utility if they will offer similar rebates and help for other renewable measures.

The following four tables summarize the proposed Energy Conservation Measures (ECM) and their economic relevance:

Table 1 - Highly Recommended 0-5 Year Payback ECMs																			
ECM #	ECM description	source	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 energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2	Install 3 Drinks vending machine, 3 reach-in cooler, and 1 snack energy misers	www.usatech.com and established costs	1,853	0	1,853	10,059	2.7	0	0.4	0	1,619	12	19,434	1.1	949	79	87	14,077	13,781
3.3	69 New occupancy sensors to be installed with incentives	RS Means, lit search	15,180	1,380	13,800	61,588	12.8	0	2.3	0	9,916	15	148,735	1.4	978	65	72	102,878	84,376
7	Tie kitchen hood exhaust fans and MUA to EMS	similar projects	8,000	0	8,000	6,654	1.8	1,754	2.2	0	3,344	15	50,167	2.4	527	35	42	31,355	29,638
3.4	18 New motion sensors to be installed with incentives	RS Means, lit search	3,960	360	3,600	6,474	1.3	0	0.2	0	1,042	15	15,634	3.5	334	22	28	8,664	8,869
5	Transfer 450cfm from AHU2 to AHU1 areas	RS Means	1,800	0	1,800	3,000	0.8	0	0.1	0	483	15	7,245	3.7	303	20	26	3,883	4,110
1	Replace old refrigerator with 18 cu ft Energy Star refrigerator	Energy Star purchasing and procurement site, similar projects	750	0	750	1,200	0.1	0	0.0	0	193	12	2,318	3.9	209	17	24	1,150	1,644
	TOTALS		**31,543**	**1,740**	**29,803**	**88,975**	**19.5**	**1,754**	**5.2**	**0**	**16,598**	**-**	**243,534**	**1.8**	**-**	**-**	**-**	**162,008**	**142,417**

Assumptions: Discount Rate: 3.2% per DOE FEMP; Energy Price Escalation Rate: 0% per DOE FEMP Guidelines

Table 2 - Recommended >5 Year Payback ECMs																			
ECM #	ECM description	source	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 energy 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
8.1	Replace (1) 3 HP motors with premium effciency motor	similar projects, DOE Motor Master + International	357	65	292	318	0.1	0	0.0	0	51	20	1,024	5.7	251	13	17	456	436
3.2	12 New CFL fixtures to be installed with incentives	RS Means, lit search	614	0	614	624	0.1	0	0.0	7	108	5	502	5.7	-12	-2	-4	-124	855
6	CO2 based demand controlled ventilation	RS Means and similar projects	19,008	0	19,008	0	0.0	2,192	2.4	0	2,841	15	42,612	6.7	124	8	12	14,420	25,646
8.2	Replace (2) 2 HP motors with premium effciency motor	similar projects, DOE Motor Master + International	650	110	540	424	0.1	0	0.0	0	68	20	1,365	7.9	153	8	11	457	581
4	Retro commissionin g	Past Projects	18,750	0	18,750	1,828	0.5	667	0.8	910	2,069	15	17,378	9.1	65	4	7	5,591	10,306
8.3	Replace (3) 1.5 HP motors with premium effciency motor	similar projects, DOE Motor Master + International	915	144	771	477	0.1	0	0.0	0	77	20	1,536	10.0	99	5	8	351	653
3.1	3 New T8 fixtures to be installed with incentives	RS Means, lit search	646	90	556	195	0.0	0	0.0	20	51	15	471	10.8	39	3	4	49	267
	TOTALS		**40,940**	**409**	**40,531**	**3,866**	**1.0**	**2,859**	**3.3**	**937**	**5,265**	**-**	**64,889**	**7.7**	**-**	**-**	**-**	**21,199**	**38,745**

Table 3 - Recommended End of Life Cycle ECMs																			
ECM #	ECM description	source	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 energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
10	ReplaceDHW heater with a condensing boiler	RS Means	13,930	800	13,130	0	0.0	2,314	2.5	700	3,698	20	59,966	3.6	463	23	28	40,888	27,068
9	Replace hot water boiler with a condensing boiler	RS Means	57,550	4,000	53,550	0	0.0	6,800	7.4	700	9,513	20	176,256	5.6	255	13	17	85,395	79,560
	TOTALS		**71,480**	**4,800**	**66,680**	**0**	**0.0**	**9,114**	**9.9**	**1,400**	**13,211**	**-**	**236,222**	**5.0**	**-**	**-**	**-**	**126,282**	**106,628**

Table 4 - Renewable Energy Generation Measures																			
ECM #	ECM description	source	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 energy 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	Install 50 kW PV rooftop system (with $1/W INCENTIVE and $600/1MWh SREC)	similar projects	375,000	50,000	325,000	56,721	50.0	0	2.1	0	42,732	25	744,100	7.6	284	11	11	235,133	77,708
12	Install 12 kW wind turbine system	similar projects	134,400	24,448	109,952	7,640	12.0	0	0.3	0	1,230	25	30,751	89.4	-72	-3	-	-89,003	10,467
	TOTALS		**509,400**	**74,448**	**434,952**	**64,361**	**62.0**	**0.0**	**2.4**	**0.0**	**43,962**	**-**	**774,851**	**9.9**	**-**	**-**	**-**	**146,130**	**88,175**

1. HISTORIC ENERGY CONSUMPTION

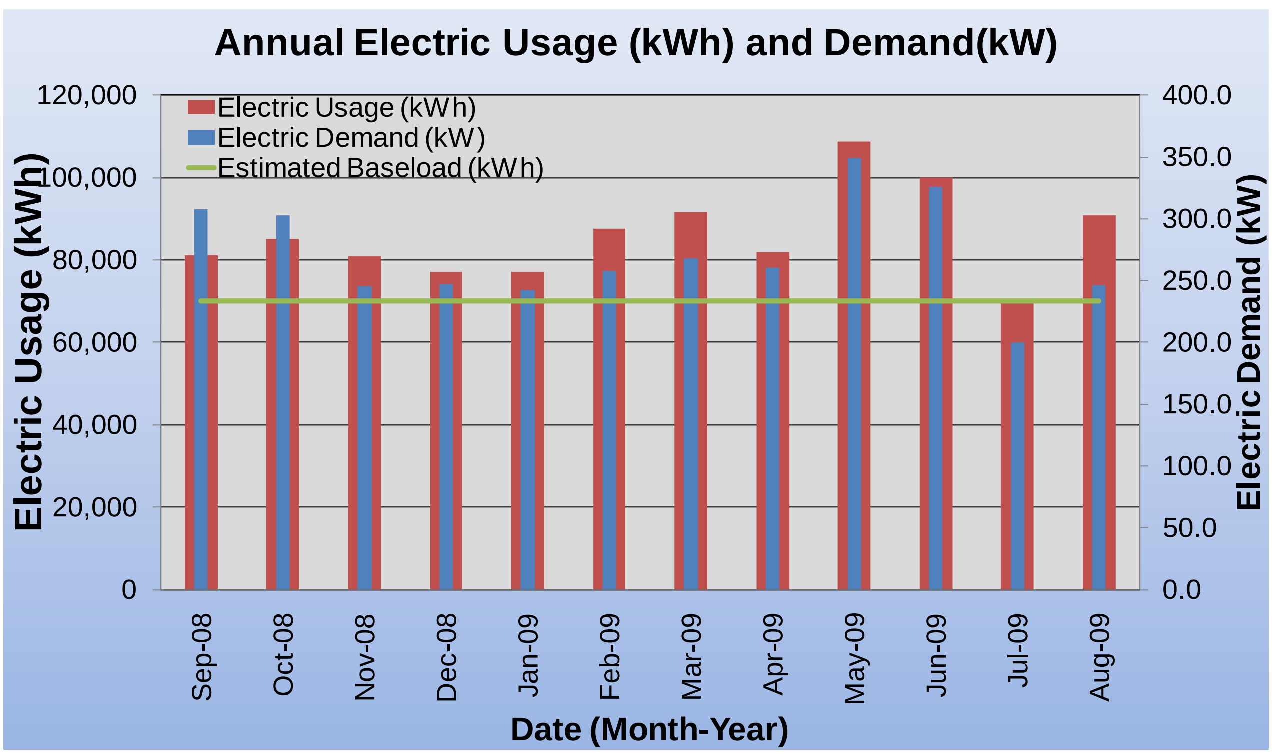
1.1. Energy usage and cost analysis

SWA analyzed utility bills from September 2008 through August 2009 that were received from the BOE and the utility company supplying the Ocean County Vocational Technical School building natural gas.

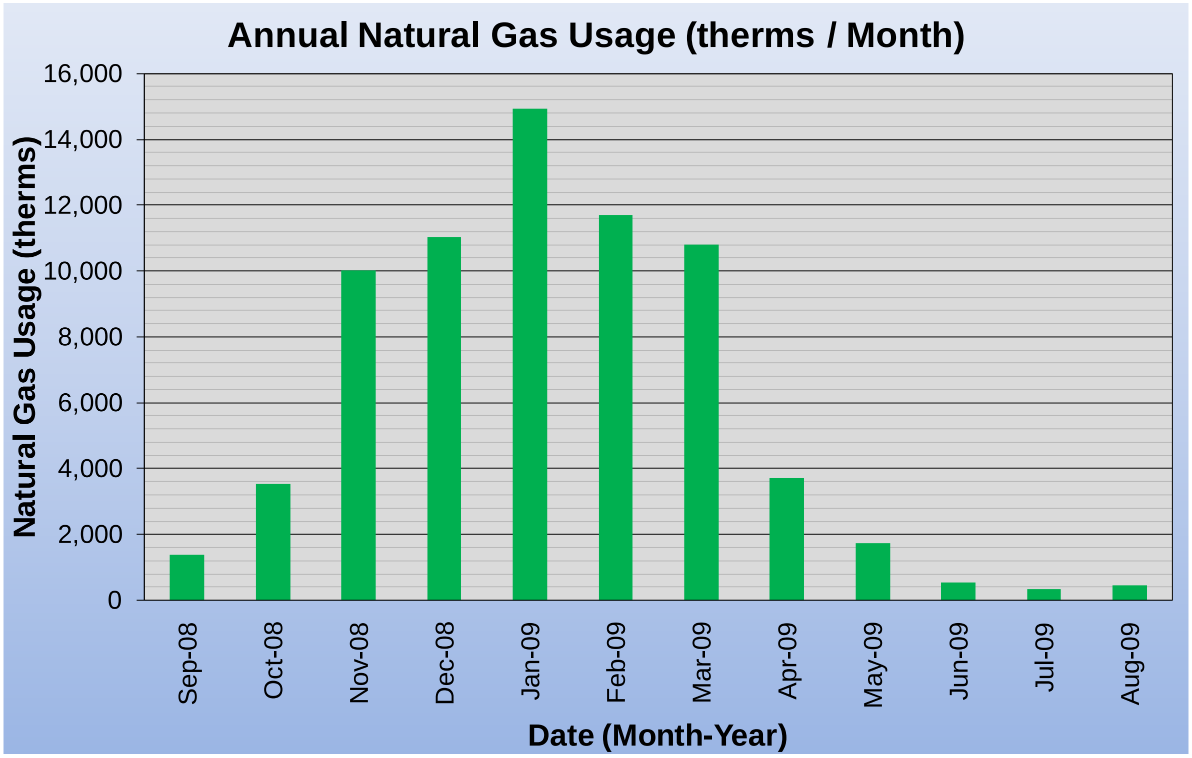
Electricity - The Ocean County Vocational Technical School building is currently served by one electric meter. The Ocean County Vocational Technical School building currently buys electricity from JCP&L at **an average rate of $0.161/kWh** based on 12 months of utility bills from September 2008 to August 2009. The Ocean County Vocational Technical School building purchased **approximately 1,032,400 kWh or $166,719 worth of electricity** in the previous year. The average monthly demand was 271 kW.

Natural gas - The Ocean County Vocational Technical School building is currently served by one meter for natural gas. The Ocean County Vocational Technical School building currently buys natural gas from NJNG at **an average aggregated rate of $1.296/therm** based on 12 months of utility bills for September 2008 to August 2009. The Ocean County Vocational Technical School building purchased **approximately 70,197 therms or $90,956 worth of natural gas** in the previous year.

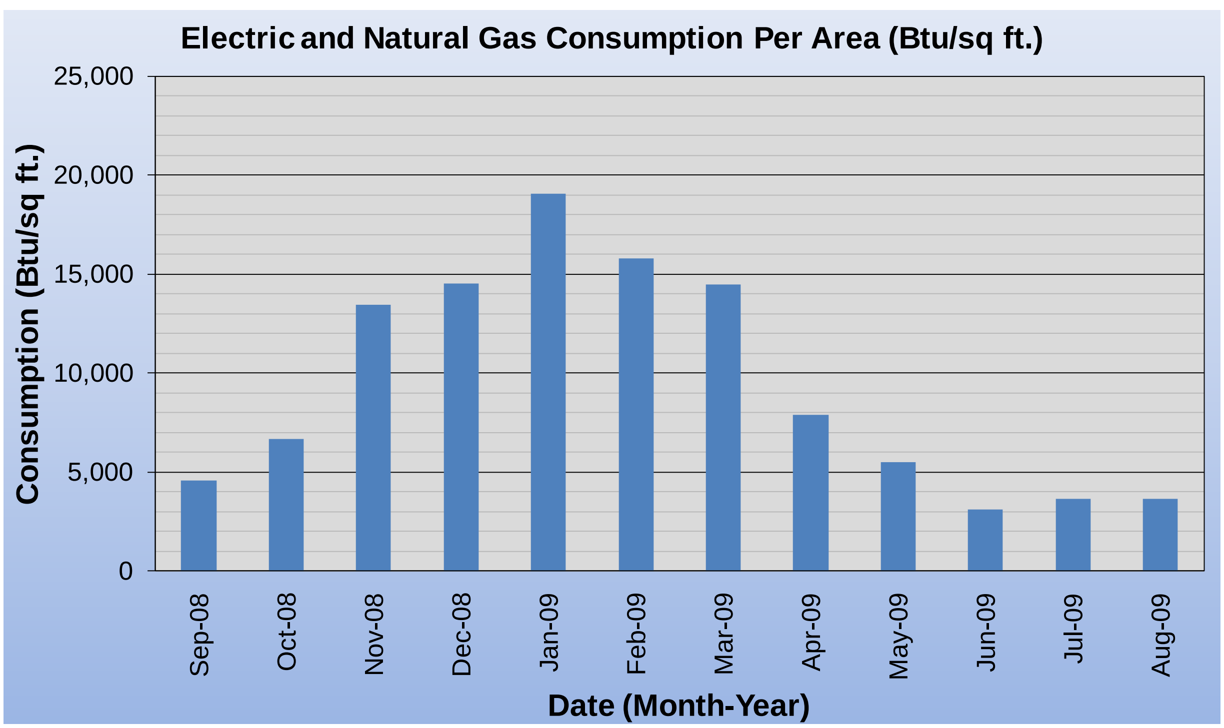
The following chart shows electricity use for the Ocean County Vocational Technical School building based on utility bills for the 12 month period of September 2008 to August 2009.



The following chart shows the natural gas consumption for the Ocean County Vocational Technical School building based on natural gas bills for the 12 month period of September 2008 to August 2009.

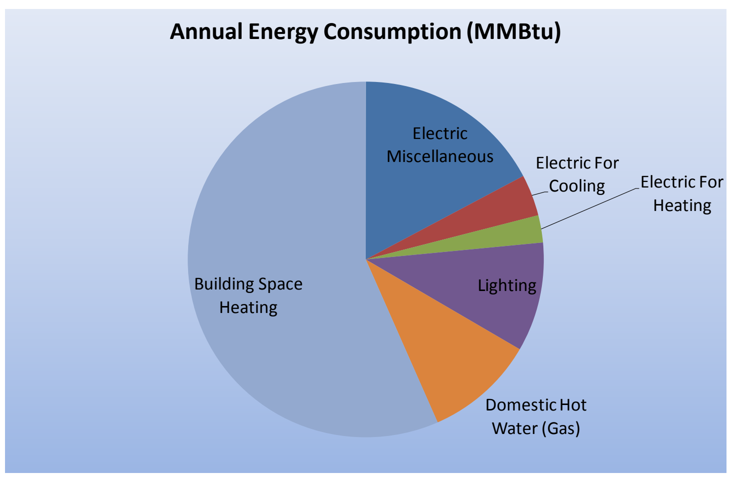


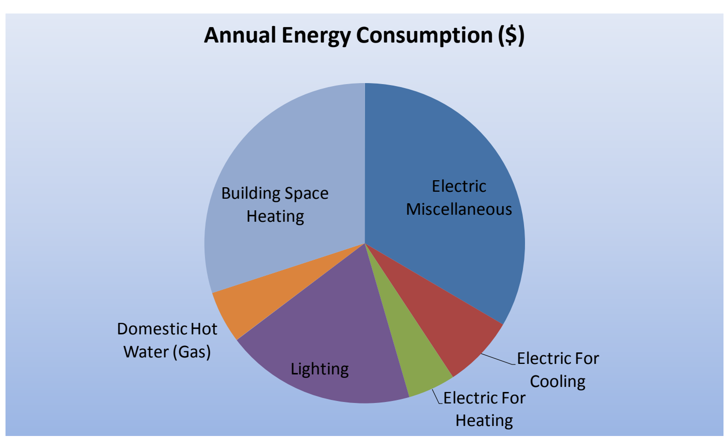
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Ocean County Vocational Technical School building based on utility bills for the 12 month period of September 2008 to August 2009.



The following table and chart pies show energy use for the Ocean County Vocational Technical School building based on utility bills for the 12 month period of September 2008 to August 2009. Note electrical cost at $47/MMBtu of energy is more than 3.6 times as expensive to use as natural gas at $13/MMBtu.

2008 Annual Energy Consumption / Costs					
	MMBtu	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Electric Miscellaneous	1,817	17%	$86,002	33%	47
Electric For Cooling	396	4%	$18,732	7%	47
Electric For Heating	261	2%	$12,338	5%	47
Lighting	1,049	10%	$49,648	19%	47
Domestic Hot Water (Gas)	1,052	10%	$13,626	5%	13
Building Space Heating	5,968	57%	$77,330	30%	13
Totals	10,543	100%	$257,675	100%	24
Total Electric Usage	3,523	33%	$166,719	65%	47
Total Gas Usage	7,020	67%	$90,956	35%	13
Totals	10,543	100%	$257,675	100%	24





1.2. Utility rate

The Ocean County Vocational Technical School building currently purchases electricity from its utility at a general service market rate for electricity use (kWh) with a separate (kW) demand charge. The Ocean County Vocational Technical School building currently paid an average rate of approximately $0.161/kWh based on the 12 months of utility bills of September 2008 to August 2009.

The Ocean County Vocational Technical School building currently purchases natural gas supply from the NJNG at a general service market rate for natural gas (therms). There is one gas meter that provides natural gas service to the Ocean County Vocational Technical School building currently. The average aggregated rate (supply and transport) for the meter is approximately $1.296/therm based on 12 months of utility bills for September 2008 to August 2009.

1.3. Energy benchmarking

SWA entered energy information about the Ocean County Vocational Technical School building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The building performance rating received a score of 6 when compared to other school buildings. Buildings achieving an Energy Star rating of 75 or higher and professionally verified to meet current indoor environmental standards are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance to students, parents, taxpayers, and employees. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification to the United States Green Building Council (USGBC).

The Site Energy Use Intensity is 115.0 kBtu/sq ft yr compared to the national average of a K12 School building consuming 68.0 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 5.2 kBtu/sqft yr, with an additional 3.3 kBtu/sq ft yr from the recommended ECMs, 9.9 kBtu/sq ft yr from the recommended End of Life Cycle ECMs, and 2.4 kBtu/sq ft yr from Renewable Energy measures. These recommendations could account for at least 20.8 kBtu/sq ft yr reduction, which when implemented would make the building energy consumption lower.

SWA has created the Portfolio Manager information for Ocean County Vocational Technical School Board of Education. This information can be accessed at: https://www.energystar.gov/istar/pmpam/, with the following:

Username: OceanCountyBOE
Password: ocvtsboe

This information is also being shared with TRC Energy Services (user name of TRC-LGEA).

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
OCVTS - Brick Center

Building ID: 1928948
For 12-month Period Ending: August 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: February 03, 2010

Facility
OCVTS - Brick Center
350 Chambers Bridge Road
Brick, NY 08723

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1971
Gross Floor Area (ft²): 92,000

Energy Performance Rating[2] (1-100) 6

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	3,522,549
Natural Gas (kBtu)[4]	7,021,365
Total Energy (kBtu)	10,543,914

Energy Intensity[5]	
Site (kBtu/ft²/yr)	115
Source (kBtu/ft²/yr)	208

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	910

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison	
National Average Site EUI	68
National Average Source EUI	124
% Difference from National Average Source EUI	68%
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[6] for Indoor Environmental Conditions:

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

Certifying Professional
N/A

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

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, PE 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

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The two stories Ocean County Vocational Technical School building was originally built in 1971 and approximated 44,000 sq ft. In 1981 the school was doubled in size to 88,000 sq ft, and in 2007 a 4,000 sq ft addition was built. Today, the building consists of 92,000 square feet of conditioned spaces. The building includes various types of classrooms serving various technologies including construction, automotive, graphic design, HVAC, computer technology and service occupations and life skills. The building also includes administrative offices, culinary arts, a bakery and kitchen, child care, an auditorium, student services, and boiler and utility rooms.

2.2. Building occupancy profiles

The school opens doors to students the first week of September and finishes for the summer in the third week of July. The building is occupied on weekdays by 54 faculty / staff employees and 800 students from 6am to 10pm. There are two school sessions (each with approximately 400 students) run Monday through Thursday from 6am to 2:30pm and 6pm to 10pm. Friday operates just the first session and there are no evening classes. The building remains unoccupied over the weekend.

2.3. Building envelope

2.3.1. Exterior Walls

The 1981 and 2007 section of the building exterior wall envelope consists of a mixture of 4" brick veneer, 2" rigid insulation, 6" CMU (Concrete Masonry Unit) walls, and garage doors. The 1971 section of building wall assemblies do not contain wall insulation. Interior wall finishes are a mix of painted CMU and gypsum wall board. During the next major construction, SWA recommends insulating the exterior walls to the current local building code by adhering 2" polyiso boards (Polyisocyanurate) together with furring strips and gypsum wall boards to the inside of the painted CMU walls.

Various types of exterior wall finishes – Exterior grade plywood and cement textured finish on CMU

Large crack found in interior training room wall; Cement finish cracked and coming off exterior wall of training room

Overall the exterior wall assemblies of the building appear to be in excellent condition with no major issues of concern. There were no additional areas of concern mentioned to SWA at the time of the building audit. The above image on the left shows a damaged section of the exterior wall façade that should be repaired. There was also an insect hive seen in the back of the building which should be removed. SWA recommends regular maintenance to exterior walls, re-pointing brick veneer, caulking around windows or doors, and removing all damage due to insects or rodents. Attention and maintenance should be given to these areas as uncontrolled roof water runoff can potentially penetrate exterior walls and cause energy losses and structural damage. Special attention should be given to roof drainage to avoid water damage to exterior wall assemblies.

2.3.2.Roof

Ocean County Vocational Technical School built-up roof was installed in three phases in 1996, 2000, and 2007. The 1996 roof section assembly (which is over the 1971 section of the building) is ballasted, contains a 4 ply built up roof system with tapered 1 ½: inches of polystyrene insulation. The 2000 roof section (built over the 1981 section of the building) is built-up, contains a 4 ply membrane and 1 ½ inches of polystyrene insulation. The 2007 roof section is non-ballasted, with 1 ½ inches of polystyrene insulation. The fascia around the perimeter of the building was recently replaced with ribbed metal seamed fascia. At the time of replacement, opportunities were taken for additional air sealing and insulation, offering further comfort benefits and reducing energy loss (as was told during the time of the audit).

Built-up roof at OCVTS; Metal seamed roof above side entrance

The roof appeared to be in age appropriate condition with few areas of notable pooling due to clogged downspouts or insufficient grading. There was also an area at a corner of the roof (noted in the image below) where the membrane is cracked given an entry way for precipitation.


Pooling on roof and area of built-up missing gravel

Cracked membrane at roof corner

At the time of the audit, SWA was told there are no roof leaks or roof maintenance issues. Regular maintenance should be performed to prevent potential damage to the integrity of the roofing system. When it is time for roof replacement, SWA recommends an Energy Star certified roof membrane and rigid insulation (3") assembly.

2.3.3. Base

The building's base is uninsulated 4" concrete slab-on grade with a perimeter footing and concrete block stem walls. No water seepage through the slab or other issues related to thermal performance was detected.

2.3.4. Windows

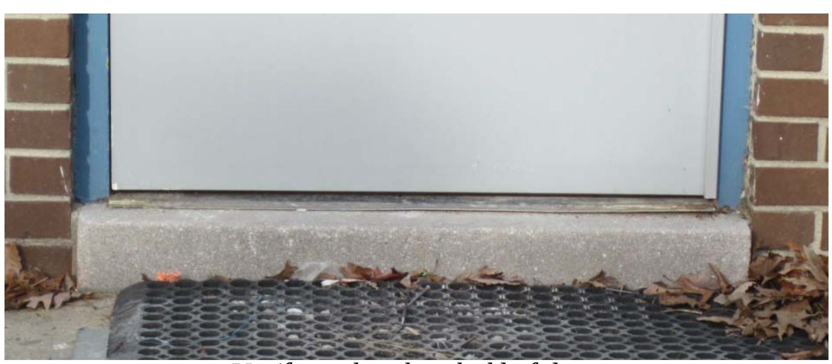
All windows were replaced in 2007 with low-e, double pane, insulated, aluminum framed windows. The windows appeared to be in very good condition. Regular maintenance should be performed, re-caulking around the perimeter of windows (exterior and interior) to ensure a tight seal.

Double Aluminum Window panel wall system

2.3.5. Exterior doors

At the time of the audit SWA was told all doors were recently replaced (in 2007) during the period of the window replacement. The FRP exterior doors were inspected and observed to be in very good condition. SWA recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals. Tight seals around doors will help ensure the building to be is kept continuously insulated. When exterior doors or garage doors warrant replacement SWA recommends researching R values of insulated doors with effective seals.

Exterior types of doors all requiring maintenance to verify air tight seals



Verify seal at threshold of door

2.3.6. Building air tightness

In addition to the above mentioned recommendations SWA suggests air sealing, caulking and / or insulating around all plumbing, electrical, HVAC and structural envelope penetrations. This should include bottom and top plates, recessed light fixtures, electrical boxes, chimney walls and window, or sleeve air conditioner units.

2.4. HVAC Systems

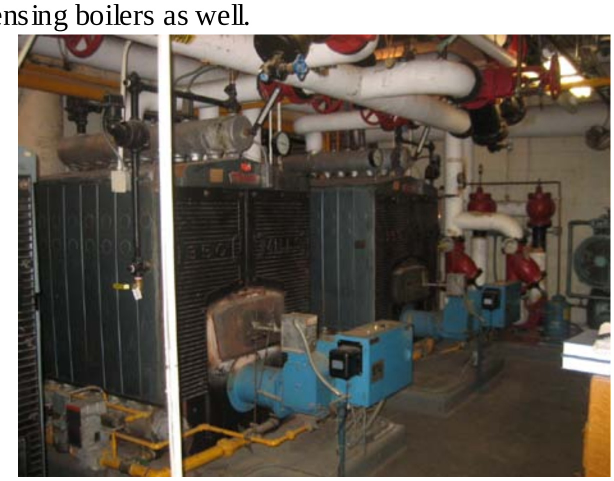
Ocean County Vocational Training School (OCVTS) is heated and cooled by various systems. The original section of the building was built in 1971 had no provision for cooling. The 1981 addition was built as a four-pipe hot and chilled water system, and so was the 2008 addition of printing areas.

2.4.1 Heating

The building has a variety of hot water heating unit ventilators, which were installed in 1971 and later replaced in 2000. Some unit ventilators are ceiling mounted and referred to as MUA (make up air) units, which are mostly located in shops. The 1981 section of the building consists of air handling units with hot and chilled water coils and unit ventilators also with hot and chilled water pipes. The unit ventilators in this addition were installed in the shops. Air handling unit 1 has Variable Air Volume (VAV) boxes for control. Kitchen and Culinary areas have natural gas fired roof top package units which were installed at various times. Scattered throughout the school are enclosed wall mounted hot water finned tube radiation and cabinet heaters.

The building contains a pneumatic Honeywell energy management system. Heating is controlled by individual room thermostats and sensors. The temperature set points for heating is set between 68-72 deg F for occupied mode, and 55 deg F for unoccupied mode.

The heating hot water is produced by three (3) gas-fired, hot water boilers located in the boiler room. The boilers are HB Smith cast iron sectional type with 11 sections and a rated capacity of 2,292 MBH; estimated efficiency of these boilers is only about 75%. The burners are rated for a capacity of 3,311 MBH. These boilers were installed in the year 1971 and are past their expected service life of 30 years, as published in the 2007 ASHRAE HVAC Applications Handbook. SWA recommends replacing one boiler at this time as part of the energy conservation measure with a newer technology condensing boiler (see ECM#9). SWA also recommends replacing other two boilers as part of capital improvement with condensing boilers as well.



Hot Water Boilers

The heating system piping is set up in a primary loop system. There is one pair (main and backup) of base-mounted hot water circulating supply pumps located in the boiler room for 1971 and 1981 sections respectively. The pumps are driven by high efficiency motors recently installed and are complete with variable frequency drives

There were no complaints about the ability of the heating system to provide adequate heating to the building occupants. The facility was upgraded with new Anderson Thermopane windows, doors, soffit, and fascias. As a result the building construction has become very tight and results in less heat loss during winter.

2.4.2 Cooling

The building has some unit ventilators that were replaced in 2000 equipped with DX coils; condensing units are either located outdoors or on roof. The 1981 section of the building consists of air handling units with hot and chilled water coils and unit ventilators also with hot and chilled water pipes. These are 4 pipe units with a single entry valve. The unit ventilators in this addition were installed in the shops. Air handling unit 1 has Variable Air Volume (VAV) boxes for control. Kitchen and Culinary areas have roof top package units for cooling which were installed at various times.

The building contains a pneumatic Honeywell energy management system. Cooling is controlled by individual room thermostats and sensors. The temperature set points for heating is set between 72-76 deg F for occupied mode, and 80 deg F for unoccupied mode.

The chilled water is produced by one (1) air cooled pad mounted McQuay chiller located outside on grade. The chiller has a rated capacity of 100 tons and was installed in 1981- it is past its service life of 25 years as published in the 2007 ASHRAE HVAC Applications Handbook. SWA recommends replacing the chiller with a new one (see section 4, capital improvements for more detail).

The cooling system is set up as a primary loop system. There is one chilled water supply pump for the 1981 section and one pump for the 2007 addition of printing areas. Reportedly, the latter has to be operated during winter to avoid water freezing in pipes; it is set to operate when the temperature falls below 35 deg F. SWA considered heat tracing the pipes as an ECM; however the economics did not justify carrying it out. As such, it is mentioned as part of capital improvement for the building.

There were no major complaints about the ability of the cooling system to provide adequate cooling to the building occupants. Based on the condition of the existing equipment and control systems, SWA does not recommend replacing any major equipment.

2.4.3 Ventilation

The school is equipped with H/V units, MUA units, and unit ventilators. This equipment allow preset outside air for ventilation during occupied modes. The dampers are supposed to close during unoccupied modes. SWA recommends the facility to check damper operations as part of regular operation and maintenance. SWA also considered replacing dampers on some H/V and MUA units with motorized dampers, operated from space/return duct based carbon dioxide sensors for energy savings (see ECM#6 for details).Most roof top units were equipped with outside air enthalpy based economizers.

The hood in the Kitchen is exhausted via two rooftop exhaust fans with makeup air provided by a gas-fired rooftop makeup air unit. The fans for this hood were noted to be operating at night while the area was unoccupied, which is likely leading to unnecessary heat loss and energy use in the building. SWA recommended ECM#7 to rectify this by tying the fans and MUA to the EMS.

Additionally, there are various mushroom type roof mounted exhaust fans, some of which are past their service life. SWA recommends replacing these with new fans as part of capital improvement.

Measurement or verification of the code compliance for ventilation was not part of this energy study. However, during retro-commissioning or system upgrades (as per ECM#4), the scope should include readjustment of outside air dampers at louvers, roof ventilator and the heat recovery units to provide code compliant level of outside air to the spaces.

2.4.4 Domestic Hot Water

There is one, Patterson Kelley, domestic hot water boiler in the Boiler Room that was originally installed in 1971. It is rated at 420MBH and is estimated to be about 70% efficient. The original heater was fuel oil run; however, it was converted to natural gas in the 1980s. It is past its service life. SWA recommends installing a new condensing boiler and leave the existing as back-up to the new one. The reason for not completely removing is that then the new boiler can be base loaded for continuous operation, and the back up only covering for peak loads (see ECM# 10 for details). The hot water is produced at 140deg F for meeting kitchen requirements.

Domestic Water Heaters

2.5. Electrical systems

2.5.1.Lighting

Interior Lighting - The Ocean County Vocational Technical School building currently consists of mostly high performanceT8 fluorescent fixtures with electronic ballasts. Based on measurements of lighting levels for each space, there are not any vastly over-illuminated areas. SWA recommends installing occupancy sensors in classrooms, bathrooms, closets, offices and areas where payback on savings are justified. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion or sound is detected within a set time period. See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

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

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mix of CFLs and Metal Halide fixtures. Exterior lighting is controlled by photocell sensors. SWA is not recommending any upgrades to the exterior lighting or timers.

2.5.2. Appliances and process

Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. For example, Energy Star refrigerators use as little as 315 kWh / yr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Building management should select Energy Star label appliances and equipment when replacing: refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov. SWA recommends consulting with the vendor that supplies all vending machines, requesting Energy Star models when the contract is due for renewal. Also, energy vending miser devices are now available for conserving energy usage by Drinks and Snacks vending machines. When equipped with the vending miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines.

Various vending machines or reach-in coolers in OCVTS

SWA also recommends removal of all unnecessary appliances throughout the school. Small personal refrigerators, additional microwaves, or other appliances add to the school electrical load.

Old refrigerator and multiple microwaves in Faculty Lounge

Computers left on in the building consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. Televisions in meeting areas use approximately 3-5 watts of electricity when turned off. SWA recommends all computers and all appliances (i.e. coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off. The Ocean County Vocational Technical School building computers are generally programmed for the power save mode, to shut down after a period of time that they have not been used.

Computers left on in vacant classroom

Commercial Kitchen Equipment

There is one (1) walk-in cooler located in the Kitchen that is in good condition and was installed in 2005. According to the nameplate data for the two (2) evaporator fans, each fan is 1/20 hp. The box was 10' wide x 8' deep approximately.

The kitchen also contains three (3) reach-in coolers and three (3) drinks vending machines. SWA recommends installing vending misers for energy savings (see ECM#2 for details).

The kitchen has all gas appliances, most of which were converted from electric in 2005. The kitchen also contains two kitchen hoods for fryers along with interlocked make up air unit. It also contains several pieces of commercial-style cooking equipment, including a gas-fired Garland 6-burner oven range with griddle, steamer and steam kettle, a gas fryer and (2) gas convection ovens. Most equipment was installed in 2005, when an existing shop was converted to a kitchen classroom for training.

The dishwasher has its own gas fired water heater which was installed in 2007 and manufactured by Bosch.

2.5.3. Elevators

Most areas of the building are single story high. Only 1981 section has two stories and is equipped with one (1) hydraulic elevator that is sparingly used.

2.5.4. Others electrical systems

There are not currently any other significant energy impacting electrical systems installed at the Ocean County Vocational Technical School building.

There is one (1) 60KW gas-fired emergency generator located outside on grade. The generator serves emergency lighting and receptacles, boiler and hot water circulating pumps, walk-in freezer and the fire pump. It is relatively new; the name plate was not available for inspection of further details.

Emergency Generator

3. EQUIPMENT LIST

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life
HVAC	AHU-1: Built up air handler in 6 modules; 3 hp blower motor; 1500cfm@1.5"SP; approx 5 tons cooling, and 50MBH heating - chilled and hot water; 350cfm OA	Graphics	Trane, T series climate changer, Model TSCB003, S/N K07F74013	Elec.	Existing graphics lab - B39	2008	90%
HVAC	AHU-2: Built up air handler in 6 modules; 3 hp blower motor; 1500cfm@1.5"SP; approx 5 tons cooling, and 50MBH heating - chilled and hot water; 350cfm OA	Graphics	Trane, T series climate changer, Model TSCB003, S/N K07F74021	Elec.	New Printing lab	2008	90%
Ventilation	EF exhaust fan, 1/5hp, 115/1/60, 1750 rpm	Graphics	Penn Barry, Model DX11Q, S/N M07AK88660	Elec.	Toilet	2008	90%
Ventilation	Exhaust fan, 210 cfm	Graphics	Dayton, Model 4YC67, S/N 11056816 0710	Elec.	Chemical storage	2008	90%
Cooling	Condensing Unit, 115/60/1, MCA 8.6, 9000Btu/hr, R410A	Roof - 1981 section	LG, Model LSU092CE, S/N 902KAHF00153	Elec.	N/A	N/A	87%
Ventilation	Exhaust fan, 1/4 hp motor est.	Roof over Computer Tech office	N/A	Elec.	Computer Tech office	1981	0%
Ventilation	Exhaust fan, 1/4 hp motor est.	Roof over HVAC-R	N/A	Elec.	HVAC-R	1981	0%
Ventilation	Exhaust fan, 1/4 hp motor est.	Roof over Bldg. Maint.	Penn, Model DD531	Elec.	Bldg. Maint.	1981	0%
Ventilation	Exhaust fan, 1/4 hp motor est.	Roof over Intro to Auto	Penn, Model DD531	Elec.	Intro to Auto	1981	0%
Ventilation	Exhaust fan, 1/4 hp motor est.	Roof over Intro to Auto	Penn, Model BB461	Elec.	Intro to Auto	1981	0%
Ventilation	Exhaust fan, 1/2 hp motor est.	Roof over Arch/Engg design	Penn, Model CB10	Elec.	Arch/Engg design	1981	0%
Ventilation	Exhaust fan, 1/4 hp motor est.	Roof over Fashion Merchandising	Penn, Model BB43	Elec.	Fashion Merchandising	1981	0%
Ventilation	Exhaust fan, 1/4 hp motor est.	Roof over Tech/Elec Art	N/A	Elec.	Tech/Elec Art	1981	0%
Ventilation	Exhaust fan, 1/3 hp motor est.	Roof over Auditorium	Penn, Model CB18	Elec.	Auditorium	1981	0%
Ventilation	Exhaust fan, 1/4 hp motor est.	Roof over Men's room	N/A	Elec.	Men's room	1981	0%
Ventilation	Exhaust fan, 1/4 hp motor est.	Roof over Women's room	N/A	Elec.	Women's room	1981	0%
Ventilation	EF1: Exhaust fan, 120/1/60, 1100 cfm, 1/4 hp motor	Roof	Loren Cook, Model 150V3B, S/N 2155576887000007011199	Elec.	Kitchen	2000	55%
Ventilation	EF2: Exhaust fan, 120/1/60, 315 cfm, 1/6 hp motor	Roof	Loren Cook, Model 100C2B, S/N 2155576887000017011199	Elec.	Toilet	2000	55%
Ventilation	EF3: Exhaust fan, 120/1/60, 200 cfm, 1/6 hp motor	Roof	Loren Cook, Model 100C2B, S/N 2155576887000017021199	Elec.	Toilet	2000	55%
Ventilation	EF4: Exhaust fan, 120/1/60, 630 cfm, 1/6 hp motor	Roof	Loren Cook, Model 120C2B, S/N 215557688700002801199	Elec.	Toilet	2000	55%
Ventilation	EF5: Exhaust fan, 120/1/60, 630 cfm, 1/6 hp motor	Roof	Loren Cook, Model 120C2B, S/N 2155576887000028021199	Elec.	Toilet	2000	55%
Ventilation	EF6: Exhaust fan, 120/1/60, 600 cfm, 1/6 hp motor	Roof	Loren Cook, Model 100C2B, S/N 2155576887000017031199	Elec.	Locker room	2000	55%
Ventilation	EF7: Exhaust fan, 120/1/60, 260 cfm, 1/6 hp motor	Roof	Loren Cook, Model 120C2B, S/N 2155576887000028031199	Elec.	Darkroom	2000	55%
Ventilation	EF8: Exhaust fan, 120/1/60, 500 cfm, 1/6 hp motor	Roof	Loren Cook, Model 120C2B, S/N 2155576887000028041199	Elec.	Locker room	2000	55%
Ventilation	EF9: Exhaust fan, 120/1/60, 3800 cfm, 1/2 hp motor	Roof	Nameplate N/A	Elec.	Auto shop	2000est	55%

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Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life
Ventilation	KEF1: Exhaust fan, 120/1/60, 6000 cfm, 1hp motor	Roof	Nameplate N/A	Elec.	Kitchen	2000	55%
Ventilation	KEF2: Exhaust fan, 120/1/60, 6000 cfm, 1hp motor	Roof	Nameplate N/A	Elec.	Kitchen	2000	55%
Ventilation	EF-X1, exhaust fan, 1/4 hp motor est.,120/1/60	Roof	Dayton, Model 4HX81A	Elec.	Bathroom B23	1971	0%
Ventilation	EF-X2, exhaust fan, 1/4 hp motor est.,120/1/60	Roof	Dayton, Model 4HX96A	Elec.	Culinary Arts B17	1971	0%
Ventilation	EF-X3, exhaust fan, 1.5 hp motor est.,208/3/60, 6Amp; 3600 cfm @ 0.5"SP	Roof	Cambridge, Model R115F, S/N 8124915	Elec.	Culinary Arts B17	1971	0%
Ventilation	EF-X4, exhaust fan, 3/4 hp motor est.,120/1/60, 3.2Amp; 1800cfm @ 0.5" SP	Roof	Cambridge, Model R110F, S/N 8125010	Elec.	Culinary Arts B17	1971	0%
Ventilation	EF-X5, exhaust fan, 3/4 hp motor est., 1100 rpm	Roof	Dayton, Model 4HZ57	Elec.	Culinary Arts B17	1971	0%
Ventilation	EF-X6, exhaust fan, 1 hp motor est.,208/3/60, 6Amp; 3000 cfm @ 0.5"SP	Roof	Cambridge, Model R115F, S/N 8125115	Elec.	Bakery B26	1971	0%
Ventilation	EF-X8, exhaust fan, 1/2 hp motor est	Roof	Greenheck, Model CUBE-300-10, S/N 01L03946	Elec.	Auto Tech B29	1971	0%
Ventilation	EF-X9, exhaust fan, 1/2 hp motor est	Roof	Greenheck, Model CUBE-300-10, S/N 01L06945	Elec.	Auto Tech B29	1971	0%
Ventilation	EF-X10, Kitchen exhaust fan c/w premium efficiency motor	Roof	Loren Cook, Model 195VCCR, S/N 85812271-00/0001906	Elec.	Kitchen	2004	75%
Cooling	CU24: Condensing Unit, 208-230/60/1, MCA 38, 5 tons, R22	Roof	Trane, XE1200 Model TTP060D100A0, S/N P382U791F	Elec.	Dining room Unit ventilator, B17	2000	40%
Cooling	CU5: Condensing Unit, 208-230/60/1, MCA 38, 5 tons, R22	Roof	Trane, XE1200 Model TTP060D100A0, S/N P384K611F	Elec.	Dining room Unit ventilator, B17	2000	40%
Cooling	Condensing Unit, 115/1/60, MCA20, SEER16, R410A	Roof	Sanyo, Model C0971, S/N 0100982	Elec.	Principal, B2	2009	93%
Cooling	Condensing Unit, 230/1/60, MCA18, SEER16, R410A	Roof	Sanyo, Model C3672R, S/N 0090682	Elec.	Café, B16	2009	93%
Cooling	Condensing Unit, 208-230/60/1, MCA 38, 5 tons, R22	Roof	Trane, XE1200 Model TTP060D100A0, S/N P2912N82F	Elec.	Deli	2000	40%
Cooling	Condensing Unit, 208-230/60/1, MCA 38, 5 tons, R22	Roof	Trane, XE1200 Model TTP060D100A0, S/N W09517510	Elec.	Store B15	2000	40%
Cooling	Condensing Unit, 208-230/60/1, MCA 8, 2.5 tons, R22	On grade, outside Bakery	Trane, Model 2TTB3018A100AA, S/N 8104Y9A3F	Elec.	Bakery B25	2009	93%
Cooling	Condensing Unit, 208-230/60/1, MCA 10, 2 tons, R22	On grade, outside Bakery	Trane, Model 2TTB2018A100AA, S/N 3095P3B3F	Elec.	Bakery B28	2004	67%
Cooling	Condensing Unit, 208-230/1/60, R22, MCA 18.8, 2 tons	On grade, outside Auto. Tech	Carrier, Model 38BNE024301, S/N 3404V80326	Elec.	Auto Tech. B29	2008	87%
Cooling	Condensing Unit, 208-230/60/1, MCA 18, R22, 2.5 tons	On grade, outside Computer Lab	Trane, XE1200 Model TTP030D100A0, S/N P382TMW2F	Elec.	Computer lab B8	2000	40%
Cooling	Condensing Unit, 208-230/60/1, MCA 18, R22, 2.5 tons	On grade, outside Computer Lab	Trane, XE1200 Model TTP030D100A0, S/N P382TTR2F	Elec.	Computer lab B8	2000	40%
Cooling	Condensing Unit, 208-230/60/1, MCA 18, R22, 2.5 tons	On grade, outside Cosmetology	Trane, XE1200 Model TTP030D100A0, S/N P38344H2F	Elec.	Cosmetology B6	2000	40%
Cooling	Condensing Unit, 208-230/60/1, MCA 18, R22, 2.5 tons	On grade, outside Cosmetology	Trane, XE1200 Model TTP030D100A0, S/N P3834422F	Elec.	Cosmetology B6	2000	40%
HVAC	Air cooled package unit, 7.5 tons, 208-230/3/60, R22, Motor est 1.5hp, original	Roof	ArcoAire, Model PAB00N2HA, S/N L945036061	Elec.	Offices	1995	0%

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Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
HVAC	Air cooled package unit, 7.5 tons, 208-230/3/60, R22, No heating;Motor est 1.5hp, original	Roof	ArcoAire, Model PAB00N2HA, S/N L945036057	Elec.	Supermarket B27 NOW BAKERY	1995	0%
HVAC	Air cooled package unit, 4 tons, 208-230/3/60, R22, gas heating 90/72.9 MBH in/out; Motor est 1hp, original	Roof	Trane, Model YCD049C3LABE, S/N N32103247D	Gas/Elec.	Culinary B36	2000	40%
HVAC	Air cooled package unit, 4 tons, 208-230/3/60, R22, gas heating 90/72.9 MBH in/out; Motor est 1hp, original	Roof	Trane, Model YCD049C3LABE, S/N N32101573D	Gas/Elec.	Culinary B37	2000	40%
HVAC	Air cooled package unit, 5 tons, 208-230/3/60, R22, gas heating 120/96 MBH in/out; Motor est 1hp, original	Roof	Carrier, Model 48HJF006, S/N 4904G40418	Gas/Elec.	Culinary Kitchen B35	2000	40%
Heating	Make up air unit with gas heating, 3 hp high efficiency, 208/3/60, 200MBH avg. heating capacity, 80% eff. Est., 4000 cfm	Roof	RUPP Air Systems, Model R2D.500-G15	Gas/Elec.	Culinary Kitchen B35	2005	73%
HVAC	Air cooled package unit, 5 tons, 208-230/3/60, R22, gas heating 93/66 MBH in/out; Motor est 1hp, original	Roof	Carrier, Model 48HJE006, S/N 4904G40421	Gas/Elec.	Culinary Kitchen B35	2000	40%
HVAC	AH-1: draw through air handler, chilled/hot water, 15hp hgih eff. Motor (new), c/w VFD; 14000-15,000 cfm est.	Roof mechanical room	Trane, Model CC0B31ELEB, S/N K81025201	Elec.	1981 section; 1st floor classrooms and 2nd floor misc.	1981	0%
HVAC	AH-2: draw through air handler, chilled/hot water, 1 hp prem. Eff. motor, 208/3/60, 2400 cfm; motor replaced 3 yrs ago	Ceiling space outside B55	Trane, Model CC08006AEB6, S/N K81025203	Elec.	Consumer Office, B55	1981	0%
HVAC	AH-3: draw through air handler, chilled/hot water, 1 hp prem eff motor, 208/3/60, 2300 cfm; motor replaced 3 yrs ago	Roof mechanical room	Trane, Model CCD800CEB, S/N K8102502	Elec.	Cosmetology	1981	0%
HVAC	AH-4: draw through air handler, chilled/hot water, 3/4 hp prem eff motor, 208/3/60, 1400 cfm; motor replaced 3 yrs ago	Ceiling space outside B76	Nameplate N/A	Elec.	Support Services, B76	1981	0%
HVAC	AH-5: draw through air handler, chilled/hot water, 1 hp prem eff. motor, 208/3/60, 2100 cfm; motor replaced 3 yrs ago	Ceiling space outside B74	Trane, Model CCD806ATEB, S/N K81D25205	Elec.	Arch/Engg design, B74	1981	0%
HVAC	RF-1: Return air fan AH-1, 1hp motor c/w VFD, 11000cfm est.	Roof mechanical room	Name Plate N/A	Elec.	Serves AH-1	1981	0%
Heating	Hot water unit heater, with 1 hp est motor	Roof mechanical room	Trane, nameplate n/a	Elec.	Roof mechanical room	1981	0%
H/V	H/V unit 2, 2HP blower fan, 200/3/60, c/w HW heating coil; 4100cfm, 360cfm OA	Marine trades, B46	Trane Torrivent, Model TVDEI0AL083S1L00, S/N K81126068	Elec.	Marine trades, B46	1981	0%
H/V	H/V unit 3, 1.5HP blower fan, 200/3/60, c/w HW heating coil; 5800 cfm, 360/2080cfm OA	A/C shop, B44	Trane Torrivent, Model TV0812AL083S1L08, S/N K81120064	Elec.	A/C shop, B44	1981	0%

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Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
H/V	H/V unit 1, 2HP blower fan, 200/3/60, c/w HW heating coil; 5350 cfm, 720cfm OA	Bldg. Maint and Const. trades, B48/49	Trane Torrivent, Model T12AMZ, S/N K81F26070	Elec.	Bldg. Maint and Const. trades, B48/49	1981	0%
H/V	H/V unit 4, 3HP blower fan, 200/3/60, c/w HW heating coil; 5400cfm, 720/2900cfm OA	Auto shops, B40/42	Trane Torrivent, Model T12AMZ, S/N K81F26070	Elec.	Auto shops, B40/42	1981	0%
H/V	H/V unit 5, 3/4HP blower fan, 200/3/60, c/w HW heating coill 2600cfm	Bakery, B26	Trane Torrivent, Model TVD60CAL0B2DRR00, S/N K81126457	Elec.	Bakery, B26	1981	0%
HVAC	4 Unit ventilators with CHW/HW coils, 1/6hp motor and OA dampers	1981 section shops	Nameplate N/A	Elec.	1981 section shops	1981	0%
Ventilation	Make-up air unit (2 nos.), c/w 1/2 hp fan motor, 1 axle, 3 forward curve centrifugal blowers, and HW heating coil; 700cfmOA avg	Construction Technology, B31	Nameplate N/A	Elec.	Construction Technology, B31	2000	55%
Ventilation	Make-up air unit (2 nos.), c/w 1/2 hp fan motor, 1 axle, 3 forward curve centrifugal blowers, and HW heating coil; 700cfmOA avg	Auto Tech, B29	Nameplate N/A	Elec.	Auto Tech, B29	2000	55%
Ventilation	Make-up air unit (1 nos.), c/w 1/2 hp fan motor, 1 axle, 3 forward curve centrifugal blowers, and HW heating coil	Supermarket, B27	Nameplate N/A	Elec.	Supermarket, B27	2000	55%
Cooling	Chiller, 100 tons, R-22, 208/3/60, 424Amps, air cooled	On grade	McQuay, Model ALR100E12, S/N 56F8128201	Elec.	Whole building	1981	0%
Heating	Hot water pumps, 7.5hp motor, less than 5 years old and high efficiency,	Boiler room	Armstrong, Model 819359-M, S/N 102002-1, and -2	Elec.	1971 section of the building	1971	0%
Heating	Hot water pumps, 5hp, 1750rpm motor, 223gpm @60'head, motor less than 5 year old, high eff.	Boiler room	Armstrong, Model 4030, S/N 102327 and 102328	Elec.	1981 section of the building	1981	0%
Cooling	Chilled water pump, 5 hp, vertical in line, high eff. Motor	Loading dock	N/A	Elec.	1981 section of the building	1981	0%
Cooling	Chilled water pump, 2hp with high eff. Motor	Loading dock	N/A	Elec.	2007 Printing section units	2008	90%
Controls	Air compressor, 200psi@650 deg F, 2 motors @5 hp each.AO Smith, high eff. E+3	Boiler room	Wood Industrial Products, Model 795091	Elec.	Whole building	2009	90%
Heating	Hot water boiler, burner capacity 3311 MBH, 2292 MBH HW out, sectionalized, 11 heating sections, est. efficiency 75%	Boiler room	HB Smith, 3500 Millls Boiler, S/N 30680-1	Gas	Whole building	1971	0%
Heating	Hot water boiler, burner capacity 3311 MBH, 2292 MBH HW out, sectionalized, 11 heating sections, est. efficiency 75%	Boiler room	HB Smith, 3500 Millls Boiler, S/N 30679-1	Gas	Whole building	1971	0%

Continued on next page

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
Heating	Hot water boiler, burner capacity 3311 MBH, 2292 MBH HW out, sectionalized, 11 heating sections, est. efficiency 75%	Boiler room	HB Smith, 3500 Millls Boiler, S/N 30679-2	Gas	Whole building	1971	0%
Heating	DHW, 420MBH input, oil fired water heater, Natl BD 24864; est eff. 70%	Boiler room	Industrial Combustion, Patterson Kelly, Model 300-3/8T, S/N 215991	converted 1980s to nat gas	Whole building	1971	0%
Heating	DHW heater, input max 175MBH, min 35MBH	Bakery, B77	Bosch, Model GWH 635 ES N, S/N 7 703 311 017	Gas	Dishwasher	2007	80%
Cooling	Walk-in fridge, with Heatcraft evaporator, 115/1/60, 2*1/20hp each, 20Amps	Kitchen	Fridge enclosure by KOLPAK, evap.by Heatcraft, Model ADT104A, S/N D02F08535 and 536	Elec.	Kitchen	N/A	50%
Elec.	Generator, 60kW	Outside, on grade	Kohler, name plate N/A	Elec.	Whole building	2001 est.	47%
End of HVAC Inventory							

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.

4. ENERGY CONSERVATION MEASURES

Based on the assessment of the South River Ocean County Vocational Technical School, SWA has separated the investment opportunities into three recommended categories:

1. Capital Improvements - Upgrades not directly associated with energy savings
2. Operations and Maintenance - Low Cost / No Cost Measures
3. Energy Conservation Measures - Higher cost upgrades with associated energy savings

Category I Recommendations: Capital Improvements

- Replace 1971 heating boilers – The facility consists of three (3) boilers. SWA recommends replacing two (2) with newer technology condensing boilers as part of capital improvement. The third boiler makes an economic justification for replacement on its own and will be used as the lead boiler. Estimated cost to replace two boilers is approximately $120,000.

- Upgrade Building Management System (BMS) - The building contains a pneumatic Honeywell building management system which was mostly installed in 1981. The BMS should be upgraded to the latest technology DDC system as part of capital improvement to provide reliability and tighter control on operations, monitoring, and control of equipment. This upgrade will result in energy savings via improved temperature and humidity control of various spaces and equipment. Estimated cost per point for this 100% DDC option is about $2400.

  In lieu of the above 100% DDC option, OCVTS may consider replacing existing pneumatic thermostats with new wireless pneumatic thermostats (WPT). This is a cost effective way of upgrading a pneumatic system to DDC without replacing all pneumatic control devices. The wireless thermostat communicates with a wireless HUB allowing the EBI to communicate to the thermostats via the BACnet protocol. Once integrated, setpoint adjustments, scheduling, night setbacks, etc would be available via the EBI system. This functionality as well as the standard EBI alarming, trending and reporting allows an upgrade to the pneumatic controls. Estimated cost per point for this virtual DDC option is about $500 per point.

- Install heat tracing on chilled water pipes: Chilled water pumps installed in 2007 for printing areas do not run on glycol and have no heat tracing either. The mechanical equipment it serves is on roof. These pumps have to be operated during winter to avoid water freezing in pipes; it is set to operate when the temperature falls below 35 deg F. SWA considered heat tracing the pipes as an ECM; however the economics did not justify carrying it out resulting a long pay back. SWA recommends installing heat tracing all exposed chilled water pipes at an approximate cost of $15,000.

- Replace exhaust fans past service life: There are various mushroom type roof mounted exhaust fans which are past their service life (see section 3 for details). Most were installed in 1971 and in 1981. SWA recommends replacing these with new fans and complete with premium efficiency motors as part of capital improvement.

- Replace roof top package units – Units serving offices and Supermarket were installed in 1995 and are past their service life. SWA recommends replacing these units with new, similar equipment, complete with premium efficiency motors and enthalpy controlled economizers. This measure cannot be justified based on economics of replacement alone, and is hence recommended as a capital improvement. The estimated cost of replacement is approximately $25,000.

- Replace chiller – The reciprocating air cooled chiller was originally installed in 1981 and is past its service life. SWA recommends replacing it with a new screw air cooled chiller. Although water cooled chillers are generally more efficient than air cooled chillers, the chiller recommendation from SWA is the former based on the limited operating hours at the college. The best available reciprocating chillers can achieve 1kW/ton, but screw chillers in 100 ton capacity can achieve up to 0.94kW/ton. Estimated cost of replacement is $125,000. Chillers equipped with Turbocor compressors can be extremely efficient and cost a lot more – SWA recommends OCVTS to consider buying a chiller with Turbocor compressors.

- Replace air handling units, unit ventilators and H/V units – Most units installed in the 1981 addition have past their service lives and must be replaced as part of capital improvement. SWA recommends to have new equipment with premium efficiency motors and motorized modulating fresh air intake dampers controlled by space carbon dioxide sensors.

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

Category II Recommendations: Operations and Maintenance

- Boiler room piping insulation - Insulate all hot and chilled water piping to efficiently deliver heat where required and provide personnel protection.

- Shut down kitchen hood fans during unoccupied hours – Operating the kitchen hood fans during unoccupied hours exhausts conditioned air from the building and involves unnecessary energy use. Adjust controls system to shut down kitchen hood during unoccupied hours.

- Check outside air dampers: H/V units, Make Up Air (MUA) units, and unit ventilators allow preset outside air for ventilation during occupied modes. The dampers are supposed to close during unoccupied modes. SWA recommends the facility to check damper operations regularly and ensure that dampers close tightly automatically during unoccupied mode setting.

- Inspect and replace door gaskets for walk-in refrigerators in the Kitchen. Ineffective gasketing allows infiltration of warm air into the walk-in box, which increases the run-time of the compressors.

- Water levels in the expansion tanks and the integrity of the tank bladder should be checked to confirm proper operation.

- Replace filters on a regular schedule to minimize air pressure losses.

- Use Energy Star labeled appliances - such as Energy Star refrigerators that should replace older energy inefficient equipment.

- Maintain roofs - SWA recommends regular maintenance to verify water is draining correctly.

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

- Provide weather stripping / air sealing - SWA observed that exterior door weather-stripping in places was beginning to deteriorate. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected and any missing or deteriorated caulking should be re-caulked to provide an unbroken seal around the window frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.

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

- Provide water efficient fixtures and controls - Adding controlled on / off timers on all lavatory faucets is a cost-effective way to reduce domestic hot water demand and save water. Building staff can also easily install 0.5gpm faucet aerators 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 save both energy and money through reduced energy consumption for water heating, while also decreasing water / sewer bills

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

- Create an energy educational program - that teaches how to minimize their energy use. The US 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/

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Table 1 - Highly Recommended 0-5 Year Payback ECMs
2	Install 3 Drinks vending machine, 3 reach-in cooler, and 1 snack energy misers
3.3	69 New occupancy sensors to be installed with incentives
7	Tie kitchen hood exhaust fans and MUA to EMS
3.4	18 New motion sensors to be installed with incentives
5	Transfer 450cfm from AHU2 to AHU1 areas
1	Replace old refrigerator with 18 cu ft Energy Star refrigerator
	Table 2 - Recommended 5-10 Year Payback ECMs
8.1	Replace (1) 3 HP motors with premium effciency motor
3.2	12 New CFL fixtures to be installed with incentives
6	CO2 based demand controlled ventilation
8.2	Replace (2) 2 HP motors with premium effciency motor
4	Retro commissioning
8.3	Replace (3) 1.5 HP motors with premium effciency motor
3.1	3 New T8 fixtures to be installed with incentives
	Table 3 - Recommended End of Life Cycle ECMs
9	Replace one Hot water boiler
10	ReplaceDHW heater with a condensing boiler
	Table 4 - Renewable Energy Generation Measures
11	Install 50 kW PV rooftop system (with $1/W INCENTIVE and $600/1MWh SREC)
12	Install 12 kW wind turbine system

ECM#1: ***Replace Old Refrigerator with Energy Star Model***

Description:

On the days of the site visit, SWA observed an older refrigerator in the faculty lounge which is not Energy Star rated (using as much as 1700 kWh/yr). Appliances, such as refrigerators, that are over 10-12 years of age should be replaced with newer efficient models with the Energy Star label. SWA recommends the replacement of the existing refrigerator which is operating at the end of its useful lives with a more modern, ENERGY STAR®, energy efficient appliance. Besides saving energy, the replacement will also keep the kitchen area cooler. In addition, the existing systems utilize R-12 refrigerant, which is not an ozone-friendly refrigerant. Newer systems should be specified with R-134A or R-404A refrigerant. When compared to the average electrical consumption of older equipment, Energy Star equipment results in large savings. Look for the Energy Star label when replacing appliances and equipment, including: window air conditioners, refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov.

Installation cost:

Estimated installed cost: $750 (includes $150 labor)

Source of cost estimate: *Energy Star purchasing and procurement site, similar projects, Manufacturer and Store established costs*

Economics:

ECM #	ECM description	source	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 energy 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	Replace old refrigerator with 18 cu ft Energy Star refrigerator	Energy Star purchasing and procurement site, similar projects	750	0	750	1200	0.1	0	0.0	0	193	12	2,318	3.9	209.1	17.4	23.8	1,150	1,644

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. SWA assumed one annual call to a refrigeration contractor to perform minor repairs on old refrigerators.

Rebates/financial incentives:

NJ Clean Energy - There are not any incentives at this time offered by the state of NJ for this energy conservation measure.

Options for funding the ECM: *This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#2: ***Install Vending Misers on all soda vending, reach-in coolers, and snack vending machines***

Description:

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

Snacks vending miser devices can be used on Snacks vending machines to achieve maximum energy savings that result in reduced operating costs and decreased greenhouse gas emissions with existing machines. Snacks vending miser devices also use a Passive Infrared Sensor (PIR) to determine if there is anyone within 25 feet of the machine. It waits for 15 minutes of vacancy, then powers down the machine. If a customer approaches the machine while powered down, the snacks vending miser will sense the presence and immediately power up.

Installation cost:

Estimated installed cost: $1853 (includes $700 labor)
Source of cost estimate: www.usatech.com *and established costs*

ECM #	ECM description	source	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 energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2	Install 3 Drinks vending machine, 3 reach-in cooler, and 1 snack energy misers	www.usatech.com and established costs	1,853	0	1,853	10,059	2.7	0	0.4	0	1,619	12	19,434	1.1	948.8	79.1	87.4	14,077	13,781

Assumptions: SWA assumes energy savings based on 75 operating hours/week; the modeling calculator found at www.usatech.com or http://www.usatech.com/energy_management/energy_calculator.php

Rebates/financial incentives:
NJ Clean Energy - There are not any incentives at this time offered by the state of NJ for this energy conservation measure.

Options for funding the ECM: *This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#3: *Building Lighting Upgrades*

Description:

On the days of the site visits, SWA completed a lighting inventory of the Ocean County Vocational Technical School building (see Appendix A). The existing lighting consists of mostly high performance T8 fluorescent fixtures with electronic ballasts. SWA has performed an evaluation of installing occupancy sensors in classrooms, offices and bathrooms where the payback is justified. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Ocean County Vocational Technical School Board of Education may decide to perform this work with in-house resources from its Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor to obtain savings.

Installation cost:

Estimated installed cost: $20,400 (includes $12,500 labor estimate)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics (with incentives):

ECM #	ECM description	source	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 energy 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
3.1	3 New T8 fixtures to be installed with incentives	RS Means, lit search	646	90	556	195	0.0	0	0.0	20	51	15	471	10.8	38.7	2.6	4.4	49	267
3.2	12 New CFL fixtures to be installed with incentives	RS Means, lit search	614	0	614	624	0.1	0	0.0	7	108	5	502	5.7	-12.4	-2.5	-4.2	-124	855
3.3	69 New occupancy sensors to be installed with incentives	RS Means, lit search	15,180	1,380	13,800	61,588	12.8	0	2.3	0	9,916	15	148,735	1.4	977.8	65.2	71.8	102,878	84,376
3.4	18 New motion sensors to be installed with incentives	RS Means, lit search	3,960	360	3,600	6,474	1.3	0	0.2	0	1,042	15	15,634	3.5	334.3	22.3	28.3	8,664	8,869

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 4 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

NJ Clean Energy - Wall Mounted occupancy sensors ($20 per control)
Maximum incentive amount is $1740.

NJ Clean Energy - T5 and T8 lamps with electronic ballast in existing facilities ($10-30 per fixture, depending on quantity and lamps)
Maximum incentive amount is $90.

Options for funding the Lighting ECM: *This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#4: ***Retro-commissioning of mechanical equipment***

Description:
Retro-commissioning is a process that seeks to improve how building equipment and systems function together. Depending on the age of the building, retro-commissioning can often resolve problems that occurred during design or construction and / or address problems that have developed throughout the building's life. Owners often undertake retro-commissioning to optimize building systems, reduce operating costs, and address comfort complaints from building occupants.

Since most HVAC system and hydronics at the building was installed in 1981, SWA recommends undertaking retro-commissioning to optimize system operation. The retro-commissioning process should include a review of existing operational parameters for all installed equipment, such as AHU dampers, chilled and hot water valves, and terminal air delivery grilles. During retro-commissioning, the individual loop temperatures for chilled and hot water should also be reviewed to identify opportunities for optimizing system performance.

Installation cost:
Estimated installed cost: $18,750 (includes $16,200 labor estimate)
Source of cost estimate: Similar projects

Economics (without incentives):

ECM #	ECM description	source	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 energy 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	Retro commissioning	Past Projects	18,750	0	18,750	1,828	0.5	667	0.8	910	2,069	15	17,378	9.1	65.5	4.4	7.1	5,591	10,306

Assumptions: Typical savings for retro-commissioning range from 5-20%, as a percentage of the total space conditioning consumption. SWA assumed 5% savings based on prorata area for AHU served areas. Estimated costs for retro-commissioning range from $0.50-$2.00 per square foot. SWA assumed $0.75 per square foot of a total square footage of 25,000. SWA also assumed on the average 1/2 hr/wk operational savings when systems are operating per design versus the need to make more frequent adjustments.

Rebates/financial incentives:
NJ Clean Energy - There are not any incentives at this time offered by the state of NJ for this energy conservation measure.

Options for funding the Lighting ECM: *This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#5: *Transfer 450cfm from AHU2 to AHU1 served areas*

Description:

AHU-2 was originally designed to serve a dry cleaning room in 1981; however, over due course of time this room has become like an office space. There is spare cooling capacity available in AHU-2 as dry cleaning load does not exist any more. At the same time, AHU-1 served areas have been added with computers thereby increasing the cooling load on AHU-1. Facility people have hence tried to speed up the AHU-1 fan to extract maximum possible air flow as permitted by the tip speed of the fan. SWA recommends diverting 450 cfm of air from AHU-2 to computer lab perimeter space served by AHU-1. This measure can be accomplished by re-routing the terminal ducts in computer lab over to the B55 and reconnecting to AHU-2 trunk duct.

Installation cost:

Estimated installed cost: $1,800 (includes $1,000 labor estimate)
Source of cost estimate: RS Means

Economics (without incentives):

ECM #	ECM description	source	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 energy 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	Transfer 450cfm from AHU2 to AHU1 areas	RS Means	1,800	0	1,800	3,000	0.8	0	0.1	0	483	15	7,245	3.7	302.5	20.2	26.0	3,883	4,110

Assumptions: Savings are expected to accrue from a better control of AHU-1; currently, it serves both internal and external areas through VAV boxes. As a result, the unit would be in cooling mode (with the economizer) in shoulder and winter seasons. By eliminating perimeter areas, AHU-1 will be better controlled and remain less in heating mode as a result. Because of this change, kWh savings occur equivalent to the heat displaced to AHU-2, which will anyway be in the heating mode during those seasons.

Rebates/financial incentives:

NJ Clean Energy - There are not any incentives at this time offered by the state of NJ for this energy conservation measure.

Options for funding the Lighting ECM: *This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#6: *Demand Controlled Ventilation*

Description:

Currently, the building has no control on ventilation air during the occupied hours. SWA recommends installing CO2 sensors in the return ducts of the following ventilation systems: 1981 portion shops including Marine Trades, Air conditioning, Building Maintenance / Construction trades served by H/V units, and Construction Technology and Supermarket served by make up air units. Normally the fans turn on during the day, usually an hour before operation until an hour after operation and remain on full power during the occupied mode; in winter, the fans may turn on again if heat is required but ventilation dampers are closed. The CO2 sensors allow the fans to run allowing enough outside air to offset the carbon dioxide generated by the occupants. By keeping the CO2 level less than 1000ppm within the conditioned space, the outside air is reduced to the minimum allowable in compliance with ASHRAE requirements. Along with the sensors, necessary motorized air intake dampers will also have to be installed.

Installation cost:

Estimated installed cost: $19,008 (includes $10,325 labor estimate)
Source of cost estimate: RS Means, and similar projects

Economics (without incentives):

ECM #	ECM description	source	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 energy 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
6	CO2 based demand controlled ventilation	RS Means and similar projects	19,008	0	19,008	0	0.0	2,192	2.4	0	2,841	15	42,612	6.7	124.2	8.3	12.3	14,420	25,646

Assumptions: SWA estimated savings based on 50% reduction of outside air throughout the year based on occupancy schedules.

Rebates/financial incentives:
NJ Clean Energy - There are not any incentives at this time offered by the state of NJ for this energy conservation measure.

Options for funding the Lighting ECM: *This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#7: *Tie kitchen hood fans and MUA to EMS*

Description:

The kitchen hood exhaust fans are manually operated and interlocked with the kitchen make up air unit. As a result, if not manually shut down, the combination continues to operate even during the unoccupied mode. SWA looked at the possibility of installing timers, but preferred to have these fans/MUA controlled from the energy management system. It is proposed to shut down these units completely during the unoccupied hours. Similar control exists at other vocational schools operated by the county. The EMS is pneumatic. This measure will require new pneumatic lines from the equipment to the controllers along with programming.

Installation cost:

Estimated installed cost: $8,000 (includes $5,200 labor estimate)
Source of cost estimate: RS Means, and similar projects

Economics (without incentives):

ECM #	ECM description	source	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 energy 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
7	Tie kitchen hood exhaust fans and MUA to EMS	similar projects	8,000	0	8,000	6,654	1.8	1,754	2.2	0	3,344	15	50,167	2.4	527.1	35.1	41.6	31,355	29,638

Assumptions: SWA estimated kWh savings based on 1500 hours of run time reduction for two kitchen exhaust fans with 2 hp motors and one MUA with 3 hp motor. Therms savings will occur during winter as a result of less make up air requirement.

Rebates/financial incentives:
NJ Clean Energy - There are not any incentives at this time offered by the state of NJ for this energy conservation measure.

Options for funding the Lighting ECM: *This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#8: *Install Premium Efficiency Motors*

Description:

The Ocean County Vocational Technical School consists of many standard efficiency motors, which SWA identified as follows:

1 hp (6 total): On air cooled package units serving culinary areas installed in 2000 (4), and on kitchen exhaust fans installed in 2000 (2)
1.5 hp (3 total): On air cooled package units serving offices and bakery installed in 1995 (2), and H/V unit serving HVAC shop (1)
2 hp (2 total): On H/V units serving 1981 areas Marine trades and building maint.
3 hp (1 total): H/V unit serving Auto shop

Generally the above equipment is in good to fair condition and has not reached its end of life. SWA recommends replacing the motors only with premium efficiency motors to realize maximum energy savings. The economics for replacing 1 hp motors results in a very long payback because use hours of the equipment are limited due to the kind of service; hence motor replacement for item 8.4 below is recommended as part of capital improvement.

Installation cost:

Estimated installed cost: $3,055 (estimated labor cost, $650)
Source of cost estimate: Similar projects and DOE Motor Master International selection & savings analysis

Economics (without incentives):

ECM #	ECM description	source	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 energy 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
8.1	Replace (1) 3 HP motors with premium effciency motor	similar projects, DOE Motor Master + International	357	65	292	318	0.1	0	0.0	0	51	20	1,024	5.7	250.7	12.5	16.7	456	436
8.2	Replace (2) 2 HP motors with premium effciency motor	similar projects, DOE Motor Master + International	650	110	540	424	0.1	0	0.0	0	68	20	1,365	7.9	152.8	7.6	11.1	457	581
8.3	Replace (3) 1.5 HP motors with premium effciency motor	similar projects, DOE Motor Master + International	915	144	771	477	0.1	0	0.0	0	77	20	1,536	10.0	99.2	5.0	7.7	351	653
8.4	Replace (6) 1 HP motors with premium effciency motor	similar projects, DOE Motor Master + International	1,722	270	1,452	636	0.2	0	0.0	0	102	20	2,048	14.2	41.0	2.1	3.5	44	871

Assumptions: SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. The DOE Motor Master International selection and calculator was used considering equipment should operate for approximately 5,000 hours per year.

Rebates/financial incentives:

NJ Clean Energy - Premium three-phase motors ($45-$700 per motor)
Maximum incentive amount is $589.

Options for funding the Lighting ECM: *This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM #9: *Replace one Heating boiler*

Description:

Existing hydronic boilers located in the boiler room have past their service lives and were installed in 1971. SWA analyzed the economics of replacing the boilers in kind and also the incremental cost and savings of upgrading the boilers with new technology. The boilers are HB Smith cast iron sectional type with 11 sections and a rated capacity of 2,292 MBH. The facility usually runs only one boiler, but may run two if the outside temperature dips below 30 deg F, and even three if the temperature falls below 15 deg F. As such, SWA recommends only replacing one boiler with a new condensing boiler of 2000MBH capacity. This will be the lead boiler, followed by one more boiler when temperature dips, and then followed by another boiler in case of extreme temperatures. The efficiency of 1971 boilers is estimated at 75%, and that of condensing boiler at 90% minimum. Condensing boilers allow condensation of moisture in flue gases resulting in lower flue gas temperatures with increased efficiencies.

Installation cost

Estimated installed cost: $53,550 (estimated labor cost of $10,200)
Source of cost estimate: RS Means and similar projects

Economics:

ECM #	ECM description	source	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 energy 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
9a	Replace hot water boiler with an in kind	RS Means	45,250	4,000	41,250	0	0.0	3,600	3.9	700	5,366	20	93,312	7.7	160.2	8.0	11.5	37,120	42,120
9b	Incremental cost to replace with a condensing boiler	RS Means	12,300	0	12,300	0	0.0	3,200	3.5	0	4,147	20	82,944	3.0	574.3	28.7	33.6	48,274	37,440
9	Replace hot water boiler with a condensing boiler	RS Means	57,550	4,000	53,550	0	0.0	6,800	7.4	700	9,513	20	176,256	5.6	255.3	12.8	17.0	85,395	79,560

Assumptions: SWA estimated that 80% of boiler plant heating load will be taken over by the new boiler; 20% by lag boilers. SWA assumed the efficiency of condensing boilers at 92% for calculations.

Rebates/financial incentives:

NJ Clean Energy - Gas-fired water heaters > 50 gallons ($1.00 - $2.00 per MBH)
Maximum incentive amount is $4,000.

Options for funding the Lighting ECM: *This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM #10: *Install New Domestic Hot Water Heater*

Description:

The existing domestic water heater located in boiler room is original and was installed in 1971. It is past its service life. It was originally designed as a fuel oil boiler but was converted to natural gas in the 1980's. SWA recommends installing a new 400MBH condensing boiler and leave the existing as a backup for additional heating requirements during peak load. The efficiency of 1971 boilers is estimated at 70%, and that of condensing boiler at 90% minimum. Condensing boilers allow condensation of moisture in flue gases resulting in lower flue gas temperatures with increased efficiencies. As a result of this addition, it is expected that more than 80% of the heating load would be catered by the new heater.

Installation cost

Estimated installed cost: $13,130 (estimated labor cost of $3,200)
Source of cost estimate: RS Means and similar projects

Economics:

ECM #	ECM description	source	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 energy 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
10a	Replace DHW heater with an in kind one	RS Means	9,580	800	8,780	0	0.0	1,472	1.6	700	2,608	20	38,160	3.4	494.1	24.7	29.5	29,313	17,225
10b	Incremental cost to replace with a condensing boiler	RS Means	4,350	0	4,350	0	0.0	841	0.9	0	1,090	20	21,806	4.0	401.3	20.1	24.8	11,575	9,843
10	ReplaceDHW heater with a condensing boiler	RS Means	13,930	800	13,130	0	0.0	2,314	2.5	700	3,698	20	59,966	3.6	463.3	23.2	28.0	40,888	27,068

Assumptions: SWA estimated that 80% of domestic hot water heating load will be taken over by the new condensing boiler.

Rebates/financial incentives:

NJ Clean Energy - Gas-fired water heaters > 50 gallons ($1.00 - $2.00 per MBH)
Maximum incentive amount is $800.

Options for funding the Lighting ECM: *This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#11: *Install 50 kW PV system*

Description:

Currently, OCVTS does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels, can be mounted on the building roofs, and can offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc… being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. SWA presents below the economics, and recommends at this time that OCVTS further review installing a 50 kW PV system to offset electrical demand and reduce the annual net electric consumption for the building, and review guaranteed incentives from NJ rebates to justify the investment. The OCVTS is not eligible for a 30% federal tax credit. Instead, it may consider applying for a grant and / or engage a PV generator / leaser who would install the PV system and then sell the power at a reduced rate. JCP&L provides the ability to buy SRECs at $600 / MWh or best market offer.

The size of the system was determined using the amount of roof surface area as a limiting factor, as well as the facilities annual base load. Currently, there is no upfront incentive to install PV systems larger than 50kW. SWA considered a 250kW system for OCVTS which resulted in a 8.8 year pay back without these incentives. A PV system could be installed on a portion of the roof facing South or West. A commercial multi-crystalline 123 watt panel (17.2 volts, 7.16 amps) has 10.7 square feet of surface area (11.51 watts per square foot). A 50 kW system needs approximately 217 panels which would take up 3,800 square feet. The installation of a renewable Solar Photovoltaic power generating system could serve as a good educational tool and exhibit for the community as well.

http://www.windpoweringamerica.gov/images/windmaps/nj_30m_800.jpg

Installation cost:

Estimated installed cost: $325,000 (labor included at $3/Watt, totaling $150,000)
Source of cost estimate: Similar projects

Economics (with incentives):

ECM #	ECM description	source	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 energy 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	Install 50 kW PV rooftop system (with $1/W INCENTIVE and $600/1MWh SREC)	similar projects	375,000	50,000	325,000	56,721	50.0	0	2.1	0	42,732	25	744,100	7.6	284	11	11	235,133	77,708

Assumptions: SWA estimated the cost and savings of the system based on past PV projects. SWA projected physical dimensions based on a typical Polycrystalline Solar Panel (123 Watts, Model ND-123UJF). PV systems are sized based on Watts and physical dimensions for an array will differ with the efficiency of a given solar panel (W/sq ft).

Rebates/financial incentives:

NJ Clean Energy - Renewable Energy Incentive Program, Incentive based on $1.00 / watt Solar PV application for systems 50kW or less. Incentive amount for this application is $50,000

http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program

NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. ***A total of $33,600 / year, based on $600/SREC, has been incorporated in the cash flows above for the OCVTS; however, it requires proof of performance, application approval and negotiations with the utility.***

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#12: *Install 12kW Wind system*

Description:

Wind power production is highly applicable for OCVTS as it is close to Atlantic Ocean coast line and has wind speeds that can be successfully harnessed. Most wind power turbines need above 4m/s (around 9 miles/hour) winds to produce electricity. Brick building location has average wind velocity of 5m/s (11miles/hour) at 30m height. Currently, the Brick building does not use any renewable energy systems. SWA recommends installing a building roof mounted small modular wind turbine system of the type manufactured by AeroVironment, Inc. Unlike other small wind turbine designs, Architectural Wind™ combines the functional with the aesthetic to create a modular and architecturally enhancing small wind turbine system. The AVX1000 operates at wind speeds as low as 5 mph (2.2 m/s) and can withstand wind gusts of 120 mph (54 m/s).

Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc… being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Wind systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well.

There are many possible locations for a 12kW Wind system installation on top of the building. The supplier would need to first determine via recorded analysis at the proposed location(s) consistency and wind speeds available. Area winds of 10 mph will run turbines smoothly and capture the needed power. This is a roof-mounted wind turbine (used for generating electricity) that spins around a horizontal axis. A 12kW system comprises of 12 individual, 1kW units, which are about 10ft high and 6ft wide. Please see the picture on next page, and visit the following website for more details:

http://www.avinc.com/downloads/ArchWindFAQs.pdf

SWA presents below the economics for a 12 kW wind power system. Note that the building is not eligible for a 30% federal tax credit; however, it may consider applying for a grant and / or engage a Wind Power generator / leaser who would install the Wind system and then sell the power at a reduced rate. The installation of a renewable Wind power generating system could serve as a good educational tool and exhibit for the community. **It is very important that Wind measurements and recordings be taken at the chosen location for at least a couple of months to assure that sufficient wind and speed is available for proper operation and to meet incentive requirements.**

The payback period for this wind turbine system is very long; alternate systems with less payback period could be considered; however, they comprise of ground based wind turbines which require multitudes of approval from various authorities and are very time consuming at a small scale. SWA does not recommend OCVTS to pursue the alternatives. The present recommendation would serve as a community education and demonstrative tool.

Installation cost:
Estimated installed cost: $134,400
Source of cost estimate: Manufacturer

Economics (with incentives):

ECM #	ECM description	source	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 energy 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
12	Install 12 kW wind turbine system	similar projects	134,400	24,448	109,952	7,640	12.0	0	0.3	0	1,230	25	30,751	89.4	-72.0	-2.9	-	-89,003	10,467

Assumptions: SWA estimated the cost and savings of the system based on past wind projects. SWA projected physical dimensions based on a 1kW-AeroVironment AVX1000 turbine system.

Rebates/financial incentives:

NJ Clean Energy - Renewable Energy Incentive Program, Incentive at this time:
http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program

NJ Clean Energy - Wind Upfront Incentive Program, Expected performance buy-down (EPBB) is modeled on an annual kWh production of 1-16,000 kWh for a $3.20/kWh upfront incentive level. This has been incorporated in the above costs, however it requires proof of performance, application approval and negotiations with the utility. Presently, renewable energy credits market does not exist for wind generated power.

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There are not currently any existing renewable energy systems.

5.2. Wind

Description:

Please see the above recommended ECM#12.

5.3. Solar Photovoltaic

Please see the above recommended ECM#11.

5.4. Solar Thermal Collectors

Description:

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

5.5. Combined Heat and Power

Description:

CHP is not applicable for this building because of insufficient thermal baseload.

5.6. Geothermal

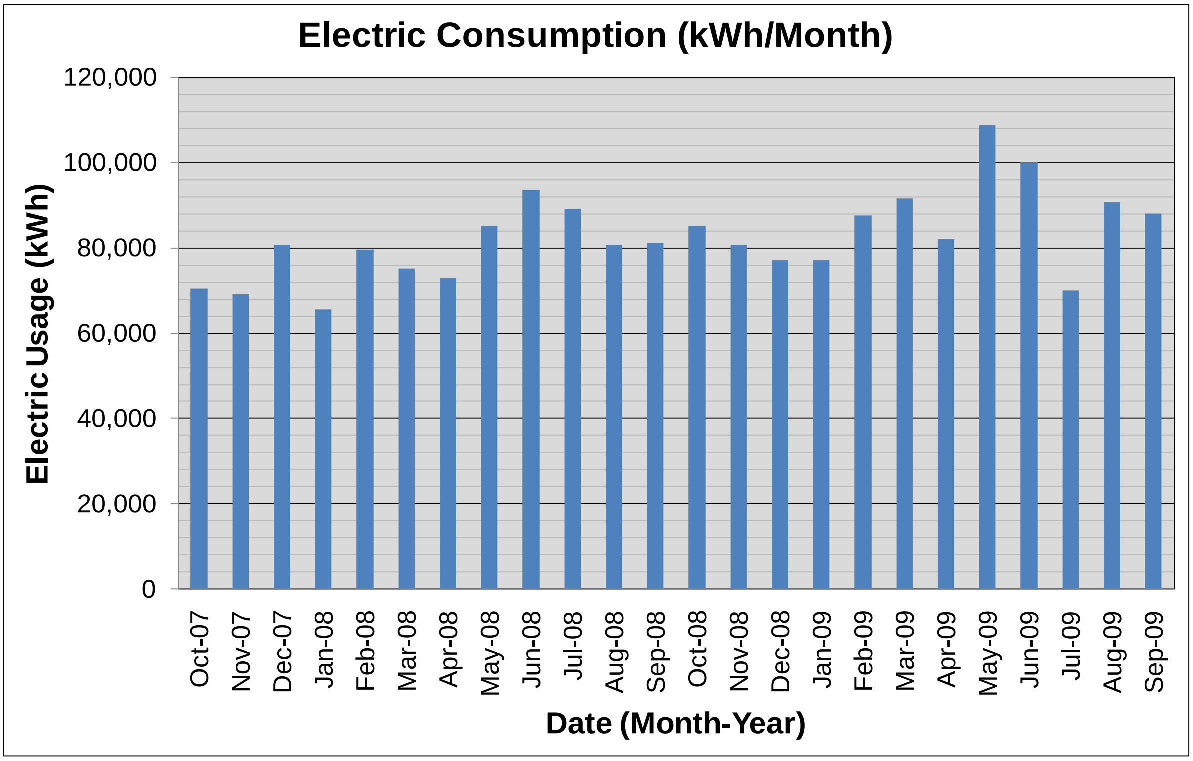
Description:

Geothermal heat pump loop system is not cost effective for this building because entire HVAC system would have to be replaced, and at a considerable cost.

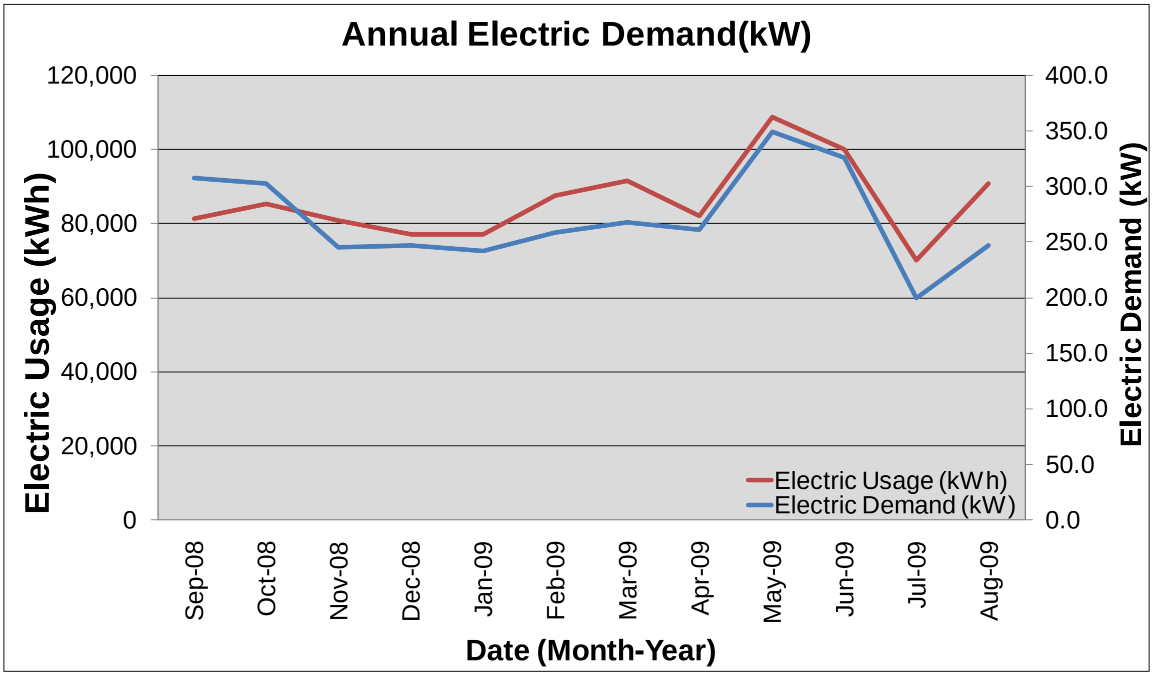
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load profiles

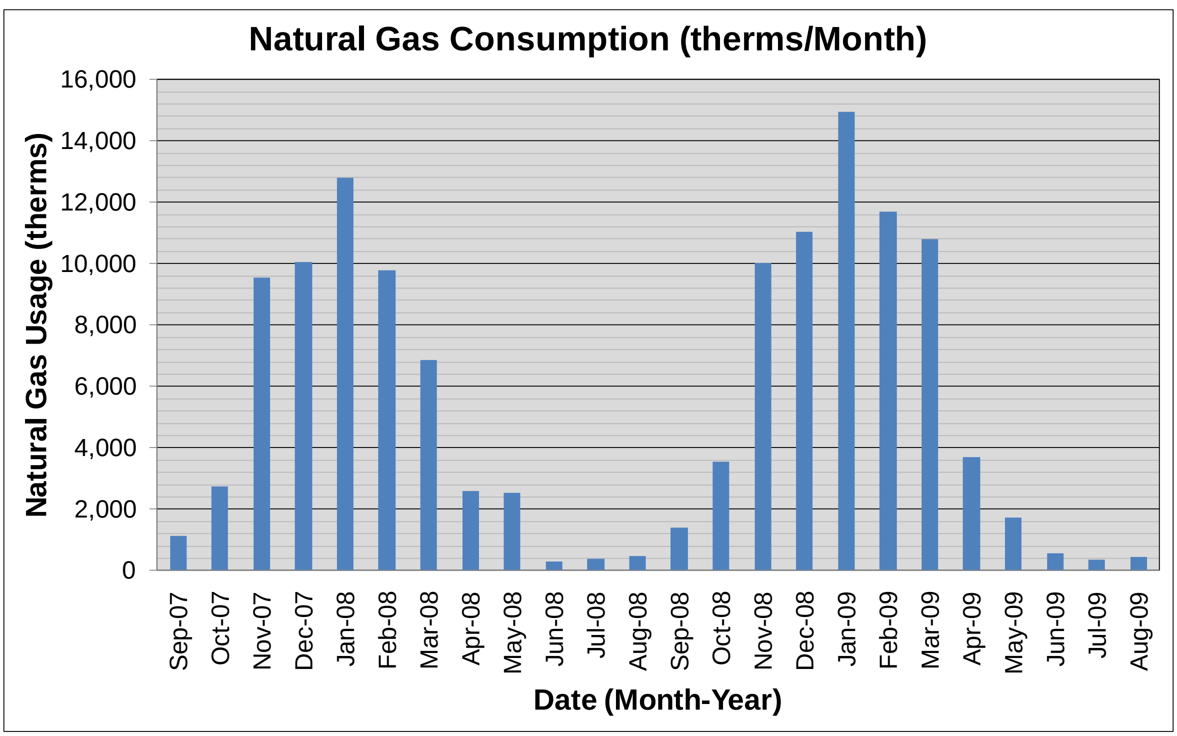
The following charts show annual electric and natural gas load profiles for the Ocean County Vocational Technical School:

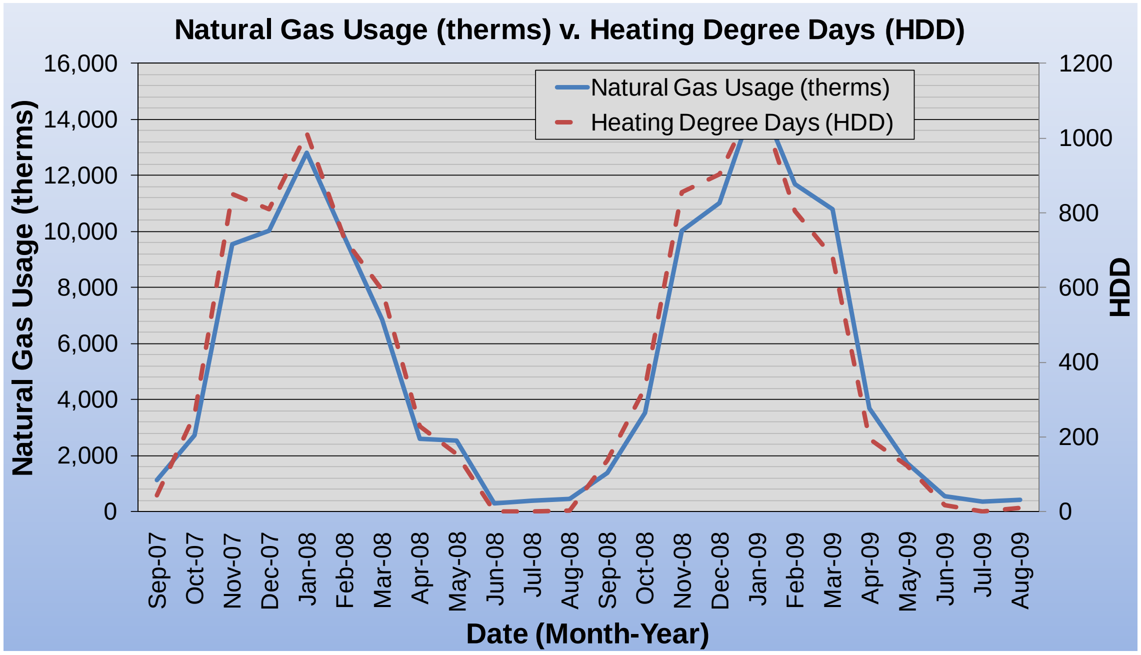


Some minor unusual electric fluctuations shown may be due to adjustments between estimated and actual meter readings. Also, note on the following chart how the electrical Demand peaks (except for a few unusual fluctuation anomalies) follow the electrical consumption peaks – our observation that it is either a faulty meter read or input error on the part of utility.



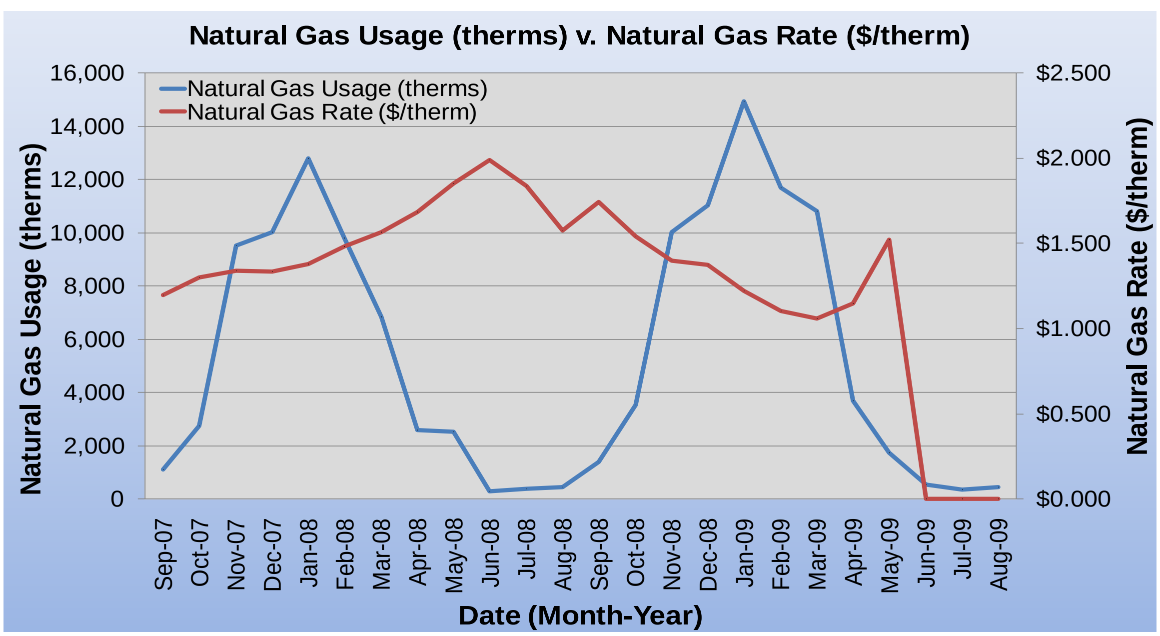
The following is a chart of the natural gas annual load profile for the building, peaking in the coldest months of the year and a chart showing natural gas consumption following the "heating degree days" curve.





6.2. Tariff analysis

Currently, natural gas is provided to the Ocean County Vocational Technical School building via one gas meter with NJNG acting as the supply and transport company. Gas is provided by NJNG at a general service rate. The suppliers' general service rate for natural gas charges a market-rate price based on use and the Ocean County Vocational Technical School billing does not breakdown demand costs for all periods. Typically, the natural gas prices increase during the heating months when natural gas is used by the hot water boiler units. The high gas price per therm fluctuations in the summer may be due to high energy costs that occurred in 2008 and low use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months.



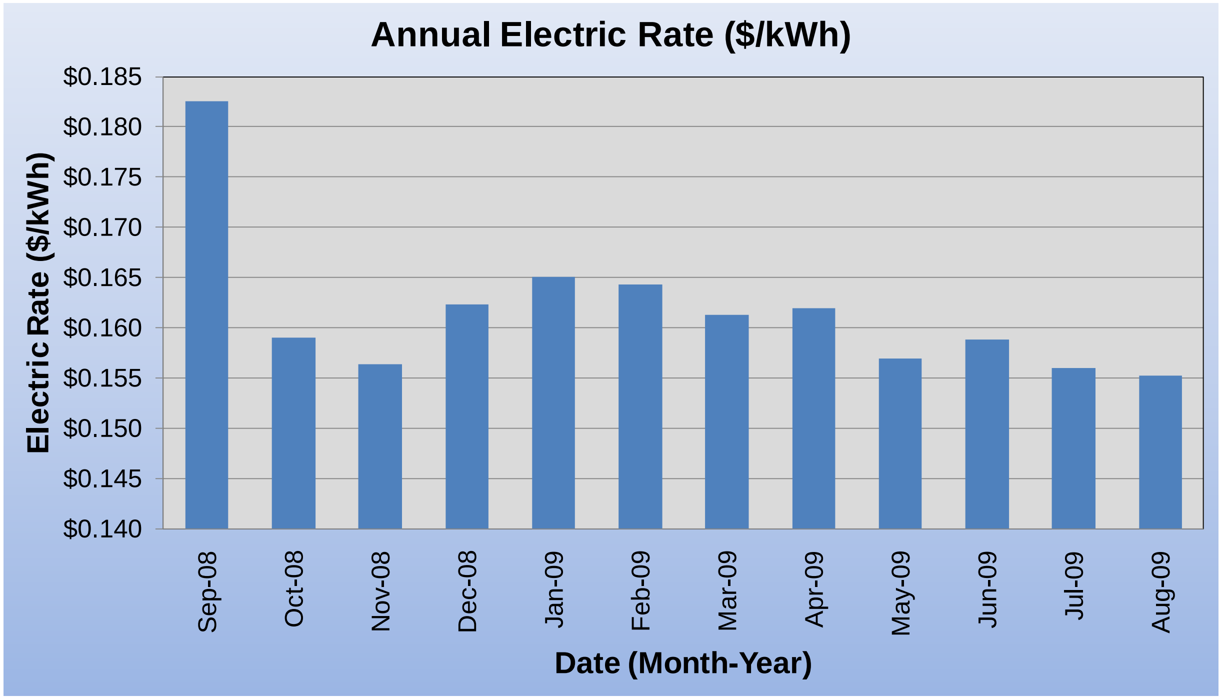
The Ocean County Vocational Technical School building is direct-metered (via one main meter) and currently purchases electricity from JCP&L at a general service rate. The general service rate for electric charges are market-rate based on use and the Ocean County Vocational Technical School building billing does show a breakdown of demand costs. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the electricity prices increase during the cooling months when electricity is used by air conditioning equipment.

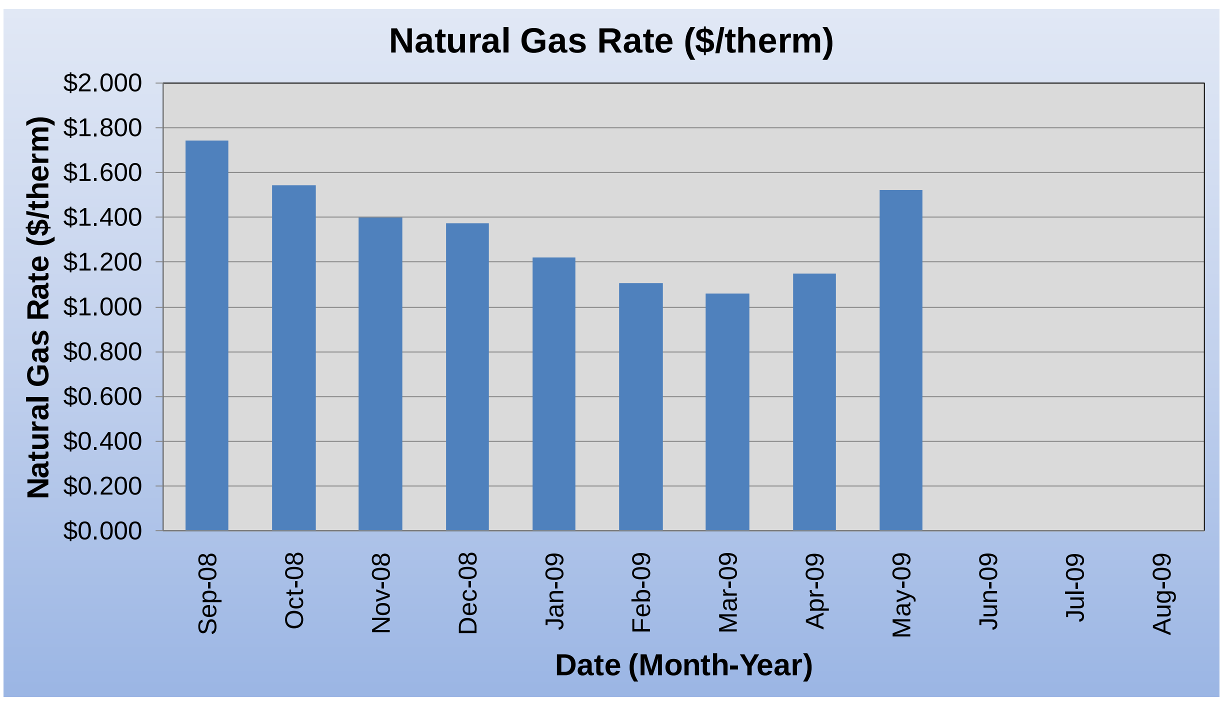
6.3. Energy Procurement strategies

The Ocean County Vocational Technical School building receives natural gas via one incoming meter. New Jersey Natural Gas supplies the gas and transports it. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner. Electricity is also purchased via one incoming meter directly for the Ocean County Vocational Technical School building from South River electric utility consortium without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations up to 15% over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 47% over the most recent 12 month period. Some of these fluctuations may have been caused by adjustments between estimated and actual meter readings, others may be due to unusual high and escalating energy costs in 2008. The average estimated NJ commercial utility rates for electric and gas are $0.150/kWh and $1.550/therm respectively. The Ocean County Vocational Technical School building annual utility costs are $11,859 higher for electric when compared to the average estimated NJ commercial utility rates. SWA recommends OCVTS to consider buying electricity and gas from third party suppliers noted in Appendix B to reduce utility costs.

SWA recommends that the Ocean County Vocational Technical School Board of Education further explore opportunities of purchasing electricity from an ESCOs in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Ocean County Vocational Technical School building. Appendix B contains a complete list of third party energy suppliers for the South River Township service area. The Ocean County Vocational Technical School Board of Education may want to consider partnering with other school districts, municipalities, townships and communities to aggregate a substantial electric and natural gas use for better leveraging in negotiations with their local utility and ESCOs. This sort of activity is happening in many parts of the country and in New Jersey. Also, the Ocean County Vocational Technical School building would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time (without a large capital investment) to shed a minimum of 150 kW electric demand when requested by the utility during peak demand periods, which is the typical threshold for considering this option.

The following charts show the Ocean County Vocational Technical School building monthly spending per unit of energy in 2008.


Annual Electric Rate ($/kWh)
Electric Rate ($/kWh)
$0.185
$0.180
$0.175
$0.170
$0.165
$0.160
$0.155
$0.150
$0.145
$0.140
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Date (Month-Year)


Natural Gas Rate ($/therm)
Natural Gas Rate ($/therm)
$2.000
$1.800
$1.600
$1.400
$1.200
$1.000
$0.800
$0.600
$0.400
$0.200
$0.000
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Date (Month-Year)

7. METHOD OF ANALYSIS

7.1. Assumptions and tools

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

7.2. 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.

Appendix A: 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	1	Culinary kitchen B20 ()	arabol	E	4'T8	44	2	32	S	12	260	6	3,080	9,610	C	arabol	4'T8	E	OS	44	2	32	9	260	6	3080	7207	0	2402	2402
2	1	Culinary kitchen B20 ()	arabol	E	4'T8	4	4	32	S	12	260	13	564	1,760	C	arabol	4'T8	E	OS	4	4	32	9	260	13	564	1320	0	440	440
3	1	Culinary kitchen B22 ()	crew-i	E	CFL	2	1	15	S	12	260	0	30	94	N/A	crew-i	CFL	E	S	2	1	15	12	260	0	30	94	0	0	0
4	1	Freezer ()	arabol	M	4'T12	3	2	40	S	10	260	15	285	741	T8	arabol	4'T8	E	MS	3	2	32	8	260	6	210	410	195	137	332
5	1	Culinary office B 19 ()	arabol	E	4'T8	2	4	32	S	12	260	13	282	880	C	arabol	4'T8	E	OS	2	4	32	9	260	13	282	660	0	220	220
6	1	Culinary locker room B 20 A ()	arabol	E	4'T8	2	2	32	S	4	260	6	140	146	C	arabol	4'T8	E	MS	2	2	32	3	260	6	140	109	0	36	36
7	1	Culinary Dining rm Bl6 ()	crew-i	E	CFL	5	5	7	S	12	260	1	180	562	N/A	crew-i	CFL	E	S	5	5	7	12	260	1	180	562	0	0	0
8	1	Dining rm B16 ()	ecesse	E	4'T8	18	4	32	S	16	260	13	2,538	10,558	C	ecesse	4'T8	E	OS	18	4	32	12	260	13	2538	7919	0	2640	2640
9	1	Dining rm B16 ()	xit Sig	N	LED	1	1	5	N	24	365	1	6	53	N/A	xit Sig	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
10	1	Electrical Rm B21 ()	arabol	E	4'T8	1	2	32	S	4	260	6	70	73	N/A	arabol	4'T8	E	S	1	2	32	4	260	6	70	73	0	0	0
11	1	Mens locker rm Culinary B20B ()	arabol	E	4'T8	3	2	32	S	4	260	6	210	218	C	arabol	4'T8	E	OS	3	2	32	3	260	6	210	164	0	55	55
12	1	Bakery Store B33 ()	arabol	E	4'T8	5	2	32	S	9	260	6	350	819	C	arabol	4'T8	E	OS	5	2	32	7	260	6	350	614	0	205	205
13	1	Bakery Store B33 ()	arabol	E	4'T8	25	2	32	S	9	260	6	1,750	4,095	C	arabol	4'T8	E	OS	25	2	32	7	260	6	1750	3071	0	1024	1024
14	1	Bakery classrm B 25 ()	arabol	E	4'T8	8	2	32	S	9	260	6	560	1,310	C	arabol	4'T8	E	OS	8	2	32	7	260	6	560	983	0	328	328
15	1	Bakery Fundamentals B27 ()	arabol	E	4'T8	41	2	32	S	9	260	6	2,870	6,716	C	arabol	4'T8	E	OS	41	2	32	7	260	6	2870	5037	0	1679	1679
16	1	Bakery Fundamentals B28 ()	arabol	E	4'T8	8	2	32	S	9	260	6	560	1,310	C	arabol	4'T8	E	OS	8	2	32	7	260	6	560	983	0	328	328
17	1	Bakery Fundamentals B28 ()	arabol	E	4'T8	1	2	32	S	9	260	6	70	164	C	arabol	4'T8	E	OS	1	2	32	7	260	6	70	123	0	41	41
18	1	Bakery bathroom B28 ()	arabol	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	arabol	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
19	1	Automotive B 29 ()	arabol	E	4'T8	88	2	32	S	9	260	6	6,160	14,414	C	arabol	4'T8	E	OS	88	2	32	7	260	6	6160	10811	0	3604	3604
20	1	Automotive B 29 ()	arabol	E	4'T8	2	2	32	S	9	260	6	140	328	C	arabol	4'T8	E	OS	2	2	32	7	260	6	140	246	0	82	82
21	1	Automotive B 30 ()	arabol	E	4'T8	8	2	32	S	9	260	6	560	1,310	C	arabol	4'T8	E	OS	8	2	32	7	260	6	560	983	0	328	328
22	1	Automotive B 30 ()	arabol	E	4'T8	1	2	32	S	9	260	6	70	164	N/A	arabol	4'T8	E	S	1	2	32	9	260	6	70	164	0	0	0
23	1	Construction B 31 ()	arabol	E	4'T8	68	2	32	S	9	260	6	4,760	11,138	C	arabol	4'T8	E	OS	68	2	32	7	260	6	4760	8354	0	2785	2785
24	1	Construction B 31 bath ()	arabol	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	arabol	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
25	1	Construction B 32 Classrm ()	arabol	E	4'T8	8	2	32	S	9	260	6	560	1,310	C	arabol	4'T8	E	OS	8	2	32	7	260	6	560	983	0	328	328
26	1	Construction B 32 ()	arabol	E	4'T8	1	2	32	S	9	260	6	70	164	C	arabol	4'T8	E	OS	1	2	32	7	260	6	70	123	0	41	41
27	1	Construction B 32 office ()	arabol	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	arabol	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
28	1	Auto / Const / Bakery Hallway ()	arabol	E	4'T8	12	2	32	S	16	260	6	840	3,494	C	arabol	4'T8	E	MS	12	2	32	12	260	6	840	2621	0	874	874
29	1	Auto / Const / Bakery Hallway ()	xit Sig	N	LED	2	1	5	N	24	260	1	12	75	N/A	xit Sig	LED	N	N	2	1	5	24	260	1	12	75	0	0	0
30	1	Culinary kitchen B 35 ()	xit Sig	N	LED	2	1	5	N	24	260	1	12	75	N/A	xit Sig	LED	N	N	2	1	5	24	260	1	12	75	0	0	0
31	1	Culinary kitchen B 35 ()	ecesse	E	4'T8	20	3	32	S	16	260	10	2,120	8,819	C	ecesse	4'T8	E	OS	20	3	32	12	260	10	2120	6614	0	2205	2205
32	1	Culinary kitchen B 35 bathroom ()	ecesse	E	4'T8	3	2	32	S	2	260	6	210	109	N/A	ecesse	4'T8	E	S	3	2	32	2	260	6	210	109	0	0	0
33	1	Culinary kitchen B 34 classroom ()	arabol	E	4'T8	8	2	32	S	9	260	6	560	1,310	C	arabol	4'T8	E	OS	8	2	32	7	260	6	560	983	0	328	328
34	1	Culinary kitchen B 34 office ()	arabol	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	arabol	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
35	1	Culinary kitchen B37storage ()	arabol	E	4'T8	12	2	32	S	4	260	6	840	874	C	arabol	4'T8	E	MS	12	2	32	3	260	6	840	655	0	218	218
36	1	Culinary kitchen B37storage ()	xit Sig	N	LED	1	1	5	S	24	260	1	6	37	N/A	xit Sig	LED	N	S	1	1	5	24	260	1	6	37	0	0	0
37	1	Culinary kitchen B77 lockerrm ()	ecesse	E	4'T8	3	2	32	S	2	260	6	210	109	N/A	ecesse	4'T8	E	S	3	2	32	2	260	6	210	109	0	0	0
38	1	Culinary kitchen B77 lockerrm ()	U-shap	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	U-Shap	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
39	1	Culinary kitchen B 36 classroom ()	ecesse	E	4'T8	12	3	32	S	9	260	10	1,272	2,976	C	ecesse	4'T8	E	OS	12	3	32	7	260	10	1272	2232	0	744	744
40	1	Culinary kitchen B 36 classroom ()	arabol	E	4'T8	2	1	32	S	9	260	3	70	164	C	arabol	4'T8	E	OS	2	1	32	7	260	3	70	123	0	41	41
41	1	Culinary kitchen B 37 classroom ()	arabol	E	4'T8	2	1	32	S	9	260	3	70	164	C	arabol	4'T8	E	OS	2	1	32	7	260	3	70	123	0	41	41
42	1	Culinary kitchen B 37 classroom ()	arabol	E	4'T8	12	3	32	S	9	260	10	1,272	2,976	C	arabol	4'T8	E	OS	12	3	32	7	260	10	1272	2232	0	744	744
43	1	Delicatessen B15 ()	ecesse	E	4'T8	4	4	32	S	9	260	13	564	1,320	C	ecesse	4'T8	E	OS	4	4	32	7	260	13	564	990	0	330	330
44	1	Culinary B14 classroom ()	arabol	E	4'T8	8	2	32	S	9	260	6	560	1,310	C	arabol	4'T8	E	OS	8	2	32	7	260	6	560	983	0	328	328
45	1	Main office B1 ()	arabol	E	4'T8	7	4	32	S	9	260	13	987	2,310	C	arabol	4'T8	E	OS	7	4	32	7	260	13	987	1732	0	577	577
46	1	Main office B2 ()	arabol	E	4'T8	4	4	32	S	9	260	13	564	1,320	C	arabol	4'T8	E	OS	4	4	32	7	260	13	564	990	0	330	330
47	1	Main office B3 nurse ()	arabol	E	4'T8	7	4	32	S	9	260	13	987	2,310	C	arabol	4'T8	E	OS	7	4	32	7	260	13	987	1732	0	577	577
48	1	Main office B3 nurse ()	U-shap	E	4'T8	1	2	32	S	9	260	6	70	164	N/A	U-Shap	4'T8	E	S	1	2	32	9	260	6	70	164	0	0	0
49	1	Main office bath ()	crew-i	N	Inc	1	2	60	S	4	260	0	120	125	CFL	crew-i	CFL	N	S	1	2	20	4	260	0	40	42	83	0	83
50	1	Main office B1 ()	ecesse	E	4'T8	1	4	32	S	9	260	13	141	330	C	ecesse	4'T8	E	OS	1	4	32	7	260	13	141	247	0	82	82
51	1	Main office B1 copy rm ()	ecesse	E	4'T8	3	4	32	S	9	260	13	423	990	C	ecesse	4'T8	E	MS	3	4	32	7	260	13	423	742	0	247	247
52	1	Boiler Rm B 13 ()	arabol	E	4'T8	3	2	32	S	4	260	6	210	218	C	arabol	4'T8	E	MS	3	2	32	3	260	6	210	164	0	55	55
53	1	Boiler Rm B 13 ()	crew-i	N	Inc	5	1	60	S	4	260	0	300	312	CFL	crew-i	CFL	N	MS	5	1	20	3	260	0	100	78	208	26	234
54	1	Bathroom Men B 23 ()	crew-i	N	Inc	2	1	60	S	4	260	0	120	125	CFL	crew-i	CFL	N	S	2	1	20	4	260	0	40	42	83	0	83
55	1	Bathroom Women B 24 ()	crew-i	N	Inc	2	1	60	S	4	260	0	120	125	CFL	crew-i	CFL	N	S	2	1	20	4	260	0	40	42	83	0	83
56	1	Bathroom Women B 24 ()	ecesse	E	4'T8	1	3	32	S	4	260	10	106	110	N/A	ecesse	4'T8	E	S	1	3	32	4	260	10	106	110	0	0	0

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
57	1	Bathroom Men B 23 ()	ecesse	E	4'T8	1	3	32	S	4	260	10	106	110	N/A	ecesse	4'T8	E	S	1	3	32	4	260	10	106	110	0	0	0
58	1	Bathroom Men B 5A ()	crew-i	N	Inc	1	2	60	S	4	260	0	120	125	CFL	crew-i	CFL	N	S	1	2	20	4	260	0	40	42	83	0	83
59	1	Bathroom Women B 5B ()	crew-i	N	Inc	1	2	60	S	4	260	0	120	125	CFL	crew-i	CFL	N	S	1	2	20	4	260	0	40	42	83	0	83
60	1	Faculty B5 ()	ecesse	E	2'T8	7	2	17	S	16	260	3	259	1,077	C	ecesse	2'T8	E	OS	7	2	17	12	260	3	259	808	0	269	269
61	1	Janitor's Closet ()	arabol	E	4'T8	1	2	32	S	4	260	6	70	73	N/A	arabol	4'T8	E	S	1	2	32	4	260	6	70	73	0	0	0
62	1	Cosmetology B6 ()	ecesse	E	4'T8	30	2	32	S	9	260	6	2,100	4,914	C	ecesse	4'T8	E	OS	30	2	32	7	260	6	2100	3686	0	1229	1229
63	1	Cosmetology B7 ()	ecesse	E	4'T8	3	4	32	S	9	260	13	423	990	C	ecesse	4'T8	E	OS	3	4	32	7	260	13	423	742	0	247	247
64	1	Cosmetology B7 Men's bath ()	ecesse	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	ecesse	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
65	1	Cosmetology B7 Women's bath ()	ecesse	E	4'T8	4	2	32	S	2	260	6	280	146	N/A	ecesse	4'T8	E	S	4	2	32	2	260	6	280	146	0	0	0
66	1	Printing B11 ()	ecesse	E	4'T8	32	3	32	S	9	260	10	3,392	7,937	C	ecesse	4'T8	E	OS	32	3	32	7	260	10	3392	5953	0	1984	1984
67	1	Printing B12 ()	ecesse	E	4'T8	4	3	32	S	9	260	10	424	992	C	ecesse	4'T8	E	OS	4	3	32	7	260	10	424	744	0	248	248
68	1	Printing B12 closet ()	ecesse	E	4'T8	2	2	32	S	2	260	6	140	73	N/A	ecesse	4'T8	E	S	2	2	32	2	260	6	140	73	0	0	0
69	1	Printing BH Storage ()	ecesse	E	4'T8	4	2	32	S	2	260	6	280	146	N/A	ecesse	4'T8	E	S	4	2	32	2	260	6	280	146	0	0	0
70	1	Printing darkroom ()	ecesse	E	4'T8	4	2	32	S	2	260	6	280	146	N/A	ecesse	4'T8	E	S	4	2	32	2	260	6	280	146	0	0	0
71	1	Printing B11 ()	ecesse	E	4'T8	4	2	32	S	9	260	6	280	655	C	ecesse	4'T8	E	OS	4	2	32	7	260	6	280	491	0	164	164
72	1	Printing B11 ()	xit Sig	N	LED	2	1	5	N	24	260	1	12	75	N/A	xit Sig	LED	N	N	2	1	5	24	260	1	12	75	0	0	0
73	1	Printing B11 storage ()	ecesse	E	4'T8	4	2	32	S	2	260	6	280	146	N/A	ecesse	4'T8	E	S	4	2	32	2	260	6	280	146	0	0	0
74	1	Printing B11 women's bath ()	ecesse	E	2'T8	6	2	17	S	4	260	3	222	231	N/A	ecesse	2'T8	E	S	6	2	17	4	260	3	222	231	0	0	0
75	1	Printing B11 men's bath ()	ecesse	E	2'T8	5	2	17	S	4	260	3	185	192	N/A	ecesse	2'T8	E	S	5	2	17	4	260	3	185	192	0	0	0
76	1	Photography B 39 ()	ecesse	E	4'T8	30	3	32	S	9	260	10	3,180	7,441	C	ecesse	4'T8	E	OS	30	3	32	7	260	10	3180	5581	0	1860	1860
77	1	Photography B 39 men's bathrm ()	arabol	E	2'T8	2	2	17	S	4	260	3	74	77	N/A	arabol	2'T8	E	S	2	2	17	4	260	3	74	77	0	0	0
78	1	Photography B 39 W0men's bathrm (	arabol	E	2'T8	2	2	17	S	4	260	3	74	77	N/A	arabol	2'T8	E	S	2	2	17	4	260	3	74	77	0	0	0
79	1	Photography B 39 matting area ()	ecesse	E	4'T8	15	2	32	S	9	260	6	1,050	2,457	C	ecesse	4'T8	E	OS	15	2	32	7	260	6	1050	1843	0	614	614
80	1	Photography B 39 ()	xit Sig	N	LED	1	1	5	N	24	365	1	6	53	N/A	xit Sig	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
81	1	Computer Lab B8 ()	arabol	E	4'T8	21	2	32	S	9	260	6	1,470	3,440	C	arabol	4'T8	E	OS	21	2	32	7	260	6	1470	2580	0	860	860
82	1	Computer Lab B8 bathroom ()	arabol	E	4'T8	1	2	32	S	4	260	6	70	73	N/A	arabol	4'T8	E	S	1	2	32	4	260	6	70	73	0	0	0
83	1	Computer Lab B8 closet ()	arabol	E	4'T8	2	2	32	S	2	260	6	140	73	N/A	arabol	4'T8	E	S	2	2	32	2	260	6	140	73	0	0	0
84	1	Bathroom Men B64 ()	ecesse	E	4'T8	2	2	32	S	4	260	6	140	146	N/A	ecesse	4'T8	E	S	2	2	32	4	260	6	140	146	0	0	0
85	1	Elevator Mech. Rm B63A ()	arabol	E	2'T8	1	2	17	S	2	260	3	37	19	N/A	arabol	2'T8	E	S	1	2	17	2	260	3	37	19	0	0	0
86	1	Bathroom Women B63 ()	ecesse	E	4'T8	2	2	32	S	4	260	6	140	146	N/A	ecesse	4'T8	E	S	2	2	32	4	260	6	140	146	0	0	0
87	1	Student services B62 ()	ecesse	E	4'T8	14	4	32	S	9	260	13	1,974	4,619	C	ecesse	4'T8	E	OS	14	4	32	7	260	13	1974	3464	0	1155	1155
88	1	ident services B62 women's bathroom	ecesse	N	Inc	1	1	40	S	4	260	0	40	42	N/A	ecesse	CFL	N	S	1	1	40	4	260	0	40	42	0	0	0
89	1	tudent services B62 men's bathroom	ecesse	N	Inc	1	1	40	S	4	260	0	40	42	N/A	ecesse	CFL	N	S	1	1	40	4	260	0	40	42	0	0	0
90	1	Student services B62 file rm ()	arabol	E	4'T8	1	2	32	S	4	260	6	70	73	N/A	arabol	4'T8	E	S	1	2	32	4	260	6	70	73	0	0	0
91	1	Office B61 ()	ecesse	E	4'T8	3	4	32	S	9	260	13	423	990	C	ecesse	4'T8	E	OS	3	4	32	7	260	13	423	742	0	247	247
92	1	Office B6O ()	ecesse	E	4'T8	4	4	32	S	9	260	13	564	1,320	C	ecesse	4'T8	E	OS	4	4	32	7	260	13	564	990	0	330	330
93	1	Office B57 ()	ecesse	E	4'T8	2	4	32	S	9	260	13	282	660	C	ecesse	4'T8	E	OS	2	4	32	7	260	13	282	495	0	165	165
94	1	Office B59 ()	ecesse	E	4'T8	4	4	32	S	9	260	13	564	1,320	C	ecesse	4'T8	E	OS	4	4	32	7	260	13	564	990	0	330	330
95	1	Conference rm B58 ()	ecesse	E	4'T8	2	4	32	S	9	260	13	282	660	C	ecesse	4'T8	E	OS	2	4	32	7	260	13	282	495	0	165	165
96	1	Consumer office B 55 ()	ecesse	E	4'T8	10	3	32	S	9	260	10	1,060	2,480	C	ecesse	4'T8	E	OS	10	3	32	7	260	10	1060	1860	0	620	620
97	1	Consumer office B 55 men bath ()	ecesse	N	Inc	1	1	40	S	2	260	0	40	21	N/A	ecesse	CFL	N	S	1	1	40	2	260	0	40	21	0	0	0
98	1	Consumer office B 55 W0men bath (	ecesse	N	Inc	1	1	60	S	2	260	0	60	31	N/A	ecesse	CFL	N	S	1	1	60	2	260	0	60	31	0	0	0
99	1	Consumer office B 56 ()	ecesse	E	4'T8	2	3	32	S	9	260	10	212	496	C	ecesse	4'T8	E	OS	2	3	32	7	260	10	212	372	0	124	124
100	1	Auxiliary classroom B54 ()	ecesse	E	4'T8	4	3	32	S	9	260	10	424	992	C	ecesse	4'T8	E	OS	4	3	32	7	260	10	424	744	0	248	248
101	1	Life skills B 52 ()	ecesse	E	4'T8	16	4	32	S	9	260	13	2,256	5,279	C	ecesse	4'T8	E	OS	16	4	32	7	260	13	2256	3959	0	1320	1320
102	1	Service occupations B53 ()	ecesse	E	4'T8	4	4	32	S	9	260	13	564	1,320	C	ecesse	4'T8	E	OS	4	4	32	7	260	13	564	990	0	330	330
103	1	Service occupations B53 bath ()	ecesse	E	2'T8	1	2	17	S	4	260	3	37	38	N/A	ecesse	2'T8	E	S	1	2	17	4	260	3	37	38	0	0	0
104	1	B52 bath ()	ecesse	E	2'T8	1	2	17	S	4	260	3	37	38	N/A	ecesse	2'T8	E	S	1	2	17	4	260	3	37	38	0	0	0
105	1	B52 A ()	arabol	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	arabol	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
106	1	Child care B51 ()	ecesse	E	4'T8	38	4	32	S	9	260	13	5,358	12,538	C	ecesse	4'T8	E	OS	38	4	32	7	260	13	5358	9403	0	3134	3134
107	1	Child care B51 bath ()	ecesse	E	2'T8	1	2	17	S	4	260	3	37	38	N/A	ecesse	2'T8	E	S	1	2	17	4	260	3	37	38	0	0	0
108	1	B51A storage ()	ecesse	E	4'T8	2	4	32	S	2	260	13	282	147	N/A	ecesse	4'T8	E	S	2	4	32	2	260	13	282	147	0	0	0
109	1	Janitor's Closet B5OA ()	arabol	E	2'T8	1	1	17	S	8	260	2	19	40	N/A	arabol	2'T8	E	S	1	1	17	8	260	2	19	40	0	0	0
110	1	Janitor's office B50 ()	arabol	E	4'T8	10	2	32	S	16	260	6	700	2,912	C	arabol	4'T8	E	OS	10	2	32	12	260	6	700	2184	0	728	728

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)
111	1	B40 ()	arabol	E	4'T8	30	2	32	S	9	260	6	2,100	4,914	C	arabol	4'T8	E	OS	30	2	32	7	260	6	2100	3686	0	1229	1229
112	1	B40 ()	arabol	E	2'T8	1	2	17	S	4	260	3	37	38	N/A	arabol	2'T8	E	S	1	2	17	4	260	3	37	38	0	0	0
113	1	B40 bath ()	arabol	E	2'T8	1	2	17	S	4	260	3	37	38	N/A	arabol	2'T8	E	S	1	2	17	4	260	3	37	38	0	0	0
114	1	Auto Tech B42 bath ()	arabol	E	2'T8	1	1	17	S	4	260	2	19	20	N/A	arabol	2'T8	E	S	1	1	17	4	260	2	19	20	0	0	0
115	1	Auto Tech B42 ()	arabol	E	4'T8	30	2	32	S	9	260	6	2,100	4,914	C	arabol	4'T8	E	OS	30	2	32	7	260	6	2100	3686	0	1229	1229
116	1	Auto Tech B42 ()	arabol	E	4'T8	1	2	32	S	9	260	6	70	164	N/A	arabol	4'T8	E	S	1	2	32	9	260	6	70	164	0	0	0
117	1	Auto Tech B4I classroom ()	arabol	E	4'T8	8	2	32	S	9	260	6	560	1,310	C	arabol	4'T8	E	OS	8	2	32	7	260	6	560	983	0	328	328
118	1	Auto Tech B42 ()	arabol	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	arabol	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
119	1	Construction B49 ()	arabol	E	4'T8	30	2	32	S	9	260	6	2,100	4,914	C	arabol	4'T8	E	OS	30	2	32	7	260	6	2100	3686	0	1229	1229
120	1	Construction B47 classroom ()	arabol	E	4'T8	8	2	32	S	9	260	6	560	1,310	C	arabol	4'T8	E	OS	8	2	32	7	260	6	560	983	0	328	328
121	1	Construction B47 bath ()	arabol	E	2'T8	1	1	17	S	4	260	2	19	20	N/A	arabol	2'T8	E	S	1	1	17	4	260	2	19	20	0	0	0
122	1	Building maintenance B48 ()	arabol	E	4'T8	22	2	32	S	9	260	6	1,540	3,604	C	arabol	4'T8	E	OS	22	2	32	7	260	6	1540	2703	0	901	901
123	1	Building maintenance B48 bath ()	arabol	E	2'T8	1	1	17	S	4	260	2	19	20	N/A	arabol	2'T8	E	S	1	1	17	4	260	2	19	20	0	0	0
124	1	HVAC B44 ()	arabol	E	4'T8	60	2	32	S	9	260	6	4,200	9,828	C	arabol	4'T8	E	OS	60	2	32	7	260	6	4200	7371	0	2457	2457
125	1	HVAC B44 bath ()	arabol	E	2'T8	1	1	17	S	4	260	2	19	20	N/A	arabol	2'T8	E	S	1	1	17	4	260	2	19	20	0	0	0
126	1	HVAC B44 bath ()	arabol	E	2'T8	1	1	17	S	4	260	2	19	20	N/A	arabol	2'T8	E	S	1	1	17	4	260	2	19	20	0	0	0
127	1	HVAC B 43 ()	arabol	E	4'T8	8	2	32	S	9	260	6	560	1,310	C	arabol	4'T8	E	OS	8	2	32	7	260	6	560	983	0	328	328
128	1	HVAC B 42 ()	arabol	E	4'T8	2	2	32	S	9	260	6	140	328	N/A	arabol	4'T8	E	S	2	2	32	9	260	6	140	328	0	0	0
129	1	Evaluation B46 ()	arabol	E	4'T8	48	2	32	S	9	260	6	3,360	7,862	C	arabol	4'T8	E	OS	48	2	32	7	260	6	3360	5897	0	1966	1966
130	1	Evaluation B46 bath ()	arabol	E	2'T8	1	1	17	S	4	260	2	19	20	N/A	arabol	2'T8	E	S	1	1	17	4	260	2	19	20	0	0	0
131	1	Evaluation B46 bath ()	arabol	E	2'T8	1	1	17	S	4	260	2	19	20	N/A	arabol	2'T8	E	S	1	1	17	4	260	2	19	20	0	0	0
132	1	Evaluation B46 bath ()	arabol	E	2'T8	1	1	17	S	4	260	2	19	20	N/A	arabol	2'T8	E	S	1	1	17	4	260	2	19	20	0	0	0
133	1	Evaluation B45 ()	arabol	E	4'T8	8	2	32	S	9	260	6	560	1,310	C	arabol	4'T8	E	OS	8	2	32	7	260	6	560	983	0	328	328
134	1	Const/ Auto Hallway ()	arabol	E	4'T8	7	2	32	S	16	260	6	490	2,038	C	arabol	4'T8	E	MS	7	2	32	12	260	6	490	1529	0	510	510
135	1	Const/ Auto Hallway ()	xit Sig	N	LED	2	1	5	N	24	260	1	12	75	N/A	xit Sig	LED	N	N	2	1	5	24	260	1	12	75	0	0	0
136	1	Const/ Auto Hallway ()	ecesse	E	4'T8	1	2	32	S	16	260	6	70	291	C	ecesse	4'T8	E	MS	1	2	32	12	260	6	70	218	0	73	73
137	1	Child services hallway ()	xit Sig	N	LED	2	1	5	N	24	365	1	12	105	N/A	xit Sig	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
138	1	Child services hallway ()	ecesse	E	4'T8	11	2	32	S	16	260	6	770	3,203	C	ecesse	4'T8	E	MS	11	2	32	12	260	6	770	2402	0	801	801
139	1	Child services hallway ()	ecesse	E	4'T8	1	2	32	S	16	260	6	70	291	C	ecesse	4'T8	E	MS	1	2	32	12	260	6	70	218	0	73	73
140	1	Stairwell ()	ecesse	E	4'T8	3	2	32	S	16	260	6	210	874	C	ecesse	4'T8	E	MS	3	2	32	12	260	6	210	655	0	218	218
141	2	Stairwell ()	ecesse	E	4'T8	4	2	32	S	16	260	6	280	1,165	C	ecesse	4'T8	E	MS	4	2	32	12	260	6	280	874	0	291	291
142	2	Cosmetology B65 ()	ecesse	E	4'T8	23	4	32	S	9	260	13	3,243	7,589	C	ecesse	4'T8	E	OS	23	4	32	7	260	13	3243	5691	0	1897	1897
143	2	Cosmetology B65 locker rm ()	ecesse	E	4'T8	1	2	32	S	4	260	6	70	73	N/A	ecesse	4'T8	E	S	1	2	32	4	260	6	70	73	0	0	0
144	2	Cosmetology B65 locker rm ()	ecesse	E	4'T8	1	2	32	S	4	260	6	70	73	N/A	ecesse	4'T8	E	S	1	2	32	4	260	6	70	73	0	0	0
145	2	Cosmetology B65 bath ()	ecesse	N	Inc	1	1	60	S	4	260	0	60	62	N/A	ecesse	CFL	N	S	1	1	60	4	260	0	60	62	0	0	0
146	2	Cosmetology B65 bath ()	ecesse	N	Inc	1	1	60	S	4	260	0	60	62	N/A	ecesse	CFL	N	S	1	1	60	4	260	0	60	62	0	0	0
147	2	Storage B66 ()	ecesse	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	ecesse	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
148	2	Janitor's Closet B 68 ()	arabol	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	arabol	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
149	2	Print Graphics B80 ()	ecesse	E	4'T8	18	4	32	S	9	260	13	2,538	5,939	C	ecesse	4'T8	E	OS	18	4	32	7	260	13	2538	4454	0	1485	1485
150	2	Print Graphics B80 bath ()	crew-i	E	CFL	1	1	15	S	4	260	0	15	16	N/A	crew-i	CFL	E	S	1	1	15	4	260	0	15	16	0	0	0
151	2	Print Graphics B80 bath ()	crew-i	E	CFL	1	1	15	S	4	260	0	15	16	N/A	crew-i	CFL	E	S	1	1	15	4	260	0	15	16	0	0	0
152	2	Print Graphics B81 ()	ecesse	E	4'T8	2	2	32	S	4	260	6	140	146	N/A	ecesse	4'T8	E	S	2	2	32	4	260	6	140	146	0	0	0
153	2	Print Graphics B81 files ()	arabol	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	arabol	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
154	2	Bathroom Women ()	arabol	E	4'T8	2	2	32	S	9	260	6	140	328	N/A	arabol	4'T8	E	S	2	2	32	9	260	6	140	328	0	0	0
155	2	Bathroom Men ()	arabol	E	4'T8	2	2	32	S	9	260	6	140	328	N/A	arabol	4'T8	E	S	2	2	32	9	260	6	140	328	0	0	0
156	2	Video studio ()	arabol	E	4'T8	6	4	32	S	9	260	13	846	1,980	C	arabol	4'T8	E	OS	6	4	32	7	260	13	846	1485	0	495	495
157	2	Electronic Art B78 ()	arabol	E	4'T8	18	4	32	S	9	260	13	2,538	5,939	C	arabol	4'T8	E	OS	18	4	32	7	260	13	2538	4454	0	1485	1485
158	2	Electronic Art B78 closet ()	arabol	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	arabol	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
159	2	Electronic Art B78 bath ()	crew-i	N	CFL	1	1	15	N	4	260	0	15	16	N/A	crew-i	CFL	N	N	1	1	15	4	260	0	15	16	0	0	0
160	2	Electronic Art B78 bath ()	crew-i	N	CFL	1	1	15	N	4	260	0	15	16	N/A	crew-i	CFL	N	N	1	1	15	4	260	0	15	16	0	0	0
161	2	Auditorium B 72 ()	ecesse	E	4'T8	16	4	32	S	9	260	13	2,256	5,279	C	ecesse	4'T8	E	OS	16	4	32	7	260	13	2256	3959	0	1320	1320
162	2	Auditorium B 71 closet ()	ecesse	E	4'T8	2	2	32	S	2	260	6	140	73	N/A	ecesse	4'T8	E	S	2	2	32	2	260	6	140	73	0	0	0
163	2	Auditorium B 71 bath ()	crew-i	N	CFL	1	1	15	S	4	260	0	15	16	N/A	crew-i	CFL	N	S	1	1	15	4	260	0	15	16	0	0	0
164	2	Auditorium B 71 bath ()	crew-i	N	CFL	1	1	15	S	4	260	0	15	16	N/A	crew-i	CFL	N	S	1	1	15	4	260	0	15	16	0	0	0
165	2	support B76 ()	ecesse	E	4'T8	22	4	32	S	9	260	13	3,102	7,259	C	ecesse	4'T8	E	OS	22	4	32	7	260	13	3102	5444	0	1815	1815
166	2	support B76 closet ()	ecesse	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	ecesse	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
167	2	support B76 bath ()	crew-i	N	CFL	1	1	15	S	4	260	0	15	16	N/A	crew-i	CFL	N	S	1	1	15	4	260	0	15	16	0	0	0
168	2	support B76 bath ()	crew-i	N	CFL	1	1	15	S	4	260	0	15	16	N/A	crew-i	CFL	N	S	1	1	15	4	260	0	15	16	0	0	0
169	2	Arch / Eng B74 ()	ecesse	E	4'T8	20	4	32	S	9	260	13	2,820	6,599	C	ecesse	4'T8	E	OS	20	4	32	7	260	13	2820	4949	0	1650	1650
170	2	Arch / Eng B74 bath ()	ecesse	E	2'T8	2	2	17	S	4	260	3	74	77	N/A	ecesse	2'T8	E	S	2	2	17	4	260	3	74	77	0	0	0

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
171	2	Arch / Eng B74 bath ()	ecesse	E	2'T8	2	2	17	S	4	260	3	74	77	N/A	ecesse	2'T8	E	S	2	2	17	4	260	3	74	77	0	0	0
172	2	Fashion Mer B75 ()	ecesse	E	4'T8	23	4	32	S	9	260	13	3,243	7,589	C	ecesse	4'T8	E	OS	23	4	32	7	260	13	3243	5691	0	1897	1897
173	2	Fashion Mer B75 bath ()	crew-i	N	CFL	1	1	15	S	4	260	0	15	16	N/A	crew-i	CFL	N	S	1	1	15	4	260	0	15	16	0	0	0
174	2	Fashion Mer B75 bath ()	crew-i	N	CFL	1	1	15	S	4	260	0	15	16	N/A	crew-i	CFL	N	S	1	1	15	4	260	0	15	16	0	0	0
175	2	Hallway ()	ecesse	E	4'T8	12	2	32	S	16	260	6	840	3,494	C	ecesse	4'T8	E	MS	12	2	32	12	260	6	840	2621	0	874	874
176	2	Hallway ()	xit Sig	N	LED	2	1	5	N	24	365	1	12	105	N/A	xit Sig	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
177	2	Hallway ()	xit Sig	N	LED	1	1	5	N	24	365	1	6	53	N/A	xit Sig	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
178	2	Hallway ()	arabol	E	4'T8	4	2	32	S	16	260	6	280	1,165	C	arabol	4'T8	E	MS	4	2	32	12	260	6	280	874	0	291	291
179	1	Staircase ()	arabol	E	4'T8	1	2	32	S	16	260	6	70	291	C	arabol	4'T8	E	MS	1	2	32	12	260	6	70	218	0	73	73
180	1	Staircase ()	xit Sig	N	LED	1	1	5	N	24	365	1	6	53	N/A	xit Sig	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
181	1	Main Hallway ()	xit Sig	N	LED	4	1	5	N	24	365	1	24	210	N/A	xit Sig	LED	N	N	4	1	5	24	365	1	24	210	0	0	0
182	1	Main Hallway ()	ecesse	E	4'T8	17	2	32	S	16	260	6	1,190	4,950	C	ecesse	4'T8	E	MS	17	2	32	12	260	6	1190	3713	0	1238	1238
183	1	Main Hallway Entrance ()	ecesse	E	4'T8	3	4	32	S	16	260	13	423	1,760	C	ecesse	4'T8	E	MS	3	4	32	12	260	13	423	1320	0	440	440
184	1	Main Hallway Entrance ()	xit Sig	N	LED	2	1	5	N	24	365	1	12	105	N/A	xit Sig	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
185	Ext	Exterior ()	crew-i	N	MH	9	1	150	PC	12	365	38	1,692	7,411	MH	crew-i	MH	N	PC	9	1	150	12	365	38	1692	7411	0	0	0
186	Ext	Exterior ()	crew-i	N	MH	9	1	250	PC	12	365	63	2,817	12,338	MH	crew-i	MH	N	PC	9	1	250	12	365	63	2817	12338	0	0	0
187	Ext	Exterior ()	crew-i	N	MH	6	1	70	PC	12	365	18	528	2,313	MH	crew-i	MH	N	PC	6	1	70	12	365	18	528	2313	0	0	0
188	Ext	Exterior ()	crew-i	N	MH	1	1	400	PC	12	365	100	500	2,190	MH	crew-i	MH	N	PC	1	1	400	12	365	100	500	2190	0	0	0
189	Ext	Exterior ()	crew-i	N	MH	6	1	70	PC	12	365	18	528	2,313	MH	crew-i	MH	N	PC	6	1	70	12	365	18	528	2313	0	0	0
190	Ext	Exterior ()	crew-i	N	CFL	1	1	25	PC	12	365	0	25	110	N/A	crew-i	CFL	N	PC	1	1	25	12	365	0	25	110	0	0	0
Totals:						**1,367**	**402**	**6,244**				**1,308**	**120,867**	**307,440**						**1,367**	**402**	**5,996**			**1,299**	**120,192**	**238,559**	**819**	**68,062**	**68,881**

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

Proposed Lighting Summary Table			
Total Surface Area (SF)	92,000		
Average Power Cost ($/kWh)	0.1610		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	26,674	26,674	**0**
Exterior Power (watts)	6,090	6,090	**0**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	280,766	211,885	**68,881**
Lighting Power (watts)	114,777	114,102	**675**
Lighting Power Density (watts/SF)	1.25	1.24	**0.01**
Estimated Cost of Fixture Replacement ($)	1,260		
Estimated Cost of Controls Improvements ($)	19,140		
Total Consumption Cost Savings ($)	**11,117**		

Legend				
Fixture Type	**Lamp Type**	**Control Type**	**Ballast Type**	**Retrofit Category**
Exit Sign	LED	N (None)	N/A (None)	N/A (None)
Screw-in	Inc (Incandescent)	S (Switch)	E (Electronic)	T8 (Installl new T8)
Pin	1'T5	OS (Occupancy Sensor)	M (Magnetic)	T5 (Install new T5)
Parabolic	2'T5	T (Timer)		CFL (Install new CFL)
Recessed	3'T5	PC (Photocell)		LEDex (Install new LED Exit)
2'U-shape	4'T5	D (Dimming)		LED (Install new LED)
Circiline	2'T8	DL (Daylight Sensor)		D (Delamping)
Exterior	3'T8	M (Microphonic Sensor)		C (Controls Only)
	4'T8			PSMH (Install new Pulse-Start Metal Halide)
	6'T8			
	8'T8			
	2'T12			
	3'T12			
	4'T12			
	6'T12			
	8'T12			
	CFL (Compact Fluorescent Lightbulb)			
	MR16			
	MV (Mercury Vapor)			
	MH (Metal Halide)			
	HPS (High Pressure Sodium			
	LPS (Low Pressure Sodium)			

Appendix B: Third Party Energy Suppliers (ESCOs)
http://www.state.nj.us/bpu/commercial/shopping.html

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

Third Party Gas Suppliers for NJNG Service Territory	Telephone & Web Site
Cooperative Industries	(800) 628-9427
412-420 Washington Avenue	www.cooperativenet.com
Belleville, NJ 07109	
Direct Energy Services, LLC	(866) 547-2722
120 Wood Avenue, Suite 611	www.directenergy.com
Iselin, NJ 08830	
Gateway Energy Services Corp.	(800) 805-8586
44 Whispering Pines Lane	www.gesc.com
Lakewood, NJ 08701	
UGI Energy Services, Inc.	(856) 273-9995
704 East Main Street, Suite 1	www.ugienergyservices.com
Moorestown, NJ 08057	
Hess Corporation	(800) 437-7872
1 Hess Plaza	www.hess.com
Woodbridge, NJ 07095	
Intelligent Energy	(800) 724-1880
2050 Center Avenue, Suite 500	www.intelligentenergy.org
Fort Lee, NJ 07024	
Metromedia Energy, Inc.	(877) 750-7046
6 Industrial Way	www.metromediaenergy.com
Eatontown, NJ 07724	
MxEnergy, Inc.	(800) 375-1277
510 Thornall Street, Suite 270	www.mxenergy.com
Edison, NJ 08837	
NATGASCO (Mitchell Supreme)	(800) 840-4427
532 Freeman Street	www.natgasco.com
Orange, NJ 07050	
NJ Gas & Electric	(866) 568-0290
1 Bridge Plaza, Fl. 2	www.NewJerseyGasElectric.com
Fort Lee, NJ 07024	
Pepco Energy Services, Inc.	(800) 363-7499
112 Main Street	www.pepco-services.com
Lebanon, NJ 08833	
PPL EnergyPlus, LLC	(800) 281-2000
811 Church Road	www.pplenergyplus.com
Cherry Hill, NJ 08002	
South Jersey Energy Company	(800) 756-3749
One South Jersey Plaza, Route 54	www.southjerseyenergy.com
Folsom, NJ 08037	
Sprague Energy Corp.	(800) 225-1560
12 Ridge Road	www.spragueenergy.com
Chatham Township, NJ 07928	
Woodruff Energy	(800) 557-1121
73 Water Street	www.woodruffenergy.com
Bridgeton, NJ 08302	

Appendix C

Glossary and Method of Calculations

Glossary of ECM Terms

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

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

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

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

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

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

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

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

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

Calculation References

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

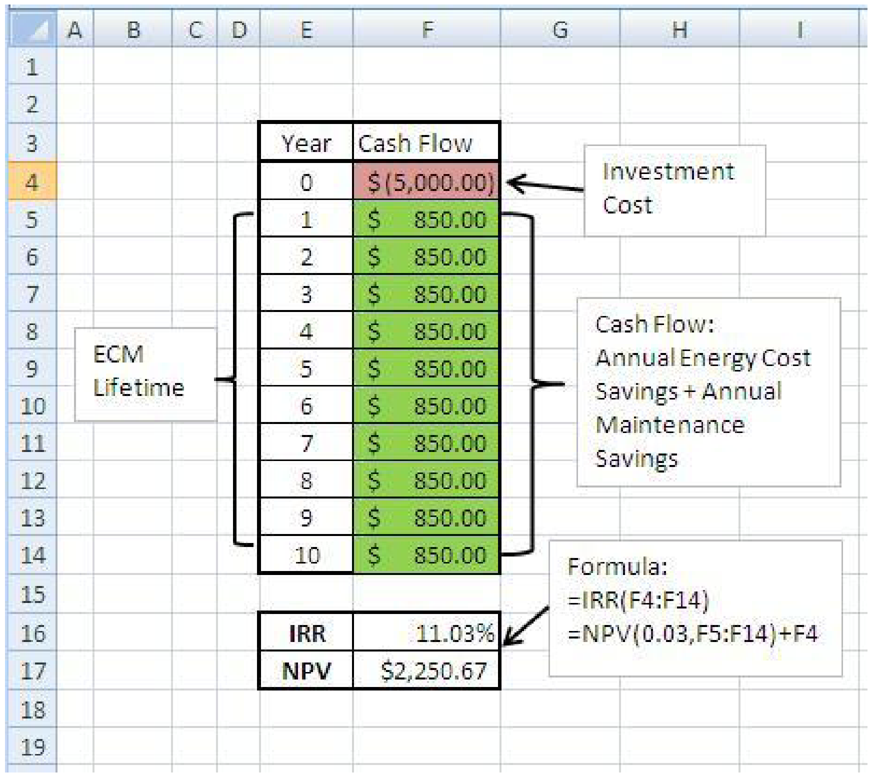
Note: The lifetime operating cost savings are all avoided operating, maintenance, and / or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding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

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

It is easiest to calculate the NPV and IRR using a spreadsheet program like Excel.

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:



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.

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NJCEP C & I Lifetimes

Measure	Measure Life
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