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Local Government Energy Program
Energy Audit Final Report

Ocean County Vocational Technical School

Toms River Center
1299 Old Freehold Road
Toms River, NJ 08753

Project Number: LGEA100

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EXECUTIVE SUMMARY

The single-story slab on grade 58,000 square feet OCVTS Toms River Center School was built in 1975. It is an "L" shaped building that houses shop rooms, classrooms, and faculty offices. The following chart provides a comparison of the current building energy usage based on the period from January 2011 through December 2011 with the proposed energy usage resulting from the installation of recommended Energy Conservation Measures (ECMs) excluding any renewable energy:

Table 1: State of Building—Energy Usage

	Electric Usage (kWh/yr)	Gas Usage (therms/yr)	Current Annual Cost of Energy ($)	Site Energy Use Intensity (kBtu/sq ft /yr)	Source Energy Use Intensity (kBtu/sq ft /yr)	Joint Energy Consumption (MMBtu/yr)
Current	828,727	20,018	$140,571	83.3	199	4,830
Proposed	783,645	17,484	$113,111	76.2	186	4,422
Savings	45,082	2,535	$27,460*	7.0	13	407
% Savings	5.4%	12.7%	19.5%	8.4%	6.8%	8.4%
Proposed Renewable Energy	171,342	0	$149,939	10.1	10.1	585
*Includes operation and maintenance savings; **Includes SRECS						

SWA has entered energy information about the Toms River Center facility into the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy Benchmarking system. The building has an Energy Star Rating of 11 and a Site Energy Utilization of 83 kBtu/sqft/yr. This score should be investigated further as there were several estimated utility bills that do not appear to be accurate.

Recommendations

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

Table 2: Energy Conservation Measure Recommendations

ECMs	First Year Savings ($)	Simple Payback Period	Initial Investment ($)	CO2 Savings (lbs/yr)
0-5 Year	$26,262	0.8	$20,696	101,946
5-10 Year	$0	-4.2	$0	0
>10 year	$1,197	14.0	$16,741	6,712
Total	$27,460	1.4	$37,437	108,658
Proposed Renewable Energy	$149,939	4.3	$639,600	306,788

Energy Conservation Measure Implementation

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

Recommended ECMs	Incentive Program (APPENDIX K for details)
Retro-commissioning	N/A
Retrofit 2 refrigerated vending machines with VendingMiser™ Devices	N/A
Add insulation to uninsulated hot water pipes	N/A
Install 40 occupancy sensors	Direct Install, Smart Start
Retrofit 2 snack vending machines with SnackMiser™ Devices	N/A
Install a 128 kW solar photovoltaic system	NJ SREC program
Replace metal halide fixtures with pulse start metal halides	Direct Install, Smart Start
Replace 2 existing boilers with higher efficiency boilers of the same capacity	Direct Install, Smart Start

Appendix L contains an Energy Conservation Measures table

Environmental Benefits

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 9 cars from the roads each year or is equivalent of planting 253 trees to absorb CO_2 from the atmosphere.

In addition to these ECMs, SWA recommends the following Operation and Maintenance (O&M) measures that would contribute to reducing energy usage and operation costs, at low or no cost:

- Replace motors with NEMA premium efficiency models
- Unclog and maintain all roof drains/scuppers.
- Provide water-efficient fixtures and controls
- Inspect and replace cracked/ineffective caulk.
- Inspect and maintain sealants at all windows for airtight performance.
- Inspect and maintain weather-stripping around all exterior doors and roof hatches.
- Purchase Energy Star® appliances when available
- Use smart power electric strips
- Create an energy educational program

SWA also recommends further evaluation with energy suppliers at the end of existing contracts. Energy suppliers are listed in Appendix H.

INTRODUCTION

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

Steven Winter Associates, Inc. (SWA) is a 40-year-old architectural/engineering research and consulting firm, with specialized expertise in green technologies and procedures that improve the safety, performance, and cost effectiveness of buildings. SWA has a long-standing commitment to creating energy-efficient, cost-saving and resource-conserving buildings. As consultants on the built environment, SWA works closely with architects, developers, builders, and local, state, and federal agencies to develop and apply sustainable, 'whole building' strategies in a wide variety of building types: commercial, residential, educational and institutional.

SWA performed an energy audit and assessment for the Toms River Center School at 1299 Old Freehold Road, Toms River, NJ. The process of the audit included facility visits on April 3rd, April 10th, and April 18th, benchmarking and energy bill analysis, assessment of existing conditions, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

The goal of this Local Government Energy Audit is to provide sufficient information to the OCVTS Public School District to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Toms River Center facility.

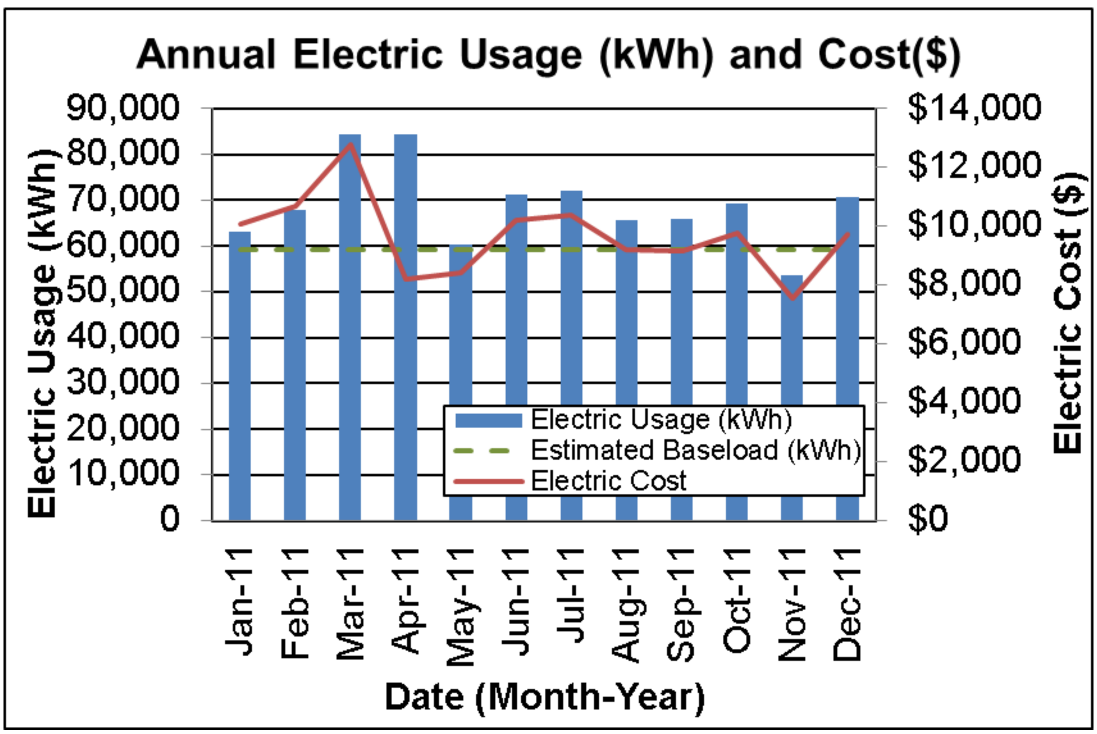
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

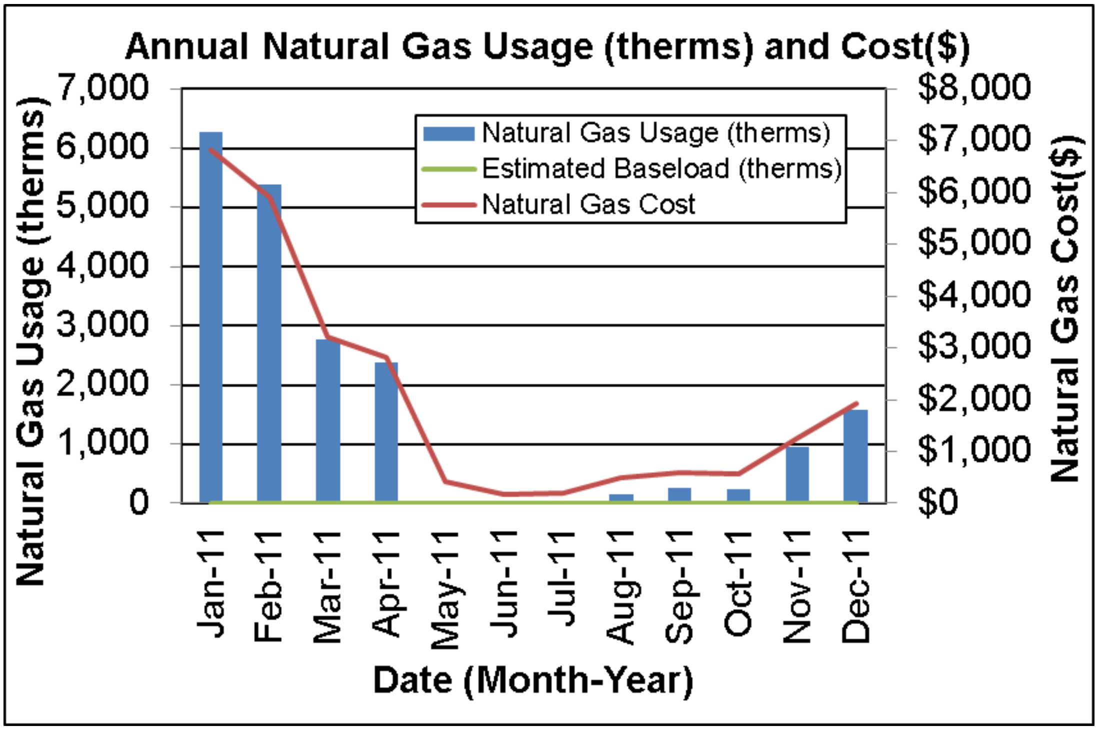
SWA reviewed utility bills from January 2010 through December 2011 that were received from the utility companies supplying Toms River Center with electricity and natural gas. A 12 month period of analysis from January 2011 through December 2011 was used for all calculations and for purposes of benchmarking the building.

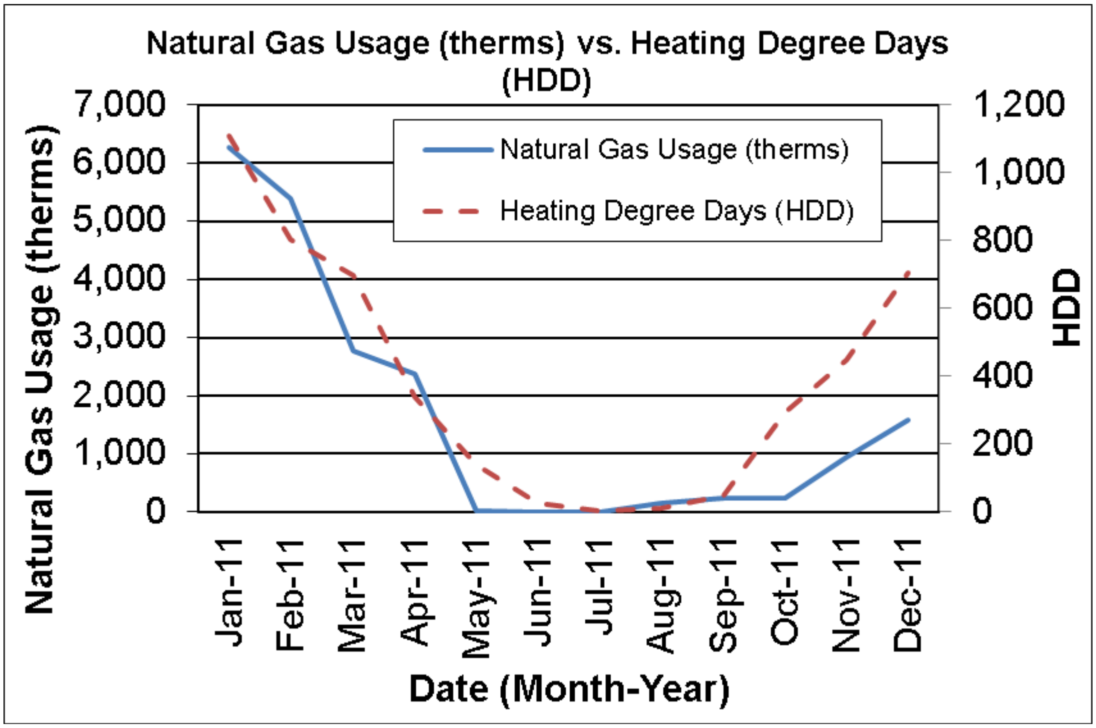
Electricity – Toms River Center is currently served by one electric meter. The school currently purchases electricity from Jersey Central Power & Light. Electricity was purchased at an average aggregated rate of $0.140/kWh and the school consumed 828,727 kWh, or $116,204 of electricity, in the previous year.

The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate Toms River Center school. The baseline usage for the school is approximately 59,067 kWh (average of the lowest 3 months of consumption). The usage peaks in March and April, while the building is using cooling and school is still in session. The usage trends are not typical for this type of building. Peak usage months may be due to estimated readings and low usage months may be due to bill corrections or billing credits. However, this cannot be verified with the data supplied to SWA; the actual bills are needed to perform a more in depth billing analysis.



Natural gas – Toms River Center School is currently served by one meter for natural gas and currently purchases natural gas from Jersey Central Power & Light, which is responsible for transmission and distribution and from Hess, which acts as a third party energy supplier. Natural gas was purchased at an average aggregated rate of $1.217/therm and the school consumed approximately 20,018 therms, or $24,366 of natural gas, in the previous year. The chart below shows the monthly natural gas usage and costs. The green line represents the approximate baseload or minimum natural gas usage required to operate the Toms River Center School during the heating season. The non-heating gas baseload for the school is approximately 127 therms (average of the lowest 3 months of consumption). As expected usage peaks in the winter months in conjunction with the operation of the gas fired hot water boilers. The monthly natural gas costs also peak in the winter months in correlation with the increased natural gas usage.

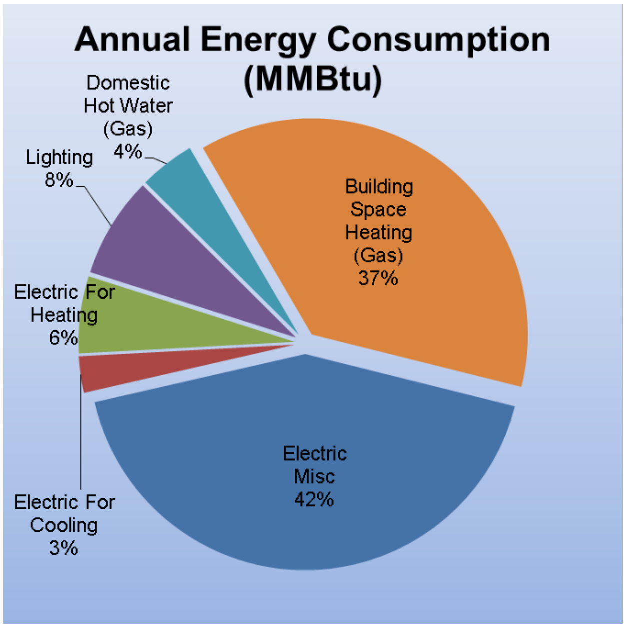


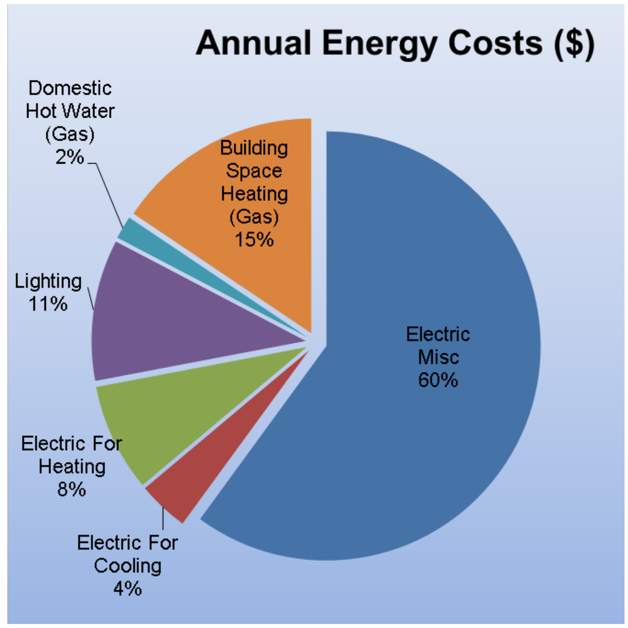


The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature of 65°F, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. As expected, the natural gas consumption profile follows the HDD curve.

The following graphs, pie charts, and table show energy use for Toms River Center School based on utility bills for the 12 month period. Note: electrical cost at $41/MMBtu of energy is almost 4 times as expensive as natural gas at $12/MMBtu.

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Misc	2,054	43%	$84,413	60%	41
Electric For Cooling	131	3%	$5,403	4%	41
Electric For Heating	278	6%	$11,422	8%	41
Lighting	364	8%	$14,966	11%	41
Domestic Hot Water (Gas)	200	4%	$2,438	2%	12
Building Space Heating (Gas)	1,802	37%	$21,929	16%	12
Totals	4,830	100%	$140,571	100%	
Total Electric Usage	2,828	59%	$116,204	83%	41
Total Gas Usage	2,002	41%	$24,366	17%	12
Totals	4,830	100%	$140,571	100%	

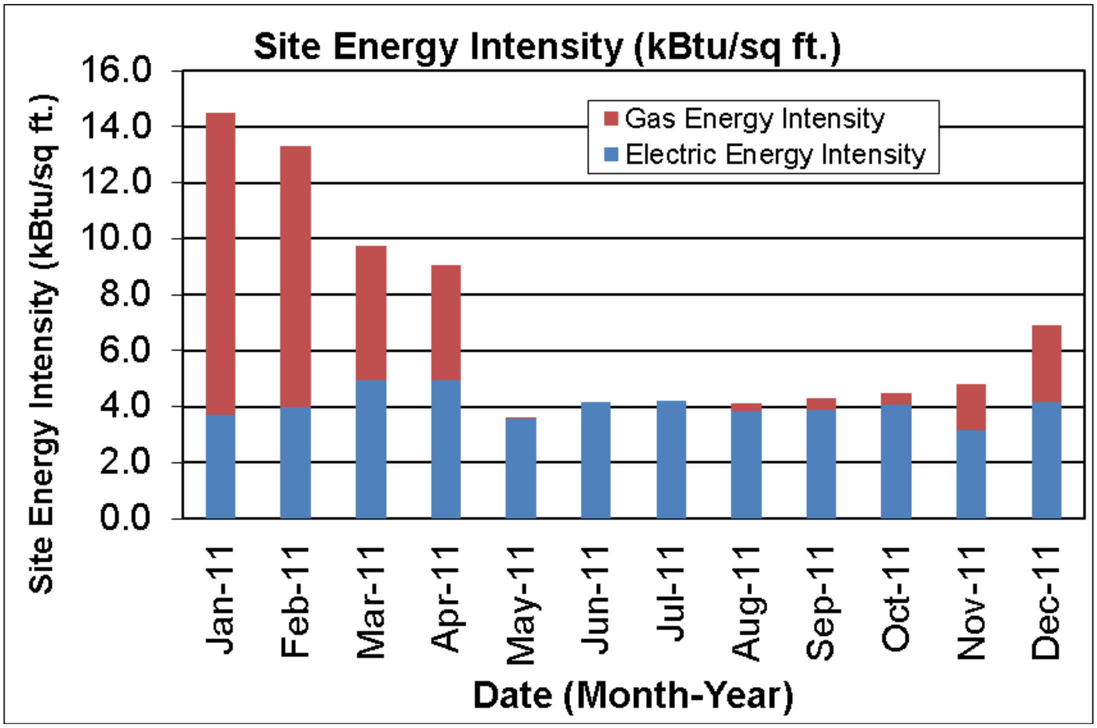




Energy Benchmarking

SWA has entered energy information about the Toms River Center in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager energy benchmarking system. This school facility is categorized as a "K-12 School" space type. Based on the data entered into the Portfolio Manager software, the building has an Energy Performance Rating of 11 out of a possible 100 points. For reference, a score of 69 is required for LEED for Existing Buildings certification and a score of 75 is required for ENERGY STAR® certification. The Site Energy Utilization Intensity (Site EUI) was calculated to be 83 kBtu/sqft/yr compared to the National Median of 55 kBtu/sqft/yr. This is a 50% difference between the buildings intensity and the national median. See the ECM section for guidance on how to further reduce the building's energy intensity.

The ENERGY STAR® Portfolio Manager uses a national survey conducted by the U.S. Energy Information Administration (EIA). This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years, and gathers data on building characteristics and energy use from thousands of buildings across the United States. The Portfolio Manager software uses this data to create a database by building type. By entering the building parameters and utility data into the software, Portfolio Manager is able to generate a performance scale from 1-100 by comparing it to similar types of buildings with similar characteristics. This 100 point scale determines how well the building performs relative to other buildings across the country, regardless of climate and other differentiating factors. A score of 11 shows the building performs 39% below the national average.



Per the LGEA program requirements, SWA has assisted the OCVTS Public School District to create an ENERGY STAR® Portfolio Manager account and share the Toms River Center Vocational & Technical School information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account information with the OCVTS Public School District (user name of “OceanCountyBOE” with a password of “ocvtsboe”) and TRC Energy Services (user name of “TRC-LGEA”).

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

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

Tariff analysis

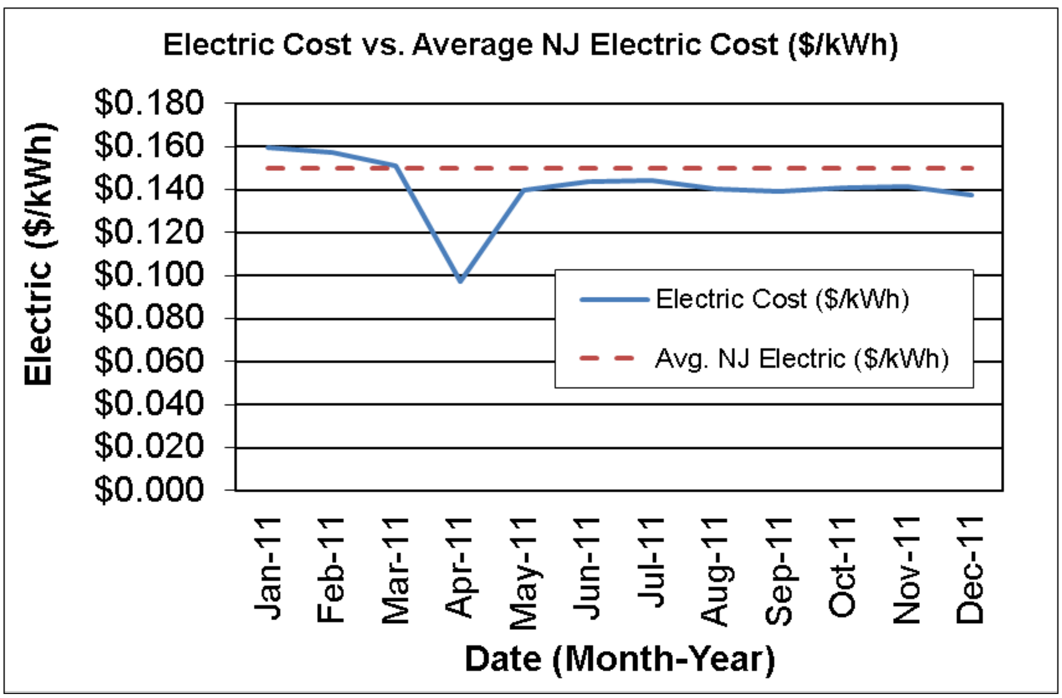
Tariff analysis can help determine if the municipality is paying the lowest rate possible for electric and gas service. Tariffs are typically assigned to buildings based on size and building type. Rate fluctuations are expected during periods of peak usage. Natural gas prices often increase during winter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

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

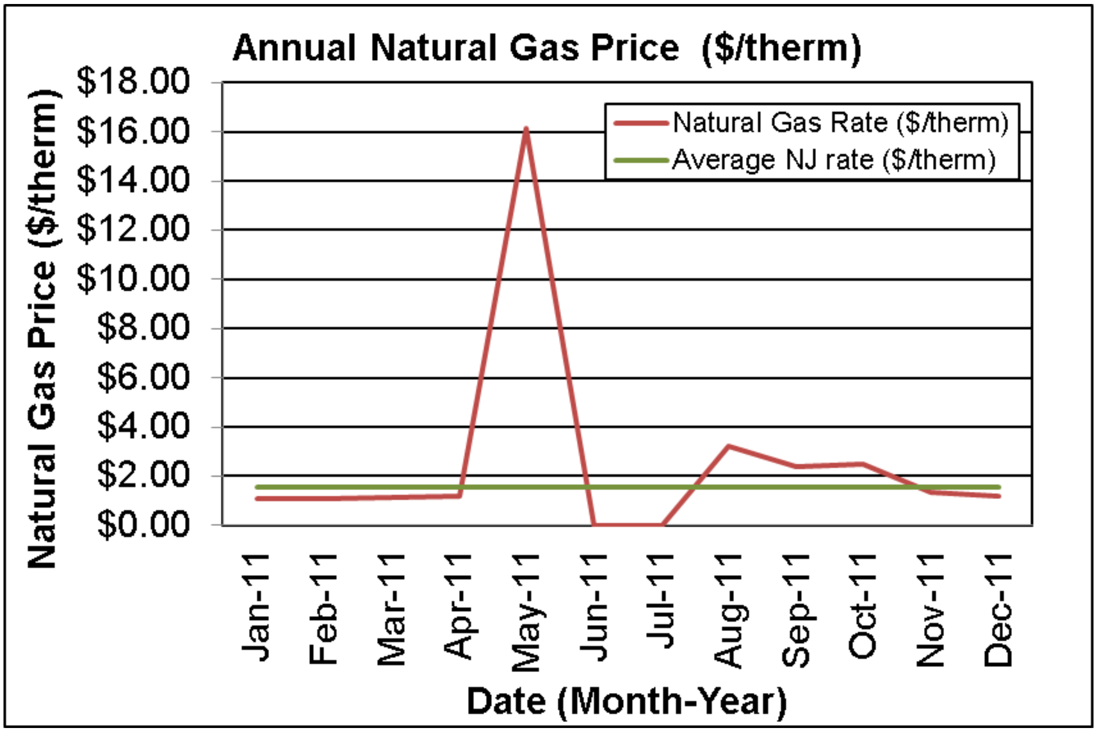
Energy Procurement strategies

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

The average estimated NJ commercial utility rates for electric are $0.150/kWh, while Toms River Center School pays a rate of $0.140/kWh. Toms River Center School annual electric utility costs are $8,105 lower, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 13% over the most recent 12 month period. Electric rate fluctuations in the winter and spring can be attributed to a combination of demand charges and market rate changes. The low cost of electricity for April may be due to a billing error, correction, or credit from the utility company, but this cannot be verified with the data provided to SWA. Actual bills from the utility company are needed to verify cost fluctuations.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while Toms River Center School pays a rate of $1.127/therm. Toms River Center School annual natural gas costs are $6,662 lower, when compared to the average estimated NJ commercial utility rates. Natural gas bill analysis shows fluctuations up to 93% over the most recent 12 month period. Utility rate fluctuations in the spring and summer months may have been caused by a combination of low usage and the assessment of fixed fees and costs. For example, May 2011 shows a large spike in the gas price rate because there is very low gas usage and a basic utility service charge that drives the price per therm upwards. For June and July there were zero therms used, so the cost per therm calculation could not be performed.



Preceding the expiration of existing third-party supplier contracts, SWA recommends that the Toms River Center explore opportunities of purchasing electricity and natural gas from alternate third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for Toms River Center School. Appendix H contains a complete list of third-party energy suppliers for OCVTS service area.

EXISTING FACILITY AND SYSTEMS DESCRIPTION

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

Based on visits from SWA on Tuesday April 3rd, Tuesday, April 10th, and Wednesday, April 18th, 2012, the following data was collected and analyzed.

Building Characteristics

The single-story slab on grade 58,000 square feet OCVTS Toms River Center was built in 1975. It is an L-shaped building that consists of vocational and technical trades' classrooms. The building is identified by three sections; the Southwest wing, the West wing and the East wing, or A-block, B-block and C-block, respectively. The A-block houses classes for computer science, medical skills, and various small offices. The B-block has slightly larger classrooms for computer repair, medical assistance, a fitness center, as well as administrative offices. Lastly, the C-block houses workshops for cosmetology, electrical trades, welding, marine trades and a storage room with mechanical equipment. The school does not have a cafeteria or a kitchen facility. The school received a major renovation in 1992 which consisted of replacing the roof, windows, doors, and roof top units. In 2008, the weld shop was retrofitted. In 2010, lighting in the hallways and administrative offices were upgraded with T5 fluorescent fixtures and occupancy sensors.

North Façade

South Façade

North Façade

Partial East Façade

Building Occupancy Profiles

The school's occupancy is approximately 400 students and 30 faculty members and operates from 6:00 AM to 10:00 PM Monday through Friday. Schooldays are broken into two sessions; a morning session and an evening session. The evening session only occurs 4 times per week. The school is closed on Saturdays and Sundays and for the months of July, and August.

Building Envelope

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

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

Exterior Walls

The exterior wall envelope is mostly constructed of brick veneer over concrete block with unconfirmed level of insulation. The interior is predominantly painted CMU (Concrete Masonry Units), vinyl wall panels, and painted gypsum board. Other areas such as the storage/mechanical room has unfinished CMU interior walls.

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

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

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


Unsealed wall opening (L) and efflorescence on brick and masonry walls indicate moisture presence within the wall cavity (R)

Roof

The Toms River Center roof is predominantly a flat and parapet type over steel roof decking, with a light-colored asphalt finish covered by aggregate BUR (loose light-colored gravel stones). Additionally, the roof is built with at least 2 ½" of polyisocyanurate (rigid board) insulation. The roof was part of the 1992 renovation and has not been replaced since.

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

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

The following specific roof problem spots were identified:

Foliage build-up on roof drain

Base

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

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

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

Windows

The building contains several different types of windows:

1. Combined fixed and awning type windows with a non-insulated aluminum frame, single glazing and interior mini blinds. The windows are located throughout the building in the classrooms and offices.

2. Fixed type windows with a non-insulated frame, single glazing and with interior mini blinds. The windows are located around the main entrance and some of the classrooms.

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

Exterior doors

The buildings contain several different types of exterior doors:

1. Aluminum type exterior doors with single-pane glass panels and a non-insulated frame. They are located at the main entrance.

2. Fiberglass reinforced polyester type doors with 1” insulated tempered glass. They are located at the emergency exits in shop rooms.

3. Metal doors with an insulated frame. They are located at the hallway exit doors.

4. Aluminum non-insulated garage doors. They are located in a few of the shop rooms.

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

The following specific door problem spots were identified:

Metal doors with a non-insulated door frame (L) and garage door type (R)

Building air-tightness

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

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

Mechanical Systems

Heating Ventilation Air Conditioning

All spaces in Toms River Center are mechanically ventilated, heated and cooled. The school contains packaged rooftop units, unit ventilators, and unit heaters to provide heating. Ventilation is provided to the building via the rooftop units and unit ventilators. Some rooftop units contain direct-expansion cooling coils for cooling various spaces.

Equipment

Heating and ventilation – The southwest wing, or A-block, of the school is heated and cooled via 6 packaged rooftop units (RTUs) manufactured by Trane. The units provide gas-fired heating and ventilation to this section. Cooling and heating capacities are 37 MBH and 150 MBH, respectively. Each RTU is controlled by one wall mounted thermostat; however, some of the RTUs serve more than one room.

The west wing or B-block section also uses RTUs for heating and ventilation. The 14 gas-fired RTUs provide heating to a faculty lunch room, health fitness room, medical assisting room, dental, conference room, and several other spaces. Each unit is also equipped with direct expansion (DX) cooling coils. Heating capacities range from 80 to 150 MBH. Cooling capacities range from 35 to 117 MBH. RTU-1 and RTU-4 are not gas-fired, but rather use variable air volume (VAV) boxes with hot water coils, for hot water reheat. Each VAV box provides heating to various administrative offices, and is controlled by wall-mounted thermostats. Fan speed is controlled via static pressure sensors located in the duct work. Hot water is provided by one atmospheric, gas-fired Slant/Fin boiler with a capacity of 180 MBH. Hot water is delivered to the VAV boxes at 160°F. Hot water is circulated through the building via one constant volume hot water loop. Hot water is circulated through the loop by a 1/6 HP Bell & Gossett pump. Some rooms contain a ceiling mounted electric cabinet heater; however they are no longer used.

Gas-fired RTUs are used to provide heating and ventilation for the C-block workshops; varying in size from 100 MBH to 600 MBH. Some RTUs were replaced in 2001 and 2008. Space temperatures are controlled by wall mounted thermostats. Unit ventilators located in the workshop offices provide supplemental electric heat and additional ventilation.

Typical Trane rooftop units

Unit ventilators in the C-block section contain a refrigerant loop served by roof-mounted condensing units, while packaged rooftop units contain both an evaporator and a DX coil. Exhaust air is removed from the building by small rooftop exhaust fans located directly above bathrooms. Return air is ducted back to some RTUS to mix with conditioned outside air. Several condensing units have been replaced in the late 2000s, while others are original from 1992.

Typical condensing unit for unit ventilators (L) and condensing unit for server equipment (R)

Controls

Building equipment including the rooftop units and exhaust fans are controlled centrally via the Trane Tracer Summit building automation system (BAS). The BAS is connected to several Trane building control units, which communicate with the roof top units. The BAS controls system setpoints, operation schedules and sequence of operations.

Trane Tracer Summit (L) and Building Control Unit (R)

Domestic Hot Water

Toms River Center provides domestic hot water (DHW) to bathrooms throughout the building via a central DHW heater located in the storage/mechanical room. The DHW system consists of a 165 MBH Raypak hot water heater and a 180 gallon A.O. Smith storage tank. Pipe insulation was lacking at the time of the site visit.

DHW storage tank (L), domestic hot water heater (C) and heating hot water boiler (R)

Electrical systems

Lighting

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

Interior Lighting - The primary interior lighting at the Toms River Center is electronically ballasted T8 lamped fixtures, which are located throughout most of the classrooms. The hallways and administration offices currently have T5 lamps with occupancy sensors. The classrooms have ceiling mounted, recessed parabolic, or ceiling suspended linear T8 fixtures. Metal halide wall pack fixtures are used to light up the atrium. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas.

Typical classroom T8 lighting (L); and T5 hallway lighting (R)

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

Typical LED exit signs (L/R)

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

Typical metal halide wallpack fixtures (L) and typical recessed CFL (R)

Appliances and process

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

Installed at the Toms River Center are several refrigerators for food and beverages. The school also has several beverage and snack vending machines, as well as commercial grade refrigerators and freezers located in the occupational services classroom.

Typical refrigerators

Typical snack and beverage vending machines

Commercial grade refrigerators

Elevators

Toms River Center is only has one story and therefore does not contain an elevator.

Other electrical systems

There are not currently any other significant energy-impacting electrical systems installed at Toms River Center other than a 100 kW natural gas Onan GenSet Emergency Generator located in the storage/mechanical room. This Onan emergency generator is operated once per week as a functional test for one hour.


100 kW natural gas generator

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

Renewable energy is defined as any power source generated from sources which are naturally replenished, such as sunlight, wind and geothermal. Technology for renewable energy is improving and the cost of installation is decreasing due to both demand and the availability of government-sponsored funding. Renewable energy reduces the need for using either electricity or fossil fuel, therefore lowering costs by reducing the amount of energy purchased from the utility company. Solar photovoltaic panels and wind turbines use natural resources to generate electricity. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Cogeneration or Combined Heat and Power (CHP) allows for heat recovery during electricity generation.

Existing systems

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

Evaluated Systems

Solar Photovoltaic

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

Based on utility analysis and a study of roof conditions, the OCVTS Toms River Center facility is a good candidate for a 128 kW Solar Panel installation. See ECM #4.

Solar Thermal Collectors

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

Wind

Toms River Center School is not a good candidate for wind power generation due to insufficient wind conditions in this area of New Jersey.

Geothermal

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

Combined Heat and Power

Toms River Center School is not a good candidate for CHP installation and would not be cost-effective due to the size and operations of the building. Typically, CHP is best suited for buildings with a constant electrical baseload to accommodate the electricity generated, as well as a means for using waste heat generated. Additionally, the seasonal occupancy schedule of the Elementary School is not well suited for a CHP installation.

PROPOSED ENERGY CONSERVATION MEASURES

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

Recommendations: Energy Conservation Measures

#	Energy Conservation Measures
ECM 1	**Retro-commissioning**
ECM 2	**Retrofit 2 refrigerated vending machines with VendingMiser™ Devices**
ECM 3	**Add insulation to uninsulated hot water pipes**
ECM 4	**Install 40 occupancy sensors**
ECM 5	**Retrofit 2 snack vending machines with SnackMiser™ Devices**
ECM 6	**Install a 128 kW solar photovoltaic system**
ECM 7	**Replace metal halide fixtures with pulse start metal halides**
ECM 8	**Replace existing boilers with higher efficiency boilers of the same capacity**

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

ECM #1: Retro-commissioning

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

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

The goals of RCx include:

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

Project cost:

Estimated installed cost: $11,600
Source of cost estimate: Similar projects

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$11,600	24,430	1	1,802	4.5	$0	$23,200	3	$69,600	0.5	500%	167%	192%	$52,105	63,600

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

Rebates/financial incentives:

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

Please see APPENDIX K for more information on Incentive Programs.

ECM #2: Retrofit 2 refrigerated vending machines with VendingMiser™ Devices

The school currently has two beverage machines which are located in the hallways and in the multi-purpose room. VendingMiser devices are available for conserving energy used by beverage vending machines and coolers. Purchasing new machines is not necessary to reduce operating costs and greenhouse gas emissions. When equipped with the VendingMiser devices, refrigerated beverage vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines. VendingMiser devices incorporate innovative energy-saving technology into small plug-and-play devices that installs in minutes, either on the wall or on the vending machine. Vending miser devices use a Passive Infrared Sensor (PIR) to: Power down the machine when the surrounding area is vacant; Monitor the room's temperature; Automatically repower the cooling system at one- to three-hour intervals, independent of sales; ensure the product stays cold. The school should request permission to install the devices if the machines are leased.

Installation cost:

Estimated installed cost: $398 (includes $40 of labor)
Source of cost estimate: www.usatech.com and established costs

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$398	3,051	0	0	0.2	$0	$428	12	$5,134	0.9	1,190%	99%	107%	$3,692	5,463

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

Rebates/financial incentives:

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

Please see APPENDIX K for more information on Incentive Programs.

ECM #3: Add pipe insulation to uninsulated hot water pipes

At the site visit, SWA found uninsulated piping coming in and out of the hot water boilers and storage tank. The uninsulated piping can pose a safety issue, as maintenance staff may get burnt from the high temperatures emitted by the pipe. Additionally, the lack of insulation enables heat loss into the surrounding space, thus reducing the temperature of the water that reaches hot water coils or the faucets. Insulating the pipes can result in a 4°F increase at the coils or faucets. The aquastat setpoints can then be decreased by 4°F, thus reducing natural gas consumption. SWA recommends installing pipe insulation to reduce energy loss and to protect staff from the hot surface.

Installation cost:

Estimated installed cost: $388
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$338	0	0	124	0.2	$0	$170	15	$2,550	2.0	654	44	50	$1,611	1,369

Assumptions: SWA calculated the savings with the following assumptions:

- 2 inch copy pipe diameter
- 68° delta-T between the ambient air and the domestic hot water temperature
- 40 feet of uninsulated pipe
- 3,200 hours of annual boiler operation
- Boiler efficiency of 80%

Rebates/financial incentives:

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

Please see APPENDIX K for more information on Incentive Programs.

ECM #4: Install 40 new occupancy sensors

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

Installation cost:

Estimated installed cost: $8,000 (includes $2,400 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$8,000	16,869	4	0	1.0	$0	$2,362	15	$35,430	3.4	343%	23%	29%	$19,180	30,204

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

Rebates/financial incentives:

- NJ Clean Energy – SmartStart – Wall-mounted Occupancy Sensors ($20 per control)
    - Maximum Incentive Amount: $800
- NJ Clean Energy – Direct Install (Up to 70% of installed costs)

Please see APPENDIX K for more information on Incentive Programs.

ECM #5: Retrofit 2 snack vending machines with SnackMiser™ Devices

SnackMiser devices are now available for conserving energy used by vending machines. Purchasing newer equipment is not necessary to reduce operating costs and greenhouse gas emissions. When equipped with the snack miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines. SnackMiser devices can be used on snack vending machines to achieve maximum energy savings that result in reduced operating costs and decreased greenhouse gas emissions with existing machines. Snack vending miser devices also use a Passive Infrared Sensor (PIR) to determine if there is anyone within 25 feet of the machine. It waits for 15 minutes of vacancy, then powers down the machine. If a customer approaches the machine while powered down, the snacks vending miser will sense the presence and immediately power up. The school should request permission to install the devices if the machines are leased.

Installation cost:

Estimated installed cost: $360 (includes $40 of labor)
Source of cost estimate: www.usatech.com and established costs

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$360	732	0	0	0.0	$0	$103	12	$1,232	3.5	242%	20%	27%	$629	1,311

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

Rebates/financial incentives:

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

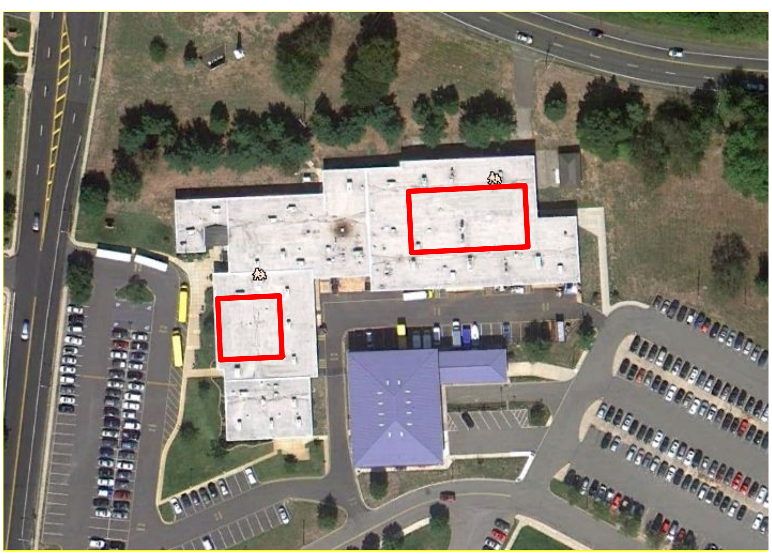
Please see APPENDIX K for more information on Incentive Programs.

ECM #6: Install 128 kW Solar Photovoltaic system

Currently, Toms River Center School does not use any renewable energy systems. Renewable energy systems such as photovoltaic (PV) panels can be mounted on the building roof facing south which 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, electric demand at a power station is high, due to the amount of air conditioners, lights, and other equipment being used within the region. Demand charges increase to offset the utility's infrastructure cost to provide enough electricity at that given time. Photovoltaic systems offset the amount of electricity used by a building and help to reduce the building's electric demand, resulting in a higher cost savings. Installing a PV system will offset electric demand and reduce annual electric consumption, while utilizing available state incentives. PV systems are modular and readily allow for future expansions.

The size of the system was determined considering the available roof surface area, without compromising service space for roof equipment and safety, as well as the facilities' annual base load and mode of operation. A commercial multi-crystalline panel has 17.1 square feet of surface area (providing 13.5 watts per square foot). A 128 kW system needs approximately 615 panels which would take up 10,525 square feet. Additionally, PV system installations should be accompanied by an evaluation of the roof's structural stability and current roof condition. The roof is nearing the end of its lifespan, it should be replaced prior to the installation of the PV system (see roof replacement under the Capital Improvement section).

A PV system would reduce the building's electric load and allow more capacity for surrounding buildings as well as serve as an example of energy efficiency for the community. The building is not eligible for a residential 30% federal tax credit. The building owner may want to 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. Utility companies in New Jersey buy Solar Renewable Energy Credits (SRECs) at the best market rate. In addition to selling electricity generated by the solar PV system, SRECs are earned every time that 1 MWh or 1,000 kWh are generated from the renewable system. SRECs sales value in NJ have dropped from $670 (November 2011) to $145 (March 2012) which results in a longer payback for the system.



The red rectangles above represent potential space for a PV system installation.

Installation cost:
Estimated installed cost: $639,600
Source of cost estimate: RS Means; Published and established costs; Similar projects

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$639,600	171,342	128	0	10.1	-$1,494	$149,939	25	$3,748,470	4.3	486	19	22	$1,209,676	306,788

Annual Solar PV Cost Savings Breakdown				
Rated Capacity (kW)	128			
Rated Capacity (kWh)	150,946			
Annual Capacity Loss	0%			
Year	kWh Capacity	Installation/Maintenance Cost	SRECs	Savings ($)
0		-$639,600	$0	
1	171,342		$24,845	$47,339
2	171,342		$24,845	$47,339
3	171,342		$24,845	$47,339
4	171,342		$24,845	$47,339
5	171,342		$24,845	$47,339
6	171,342		$24,845	$47,339
7	171,342		$24,845	$47,339
8	171,342		$24,845	$47,339
9	171,342		$24,845	$47,339
10	171,342		$24,845	$47,339
11	171,342		$24,845	$47,339
12	171,342		$24,845	$47,339
13	171,342		$24,845	$47,339
14	171,342		$24,845	$47,339
15	171,342		$24,845	$47,339
16	171,342		$0	$23,488
17	171,342		$0	$23,488
18	171,342		$0	$23,488
19	171,342		$0	$23,488
20	171,342		$0	$23,488
21	171,342		$0	$23,488
22	171,342		$0	$23,488

23	171,342		$0	$23,488
24	171,342		$0	$23,488
25	171,342		$0	$23,488
	kWh	Cost	Saving	
Lifetime Total	**4,283,559**	**$639,600**	**$372,670**	**$944,961**

Table of 12 SREC Values								
EY2012 SACP=$658			**SREC Quantity**		**Monthly**		**Cumulative**	
Month	**Year**	**Active kW DC**	**Issued in Month**	**Traded in Month**	**High ($/MWh)**	**Low ($/MWh)**	**# of SRECs Traded**	**Weighted Avg Price ($/MWh)**
Sept	2012							
Aug	2012							
Jul	2012							
Jun	2012							
May	2012							
Apr	2012							
Mar	2012	668,643	60,685	50,701	$635	$100	309,381	$342.56
Feb	2012	629,664	43,636	37,581	$650	$112	258,680	$361.67
Jan	2012	521,987	42,745	50,186	$669	$115	221,099	$373.75
Dec	2011	488,357	40,592	52,716	$658	$115	170,913	$369.46
Nov	2011	443,654	36,897	52,024	$650	$100	118,197	$353.21
Oct	2011	425,798	34,467	34,724	$658	$120	66,173	$403.07
Sept	2011	413,889	45,941	18,412	$675	$50	31,449	$401.90
Aug	2011	395,919	48,535	12,252	$665	$100	13,037	$410.48
July	2011	362,871	37,738	785	Due to low trade volume, the July trades are reported with the cumulative pricing data starting in August.			
	Total		**391,236**	**309,381**				

*The cumulative weighted average price takes into account all of the SRECs that have been traded for all of the months reported. This number can be used to reflect pricing trends. It is calculated based on [(number of SRECs sold at Price A * price A)+(number of SRECs sold at Price B * price B)+...] www.njcleanenergy.com/renewable-energy/project-activity-reports/srec-pricing/srec-pricing

Assumptions: SWA estimated the cost and savings of the system based on past PV projects. Installed costs were estimated at $5/Watt installed. SRECs are currently evaluated at $145/MWh based on the lowest SREC value in the past 12 months. SWA projected physical dimensions based on a typical Polycrystalline solar panel. PV systems are sized based on 127.9 kW and physical dimensions and efficiencies for an array will differ depending of the specific solar panel selection (W/sq ft.).

Rebates/financial incentives:

- NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1,000kWh (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 $24,844 /year, based on $145/SREC, has been incorporated in the above costs for a period of 15 years; however it requires proof of performance, application approval and negotiations with the utility.

Please see APPENDIX K for more information on Incentive Programs.

ECM #7: Replace metal halide fixtures with pulse start metal halides

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

Installation cost:

Estimated installed cost: $9,800 (includes $2,100 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$9,800	1,935	0	0	0.1	$0	$271	15	$4,065	36.2	-59%	-4%	-9%	-$6,406	3,465

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

Rebates/financial incentives:

- NJ Clean Energy – Direct Install program (Up to 70% of installed costs)
- NJ Clean Energy – SmartStart – Metal Halide with Pulse Start ($25 per fixture) – Maximum incentive amount is $350

Please see APPENDIX K for more information on Incentive Programs.

ECM #8: Replace 2 existing boilers with higher efficiency boilers of the same capacity

During the field audit, SWA inspected the (2) existing boilers on site. The boilers are both nearing the end of its estimated service life. SWA recommends the replacement of existing and inefficient boilers with higher efficiency models. Newer boilers are capable of transferring heat at a higher efficiency, which allows for heat energy savings. The boilers should be sized to match the current heating systems in place.

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$16,741	0	0	609	0.4	$456	$1,197	25	$29,930	14.0	79	3	5	$3,536	6,712

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

Rebates/financial incentives:

- NJ Clean Energy – SmartStart – Wall-mounted Occupancy Sensors ($1.75 per MBH)
- NJ Clean Energy – Direct Install (Up to 70% of installed costs)

Please see APPENDIX K for more information on Incentive Programs.

Proposed Further Recommendations

Capital Improvements

Capital Improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. Capital improvements may also constitute equipment that is currently being operated beyond its useful lifetime. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available. SWA recommends the following capital improvements for the OCVTS Toms River Center.

- The Toms River Center roof is made up of a 4-ply asphalt finish. The roof has reached the end of its useful life, as it was last replaced in 1992. Based on similar roof types, this roof surface is beyond the manufacturer's warranty and is recommended to be replaced. SWA recommends upgrading the existing roof with a high solar reflectance and increased insulation. Replacing the roof will result in some energy savings; however, due to the high capital cost, this measure will not be justified based on energy savings alone. The roof should be replaced prior to installing a PV system. SWA estimates the roof replacement to cost $309,633 based on the total footprint of the building. Accurate energy savings calculations would require the use of advanced building modeling software, which is outside the scope of this project.

- Replace End-of-Life RTUs and Condensing Units. During the audit, a complete mechanical inventory was completed and all equipment was evaluated for replacement. In total, there were 36 pieces of equipment that were found to be operating beyond their useful lifetime and are recommended for replacement as they fail. Equipment to be replaced consists of equipment located on the roof that was installed as part of the renovation in 1992. SWA recommends that this equipment is replaced with appropriately sized replacements and with the highest efficiency achievable. In addition to a better performing unit, new units will also utilize R-410A refrigerant that has a smaller negative impact on the environment compared to R-22 that is no longer being manufactured and has been phased out as of January 1, 2010. Due to the high replacement costs, the increased efficiency will not provide an attractive payback. Accurate saving calculations would require the use of advanced building modeling software, which is outside the scope of this project. Implementation costs and units to be replaced are presented below:

Replacement Component	Installed Cost
Replacement of 16 constant volume RTUs	$261,354
Replacement of 2 variable volume RTUs	$38,376
Replacement of 6 unit ventilators	$41,835
Replacement of 6 heating and ventilation units	$149,470
Replacement of 6 condensing units	$22,133
Total Replacement Costs	**$513,168**

Operations and Maintenance

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

- Replace motors with NEMA premium efficiency models – SWA observed several motors that may not be NEMA premium efficiency models. Such pumps are located in the storage/ mechanical room, and are used for hot water distribution. The exact size and efficiencies could not be determined at the time of the visit, however; SWA recommends replacing them with high efficiency models as part of routine O&M the next time that they fail.

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

- Inspect and replace cracked/ineffective caulk.

- Inspect and maintain sealants at all windows for airtight performance.

- Inspect and maintain weather-stripping around all exterior doors and roof hatches.

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

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

- Create an energy educational program - that teaches students and staff how to minimize energy use. An educational program may be incorporated into school curricula to increase students' environmental awareness. The U.S. Department of Energy offers free information for hosting energy efficiency educational programs and plans. For more information please visit: http://www1.eere.energy.gov/education/.

APPENDIX A: EQUIPMENT LIST

TAG	Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
UH-1	Heating	Trane Gas Unit Heater, Normal Input 100,000 BTU/HR., Thermal Efficiency 80%, Power consumption 90 watts CFM - 1480, Fan Type Prop, Temp Rise - 48, HP - 1/2, V/PH/Amp - 115/1/1.3, Flue diam- 6 inch,	Storage/Mechanical/Electrical Room	Trane, Model #GPND010AD410000E, Serial #A92J07508	Natural Gas	Storage/ Mechanical/Electrical Room	1992	0%
HV-1, 5	Heating & Ventilation	Rooftop Gas Heating & Ventilation Unit, MBH in - 150, MBH out- 115.5, CFM- 1800, Min OA CFM - 300, Temp Rise - 58, HP-3/4, V/Ph/Amp- 460/3/1.4	C-block Roof	GRNC015EEC19B10	Natural Gas	LPN Classroom, LPN Lab	1992	0%
HV-2	Heating & Ventilation	Rooftop Gas Heating & Ventilation Unit, MBH in - 250, MBH out- 192.5, CFM- 3000, Min OA CFM - 300, Temp Rise - 58, HP- 1, V/Ph/Amp- 460/3/1.8	C-block Roof	GRNC025EEC19B10	Natural Gas	Electrical Trades	1992	0%
HV-3	Heating & Ventilation	Rooftop Gas Heating & Ventilation Unit,Input capacity, Output capacity 480,000, Airflow 3,700-6,500 CFM, 5 HP	C-block Roof	Trane, Model #GRAA60PFBF0N2CG105U0CELQRV2	Natural Gas	Welding Shop	2008	73%
HV-4	Heating & Ventilation	Rooftop Gas Heating & Ventilation Unit, MBH in - 600, MBH out- 462.0, CFM- 4620 Min OA CFM - 4620 Temp Rise - 92, HP- 3, V/Ph/Amp- 460/3/4.5	C-block Roof	GRN060EJC29F10	Natural Gas	Marine Trades + Intro to Transportation Technologies	1992	0%
HV-6	Heating & Ventilation	Rooftop Gas Heating & Ventilation Unit, MBH in - 100, MBH out- 77.0, CFM- 1200 Min OA CFM - 300 Temp Rise - 58, HP- 1/2, V/Ph/Amp- 460/3/1.0	C-block Roof	GRNC010EEC19A10	Natural Gas	Retail Store Opportunities	1992	0%
UV	Unit Ventilator	Unit Ventilator- CFM supply- 750, CFM O.A- 250, Volts - 277, Cycles- 60, Ph. 1, Total MBH- 27.5, Sens. MBH- 17.5, Supp. Heat Coil- kW- 11.7, Rise T- 48, Volts - 480, Ph- 3, Stage - 6.	In-room	Trane, Model # TUVA07VF6AS11SN8G21	Electric	C-block classrooms	1992	0%
UV-1	Cooling for Unit Ventilators	Trane Split-DX Condensing Unit, 3-Phase, R-22, 1 Compressor, 1/5 HP	C-block Roof	Trane XE1000, Model #TWR030C100A0, Serial #G30257979	Electric	LPN Classroom	1992	0%
UV-2	Cooling for Unit Ventilators	Trane Split-DX Condensing Unit, 3-Phase, R-22, 1 Compressor, 1/5 HP	C-block Roof	Trane XE1000, Model #TWR030C100A0, Serial #G30257991	Electric	Electrical Trades Classroom	1992	0%
UV-3	Cooling for Unit Ventilators	Trane Split-DX Condensing Unit, 3-Phase, R-22, 1 Compressor, 1/5 HP	C-block Roof	Trane XE1000, Model #TWR030C100A0, Serial #G30257981	Electric	Welding Shop Classroom	1992	0%
UV-4	Cooling for Unit Ventilators	Trane Split-DX Condensing Unit, 3-Phase, R-22, 1 Compressor, 1/5 HP	C-block Roof	Trane XE1000, Model #TWR030C100A0, Serial #G30257970	Electric	Marine Trades Classroom	1992	0%

UV-5	Cooling for Unit Ventilators	Trane Split-DX Condensing Unit, 3-Phase, R-22, 1 Compressor, 1/5 HP	C-block Roof	Trane XE1000, Model #TWR030C100A0, Serial #G30257962	Electric	LPN Lab Classroom	1992	0%
UV-6	Cooling for Unit Ventilators	Trane Split-DX Condensing Unit, 3-Phase, R-22, 1 Compressor, 1/8 HP	C-block Roof	Trane XE1000, Model #TWR030C100A0, Serial #G30257995	Electric	Retail Store Opportunities Classroom	1992	0%
UV-7	Cooling for Unit Ventilators	Trane Split-DX Condensing Unit, 3-Phase, R-22, 1 Compressor, 1/5 HP	C-block Roof	Trane, Model #2TTA3060A4000AA, Serial #81820XT4F	Electric	Welding Classroom	2008	73%
GV-1	Ventilation	Gravity Ventilator	Boiler Room Vent.	GRS-18	Electric	Storage/ Mechanical/Electrical Room	1992	0%
CH-1	Heating/ Cooling	Cabinet Unit Heater- MBTU- 28.6, GPM- 3, EWT- 180, LWT- 160, CFM- 300, Volt/Amp- 120/2.	Lobby Entrance	Trane - E46A003	Electric	Lobby Entrance	1992	0%
CH-2	Heating/ Cooling	Cabinet Unit Heater- MBTU- 10, GPM- 1, EWT- 180, LWT- 160, CFM- 200, Volt/Amp- 120/3.	Faculty Room	Trane - C34A002	Electric	Faculty Room	1992	0%
HV AC-1	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 60, Sens. Cooling MBH- 45. **Indoor Fan** CFM- 1960, Ext. S.P - 0.8, HP 3/4 Volt- 460, FLA - 3.1, **Compressor** No- 1, Volt- 460, FLA- 11,	Roof	TCD060A400	Electric	Administrative Offices	1992	0%
HV AC-2	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 37, Sens. Cooling MBH- 28. **Indoor Fan** CFM- 1200, Ext. S.P - 0.4, HP 1/3 Volt- 460, FLA - 1.5, **Compressor** No- 1, Volt- 460, FLA- 11, **Heat Coil** MBH input- 80, AFUE - 80	Roof	YCD036A4LDAA	Electric	Lunch Room	1992	0%
HV AC-3	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 37, Sens. Cooling MBH- 28. **Indoor Fan** CFM- 1200, Ext. S.P - 0.4, HP 1/3 Volt- 460, FLA - 1.5, **Compressor** No- 1, Volt- 460, FLA- 11, **Heat Coil** MBH input- 80, AFUE - 80	Roof	YCD036A4LDAA	Electric	Main Office	1992	0%
HV AC-4	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 46, Sens. Cooling MBH- 39. **Indoor Fan** CFM- 1510, Ext. S.P - 0.9, HP 3/4 Volt- 460, FLA - 3.1, **Compressor** No- 1, Volt- 460, FLA- 8,	Roof	Trane, Model #TCD048C400AA, Serial #G261421640	Electric	Faculty Room	1992	0%
HV AC-5	Heating/ Cooling	Rooftop Unit- Capacity 120,000 BTU/HR., 1 compressor, R-22	Roof	Trane, Model #YCD075C4L0BE, Serial #N20100527D	Electric	Conference Room	1998	7%
HV AC-6	Heating/ Cooling	Rooftop Unit- Capacity 80,000 BTU/HR., 1 compressor, R-22	Roof	Trane, Model #YCD036C4L0BE, Serial #N25100579D	Electric	Medical Assisting	1998	7%
HV AC-7	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 46, Sens. Cooling MBH- 38. **Indoor Fan** CFM- 1600, Ext. S.P - 0.6, HP 1/2 Volt- 460, FLA - 2.1, **Compressor** No- 1, Volt- 460, FLA- 8, **Heat Coil** MBH input- 90, AFUE - 80	Roof	YCD048A4LDAA	Electric	Computer Lab	1992	0%

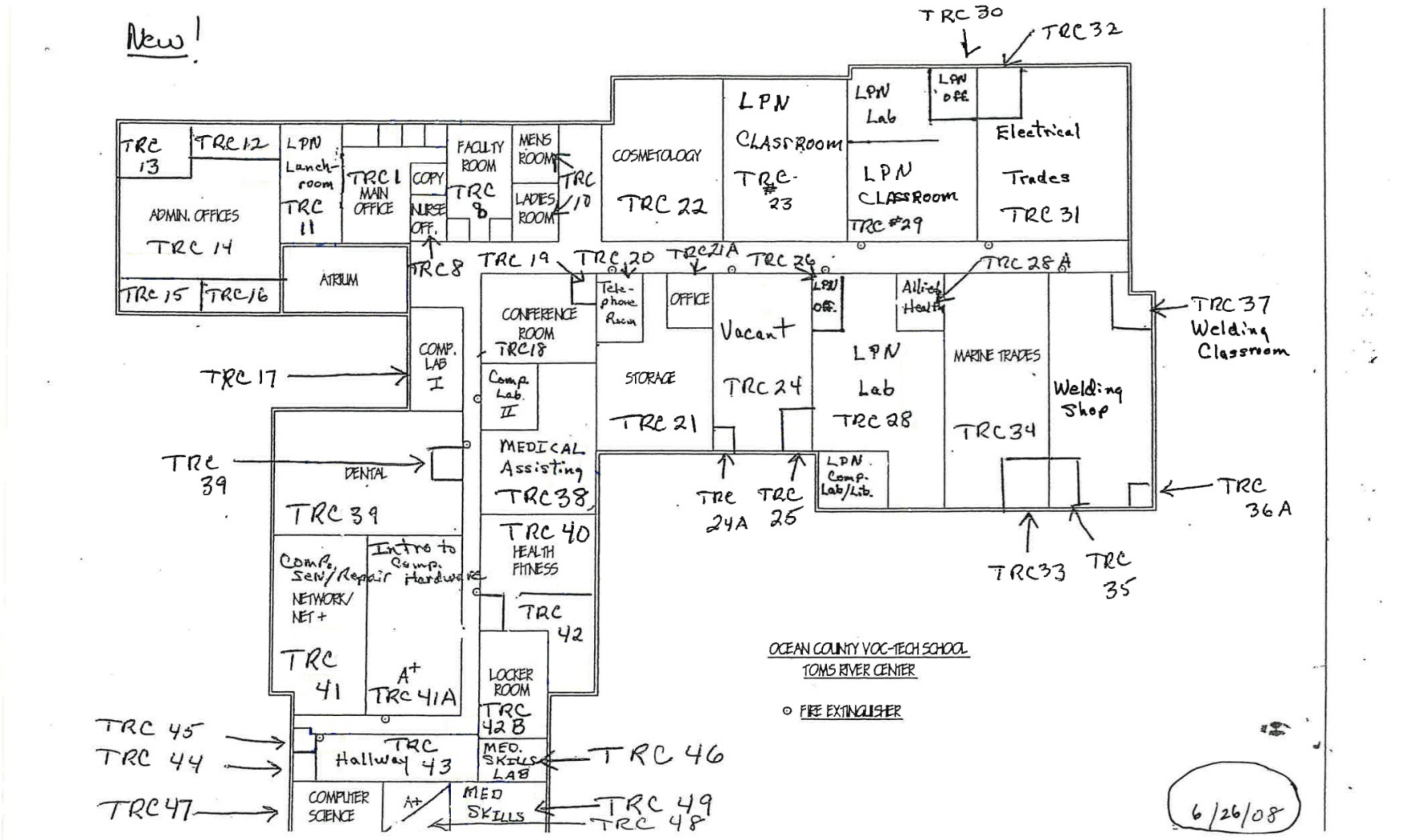
HV AC-8	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 72, Sens. Cooling MBH- 54. **Indoor Fan** CFM- 2500, Ext. S.P - 0.5, HP 1 Volt- 460, Ph- 3 FLA - 3.2, **Compressor** No- 1, Volt- 460, FLA- 13, **Heat Coil** MBH input- 120, AFUE - 78	Roof	YCD075A4LBDAA	Electric	Dental	1992	0%
HV AC-9	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 60, Sens. Cooling MBH- 45. **Indoor Fan** CFM- 2000, Ext. S.P - 0.5, HP 0.6 Volt- 460, FLA - 2.5, **Compressor** No- 1, Volt- 460, FLA- 11, **Heat Coil** MBH input- 90, AFUE - 80	Roof	YCD060A4LDAA	Electric	Medical Assisting	1992	0%
HV AC-10	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 60, Sens. Cooling MBH- 45. **Indoor Fan** CFM- 2000, Ext. S.P - 0.5, HP 0.6 Volt- 460, FLA - 2.5, **Compressor** No- 1, Volt- 460, FLA- 11, **Heat Coil** MBH input- 90, AFUE - 80	Roof	YCD060A4LDAA	Electric	Health/Fi tness	1992	0%
HV AC-11	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 60, Sens. Cooling MBH- 45. **Indoor Fan** CFM- 2000, Ext. S.P - 0.5, HP 0.6 Volt- 460, FLA - 2.5, **Compressor** No- 1, Volt- 460, FLA- 11, **Heat Coil** MBH input- 90, AFUE - 80	Roof	YCD060A4LDAA	Electric	TRC-42	1992	0%
HV AC-12	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 117, Sens. Cooling MBH- 91. **Indoor Fan** CFM- 4000, Ext. S.P - 0.7, HP 2 Volt- 460, FLA - 3.4, **Compressor** No- 2, Volt- 460, FLA- 10.1, **Heat Coil** MBH input- 150, AFUE - 82	Roof	YCD0120BL	Electric	TRC-41	1992	0%
HV AC-13	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 37, Sens. Cooling MBH- 28. **Indoor Fan** CFM- 1200, Ext. S.P - 0.4, HP 1/3 Volt- 460, FLA - 1.5, **Compressor** No- 1, Volt- 460, FLA- 6, **Heat Coil** MBH input- 150, AFUE - 80	Roof	YCD036A4LDAA	Electric	Comput er Science	1992	0%
HV AC-14	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 37, Sens. Cooling MBH- 28. **Indoor Fan** CFM- 1200, Ext. S.P - 0.4, HP 1/3 Volt- 460, FLA - 1.5, **Compressor** No- 1, Volt- 460, FLA- 6, **Heat Coil** MBH input- 150, AFUE - 80	Roof	YCD036A4LDAA	Electric	A+/TRC-49/TRC-48	1992	0%
HV AC-15	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 37, Sens. Cooling MBH- 28. **Indoor Fan** CFM- 1200, Ext. S.P - 0.4, HP 1/3 Volt- 460, FLA - 1.5, **Compressor** No- 1, Volt- 460, FLA- 6, **Heat Coil** MBH input- 150, AFUE - 80	Roof	YCD036A4LDAA	Electric	Medical Skills	1992	0%
HV AC-16	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 37, Sens. Cooling MBH- 28. **Indoor Fan** CFM- 1200, Ext. S.P - 0.4, HP 1/3 Volt- 460, FLA - 1.5, **Compressor** No- 1, Volt- 460, FLA- 6, **Heat Coil** MBH input- 150, AFUE - 80	Roof	YCD036A4LDAA	Electric	Hallway	1992	0%

HV AC-17	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 37, Sens. Cooling MBH- 28. **Indoor Fan** CFM- 1200, Ext. S.P - 0.4, HP 1/3 Volt- 460, FLA - 1.5, **Compressor** No- 1, Volt- 460, FLA- 6, **Heat Coil** MBH input- 150, AFUE - 80	Roof	YCD036A4LDAA	Electric	Medical Skills Lab	1992	0%
HV AC-18	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 37, Sens. Cooling MBH- 28. **Indoor Fan** CFM- 1200, Ext. S.P - 0.4, HP 1/3 Volt- 460, FLA - 1.5, **Compressor** No- 1, Volt- 460, FLA- 6, **Heat Coil** MBH input- 150, AFUE - 80	Roof	YCD036A4LDAA	Electric	Office	1992	0%
HV AC-19	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 117, Sens. Cooling MBH- 91. **Indoor Fan** CFM- 4000, Ext. S.P - 0.7, HP 2 Volt- 460, FLA - 3.4, **Compressor** No- 2, Volt- 460, FLA- 10.1, **Heat Coil** MBH input- 150, AFUE - 82	Roof	Trane, Model #YCD120B4L0BA, Serial #G321439070	Electric		1992	0%
HV AC-20	Heating/ Cooling	Rooftop Unit- Total Cooling MBH- 60, Sens. Cooling MBH- 45. **Indoor Fan** CFM- 2000, Ext. S.P - 0.5, HP 0.6 Volt- 460, FLA - 2.5, **Compressor** No- 1, Volt- 460, FLA- 11, **Heat Coil** MBH input- 90, AFUE - 80	Roof	Trane, Model #YCD060A4LDAA	Electric	Cosmeto logy	1992	0%
TR-24	Heating/ Cooling	Trane Rooftop Unit, Heating Input 150,000 BTU/HR., 2 compressors, R-22 refrigerant	Roof	Trane, Model # YHC120A4RLA390100C1 B20002, Serial #926100344L	Electric	TR-24	2009	80%
TR-28A	Heating/ Cooling	Trane Rooftop Unit, Heating Input 120,000 BTU/HR., 1 compressor, R-22 refrigerant	Roof	Trane, Model # YCD07C3I0BE, Serial l# R51100830D	Electric	TR-28A	2000	20%
TR-28	Heating/ Cooling	Trane Rooftop Unit, Heating Input 135,000 BTU/HR., 1 compressor, R-22 refrigerant	Roof	Trane, Model # YCD060C4HABF, Serial # R34101861D	Electric	TR-28	2000	20%
	Refrigerat or/Freeze r	Russell refrigerator/freezer compressor, 1 compressor, 1/20 HP, single phase, R-404A	Roof	Model # RLH075M44-D, Serial #E09H48567306003	Electric	Retail Store Opportu nities		
	Refrigerat or/Freeze r	Russell refrigerator/freezer compressor, 1 compressor, 1/20 HP, single phase, R-22	Roof	Model # RLH301H22-E, Serial #E09J48849604001	Electric	Retail Store Opportu nities		
	Heating/ Cooling	Trane Rooftop Unit, Heating Input 48,000 BTU/HR., 1 compressor, R-22 refrigerant	Roof	Trane, Model #YCC030F1L0BH, Serial #2055JY92H	Electric		2002	33%
RTU-1	Heating/ Cooling	Trane Rooftop Unit, Heating Input 250,000 BTU/HR., 2 compressors, R-22 refrigerant	Roof	Trane, Model #YHC120A4RHA2TH105 C10206A7, Serial #751102050L	Electric	TR-29?	2007	67%
	Cooling	Sanyo split-DX condensing unit, 1 compressor, R-22	Roof	Sanyo, Model #CL3632A, Serial #0056134	Electric	Server Room		0%
B-1	Heating	Boiler, 165 MBH Input, 152 MBH output	Storage/Mec hanical/Electr ical Room	Raypak - NB94343	Natural Gas	Storage/ Mechani cal/Elect rical Room	1991	0%

B-2	Heating	Boiler, 180 MBH Input,	Storage/Mechanical/Electrical Room	Slant/Fin Corp. - 0-780-EP	Natural Gas	Storage/Mechanical/Electrical Room	1990	0%
DHWT-1	Heating	Hot water storage tank, 180 Gallons,	Storage/Mechanical/Electrical Room	A.O. Smith - TJV 200M	Natural Gas	Storage/Mechanical/Electrical Room	1990	0%

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

Appendix B: Toms River Center Floor Plan



Appendix C: Lighting Study

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	1	Computer science (47)	Recessed Parabolic	E	8'T8	8	2	59	Sw	9	190	14	1,056	1,806	C	Recessed Parabolic	8'T8	E	OS	8	2	59	7	190	14	1056	1354	0	451	451
2	1	Computer science (47)	Recessed Parabolic	E	4'T8	1	2	32	Sw	9	190	10	74	127	N/A	Recessed Parabolic	4'T8	E	SW	1	2	32	9	190	10	74	127	0	0	0
3	1	Office (44)	Recessed Parabolic	E	8'T8	4	2	59	Sw	9	190	14	528	903	C	Recessed Parabolic	8'T8	E	OS	4	2	59	7	190	14	528	677	0	226	226
4	1	Office (45)	Recessed Parabolic	E	4'T8	2	2	32	Sw	9	190	10	148	253	C	Recessed Parabolic	4'T8	E	OS	2	2	32	7	190	10	148	190	0	63	63
5	1	Waiting Room (45)	Recessed Parabolic	E	4'T8	3	2	32	Sw	9	190	10	222	380	N/A	Recessed Parabolic	4'T8	E	Sw	3	2	32	9	190	10	222	380	0	0	0
6	1	A+ (48)	Recessed Parabolic	E	8'T8	9	2	59	Sw	9	190	14	1,188	2,031	C	Recessed Parabolic	8'T8	E	OS	9	2	59	7	190	14	1188	1524	0	508	508
7	1	A+ (48)	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
8	1	Med. Skills (49)	Recessed Parabolic	E	8'T8	8	2	59	Sw	9	190	14	1,056	1,806	C	Recessed Parabolic	8'T8	E	OS	8	2	59	7	190	14	1056	1354	0	451	451
9	1	Med. Skills (49)	Recessed Parabolic	E	4'T8	1	2	32	Sw	9	190	10	74	127	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	9	190	10	74	127	0	0	0
10	1	Med. Skills Lab (46)	Recessed Parabolic	E	8'T8	7	2	59	Sw	9	190	14	924	1,580	C	Recessed Parabolic	8'T8	E	OS	7	2	59	7	190	14	924	1185	0	395	395
11	1	Med. Skills Lab (46)	Recessed Parabolic	E	4'T8	2	2	32	Sw	9	190	10	148	253	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	9	190	10	148	253	0	0	0
12	1	Hallway (43)	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
13	1	Hallway (43)	Recessed Parabolic	E	8'T8	20	2	59	Sw	9	190	14	2,640	4,514	N/A	Recessed Parabolic	8'T8	E	SW	20	2	59	9	190	14	2640	4514	0	0	0
14	1	Hallway (43)	Recessed Parabolic	E	4'T8	2	2	32	Sw	9	190	10	148	253	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	9	190	10	148	253	0	0	0
15	1	Hallway C	Recessed Parabolic	E	4'T5	5	2	28	OS	16	190	8	320	973	N/A	Recessed Parabolic	4'T5	E	OS	5	2	28	16	190	8	320	973	0	0	0
16	1	Hallway C	Recessed Parabolic	E	2'T8	4	2	17	OS	24	190	4	152	693	N/A	Recessed Parabolic	2'T8	E	OS	4	2	17	24	190	4	152	693	0	0	0
17	1	Hallway C	Ceiling Mounted	E	2'T8	1	6	17	OS	8	190	12	114	173	N/A	Ceiling Mounted	2'T8	E	OS	1	6	17	8	190	12	114	173	0	0	0
18	1	Hallway C	Exit Sign	S	LED	4	1	5	Sw	24	365	1	22	193	N/A	Exit Sign	LED	S	Sw	4	1	5	24	365	1	22	193	0	0	0
19	1	Office (41)	Recessed Parabolic	E	8'T8	2	2	59	Sw	9	190	14	264	451	C	Recessed Parabolic	8'T8	E	OS	2	2	59	7	190	14	264	339	0	113	113
20	1	Boys Bathroom (41)	Wall Mounted	E	2'T8	1	2	17	Sw	4	190	4	38	29	C	Wall Mounted	2'T8	E	OS	1	2	17	3	190	4	38	22	0	7	7
21	1	Girls Bathroom (41)	Wall Mounted	E	2'T8	1	2	17	Sw	4	190	4	38	29	C	Wall Mounted	2'T8	E	OS	1	2	17	3	190	4	38	22	0	7	7
22	1	Computer Hardware (41)	Recessed Parabolic	E	4'T8	3	2	32	Sw	9	190	10	222	380	N/A	Recessed Parabolic	4'T8	E	Sw	3	2	32	9	190	10	222	380	0	0	0
23	1	Computer Hardware (41)	Recessed Parabolic	E	8'T8	17	2	59	Sw	9	190	14	2,244	3,837	C	Recessed Parabolic	8'T8	E	OS	17	2	59	7	190	14	2244	2878	0	959	959
24	1	storage (41)	Wall Mounted	E	2'T8	2	2	17	Sw	9	190	4	76	130	N/A	Wall Mounted	2'T8	E	Sw	2	2	17	9	190	4	76	130	0	0	0
25	1	storage (39)	Wall Mounted	E	2'T8	1	2	17	Sw	9	190	4	38	65	N/A	Wall Mounted	2'T8	E	Sw	1	2	17	9	190	4	38	65	0	0	0
26	1	Boys Bathroom (39)	Wall Mounted	E	2'T8	1	2	17	Sw	4	190	4	38	29	C	Wall Mounted	2'T8	E	OS	1	2	17	3	190	4	38	22	0	7	7
27	1	Girls Bathroom (39)	Wall Mounted	E	2'T8	1	2	17	Sw	4	190	4	38	29	C	Wall Mounted	2'T8	E	OS	1	2	17	3	190	4	38	22	0	7	7
28	1	Dental (39)	Recessed Parabolic	E	8'T8	25	2	59	Sw	9	190	14	3,300	5,643	C	Recessed Parabolic	8'T8	E	OS	25	2	59	7	190	14	3300	4232	0	1411	1411
29	1	Dental (39)	Recessed Parabolic	E	4'T8	2	2	32	Sw	9	190	10	148	253	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	9	190	10	148	253	0	0	0
30	1	Dental (39)	Exit Sign	S	LED	4	1	5	N	24	365	1	22	193	N/A	Exit Sign	LED	S	N	4	1	5	24	365	1	22	193	0	0	0
31	1	Computer Lab (17)	Ceiling Mounted	E	4'T8	6	6	32	Sw	8	190	30	1,332	2,025	C	Ceiling Mounted	4'T8	E	OS	6	6	32	6	190	30	1332	1518	0	506	506
32	1	Classroom (42)	Ceiling Mounted	E	8'T8	16	2	59	Sw	9	190	14	2,112	3,612	C	Ceiling Mounted	8'T8	E	OS	16	2	59	7	190	14	2112	2709	0	903	903
33	1	Closet (42)	Ceiling Mounted	E	2'T8	8	2	17	Sw	8	190	4	304	462	N/A	Ceiling Mounted	2'T8	E	Sw	8	2	17	8	190	4	304	462	0	0	0
34	1	Locker Room (42)	Wall Mounted	E	2'T8	4	2	17	Sw	9	190	4	152	260	N/A	Wall Mounted	2'T8	E	Sw	4	2	17	9	190	4	152	260	0	0	0
35	1	Boys Bathroom (40)	Wall Mounted	E	2'T8	1	2	17	Sw	4	190	4	38	29	C	Wall Mounted	2'T8	E	OS	1	2	17	3	190	4	38	22	0	7	7
36	1	Boys Bathroom (40)	Wall Mounted	E	2'T8	1	2	17	Sw	4	190	4	38	29	C	Wall Mounted	2'T8	E	OS	1	2	17	3	190	4	38	22	0	7	7
37	1	Girls Bathroom (40)	Wall Mounted	E	2'T8	1	2	17	Sw	4	190	4	38	29	C	Wall Mounted	2'T8	E	OS	1	2	17	3	190	4	38	22	0	7	7
38	1	Fitness Room (40)	Ceiling Mounted	E	8'T8	20	2	59	Sw	9	190	14	2,640	4,514	C	Ceiling Mounted	8'T8	E	OS	20	2	59	7	190	14	2640	3386	0	1129	1129
39	1	Medical Assisting (38)	Ceiling Mounted	E	8'T8	18	2	59	Sw	9	190	14	2,376	4,063	C	Ceiling Mounted	8'T8	E	OS	18	2	59	7	190	14	2376	3047	0	1016	1016
40	1	Computer Lab II	Ceiling Mounted	E	4'T8	8	2	32	Sw	9	190	10	592	1,012	C	Ceiling Mounted	4'T8	E	OS	8	2	32	7	190	10	592	759	0	253	253
41	1	Conference Room (18)	Recessed Parabolic	E	4'T8	26	2	32	Sw	9	190	10	1,924	3,290	C	Recessed Parabolic	4'T8	E	OS	26	2	32	7	190	10	1924	2468	0	823	823
42	1	Computer Room (19)	Recessed Parabolic	E	4'T8	4	2	32	Sw	9	190	10	296	506	C	Recessed Parabolic	4'T8	E	OS	4	2	32	7	190	10	296	380	0	127	127
43	1	Computer Room (19A)	Recessed Parabolic	E	4'T8	2	2	32	Sw	9	190	10	148	253	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	9	190	10	148	253	0	0	0
44	1	Tele/Communications Room (20)	Recessed Parabolic	E	4'T8	1	2	32	Sw	9	190	10	74	127	C	Recessed Parabolic	4'T8	E	OS	1	2	32	7	190	10	74	95	0	32	32
45	1	MER (21)	Ceiling Mounted	E	8'T8	7	2	59	Sw	9	190	14	924	1,580	N/A	Ceiling Mounted	8'T8	E	Sw	7	2	59	9	190	14	924	1580	0	0	0
46	1	MER (21)	Ceiling Mounted	E	8'T8	2	2	59	Sw	24	190	14	264	1,204	N/A	Ceiling Mounted	8'T8	E	Sw	2	2	59	24	190	14	264	1204	0	0	0
47	1	Office (21A)	Recessed Parabolic	E	4'T8	2	2	32	Sw	9	190	10	148	253	C	Recessed Parabolic	4'T8	E	OS	2	2	32	7	190	10	148	190	0	63	63
48	1	Occupational Services (24)	Recessed Parabolic	E	4'T5	20	2	28	Sw	9	190	8	1,280	2,189	C	Recessed Parabolic	4'T5	E	OS	20	2	28	7	190	8	1280	1641	0	547	547
49	1	Occupational Services (24)	Recessed Parabolic	E	4'T5	3	2	28	Sw	24	190	8	192	875	N/A	Recessed Parabolic	4'T5	E	Sw	3	2	28	24	190	8	192	875	0	0	0
50	1	Classroom (25)	Recessed Parabolic	E	4'T8	6	2	32	Sw	9	190	10	444	759	N/A	Recessed Parabolic	4'T8	E	Sw	6	2	32	9	190	10	444	759	0	0	0
51	1	Classroom (28)	Recessed Parabolic	E	4'T8	25	2	32	Sw	9	190	10	1,850	3,164	C	Recessed Parabolic	4'T8	E	OS	25	2	32	7	190	10	1850	2373	0	791	791
52	1	Mez. (28)	Recessed Parabolic	E	8'T8	4	2	59	Sw	9	190	14	528	903	N/A	Recessed Parabolic	8'T8	E	Sw	4	2	59	9	190	14	528	903	0	0	0
53	1	Classroom (28)	Exit Sign	S	LED	4	1	5	N	24	365	1	22	193	N/A	Exit Sign	LED	S	N	4	1	5	24	365	1	22	193	0	0	0
54	1	Lab Room (28)	Ceiling Mounted	E	4'T8	8	2	32	Sw	9	190	10	592	1,012	C	Ceiling Mounted	4'T8	E	OS	8	2	32	7	190	10	592	759	0	253	253
55	1	Allied Health (28A)	Ceiling Mounted	E	4'T8	6	2	32	Sw	8	190	10	444	675	C	Ceiling Mounted	4'T8	E	OS	6	2	32	6	190	10	444	506	0	169	169
56	1	Marine Trades (34)	Recessed Parabolic	E	4'T8	25	2	32	Sw	9	190	10	1,850	3,164	C	Recessed Parabolic	4'T8	E	OS	25	2	32	7	190	10	1850	2373	0	791	791
57	1	Classroom (33)	Recessed Parabolic	E	4'T8	6	2	32	Sw	9	190	10	444	759	C	Recessed Parabolic	4'T8	E	OS	6	2	32	7	190	10	444	569	0	190	190
58	1	Marine Trades (34)	Exit Sign	S	LED	4	1	5	N	24	365	1	22	193	N/A	Exit Sign	LED	S	N	4	1	5	24	365	1	22	193	0	0	0
59	1	Welding Shop (36)	Recessed Parabolic	E	4'T8	25	2	32	Sw	9	190	10	1,850	3,164	C	Recessed Parabolic	4'T8	E	OS	25	2	32	7	190	10	1850	2373	0	791	791
60	1	Classroom (35)	Recessed Parabolic	E	4'T8	6	2	32	Sw	9	190	10	444	759	C	Recessed Parabolic	4'T8	E	OS	6	2	32	7	190	10	444	569	0	190	190
61	1	Welding Shop (36)	Exit Sign	S	LED	4	1	5	Sw	24	365	1	22	193	N/A	Exit Sign	LED	S	Sw	4	1	5	24	365	1	22	193	0	0	0
62	1	Classroom (37)	Recessed Parabolic	E	4'T8	6	2	32	Sw	9	190	10	444	759	C	Recessed Parabolic	4'T8	E	OS	6	2	32	7	190	10	444	569	0	190	190
63	1	Hallway A	Recessed Parabolic	E	4'T5	35	2	28	OS	16	190	8	2,240	6,809	N/A	Recessed Parabolic	4'T5	E	OS	35	2	28	16	190	8	2240	6809	0	0	0
64	1	Hallway A	Exit Sign	S	LED	8	1	5	N	24	365	1	44	385	N/A	Exit Sign	LED	S	N	8	1	5	24	365	1	44	385	0	0	0
65	1	Electrical Trades (31)	Ceiling Mounted	E	4'T8	25	2	32	Sw	9	190	10	1,850	3,164	C	Ceiling Mounted	4'T8	E	OS	25	2	32	7	190	10	1850	2373	0	791	791
66	1	Classroom (32)	Ceiling Mounted	E	4'T8	6	2	32	Sw	9	190	10	444	759	C	Ceiling Mounted	4'T8	E	OS	6	2	32	7	190	10	444	569	0	190	190
67	1	LPN Classroom 2 (29)	Ceiling Mounted	E	4'T8	25	2	32	Sw	9	190	10	1,850	3,164	C	Ceiling Mounted	4'T8	E	OS	25	2	32	7	190	10	1850	2373	0	791	791
68	1	Office (30)	Ceiling Mounted	E	4'T8	4	2	32	Sw	9	190	10	296	506	C	Ceiling Mounted	4'T8	E	OS	4	2	32	7	190	10	296	380	0	127	127
69	1	LPN Classroom 1 (23)	Ceiling Mounted	E	4'T8	25	2	32	Sw	9	190	10	1,850	3,164	C	Ceiling Mounted	4'T8	E	OS	25	2	32	7	190	10	1850	2373	0	791	791
70	1	Electrical Trades (22)	Ceiling Mounted	E	4'T8	25	2	32	Sw	9	190	10	1,850	3,164	C	Ceiling Mounted	4'T8	E	OS	25	2	32	7	190	10	1850	2373	0	791	791

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
71	1	Main Office (1)	Ceiling Mounted	E	4'T5	14	2	28	OS	16	190	8	896	2,723	N/A	Ceiling Mounted	4'T5	E	OS	14	2	28	16	190	8	896	2723	0	0	0
72	1	Office 1	Ceiling Mounted	E	4'T5	3	2	28	OS	16	190	8	192	584	N/A	Ceiling Mounted	4'T5	E	OS	3	2	28	16	190	8	192	584	0	0	0
73	1	Office 2	Ceiling Mounted	E	4'T5	3	2	28	OS	16	190	8	192	584	N/A	Ceiling Mounted	4'T5	E	OS	3	2	28	16	190	8	192	584	0	0	0
74	1	Office 3	Ceiling Mounted	E	4'T5	3	2	28	OS	16	190	8	192	584	N/A	Ceiling Mounted	4'T5	E	OS	3	2	28	16	190	8	192	584	0	0	0
75	1	Office 4	Ceiling Mounted	E	4'T5	3	2	28	OS	16	190	8	192	584	N/A	Ceiling Mounted	4'T5	E	OS	3	2	28	16	190	8	192	584	0	0	0
76	1	Nurse Office	Ceiling Mounted	E	4'T5	4	2	28	OS	16	190	8	256	778	N/A	Ceiling Mounted	4'T5	E	OS	4	2	28	16	190	8	256	778	0	0	0
77	1	Copy Room	Ceiling Mounted	E	4'T5	4	2	28	OS	16	190	8	256	778	N/A	Ceiling Mounted	4'T5	E	OS	4	2	28	16	190	8	256	778	0	0	0
78	1	Admin Office (12)	Ceiling Mounted	E	4'T5	2	2	28	OS	16	190	8	128	389	N/A	Ceiling Mounted	4'T5	E	OS	2	2	28	16	190	8	128	389	0	0	0
79	1	Admin Office (13)	Ceiling Mounted	E	4'T5	4	2	28	OS	16	190	8	256	778	N/A	Ceiling Mounted	4'T5	E	OS	4	2	28	16	190	8	256	778	0	0	0
80	1	Admin Office (14)	Ceiling Mounted	E	4'T5	10	2	28	OS	16	190	8	640	1,945	N/A	Ceiling Mounted	4'T5	E	OS	10	2	28	16	190	8	640	1945	0	0	0
81	1	Admin Office (15)	Ceiling Mounted	E	4'T5	3	2	28	OS	16	190	8	192	584	N/A	Ceiling Mounted	4'T5	E	OS	3	2	28	16	190	8	192	584	0	0	0
82	1	Admin Office (16)	Ceiling Mounted	E	4'T5	4	2	28	OS	16	190	8	256	778	N/A	Ceiling Mounted	4'T5	E	OS	4	2	28	16	190	8	256	778	0	0	0
83	1	Atrium	Wallpack	S	MH	2	1	150	T	8	240	42	384	737	PSMH	Wallpack	PSMH	S	T	2	1	100	8	240	20	240	461	276	0	276
84	1	Exterior	Wallpack	S	MH	12	1	150	T	8	240	42	2,304	4,424	PSMH	Wallpack	PSMH	S	T	12	1	100	8	240	20	1440	2765	1659	0	1659
85	1	Exterior	Recessed Parabolic	S	CFL	6	1	13	T	9	190	0	78	133	N/A	Recessed Parabolic	CFL	S	T	6	1	13	9	190	0	78	133	0	0	0
Totals:						**652**	**167**	**2,867**				**806**	**55,956**	**106,731**						**652**	**167**	**2,767**			**762**	**54,948**	**87,926**	**1,935**	**16,869**	**18,805**

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

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

APPENDIX D: SOLAR PV SHADING ANALYSIS

Site Report

Report Name	Toms River Center
Report Date	5/21/2012 5:17:57 PM
Declination	0d 00m
Location	TOMS RIVER, NJ 08753
Lat/Long	39.959 / -74.215
Weather Station	Belmar-Monmouth County AP, NJ, Elevation: 85 Feet, (40.183/-74.067)
Site distance	17 Miles
Report Type	PV
Array Type	Fixed
Tilt Angle	39.96 deg
Ideal Tilt Angle	39.96 deg
Azimuth	180.00 deg
Ideal Azimuth	180.00 deg
Electric Cost	0.14 ($/KWH)
Panel Make	<not specified>
Panel Model	<not specified>
Panel Count	615
DC Rate (per panel)	208.0 W
Total System Size	127,920.0 W
Inverter Make	<not specified>
Inverter Model	<not specified>
Inverter Count	2
Derate Method	System Setting
Derate Factor	0.800
Layout Configuration	Custom
Layout Point Count	2

Notes: [None]

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System Picture Layout

Layout Type Custom
Layout Point Count 2

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Solar Site Analysis Report

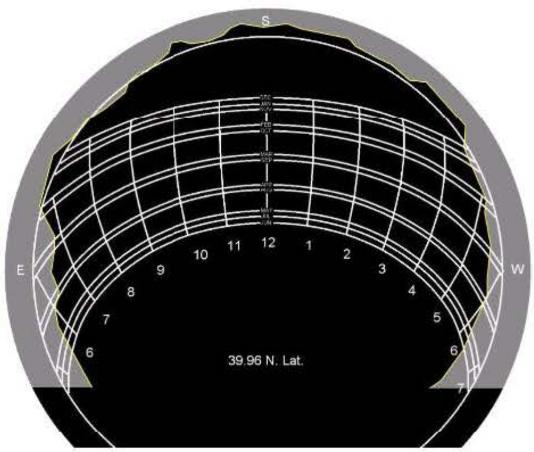
1

Image File IMG_6136.jpg

Solar Obstruction Data

Month	Unshaded % of Ideal Site Azimuth=180 Tilt=39.96	Actual Solar Rad w/ Shading Azimuth=180.0 Tilt=39.96 KWH/m² /day	Actual AC Energy (KWH) w/ shading Azimuth=180.00 Tilt=39.96	Actual AC Energy (KWH) w/o shading Azimuth=180.0 Tilt=39.96	Ideal AC Energy (KWH) w/o shading Azimuth=180.0 Tilt=39.96	Solar Cost Savings 0.14 ($/KWH)	PVWatts Unshaded % Actual Site Azimuth=180.0 Tilt=39.96	Actual Site Efficiency % Azimuth=180.0 Tilt=39.96	Ideal Site Efficiency % Azimuth=180.0 Tilt=39.96
January	100.00%	3.36	10,934.00	10,934.00	10,934.00	$1,530.76	99.96 %	99.96 %	99.96 %
February	100.00%	4.27	12,442.00	12,442.00	12,442.00	$1,741.88	100.00 %	99.79 %	99.79 %
March	99.76%	5.05	16,043.00	16,049.00	16,049.00	$2,246.02	99.67 %	99.67 %	99.67 %
April	99.41%	5.14	14,967.68	15,036.00	15,036.00	$2,095.47	99.25 %	99.25 %	99.25 %
May	98.95%	5.17	15,282.75	15,292.00	15,292.00	$2,139.59	98.94 %	98.94 %	98.94 %
June	99.15%	5.64	15,678.59	15,684.00	15,684.00	$2,195.00	99.09 %	99.09 %	99.09 %
July	99.17%	5.78	16,428.11	16,435.00	16,435.00	$2,299.94	99.14 %	99.14 %	99.14 %
August	99.17%	5.86	16,685.95	16,694.00	16,694.00	$2,336.03	99.22 %	99.22 %	99.22 %
September	98.76%	5.05	14,221.26	14,288.00	14,288.00	$1,990.98	98.70 %	98.70 %	98.70 %
October	100.00%	4.82	14,723.00	14,734.00	14,734.00	$2,061.22	100.00 %	99.65 %	99.65 %
November	100.00%	4.30	13,043.00	13,043.00	13,043.00	$1,826.02	99.96 %	99.96 %	99.96 %
December	100.00%	3.40	10,893.00	10,893.00	10,893.00	$1,525.02	99.96 %	99.96 %	99.96 %
Totals	**99.53%**	**57.85**	**171,342.34**	**171,524.00**	**171,524.00**	**$23,987.93**	**99.49 %**	**99.44 %**	**99.44 %**
	Unweighted Yearly Avg	**Effect: 99.41% Sun Hrs: 4.82**					**Unweighted Yearly Avg**	**Unweighted Yearly Avg**	**Unweighted Yearly Avg**

Notes: [None]



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Summary Report

Solar Obstruction Data

Month	Unshaded % of Ideal Site Azimuth=180 Tilt=39.96	Actual Solar Rad w/ Shading Azimuth=180.0 Tilt=39.96 KWH/m^2/day	Actual AC Energy (KWH) w/ shading Azimuth=180.00 Tilt=39.96	Actual AC Energy (KWH) w/o shading Azimuth=180.0 Tilt=39.96	Ideal AC Energy (KWH) w/o shading Azimuth=180.0 Tilt=39.96	Solar Cost Savings 0.14 ($/KWH)	PVWatts Unshaded % Actual Site Azimuth=180.0 Tilt=39.96	Actual Site Efficiency % Azimuth=180.0 Tilt=39.96	Ideal Site Efficiency % Azimuth=180.0 Tilt=39.96
January	100.00%	3.36	10,934.00	10,934.00	10,934.00	$1,530.76	99.96 %	99.96 %	99.96 %
February	100.00%	4.27	12,442.00	12,442.00	12,442.00	$1,741.88	100.00 %	99.79 %	99.79 %
March	99.76%	5.05	16,043.00	16,049.00	16,049.00	$2,246.02	99.67 %	99.67 %	99.67 %
April	99.41%	5.14	14,967.68	15,036.00	15,036.00	$2,095.47	99.25 %	99.25 %	99.25 %
May	98.95%	5.17	15,282.75	15,292.00	15,292.00	$2,139.59	98.94 %	98.94 %	98.94 %
June	99.15%	5.64	15,678.59	15,684.00	15,684.00	$2,195.00	99.09 %	99.09 %	99.09 %
July	99.17%	5.78	16,428.11	16,435.00	16,435.00	$2,299.94	99.14 %	99.14 %	99.14 %
August	99.17%	5.86	16,685.95	16,694.00	16,694.00	$2,336.03	99.22 %	99.22 %	99.22 %
September	98.76%	5.05	14,221.26	14,288.00	14,288.00	$1,990.98	98.70 %	98.70 %	98.70 %
October	100.00%	4.82	14,723.00	14,734.00	14,734.00	$2,061.22	100.00 %	99.65 %	99.65 %
November	100.00%	4.30	13,043.00	13,043.00	13,043.00	$1,826.02	99.96 %	99.96 %	99.96 %
December	100.00%	3.40	10,893.00	10,893.00	10,893.00	$1,525.02	99.96 %	99.96 %	99.96 %
Totals	**99.53%**	**57.85**	**171,342.34**	**171,524.00**	**171,524.00**	**$23,987.93**	**99.49 %**	**99.44 %**	**99.44 %**
	Unweighted Yearly Avg	**Effect: 99.41% Sun Hrs: 4.82**					**Unweighted Yearly Avg**	**Unweighted Yearly Avg**	**Unweighted Yearly Avg**

Notes: [None]

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APPENDIX E: EnergyMiser Calculations

EnergyMisers

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

Savings Calculator

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

Energy Costs ($0.000 per kWh)	$0.14
Facility Occupied Hours per Week	80
Number of Cold Drink Vending Machines	2
Number of Non-refrigerated Snack Machines	2
Power Requirements of Cold Drink Machine (Watts; 400 typical)	400
Power Requirements of Snack Machine (Watts; 80 typical)	80
VendingMiser® VM150 Price (for cold drink machines)	$199.00
SnackMiser™ SM150 Price (for snack machines)	$180.00

Calculate Savings!

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

COLD DRINK MACHINES	Current	Projected	Total Savings	% Savings
kWh	6989	3938	3051	44%
Cost of Operation	$978.43	$551.34	$427.09	44%

SNACK MACHINES	Current	Projected	Total Savings	% Savings
kWh	1398	666	732	52%
Cost of Operation	$195.69	$93.18	$102.50	52%

Location's Total Annual Savings

	Current	Projected	Total Savings	% Savings
kWh	8387	4604	3783	45%
Cost of Operation	$1,174.12	$644.52	$529.60	45%

Total Project Cost	Break Even (Months)
$758	17.18

Estimated Five Year Savings on ALL Machines = $2,647.98

Estimated Five Year Return on Investment = 249%

APPENDIX F: COST WORKS COST ESTIMATES

1299 Old Freehold Road
Toms River,
NJ, 08753
Year 2012 Quarter 2

Date: 1-Jun-12

Unit Detail Report

Cost Estimate Report
CostWorks
RSMeans

OCVTS-Toms River Center

Prepared By:
Dan Carmichael
Steven Winter Associates Inc

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 07 Thermal and Moisture Protection							
070150101600			Roof Coatings, reflective, white, elastomeric, 50 sf/gallon	1,160.00	Gal.	$17.31	$20,079.60
070505103470			Selective demolition, thermal and moisture protection, roofing, built-up, 4-ply, excluding gravel	580.00	Sq.	$131.25	$76,125.00
070505103725			Selective demolition, thermal and moisture protection, roofing, built-up, gravel removal, minimum	58,000.00	S.F.	$0.56	$32,480.00
075113202600			Built-up roofing systems, asphalt flood coat, smooth surface, 4 plies #15 asphalt felt, mopped	580.00	Sq.	$311.98	$180,948.40
Division 07 Subtotal							**$309,633.00**
Division 22 Plumbing							
220719101022			Insulation, pipe covering (price copper tube one size less than I.P.S.), mineral wool, 1" wall, 1" iron pipe size, preformed, 1200<F, plain	40.00	L.F.	$8.45	$338.00
Division 22 Subtotal							**$338.00**
Division 23 Heating, Ventilating, and Air Conditioning (HVAC)							
230505100100			Air conditioner, split unit air conditioner, 3 ton, selective demolition	6.00	Ea.	$754.44	$4,526.64
230505100190			Air conditioner, split unit air conditioner, rooftop, self contained, up to 5 ton, selective demolition	24.00	Ea.	$685.85	$16,460.40
230505100350			Boiler, gas and or oil or solid, 160 thru 2000 MBH, selective demolition	2.00	Ea.	$3,990.40	$7,980.80
235216240200			Condensing boilers, cast iron, gas fired, natural or LP, packaged, DOE MBH output, 167 MBH, (83.0%) AFUE, includes standard controls, circulator, trim	1.00	Ea.	$4,414.50	$4,414.50
235216240220			Condensing boilers, cast iron, gas fired, natural or LP, packaged, DOE MBH output, 194 MBH, (82.7%) AFUE, includes standard controls, circulator, trim	1.00	Ea.	$4,949.25	$4,949.25
237413103100			Air handling unit, packaged weatherproof, with cooling/heating coil section, filters, mixing box, constant volume, single zone, 2000 CFM, cooling coils may be chilled water or DX, heating coils may be hot water, steam or electric	16.00	Ea.	$13,428.75	$214,860.00
237413103100	A		Air conditioning, for upgrade to SEER 14 add	1.00		$2,220.00	$35,520.00

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
237413103210			Air handling unit, packaged weatherproof, with cooling/heating coil section, filters, mixing box, variable air volume, single zone, 2000 CFM, cooling coils may be chilled water or DX, heating coils may be hot water, steam or electric	2.00	Ea.	$15,821.90	$31,643.80
237413103210	A		Air conditioning, for upgrade to SEER 14 add	1.00		$2,680.00	$5,360.00
237423161100			Make-up air unit, indirect-fired, rooftop unit, natural gas, gravity vent, stainless steel exchanger, MBH is output, 70Deg.F temperature rise, 1000 MBH, includes standard controls	1.00	Ea.	$18,900.45	$18,900.45
237423161120			Make-up air unit, indirect-fired, rooftop unit, natural gas, gravity vent, stainless steel exchanger, MBH is output, 70Deg.F temperature rise, 1750 MBH, includes standard controls	2.00	Ea.	$23,718.44	$47,436.88
237423161160			Make-up air unit, indirect-fired, rooftop unit, natural gas, gravity vent, stainless steel exchanger, MBH is output, 70Deg.F temperature rise, 3250 MBH, includes standard controls	1.00	Ea.	$37,476.70	$37,476.70
237423161180			Make-up air unit, indirect-fired, rooftop unit, natural gas, gravity vent, stainless steel exchanger, MBH is output, 70Deg.F temperature rise, 4000 MBH, includes standard controls	1.00	Ea.	$45,656.15	$45,656.15
238126100150			Split ductless system, cooling only, single zone, wall mount, 2 ton cooling	6.00	Ea.	$2,624.33	$15,745.98
238126100150	A		Air conditioning, for upgrade to SEER 14 add	1.00		$310.00	$1,860.00
238219200080			Heating and ventilating unit, classroom type, heating/cooling coils, 750 CFM, 2 tons cooling, includes filter and standard controls	6.00	Ea.	$5,467.48	$32,804.88
238219200080	A		Heating and ventilating unit, classroom type, heating/cooling coils, for electric heat, add	1.00	Ea.	$1,505.00	$9,030.00
Division 23 Subtotal							**$534,626.43**

APPENDIX G: UPCOMING EQUIPMENT PHASEOUTS

LIGHTING:

- As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps are no longer being produced for commercial and industrial applications.

- As of **January 1, 2012** 100 watt incandescent bulbs have been phased out in accordance with the Energy Independence and Security Act of 2007.

- Starting **July 2012** many non energy saver model T12 lamps will be phased out of production.

- As of **January 1, 2013** 75 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- As of **January 1, 2014** 60 and 40 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- Energy Independence and Security Act of 2007 incandescent lamp phase-out exclusions:
    1. Appliance lamp (e.g. refrigerator or oven light)
    2. Black light lamp
    3. Bug lamp
    4. Colored lamp
    5. Infrared lamp
    6. Left-hand thread lamp
    7. Marine lamp
    8. Marine signal service lamp
    9. Mine service lamp
    10. Plant light lamp
    11. Reflector lamp
    12. Rough service lamp
    13. Shatter-resistant lamp (including a shatter-proof lamp and a shatter-protected lamp)
    14. Sign service lamp
    15. Silver bowl lamp
    16. Showcase lamp
    17. 3-way incandescent lamp
    18. Traffic signal lamp
    19. Vibration service lamp
    20. Globe shaped “G” lamp (as defined in ANSI C78.20-2003 and C79.1-2002 with a diameter of 5 inches or more
    21. T shape lamp (as defined in ANSI C78.20-2003 and C79.1-2002) and that uses not more than 40 watts or has a length of more than 10 inches
    22. A B, BA, CA, F, G16-1/2, G-25, G30, S, or M-14 lamp (as defined in ANSI C79.1-2002 and ANSI C78.20-2003) of 40 watts or less
    23. Candelabra incandescent and other lights not having a medium Edison screw base.

- When installing compact fluorescent lamps (CFLs), be advised that they contain a very small amount of mercury sealed within the glass tubing and EPA guidelines concerning cleanup and safe disposal of compact fluorescent light bulbs should be followed. Additionally, all lamps to be disposed should be recycled in accordance with EPA guidelines through state or local government collection or exchange programs instead.

HCFC (Hydrochlorofluorocarbons):

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

- As of **January 1, 2015,** No production and no importing of any HCFCs, except for use as refrigerants in equipment manufactured before January 1, 2010.

- As of **January 1, 2020** No production and no importing of R-142b and R-22.

APPENDIX H: THIRD PARTY ENERGY SUPPLIERS

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

Third Party Electric Suppliers for Atlantic City Electric Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com

Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for NJNG Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
NJ Gas & Electric 1 Bridge Plaza, Fl. 2 Fort Lee, NJ 07024	(866) 568-0290 www.NewJerseyGasElectric.com

Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX I: GLOSSARY AND METHOD OF CALCULATIONS

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

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

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

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

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

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

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

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

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

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

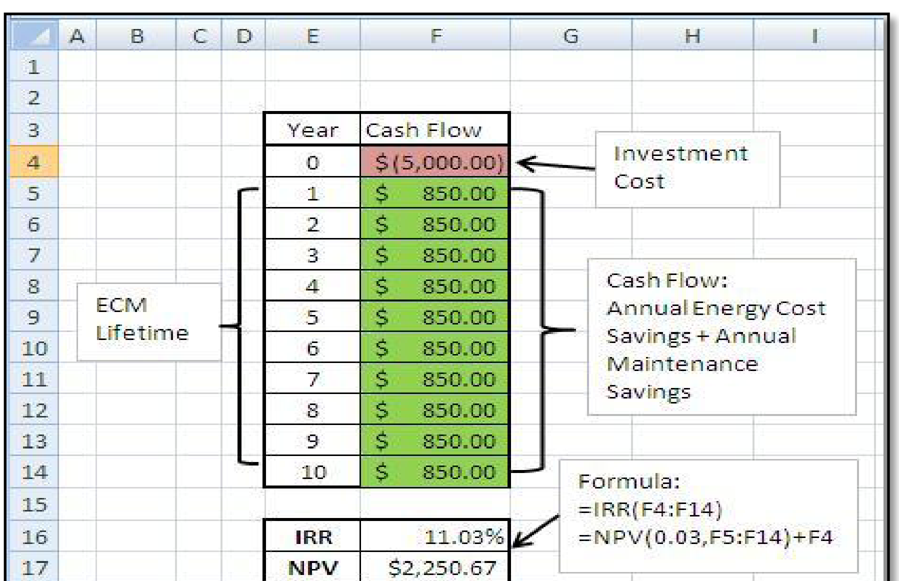
Calculation References

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

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

Excel NPV and IRR Calculation

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



Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume $145/Megawatt hour consumed per year for a maximum of 15 years; added to annual energy cost savings for a period of 15 years. (Megawatt hour used is rounded to nearest 1,000 kWh)
Assumptions:	A Solar Pathfinder device is used to analyze site shading for the building and determine maximum amount of full load operation based on available sunlight. When the Solar Pathfinder device is not implemented, amount of full load operation based on available sunlight is assumed to be 1,180 hours in New Jersey.

Total lifetime PV energy cost savings =
kWh produced by panel * [$/kWh cost * 25 years + $145/Megawatt hour /1000 * 15 years]

ECM and Equipment Lifetimes

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

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

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

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

New Jersey Clean Energy Program Commercial Equipment Life Span

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

APPENDIX J: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
OCVTS - Toms River Center

Building ID: 3097684
For 12-month Period Ending: December 31, 2011[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: May 31, 2012

Facility
OCVTS - Toms River Center
1299 Old Freehold Road
Toms River, NJ 08753

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1975
Gross Floor Area (ft²): 58,000

Energy Performance Rating[2] (1-100) 11

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	2,827,866
Natural Gas (kBtu)[4]	2,001,819
Total Energy (kBtu)	4,829,685

Energy Intensity[4]	
Site (kBtu/ft²/yr)	83
Source (kBtu/ft²/yr)	199

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	507

Electric Distribution Utility
Jersey Central Power & Light Co [FirstEnergy Corp]

National Median Comparison	
National Median Site EUI	55
National Median Source EUI	133
% Difference from National Median Source EUI	50%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry Standards[5] **for Indoor Environmental Conditions:**	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
N/A

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Values represent energy intensity, annualized to a 12-month period.
5. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

EPA Form 5900-16

APPENDIX K: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

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

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

Energy Provider Incentives

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

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

Direct Install 2011 Program*

Direct Install is a division of the New Jersey Clean Energy Programs' Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC, and other equipment with energy efficient alternatives. The program pays **up to 70%** of the retrofit costs, including equipment cost and installation costs. Each project is limited to $75,000 in incentives.

Eligibility:

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

Energy Provider Incentives

- **South Jersey Gas** – Program offers financing up to $25,000 on customer's 40% portion of the project and combines financing rate based on portion of the project devoted to gas and electric measures. All gas measures financed at 0%, all electric measures financed at normal rate. Does not offer financing on projects that only include electric measures.

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

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

Smart Start

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

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

Energy Provider Incentives

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

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

Renewable Energy Incentive Program*

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

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

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

Combined Heat and Power (CHP)

Energy Provider Incentives

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

Utility Sponsored Programs

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

Energy Efficiency and Conservation Block Grant Rebate Program

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

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

Other Federal and State Sponsored Programs

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

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

APPENDIX L: ENERGY CONSERVATION MEASURES

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Retro-commissioning	11,600	0	11,600	24,430	1	1,802	4.5	0	23,200	3	69,600	0.5	500	167	192	52,105	63,600
2	Retrofit 2 refrigerated vending machines with VendingMiser™ devices	398	0	398	3,051	0	0	0.2	0	428	12	5,134	0.9	1,190	99	107	3,692	5,463
3	Add pipe insulation to uninsulated hot water pipes	338	0	338	0	0	124	0.2	0	170	12	2,040	2.0	504	42	50	1,293	1,369
4	Install 40 occupancy sensors	8,800	0	8,000	16,869	4	0	1.0	0	2,362	15	35,430	3.4	343	23	29	19,180	30,204
5	Retrofit 2 vending machines with SnackMiser™ devices	360	none at this time	360	732	0	0	0.0	0	103	12	1,232	3.5	242	20	27	629	1,311
6	Install 127.9 kW Solar Photovoltaic system	639,600	0	639,600	171,342	128	0	10.1	-1,494	149,939	25	3,748,470	4.3	486	19	22	1,209,676	306,788
7	14 New PSMH fixtures to be installed with incentives	10,150	350	9,800	1,935	0	0	0.1	0	271	15	4,065	36.2	-59	-4	-9	-6,406	3,465

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

APPENDIX M: METHOD OF ANALYSIS

Assumptions and tools

Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) Published and established specialized equipment material and labor costs Cost estimates also based on utility bill analysis and prior experience with similar projects

Disclaimer

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

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