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December 11, 2012

Local Government Energy Program
Energy Audit Report

River Edge Public Schools

New Bridge Center
101 Greene Avenue
River Edge NJ 07661

Project Number: LGEA103

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EXECUTIVE SUMMARY

The New Bridge Center is a 40,388 ft^2, two-story structure with below-grade basement. The building was constructed in 2006 and is structurally connected to Cherry Hill Elementary School. The following chart provides a comparison of the current building energy usage based on the period from July 2011 through June 2012 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	411,099	28,152	$97,621	129.3	5,220,634	1,685
Proposed	372,888	25,437	$79,482	107.8	4,353,826	1,526
Savings	38,211	2,715	$18,139	21.5	866,808	159
% Savings	9.3%	9.6%	18.6%	16.6%	16.6%	9.4%

The New Bridge Center and the Cherry Hill Elementary School are two structurally connected schools that are part of River Edge School District. They have separate addresses, administration, employees, students, HVAC systems, and even electric meters. They do, however, share a single gas account and a single gas meter. This, in turn, makes it impossible to attribute gas usage to the respective schools. Because of this, the two buildings were entered into the Environmental Protection Agency's (EPA) Energy Star® Portfolio Manager as one single building. The two electric accounts were attributed to each space and the gas account to the entire building. Because the New Bridge Center was built in 2006 and the Cherry Hill Elementary School was built in 1948 the buildings envelopes and systems vary significantly. The energy performance rating generated is a 56, however this is an average between the two schools and doesn't represent a truly accurate score for the New Bridge Center.

SWA has entered energy information about the New Bridge Center/Cherry Hill School into the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager energy benchmarking system. The facility is categorized as an "K-12 School" space type. Based on the data entered into the Portfolio Manager software, the building has an Energy Performance Rating of 56 out of a possible 100 points. For reference, a score of 69 is required for LEED for Existing Buildings certification and a score of 75 is required for ENERGY STAR® certification. The Site Energy Use Intensity (EUI) is 48 kBtu/sqft/yr compared to the national average of 51 kBtu/sqft/yr for a "K-12 School" space type.

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

	First Year Savings ($)	Simple Payback Period	Initial Investment ($)	CO2 Savings (lbs/yr)
0-5 Year	$18,139	2.1	$38,211	152,905
Total	$18,139	2.1	$38,211	152,905

In addition to these ECMs, SWA recommends:

- Capital Investment Opportunities – measures that would contribute to reducing energy usage but require significant capital resources as well as long-term financial planning
    - Install Demand Control Ventilation
- Operation and Maintenance (O&M) measures that would contribute to reducing energy usage at little to no cost:
    - Replace belt driven fans with direct drive fans
    - Use smart power electric strips.
    - Create an energy educational program.
    - Institute a detailed Preventative Maintenance schedule.

Energy Conservation Measure Implementation

SWA recommends that the New Bridge Center implement the following Energy Conservation Measures using an appropriate Incentive Programs for reduced capital cost:

Recommended ECMs	Incentive Program (Appendix G for details)
Install thirty six (36) occupancy sensors	Direct Install
Retro-commissioning	N/A

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 New Bridge Center, located at 101 Greene Avenue, River Edge, NJ 07661. The process of the audit included a visit to the facility on June 26th, 2012, benchmarking and energy bill analysis, assessment of existing conditions, energy conservation measures and other recommendations for improvements. The scope of work included 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 River Edge School District to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the New Bridge Center.

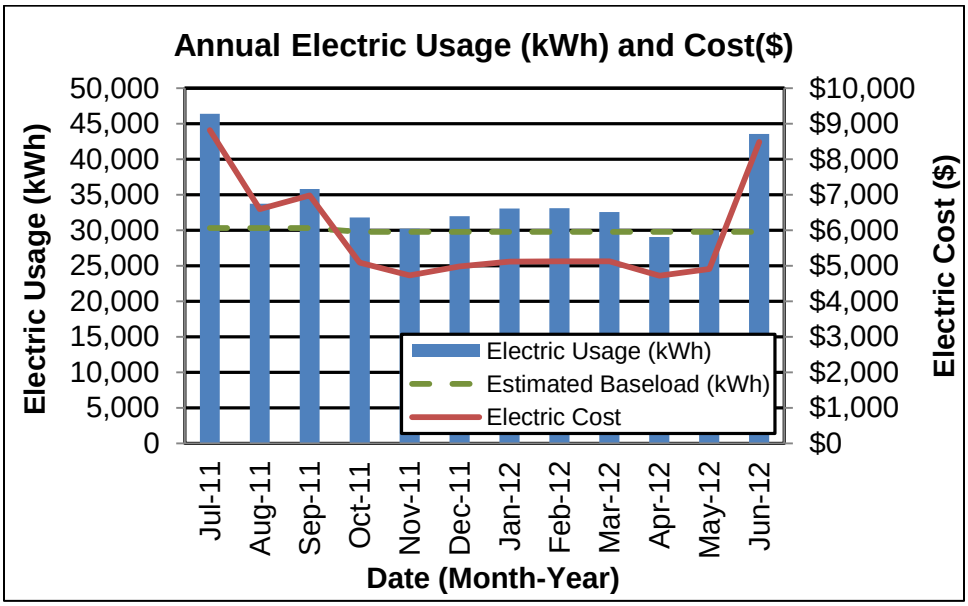
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

SWA reviewed utility bills from July 2010 through June 2012 that were received from the utility companies supplying the New Bridge Center with electricity and natural gas. A 12-month period of analysis from July 2011 through June 2012 was used for all calculations and for purposes of benchmarking the building.

Electricity – The New Bridge Center is currently served by one electric meter. The facility consumed approximately 411,099 kWh, or $70,622 of electricity, in the previous year. The average monthly demand was 151.9 kW and the annual peak demand was 211.7 kW which occurred in June 2012. New Bridge Center uses PSE&G for delivery and Champion Energy Services for supply.

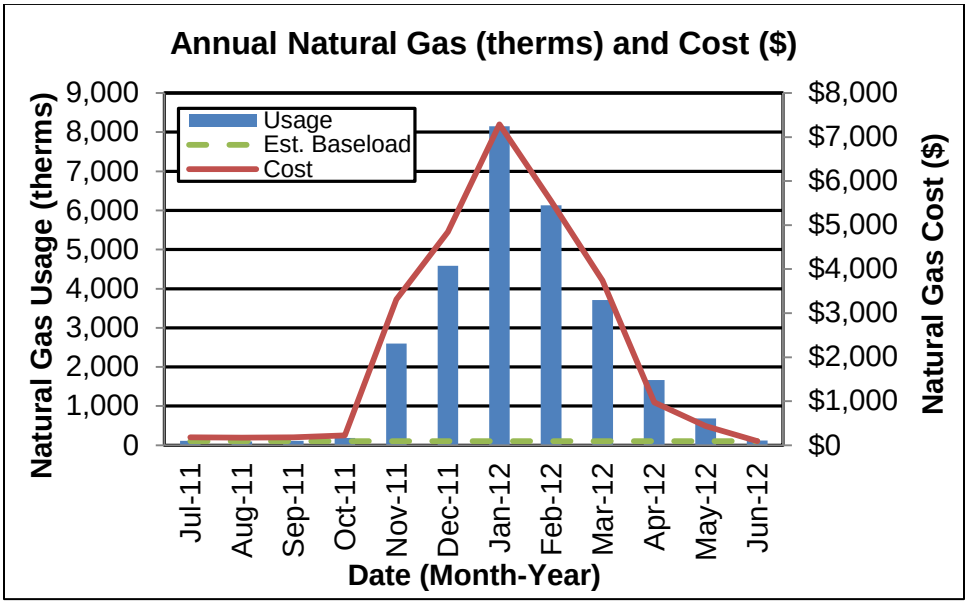
The chart below shows the monthly electric usage and costs. Electric usage expectedly peaks during summer months due to the increased use of electrically powered cooling equipment. The dashed green line represents the approximate baseload or minimum electric usage required to operate the New Bridge Center. Baseload is calculated by taking the average usage of kWh during the lowest three months of the year. Due to lack of third party supplier data, the supply rate from Roosevelt Elementary School of $0.103/kWh was assumed and used for analysis and calculations. Adding actual delivery costs and approximate supply costs, the school purchases electricity at an approximate average aggregated rate of $0.172/kWh.

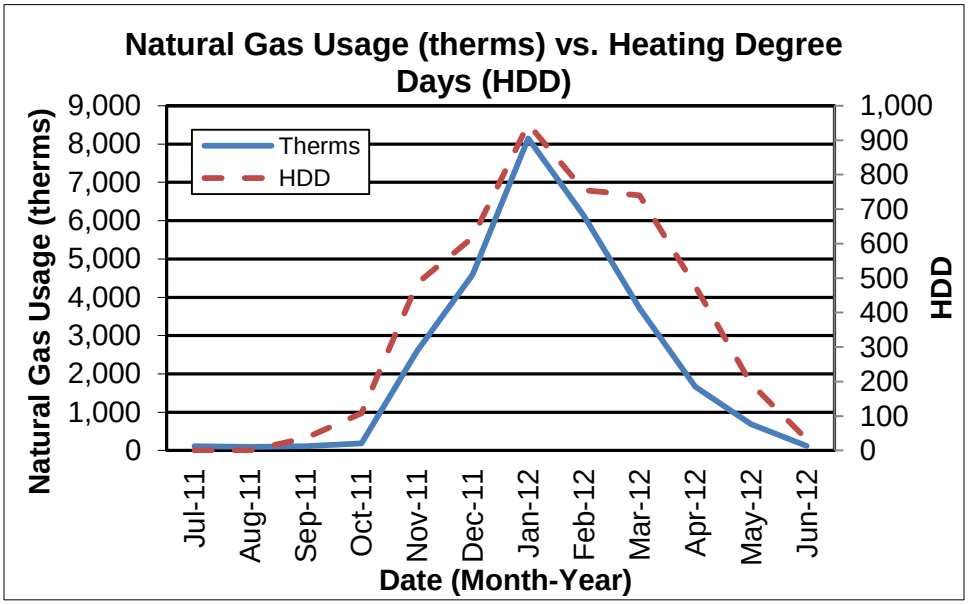


Natural gas – New Bridge Center currently shares one natural gas meter with the Cherry Hill Elementary School. Because there is only one meter, it is impossible to determine what usage is attributed to which building. Gas is purchased at an average aggregated rate of $0.96/therm. The schools consumed approximately 28,152 therms, or $26,999 of natural gas, in the previous year. The New Bridge Center uses PSE&G for delivery and Hess as a third-party supplier of natural gas.

The chart below shows the monthly natural gas usage and costs. Gas usage peaks during the winter months due to heating requirements and decreases significantly during the summer

months. The green line represents the approximate baseload or minimum natural gas usage required to operate both buildings. Baseload is calculated by taking the average usage of therms during the lowest three months of the year.



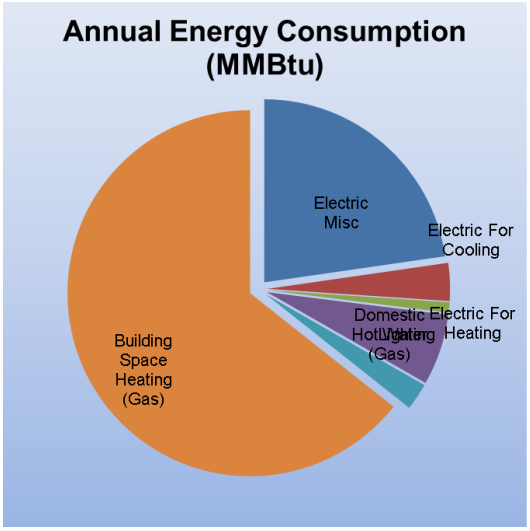


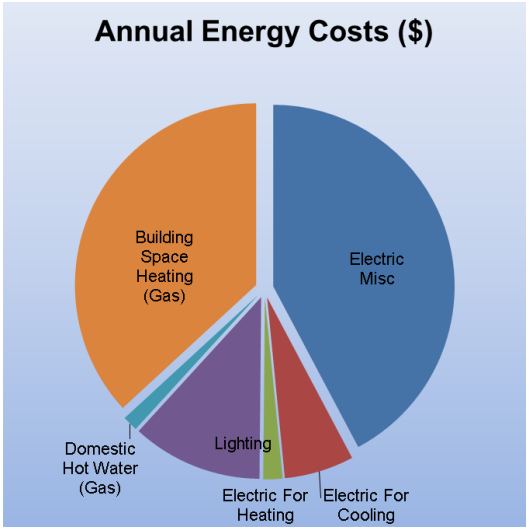
The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature, on a given day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. For the purpose of this analysis, SWA used a base temperature of 65°F.

The following graphs, pie charts, and table show energy use at the New Bridge Center based on utility bills for the 12-month period. Note that the electrical rate of $52/MMBtu is more than three times the natural gas rate of $16/MMBtu.

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Misc	959	23%	$48,255	42%	50
Electric For Cooling	141	3%	$7,085	6%	50
Electric For Heating	39	1%	$1,957	2%	50
Lighting	265	6%	$13,325	12%	50
Domestic Hot Water (Gas)	100	2%	$1,555	1%	16
Building Space Heating (Gas)	2,715	64%	$42,080	37%	16
Totals	4,218	100%	$114,257	100%	
Total Electric Usage	1,403	33%	$70,622	62%	50
Total Gas Usage	2,815	67%	$43,635	38%	16
Totals	4,218	100%	$114,257	100%	

*Much of the miscellaneous electric consumption is attributed to plug-load equipment and appliances that are discussed further in the Electrical Systems section.





Energy benchmarking

As previously stated, the Cherry Hill Elementary School and the New Bridge Center are two structurally connected schools that are part of River Edge School District. They have separate addresses, administration, employees, students, HVAC systems, and even electric meters. They do, however, share a single gas account and a single gas meter. This, in turn, makes it impossible to attribute gas usage to the respective schools. Because of this, the two buildings were entered into the Environmental Protection Agency's (EPA) Energy Star® Portfolio Manager as one single building. The two electric accounts were attributed to each space and the gas account to the entire building. Because the New Bridge Center was built in 2006 and the Cherry Hill Elementary School was built in 1948 the buildings envelopes and systems vary significantly. The energy performance rating generated is a 56, however this reflects both schools and doesn't represent a truly accurate score for the New Bridge Center.

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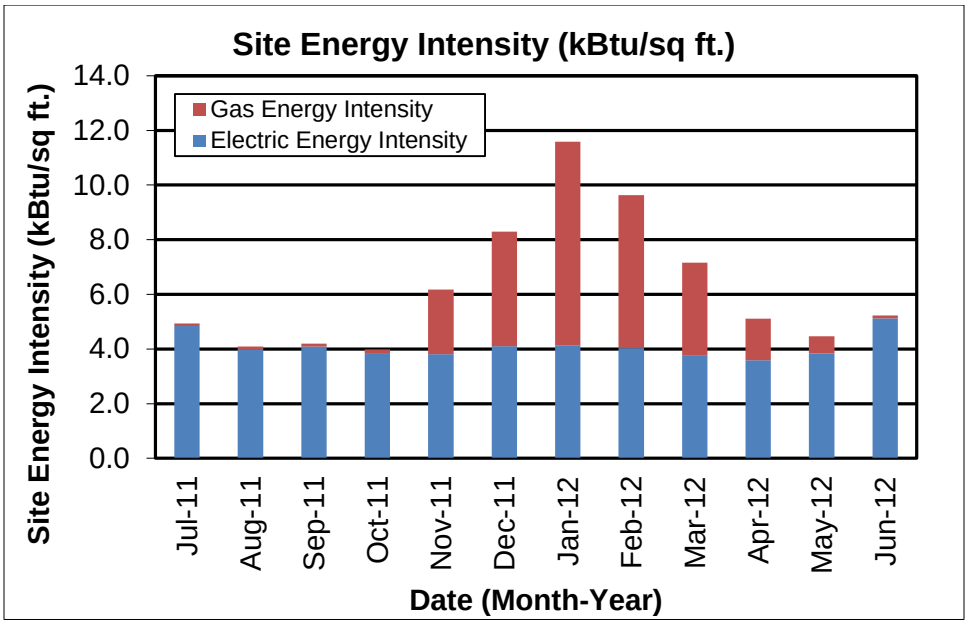
benchmarking system. The facility is categorized as an “K-12 School" space type. Based on the data entered into the Portfolio Manager software, the building has an Energy Performance Rating of 56 out of a possible 100 points. For reference, a score of 69 is required for LEED for Existing Buildings certification and a score of 75 is required for ENERGY STAR® certification. A score of 56 shows the building is 6% below the national average for “K-12 School” space types. However, because the benchmarking had to be performed in conjunction with Cherry Hill School which shares a gas meter and is a much older building, the true score could be much higher.

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 schools. This 100 point scale determines how well the building performs relative to other buildings across the country, regardless of climate and other differentiating factors.

The Site Energy Use Intensity (EUI) is 48 kBtu/sqft/yr compared to the national average of 51 kBtu/sqft/yr for a “K-12 School". This is a -6% difference between the buildings’ intensity and the national average. See ECM section for guidance on how to further improve the building’s rating.



Per the LGEA program requirements, SWA has assisted the River Edge School District to create an ENERGY STAR® Portfolio Manager account and share the New Bridge Center’s information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager Account information with the River Edge School District (user name of “RiverEdgeSchools” with a password of “njschools”) and TRC Energy Services (user name of “TRC-LGEA”).

Tariff analysis

Tariff analysis can help determine if the school is paying the lowest rate possible for electric and gas service. Tariffs are typically assigned to buildings based on size and building type. Rate

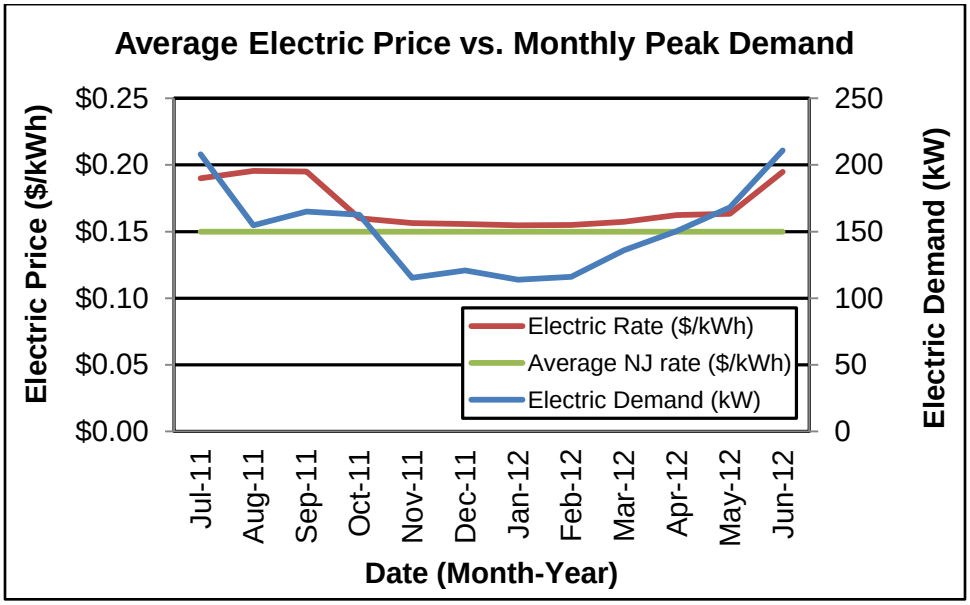
fluctuations are expected during periods of peak usage. Natural gas prices often increase during winter months since a large volume of natural gas is needed for heating equipment. Similarly, electricity prices often increase during the summer months when additional electricity is needed for cooling equipment.

As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs for the River Edge School District. The District is currently paying a negotiated rate for natural gas from Hess. The electric use for the building is direct-metered with a negotiated third-party supplier rate for supply with an additional charge for electrical demand and delivery. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

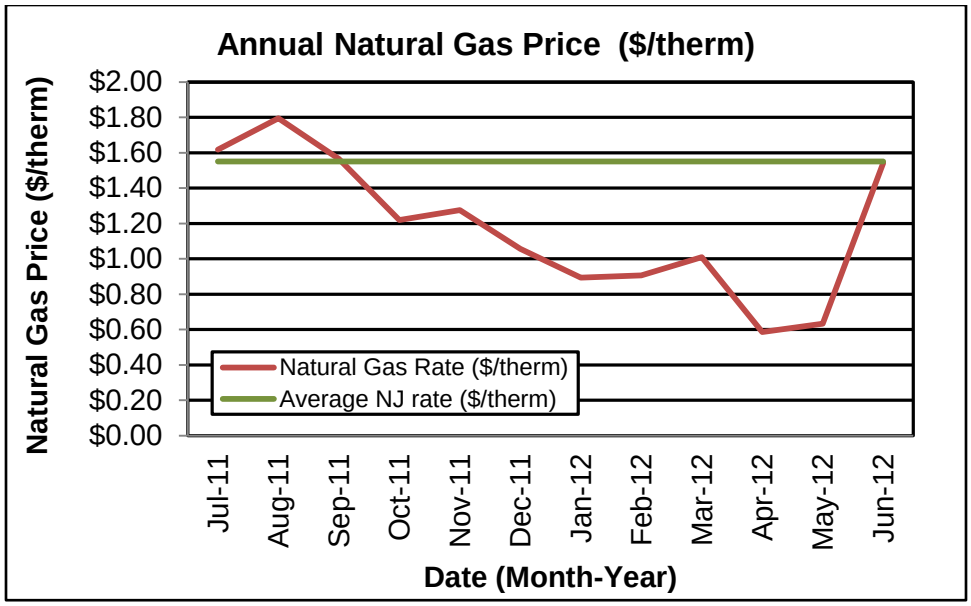
Energy Procurement strategies

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 the New Bridge Center pays a rate of $0.172/kWh. Electric bill analysis shows fluctuations of up to 21% over the 12-month period due to demand costs.



The average estimated NJ commercial utility rate for gas is $1.550/therm, while the New Bridge Center pays a rate of $0.96/therm. Natural gas bill analysis shows fluctuations up to 67% over the most recent 12-month period due to demand costs.



The graph displays a significant cost per therm increase between the months of June and October. This fluctuation is due to a much lower average consumption during those months. Because River Edge pays a base charge for natural gas service, it follows that the cost per therm during times of low usage would be considerably inflated.

SWA recommends that the New Bridge Center explore opportunities of purchasing electricity from alternative third-party supplier in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the facility. Appendix C contains a complete list of third-party energy suppliers for the River Edge service area.

EXISTING FACILITY AND SYSTEMS DESCRIPTION

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

Based on the site visit conducted by SWA on Tuesday, June 26th, 2012, the following data was collected and analyzed.

Building Characteristics

The New Bridge Center is a three-story structure constructed in 2006. The facility is used as a Pre-K and Kindergarten school. The building is structurally attached to Cherry Hill Elementary School and composed mostly of classrooms. Additional spaces throughout the building include conference rooms, the Main Office, Principal's Office, Facilities Manager's Office, bathrooms, storage and filing rooms. The boiler room is located on the ground floor.

Satellite image of the New Bridge Center courtesy of Google Earth

East Façade – Main Entrance

North Façade

West Façade

South Façade

Building Occupancy Profiles

There are 60 employees working at the New Bridge Center from Monday through Friday. Typical hours of operation are 7:00am to 7:00pm. Beginning at the end of June and through the end of July, the school hosts a summer school program. The building is at full occupancy year round, except for the month of August where the building drops to half occupancy.

Building Envelope

All findings and recommendations on the exterior envelope (base, walls, roofs, doors and windows) are based on the energy auditor's experience and expertise, on construction document reviews (if available) 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 of the New Bridge Center consists of brick veneer with precast stone accents over concrete block. Interior walls are primarily painted concrete block with areas of gypsum wallboard and tile. During the field audit, both exterior and interior surfaces were found to be in overall good condition with no signs of uncontrolled moisture, air-leakage and/or other energy-compromising issues. Exact wall insulation levels could not be verified at the time of the audit.

Roof

The roof of the New Bridge Center is composed of a roll-on bitumen membrane faced with granular stone aggregate that appears to be in good condition. Roofs, related flashing, sealants, gutters and downspouts were inspected during the field audit. They were reported to be in overall good condition. Roof insulation levels could not be verified in the field.

There are thirty six solar panels installed on the roof of New Bridge Center. They are used to power the science lab. The panels are in good condition and show no signs of damage.

Flat asphalt roof

Solar panels installed on New Bridge Center roof

Base

The building's base is composed of a partially below-grade slab ground floor, perimeter footing and poured concrete foundation walls. Slab/perimeter insulation levels could not be verified in the field.

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.

Windows

The windows are unit (predominantly single-hung) type windows with an insulated fiberglass composite frame, double-paned with UV glazing. Standard vinyl blinds provide a shading option. The windows are located throughout the buildings.

Typical single-hung window units exhibit no signs of energy-compromising issues.

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

Exterior doors

The building's typical type of exterior door is glass with aluminum frame. They are located at entrances at the front and rear of the building. A solid aluminum door with glass window is used by maintenance.

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 no signs of uncontrolled moisture and minimal air-leakage.

Typical door types with no visible energy-compromising issues

Building air-tightness

Overall, the New Bridge Center was found to be reasonably air-tight. There were no noticeable signs of air leakage at locations of ingress and egress.

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

Mechanical Systems

Heating Ventilation Air Conditioning

The entire building is fully conditioned. There were no noteworthy comfort issues at the facility brought to our attention during the time of the audit. Because the building was constructed in 2006, all equipment and the building envelope is still relatively new and comfort complaints would be expected to be low.

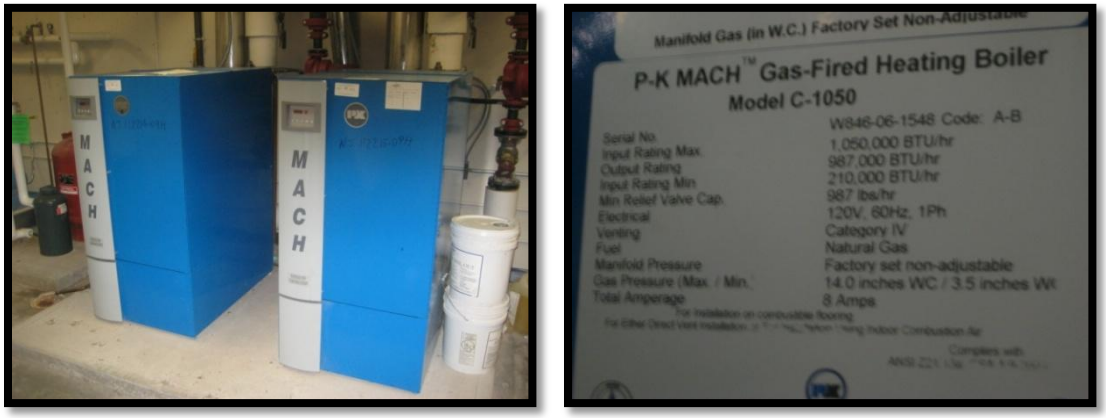
Equipment

The New Bridge Center contains two gas-fired condensing boilers that deliver hot water for heating to unit ventilators throughout the building. Rooftop air handling units provide heating and cooling to the common areas. Secondary cooling is provided by Airedale Classmate

packaged units. Exhaust fans on the roof provide mechanical ventilation to the bathrooms and mechanical equipment. A comprehensive Equipment List can be found in Appendix A.

Hot Water Boiler Description

Heating is provided by two P-K Mach-manufactured condensing boilers. Installed with the construction in 2006, the boilers are natural gas-fired with a total of 2,100 MBH maximum input, 1,974 MBH output, thermal efficiency of 94% and a maximum allowable working pressure of 14 psi. Boilers are modulated by a Heat Timer and temperatures are reset based on outside air temperature. Two 5 H.P. motor Baldor pumps, modulated by an Intellipass VFD, circulate HHW to unit ventilators throughout the building. The boilers are located on the ground floor and appear to be in good condition.

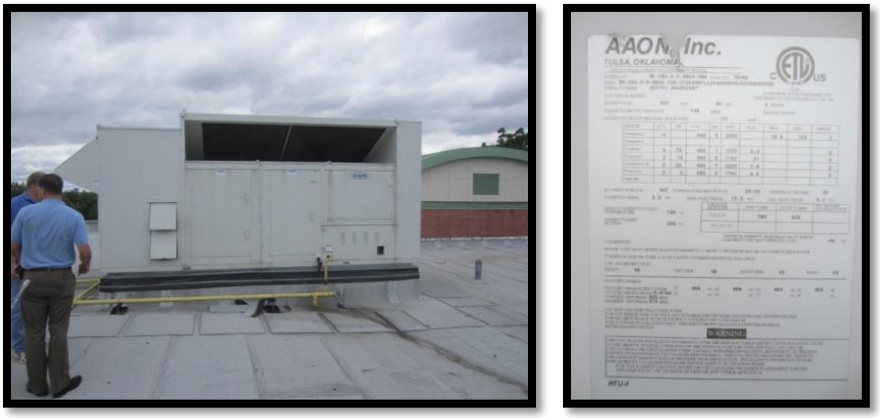


Gas-fired Hot Water Boilers located in basement Boiler Room

Two of the bathrooms at New Bridge Center have supplemental electric space heaters because they are located on an exterior wall.

Air Handling Unit Description

New Bridge Center is cooled primarily by a 50 ton rooftop Aaon packaged DX unit (Model # RN-050-3-0-BB04-3B9). The unit is the source of cooling an heating for all areas of New Bridge except for the sixteen classrooms. The unit has a heating rated input of 780 MBH and a rated output of 632 MBH for an approximate efficiency of 80%.



50 ton rooftop air handling unit

Ductless Packaged System Descriptions

The sixteen classrooms are served by a total of 12 Airedale ClassMate single packaged vertical DX cooling & heat pumps. The units house a two stage compressor and evaporator to generate cooling for the respective classrooms. The units are designed specifically for classrooms and operate quietly.

Ventilation

There are two exhaust fans located on the roof level, which provide ventilation for bathrooms. Exhaust fans appear to be in age-appropriate condition. Both fans are belt-driven and have 2 H.P. motors.

ASHRAE Standard 62-99 identifies the outdoor air ventilation required for indoor air quality. Almost all municipal, state and federal jurisdictions use these guidelines as gospel in their building codes and bylaws. The traditional method of accomplishing the ventilation rates was to set the outdoor air quantity to maximum design occupancy. This can result in a tremendous waste of energy when the occupant load is not at maximum –almost always the situation in many schools - or intermittent use of the space. Carbon dioxide monitoring and control is an acceptable method of reducing ventilation rates when occupancy is below the design load. This ensures ASHRAE standards are being met and only expending the necessary amount of energy.

Typical rooftop exhaust fan unit

Distribution Systems

The New Bridge Center employs a constant air volume system whereby cooled air is sent to various spaces throughout the building via distribution ducts from the rooftop Aaon AHU. Hot water for heating is distributed to unit ventilators throughout the New Bridge Center via a two-pipe system. Copper piping is used throughout.

Controls

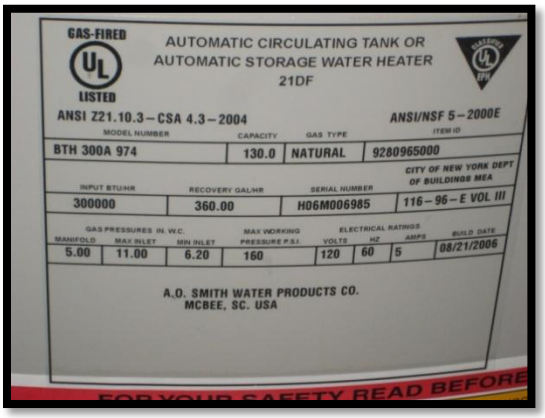
A central BMS monitors set-points throughout the building. The BMS system is manufactured by Automated Logic, however there is no service contract in place. The BMS contractor is only on-site and consulted for regularly scheduled maintenance. Sensors are only calibrated when an apparent malfunctions occurs. SWA did not have access to the BMS at the time of the audit, therefore specific set points and trending capacity is unknown. According to facilities staff all major

equipment, including boilers, heating pumps, Airedale units and AHU's are connected to the BMS.

Each classroom/office in the New Bridge Center operates as an individual zone. Thermostats for cooling are located in each classroom and can be adjusted locally or overridden by the central BMS located in the Facilities Manager's office. The thermostats control the Airedale units providing cooling to individual zones. Each zone has a separate thermostat for heating that controls the unit ventilators.

Domestic Hot Water

The building is supplied DHW by a natural gas-fired, mechanically vented energy-saver Cyclone XHE Commercial Gas Water Heater manufactured by AO Smith. The unit has a 130 gallon capacity and an input of 300,000 Btuh. The unit has a rated efficiency of 96% and appears to be in very good condition. The water is circulated by a Grundfos VersaFLo (model # UPS 50-80/4 F) 3 speed, 3 H.P. high efficiency recirculating pump.



AO Smith gas-fired unit Domestic hot water heater

Electrical systems

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

Interior Lighting

Interior lighting at the New Bridge Center is comprised of electronically ballasted, T8-lamped fixtures. Typical fixtures are 2x4 prismatic lensed recessed troffers. Smaller spaces such as

janitor's rooms and closets are illuminated with self-ballasted compact florescent lamps (CFL). All interior lighting is manually switch-operated; there are no automatic controls.

Exit Lights
Exit signs were all found to be efficient LED type.

Exterior Lighting
Exterior lighting includes various fixtures located on the roof of the building and pole mounted fixtures. Much of the perimeter space is shared with the Cherry Hill School. There are eight pole mounted Metal Halide fixtures that are 400 watts and six wall packs that are 250 watts. According to facilities management, the fixtures were installed around 2007 and are pulse start. The outdoor lamps are controlled by timers and are only on for 2-4 hours every night.

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.

The New Bridge Center has a variety of plug-load appliances throughout. There are several computers, printers, copy machines and microwaves located in the building. SWA recommends that as non- Energy Star® appliances fail, replace with Energy Star® rated appliances.

Elevators
The New Bridge Center has one hydraulic type elevator that serves the first and second floors.

Hydraulic type elevator motor

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

There are currently thirty six (36) solar panels installed on the roof of the New Bridge Center and are used to provide electricity to the computer lab.

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.

The New Bridge Center already has a Solar Photovoltaic system installed.

Solar Thermal Collectors

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

Wind

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

Geothermal

The New Bridge Center is not good candidates for geothermal installation since it would require replacement of the entire existing HVAC system, of which major components still have between 30% and 60% remaining useful life.

Combined Heat and Power

The New Bridge Center 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 high electrical baseload to accommodate the electricity generated, as well as a means for using waste heat generated. Typical applications include buildings with an absorption chiller, where waste heat would be used efficiently.

PROPOSED ENERGY CONSERVATION MEASURES

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

Recommendations: Energy Conservation Measures

	List of Highly Recommended 0-5 Year Payback ECMs
ECM 1	**Install thirty-six (36) occupancy sensors**
ECM 2	**Retro-commissioning**
	List of Capital Investment Opportunities
CI 2	**Install demand controlled ventilation**

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: Install thirty-six (36) new occupancy sensors

During the field audit, SWA completed a building lighting inventory (see Appendix B) and observed that the existing lighting has minimal to no control via occupancy sensors. SWA identified a number of areas that could benefit from the installation of occupancy sensors. SWA recommends installing occupancy sensors in areas that are occupied only part of the day and the payback on savings is justified. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advance lighting sensors include sound detection as a means to control lighting operation. The labor for the recommended installations is evaluated using prevailing electrical contractor wages.

Installation cost:

Estimated installed cost: $7,920

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, $	est. energy & operating 1st year cost savings, $	life of measure, yrs	Est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
7,200	16,962	3.5	0	5.8	0	2,544	15	38,164	2.8	530%	35%	24	19,739	25,786

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

Rebates/financial incentives:

- NJ Clean Energy – SmartStart - Wall-mounted occupancy sensors ($20, or check latest incentive per occupancy sensor) - Maximum incentive amount is $100
- NJ Clean Energy – Direct Install (Up to 70% of installed cost)

Please see Appendix H for more information on Incentive Programs

ECM #2: Retro-commission building systems and operations

SWA recommends retro-commissioning building systems and equipment. Retro-commissioning is a process that seeks to improve how building equipment and systems function together. Depending on the age of the building, retro-commissioning can often resolve problems that occurred during design or construction and/or address problems that have developed throughout the building's life. Owners often undertake retro-commissioning to optimize building systems, reduce operating costs, and address comfort complaints from building occupants. A cost of $0.75 per square foot is assumed, resulting in an approximate investment of $30,291 to implement this measure.

Even though New Bridge Center is a relatively new building, SWA recommends retro-commissioning to optimize system operation. The retro-commissioning process should include a review of existing operational parameters all equipment. During retro-commissioning, the individual loop temperatures and (setback) schedules should also be reviewed to identify opportunities for optimizing system performance, besides air balancing and damper proper operation. Retro-commissioning should address current ventilation rates and ensure that proper ventilation rates are maintained.

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
30,291	54,282	1.8	2,715	15.7	1,820	15,594	12	187,131	1.9	518%	43%	51	0	127,119

Estimated materials cost: $30,291 ($0.75/ft^2)
Source of cost estimate: Similar Projects

PROPOSED FURTHER RECOMMENDATIONS

Capital Improvements

Capital Improvements (CIs) are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available, or if the installed costs can be shared with other improvements, such as major building renovations. SWA recommends the following capital improvements for the New Bridge Center.

CI #1: Install demand controlled ventilation

SWA recommends installation of CO_2 based demand controlled ventilation (DCV) for the New Bridge Center. Currently, the Airedale Classmate units provide minimum outside air based on the building's maximum design occupancy. The proposed measure will see that instead of continuously ventilating the space at a constant rate designed to accommodate the maximum occupancy of the building, the CO_2 based demand-controlled ventilation (DCV) will assure that the amount of outside air drawn in for ventilation depends on the building's actual occupancy at any given time. This strategy results in energy savings because it reduces the amount of air that needs to be conditioned as well as the fan energy used to move that air. DCV primarily refers to when actual occupancies are approximated by measuring carbon dioxide (CO_2) levels within a building with sensors. This strategy results in energy savings because it reduces the amount of air that needs to be conditioned as well as the fan energy used to move that air.

Energy savings and payback: Based on a study conducted by the Federal Energy Management Program (FEMP), Demand Controlled Ventilation may yield a wide range of cost savings, anywhere from $0.05 to $1.00 per square foot. Savings depended on the density, variability and unpredictability of space occupancy, heating and/or cooling demand and utility rates. A more accurate approximation of energy and cost savings related to the installation of demand controlled ventilation would require a much more detailed analysis of the building's occupancy, hours of operation and equipment use.

Because the boilers modulate based on outside air temperatures and because building occupancy varies on a daily basis, particularly during evenings and weekends, estimating energy savings and payback for this measure would require a much more detailed analysis of boiler operating hours.

Estimated materials cost: $700 - $900 per zone for systems with an existing DDC programmable controller

Source of cost estimate: Demand Controlled Ventilation study conducted by the Federal Energy Management Program: http://www1.eere.energy.gov/femp/pdfs/fta_co2.pdf

Operations and Maintenance

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

- Replace belt driven ventilation fans with direct driven fans – Newer direct drive exhausts (i.e. Varigreen) use less energy and save on maintenance costs because there is no need to replace belts. Direct drive exhaust fans may realize estimated savings of 20% over similarly sized belt-driven models. It is not cost effective to simply replace the fans, however as they reach the end of their useful life, new direct drive fans should be considered. Based on current exhaust fan run-time, upgrading to direct drive exhaust fans may yield an annual electrical savings of approximately $84 and a payback of 15 years.

- Use smart power electric strips in conjunction with occupancy sensors to power down computer equipment when left unattended for extended periods of time. A smart power strip may cost approximately $30 per unit.

- Create an energy educational program - that teaches how to minimize energy use. The U.S. Department of Energy offers free information for hosting energy efficiency educational programs and plans. For more information please visit: http://www1.eere.energy.gov/education/.

- Detailed Preventative Maintenance schedule – While the maintenance crew does perform preventative maintenance tasks on a regular basis, specifics of the schedule were not readily available. SWA provides a comprehensive list of recommended preventative maintenance measures to cross-reference with the facilities' existing plan. Please see Appendix I for a typical Preventative Maintenance Plan provided by SWA.

APPENDIX A: EQUIPMENT LIST

Building System	Description	Model #	Fuel	Location	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating	Gas-fired hot water boiler; 14 PSI; 1050 MBH max. In-put, 967 MBH output, 92% nominal efficiency.	P-K Mach Model C-1050	Natural Gas	Boiler Room	All areas	2006	60%
Heating	Gas-fired hot water boiler; 14 PSI; 1050 MBH max. In-put, 967 MBH output, 92% nominal efficiency.	P-K Mach Model C-1050	Natural Gas	Boiler Room	All areas	2006	60%
Heating/ Cooling	All in one classroom units (X's 12)	Airedale Classmate, R410A refrigerant	Electric	Classrooms	Classrooms	2006	60%
Cooling	50 Ton Rooftop HVAC unit	Aaon Model No. RN-050-3-0-BB04-3B9	Electric and Natural Gas	Roof	Room 217	2006	60%
DHW	Natural gas-fired, mechanically vented hot water heater; 130 gallon capacity; 300,000 Btuh input	AO Smith: m/n BTH300A974; s/n H06M006985	Natural Gas	Boiler Room	Bathrooms and custodial slop sinks	2006	60%
Ventilation	Exhaust Fan- 2HP Belt driven	Carnes Model # VEBK18V1C1NA 20SPC1	Electric	Roof	Restrooms	2006	60%
Ventilation	Exhaust Fan- 2HP Belt driven	Carnes Model # VEBK18V1C1NA 20SPC1	Electric	Roof	Restrooms	2006	60%

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

APPENDIX B: LIGHTING STUDY

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	1	Hallway (HALL)	Recessed Parabolic	E	2'T8	17	2	17	Sw	16	261	2	612	2,556	N/A	Recessed Parabolic	2'T8	E	Sw	17	2	17	16	261	2	612	2556	0	0	0
2	1	Hallway (HALLA)	Recessed	S	CFL	5	4	23	Sw	16	261	0	460	1,921	N/A	Recessed	CFL	S	Sw	5	4	23	16	261	0	460	1921	0	0	0
3	1	Hallway (HALLB)	Recessed Parabolic	E	4'T8	4	2	32	Sw	16	261	5	276	1,153	N/A	Recessed Parabolic	4'T8	E	Sw	4	2	32	16	261	5	276	1153	0	0	0
4	1	Classroom (242)	Recessed Parabolic	E	4'T8	21	3	32	Sw	10	261	5	2,121	5,536	C	Recessed Parabolic	4'T8	E	OS	21	3	32	8	261	5	2121	4152	0	1384	1384
5	1	Bathroom Men (BATHA)	Recessed Parabolic	E	4'T8	1	3	32	Sw	5	261	5	101	132	C	Recessed Parabolic	4'T8	E	OS	1	3	32	4	261	5	101	99	0	33	33
6	1	Bathroom Men (BATHB)	Recessed Parabolic	E	4'T8	1	3	32	Sw	5	261	5	101	132	C	Recessed Parabolic	4'T8	E	OS	1	3	32	4	261	5	101	99	0	33	33
7	1	Classroom (246)	Recessed Parabolic	E	4'T8	11	3	32	Sw	10	261	5	1,111	2,900	C	Recessed Parabolic	4'T8	E	OS	11	3	32	8	261	5	1111	2175	0	725	725
8	1	Classroom (246A)	Recessed Parabolic	E	2'T8	3	2	17	Sw	10	261	2	108	282	C	Recessed Parabolic	2'T8	E	OS	3	2	17	8	261	2	108	211	0	70	70
9	1	Janitor's Closet (JAN)	Recessed Parabolic	E	2'T8	1	3	17	Sw	2	261	2	53	28	N/A	Recessed Parabolic	2'T8	E	Sw	1	3	17	2	261	2	53	28	0	0	0
10	1	Electrical Rm (ELECT)	Recessed Parabolic	E	2'T8	1	3	17	Sw	2	261	2	53	28	N/A	Recessed Parabolic	2'T8	E	Sw	1	3	17	2	261	2	53	28	0	0	0
11	1	Classroom (245)	Recessed Parabolic	E	2'T8	3	2	17	Sw	10	261	2	108	282	C	Recessed Parabolic	2'T8	E	OS	3	2	17	8	261	2	108	211	0	70	70
12	1	Classroom (245A)	Recessed Parabolic	E	4'T8	12	3	32	Sw	10	261	5	1,212	3,163	C	Recessed Parabolic	4'T8	E	OS	12	3	32	8	261	5	1212	2372	0	791	791
13	1	Classroom (243A)	Recessed Parabolic	E	4'T8	12	3	32	Sw	10	261	5	1,212	3,163	C	Recessed Parabolic	4'T8	E	OS	12	3	32	8	261	5	1212	2372	0	791	791
14	1	Classroom (243)	Recessed Parabolic	E	2'T8	3	3	17	Sw	10	261	2	159	415	C	Recessed Parabolic	2'T8	E	OS	3	3	17	8	261	2	159	311	0	104	104
15	2	Classroom (340)	Recessed Parabolic	E	4'T8	11	3	32	Sw	10	261	5	1,111	2,900	C	Recessed Parabolic	4'T8	E	OS	11	3	32	8	261	5	1111	2175	0	725	725
16	2	Classroom (341)	Recessed Parabolic	E	4'T8	11	3	32	Sw	10	261	5	1,111	2,900	C	Recessed Parabolic	4'T8	E	OS	11	3	32	8	261	5	1111	2175	0	725	725
17	2	Classroom (342)	Recessed Parabolic	E	4'T8	11	3	32	Sw	10	261	5	1,111	2,900	C	Recessed Parabolic	4'T8	E	OS	11	3	32	8	261	5	1111	2175	0	725	725
18	2	Classroom (343)	Recessed Parabolic	E	4'T8	11	3	32	Sw	10	261	5	1,111	2,900	C	Recessed Parabolic	4'T8	E	OS	11	3	32	8	261	5	1111	2175	0	725	725
19	2	Classroom (344)	Recessed Parabolic	E	4'T8	11	3	32	Sw	10	261	5	1,111	2,900	C	Recessed Parabolic	4'T8	E	OS	11	3	32	8	261	5	1111	2175	0	725	725
20	2	Classroom (345)	Recessed Parabolic	E	4'T8	11	3	32	Sw	10	261	5	1,111	2,900	C	Recessed Parabolic	4'T8	E	OS	11	3	32	8	261	5	1111	2175	0	725	725
21	2	Classroom (346)	Recessed Parabolic	E	4'T8	11	3	32	Sw	10	261	5	1,111	2,900	C	Recessed Parabolic	4'T8	E	OS	11	3	32	8	261	5	1111	2175	0	725	725
22	2	Classroom (347)	Recessed Parabolic	E	4'T8	11	3	32	Sw	10	261	5	1,111	2,900	C	Recessed Parabolic	4'T8	E	OS	11	3	32	8	261	5	1111	2175	0	725	725
23	2	Classroom (340A)	Recessed Parabolic	E	2'T8	3	3	17	Sw	10	261	2	159	415	C	Recessed Parabolic	2'T8	E	OS	3	3	17	8	261	2	159	311	0	104	104
24	2	Classroom (341A)	Recessed Parabolic	E	2'T8	3	3	17	Sw	10	261	2	159	415	C	Recessed Parabolic	2'T8	E	OS	3	3	17	8	261	2	159	311	0	104	104
25	2	Classroom (342A)	Recessed Parabolic	E	2'T8	3	3	17	Sw	10	261	2	159	415	C	Recessed Parabolic	2'T8	E	OS	3	3	17	8	261	2	159	311	0	104	104
26	2	Classroom (343A)	Recessed Parabolic	E	2'T8	3	3	17	Sw	10	261	2	159	415	C	Recessed Parabolic	2'T8	E	OS	3	3	17	8	261	2	159	311	0	104	104
27	2	Classroom (344A)	Recessed Parabolic	E	2'T8	3	3	17	Sw	10	261	2	159	415	C	Recessed Parabolic	2'T8	E	OS	3	3	17	8	261	2	159	311	0	104	104
28	2	Classroom (345A)	Recessed Parabolic	E	2'T8	3	3	17	Sw	10	261	2	159	415	C	Recessed Parabolic	2'T8	E	OS	3	3	17	8	261	2	159	311	0	104	104
29	2	Classroom (346A)	Recessed Parabolic	E	2'T8	3	3	17	Sw	10	261	2	159	415	C	Recessed Parabolic	2'T8	E	OS	3	3	17	8	261	2	159	311	0	104	104
30	2	Classroom (347A)	Recessed Parabolic	E	2'T8	3	3	17	Sw	10	261	2	159	415	C	Recessed Parabolic	2'T8	E	OS	3	3	17	8	261	2	159	311	0	104	104
31	2	Classroom-bath (340B)	Recessed Parabolic	E	4'T8	1	3	32	Sw	7	261	5	101	185	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	7	261	5	101	185	0	0	0
32	2	Classroom-bath (341B)	Recessed Parabolic	E	4'T8	1	3	32	Sw	7	261	5	101	185	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	7	261	5	101	185	0	0	0
33	2	Classroom-bath (342B)	Recessed Parabolic	E	4'T8	1	3	32	Sw	7	261	5	101	185	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	7	261	5	101	185	0	0	0
34	2	Classroom-bath (343B)	Recessed Parabolic	E	4'T8	1	3	32	Sw	7	261	5	101	185	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	7	261	5	101	185	0	0	0
35	2	Classroom-bath (344B)	Recessed Parabolic	E	4'T8	1	3	32	Sw	7	261	5	101	185	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	7	261	5	101	185	0	0	0
36	2	Classroom-bath (345B)	Recessed Parabolic	E	4'T8	1	3	32	Sw	7	261	5	101	185	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	7	261	5	101	185	0	0	0
37	2	Classroom-bath (346B)	Recessed Parabolic	E	4'T8	1	3	32	Sw	7	261	5	101	185	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	7	261	5	101	185	0	0	0
38	2	Classroom-bath (347B)	Recessed Parabolic	E	4'T8	1	3	32	Sw	7	261	5	101	185	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	7	261	5	101	185	0	0	0
39	2	Bathroom Men (BATHC)	Recessed Parabolic	E	4'T8	1	3	32	Sw	2	261	5	101	53	C	Recessed Parabolic	4'T8	E	OS	1	3	32	2	261	5	101	40	0	13	13
40	2	Bathroom Men (BATHD)	Recessed Parabolic	E	4'T8	1	3	32	Sw	2	261	5	101	53	C	Recessed Parabolic	4'T8	E	OS	1	3	32	2	261	5	101	40	0	13	13
41	1	Janitor's Closet (CUST)	Ceiling Mounted	E	4'T8	1	3	32	Sw	2	261	5	101	53	N/A	Ceiling Mounted	4'T8	E	Sw	1	3	32	2	261	5	101	53	0	0	0
42	1	Electrical Rm (ELE)	Ceiling Mounted	E	4'T8	1	3	32	Sw	2	261	5	101	53	N/A	Ceiling Mounted	4'T8	E	Sw	1	3	32	2	261	5	101	53	0	0	0
43	1	Elevator (ELEV)	Ceiling Mounted	E	4'T8	1	2	32	Sw	2	261	5	69	36	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	2	261	5	69	36	0	0	0
44	1	Corridor (LOBBY)	Ceiling Mounted	S	MH	3	1	100	Sw	12	261	28	384	1,203	PSMH	Ceiling Mounted	PSMH	S	Sw	3	1	70	12	261	14	252	789	413	0	413
45	1	Corridor (LOBBY)	Ceiling Mounted	E	4'T8	7	2	32	Sw	12	261	5	483	1,513	N/A	Ceiling Mounted	4'T8	E	Sw	7	2	32	12	261	5	483	1513	0	0	0
46	1	Hallway (HALLR)	Recessed Parabolic	E	2'T8	6	2	17	Sw	16	261	2	216	902	N/A	Recessed Parabolic	2'T8	E	Sw	6	2	17	16	261	2	216	902	0	0	0
47	1	Bathroom Men (BATHE)	Recessed Parabolic	E	4'T8	1	3	32	Sw	2	261	5	101	53	C	Recessed Parabolic	4'T8	E	OS	1	3	32	2	261	5	101	40	0	13	13
48	1	Bathroom Men (BATHF)	Recessed Parabolic	E	4'T8	1	3	32	Sw	2	261	5	101	53	C	Recessed Parabolic	4'T8	E	OS	1	3	32	2	261	5	101	40	0	13	13
49	1	Bathroom Men (BATHG)	Recessed Parabolic	E	4'T8	1	3	32	Sw	2	261	5	101	53	C	Recessed Parabolic	4'T8	E	OS	1	3	32	2	261	5	101	40	0	13	13
50	1	Classroom (141)	Recessed Parabolic	E	4'T8	13	3	32	Sw	10	261	5	1,313	3,427	C	Recessed Parabolic	4'T8	E	OS	13	3	32	8	261	5	1313	2570	0	857	857
51	1	Classroom (141)	Recessed Parabolic	E	2'T8	2	2	17	Sw	10	261	2	72	188	C	Recessed Parabolic	2'T8	E	OS	2	2	17	8	261	2	72	141	0	47	47
50	1	Classroom (143)	Recessed Parabolic	E	4'T8	13	3	32	Sw	10	261	5	1,313	3,427	C	Recessed Parabolic	4'T8	E	OS	13	3	32	8	261	5	1313	2570	0	857	857
51	1	Classroom (143)	Recessed Parabolic	E	2'T8	2	2	17	Sw	10	261	2	72	188	C	Recessed Parabolic	2'T8	E	OS	2	2	17	8	261	2	72	141	0	47	47
54	1	Teachers Lounge (TEACH)	Recessed Parabolic	E	4'T8	5	3	32	Sw	10	261	5	505	1,318	C	Recessed Parabolic	4'T8	E	OS	5	3	32	8	261	5	505	989	0	330	330
55	1	Nurse's Station (NURSE)	Recessed Parabolic	E	4'T8	4	3	32	Sw	10	261	5	404	1,054	C	Recessed Parabolic	4'T8	E	OS	4	3	32	8	261	5	404	791	0	264	264
56	1	Classroom (145)	Recessed Parabolic	E	4'T8	6	3	32	Sw	10	261	5	606	1,582	C	Recessed Parabolic	4'T8	E	OS	6	3	32	8	261	5	606	1186	0	395	395
57	1	Classroom (148)	Recessed Parabolic	E	4'T8	2	3	32	Sw	10	261	5	202	527	C	Recessed Parabolic	4'T8	E	OS	2	3	32	8	261	5	202	395	0	132	132
58	1	Elevator Mech. Rm (ELEVR)	Recessed Parabolic	E	4'T8	1	3	32	Sw	2	261	5	101	53	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	2	261	5	101	53	0	0	0
59	1	Mechanical Rm (MECH)	Ceiling Suspended	E	4'T8	10	3	32	Sw	2	261	5	1,010	527	N/A	Ceiling Suspended	4'T8	E	Sw	10	3	32	2	261	5	1010	527	0	0	0
60	Ext	Parking lot (PARK)	Pole Mounted	S	MH	8	1	400	##	3	261	112	4,096	3,207	#N/A	Pole Mounted	PSMH	##	##	8	#N/A	#N/A	#N/A	261	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
61	2	Classroom (240A)	Recessed Parabolic	E	4'T8	6	3	32	Sw	9	261	5	606	1,423	C	Recessed Parabolic	4'T8	E	OS	6	3	32	7	261	5	606	1068	0	356	356
62	2	Classroom (240B)	Recessed Parabolic	E	4'T8	6	3	32	Sw	9	261	5	606	1,423	C	Recessed Parabolic	4'T8	E	OS	6	3	32	7	261	5	606	1068	0	356	356
63	2	Classroom (241)	Recessed Parabolic	E	4'T8	12	3	32	Sw	9	261	5	1,212	2,847	C	Recessed Parabolic	4'T8	E	OS	12	3	32	7	261	5	1212	2135	0	712	712
64	2	Classroom (247)	Recessed Parabolic	E	4'T8	14	3	32	Sw	9	261	5	1,414	3,321	C	Recessed Parabolic	4'T8	E	OS	14	3	32	7	261	5	1414	2491	0	830	830
65	2	Hallway (HALLS)	Recessed Parabolic	E	4'T8	10	2	32	Sw	16	261	5	690	2,881	N/A	Recessed Parabolic	4'T8	E	Sw	10	2	32	16	261	5	690	2881	0	0	0
66	2	Hallway (HALLT)	Recessed Parabolic	E	2'T8	10	2	17	Sw	16	261	2	360	1,503	N/A	Recessed Parabolic	2'T8	E	Sw	10	2	17	16	261	2	360	1503	0	0	0
67	2	Hallway (HALLT)	Recessed Parabolic	S	CFL	5	2	13	Sw	16	261	0	130	543	N/A	Recessed Parabolic	CFL	S	Sw	5	2	13	16	261	0	130	543	0	0	0
68	2	Hallway (HALLU)	Recessed Parabolic	E	2'T8	16	2	17	Sw	16	261	2	576	2,405	N/A	Recessed Parabolic	2'T8	E	Sw	16	2	17	16	261	2	576	2405	0	0	0
69	2	Classroom (140)	Recessed Parabolic	S	CFL	4	2	13	Sw	10	261	0	104	271	C	Recessed Parabolic	CFL	S	OS	4	2	13	8	261	0	104	204	0	68	68
70	2	Classroom (140)	Recessed Parabolic	E	4'T8	6	2	32	Sw	10	261	5	414	1,081	C	Recessed Parabolic	4'T8	E	OS	6	2	32	8	261	5	414	810	0	270	270
71	2	Classroom (140)	Recessed Parabolic	E	2'T8	1	2	17	Sw	10	261	2	36	94	C	Recessed Parabolic	2'T8	E	OS	1	2	17	8	261	2	36	70	0	23	23
72	2	Meeting Room (Conf. room)	Recessed Parabolic	E	4'T8	3	2	32	Sw	10	261	5	207	540	N/A	Recessed Parabolic	4'T8	E	Sw	3	2	32	10	261	5	207	540	0	0	0
73	2	Office (Main)	Recessed Parabolic	E	4'T8	6	2	32	Sw	10	261	5	414	1,081	C	Recessed Parabolic	4'T8	E	OS	6	2	32	8	261	5	414	810	0	270	270
74	2	Office (Office 1)	Recessed Parabolic	E	4'T8	2	2	32	Sw	10	261	5	138	360	C	Recessed Parabolic	4'T8	E	OS	2	2	32	8	261	5	138	270	0	90	90
75	2	Office (director)	Recessed Parabolic	E	4'T8	3	2	32	Sw	10	261	5	207	540	C	Recessed Parabolic	4'T8	E	OS	3	2	32	8	261	5	207	405	0	135	135
76	2	Office (office 2)	Recessed Parabolic	E	4'T8	2	2	32	Sw	10	261	5	138	360	C	Recessed Parabolic	4'T8	E	OS	2	2	32	8	261	5	138	270	0	90	90
77	2	Office (office 3)	Recessed Parabolic	E	4'T8	2	2	32	Sw	10	261	5	138	360	C	Recessed Parabolic	4'T8	E	OS	2	2	32	8	261	5	138	270	0	90	90
78	2	Classroom (148)	Recessed Parabolic	E	2'T8	2	2	17	Sw	10	261	2	72	188	C	Recessed Parabolic	2'T8	E	OS	2	2	17	8	261	2	72	141	0	47	47

Legend							
Fixture Type		**Lamp Type**			**Control Type**	**Ballast Type**	**Retrofit Category**
Ceiling Suspended	Recessed	CFL	3'T12	8'T5	Autom. Timer (T)	S (Self)	N/A (None)
Exit Sign	Sconce	Inc	3'T12 U-Shaped	8'T5 U-Shaped	Bi-Level (BL)	E (Electronic)	T8 (Install new T8)
High Bay	Spotlight	LED	3'T5	8'T8	Contact (Ct)	M (Magnetic)	T5 (Install new T5)
Parabolic Ceiling Mounted	Track	HPS	3'T5 U-Shaped	8'T8 U-Shaped	Daylight & Motion (M)		CFL (Install new CFL)
Parabolic Ceiling Suspended	Vanity	MH	3'T8	Circline - T5	Daylight & Switch (DLSw)		LEDex (Install new LED Exit)
Pendant	Wall Mounted	MV	3'T8 U-Shaped	Circline - T8	Daylight Sensor (DL)		LED (Install new LED)
Recessed Parabolic	Wall Suspended	1'T12	4'T5	Circline - T12	Delay Switch (DSw)		D (Delamping)
Ceiling Mounted	Wallpack	1'T12 U-Shaped	4'T5 U-Shaped	FI.	Dimmer (D)		C (Controls Only)
Chandelier		1'T5	6'T12	Hal	Motion Sensor (MS)		PSMH (Install new Pulse-Start Metal Halide)
Equipment / Fume Hood		1'T5 U-Shaped	6'T12 U-Shaped	Induction	Motion& Switch (MSw)		
Flood		1'T8	6'T5	Infrared	None (N)		
Landscape		1'T8 U-Shaped	6'T5 U-Shaped	LPS	Occupancy Sensor (OS)		
Low Bay		2'T12 U-Shaped	6'T8	Mixed Vapor	Occupancy Sensor - CM (OSCM)		
Parabolic Wall Mounted		2'T5	6'T8 U-Shaped	Neon	Photocell (PC)		
Pole Mounted		2'T5 U-Shaped	8'T12	Quartz Halogen	Switch (Sw)		
Pole Mounted Off Building		2'T8 U-Shaped	8'T12 U-Shaped				

APPENDIX C: UPCOMING EQUIPMENT PHASEOUTS

LIGHTING:

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

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

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

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

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

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

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

HCFC (Hydrochlorofluorocarbons):

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

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

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

APPENDIX D: THIRD PARTY ENERGY SUPPLIERS

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

Alpha Gas and Electric, LLC 641 5th Street Lakewood, NJ 08701	(855) 553-6374 www.alphagasandelectric.com	**FirstEnergy Solutions** 300 Madison Avenue Morristown, NJ 07962	(800) 977-0500 www.fes.com	**Palmco Power NJ, LLC** One Greentree Centre 10000 Lincoln Drive East, Suite 201 Marlton, NJ 08053	(877) 726-5862 www.PalmcoEnergy.com
Ambit Northeast, LLC 103 Carnegie Center Suite 300 Princeton, NJ 08540	(877)-30-AMBIT (877) 302-6248 www.ambitenergy.com	**Gateway Energy Services Corp.** 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com	**Pepco Energy Services, Inc.** 112 Main St. Lebanon, NJ 08833	(800) ENERGY-9 (363-7499) www.pepco-services.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com	**GDF SUEZ Energy Resources NA, Inc.** 333 Thornall Street Sixth Floor Edison, NJ 08837	(866) 999-8374 www.gdfsuezenergyresources.com	**Plymouth Rock Energy, LLC** 338 Maitland Avenue Teaneck, NJ 07666	855-32-POWER (76937) www.plymouthenergy.com
Astral Energy LLC 16 Tyson Place Bergenfield, NJ 07621	(201) 384-5552	**Glacial Energy of New Jersey, Inc.** 75 Route 15 Building E Lafayette, NJ 07848	(888) 452-2425 www.glacialenergy.com	**Reliant Energy** 211 Carnegie Center Princeton, NJ 08540	(877) 297-3795 (877) 297-3780 www.reliant.com/pjm
Barclays Capital Services, Inc. 70 Hudson Street Jersey City, NJ 07302-4585	(888) 978-9974 www.group.barclays.com	**Green Mountain Energy Company** 211 Carnegie Center Drive Princeton, NJ 08540	(866) 767-5818 www.greenmountain.com/commercial-home	**ResCom Energy LLC 18C Wave Crest Ave. Winfield Park, NJ 07036**	(888) 238-4041 http://rescomenergy.com
BBPC, LLC d/b/a Great Eastern Energy 116 Village Blvd. Suite 200 Princeton, NJ 08540	888-651-4121 www.greateasternenergy.com	**Hess Corporation** 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com	**Respond Power LLC** 10 Regency CT Lakewood, NJ 08701	(877) 973-7763 www.respondpower.com
Blue Star Energy Services, Inc. d/b/a Blue Star Energy Solutions 309 Fellowship R2.,	(866) 258-3782 www.bluestarenergy.com	**HIKO Energy, LLC** 655 Suffern Road Teaneck, NJ 07666	(888) 264-4908 www.hikoenergy.com	**South Jersey Energy Company** 1 South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 266-6020 www.southjerseyenergy.com
BlueStar Energy Solutions 309 Fellowship Road, Fl. 2 Mount Laurel, NJ 08054	(866) 258-3782 (BLUESTAR) www.bluestarenergy.com	**HOP Energy, LLC d/b/a Metro Energy, HOP Fleet Fueling, HOP Energy Fleet Fueling** 1011 Hudson Avenue Ridgefield, NJ 07657	(877) 390-7155 www.hopenergy.com	**Sperian Energy Corp.** 1200 Route 22 East, Suite 2000 Bridgewater, NJ 08807	(888) 682-8082
Champion Energy Services, LLC 72 Avenue L Newark, NJ 07105	(877) 653-5090 www.championenergyservices.com	**Hudson Energy Services, LLC** 7 Cedar Street Ramsey, New Jersey 07446	(877) Hudson 9 www.hudsonenergyservices.com	**S.J. Energy Partners, Inc.** 208 White Horse Pike, Suite 4 Barrington, N.J. 08007	(800) 695-0666 www.sjnaturalgas.com
Clearview Electric, Inc. 505 Park Drive Woodbury, NJ 08096	(888) CLR-VIEW (888) 257-8439 www.clearviewenergy.com	**IDT Energy, Inc.** 550 Broad Street Newark, NJ 07102	(877) 887-6866 www.idtenergy.com	**Sprague Energy Corp.** 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
ConEdison Solutions Cherry Tree Corporate Center 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com	**Integrys Energy Services, Inc.** 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com	**Starion Energy PA Inc.** 101 Warburton Avenue Hawthorne, NJ 07506	(800) 600-3040 www.starionenergy.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(866) 237-7693 www.constellation.com	**Liberty Power Delaware, LLC 3000 Atrium Way Suite 273 Mt. Laurel, NJ 08054**	(866) 769-3799 www.libertypowercorp.com	**Stream Energy** 309 Fellowship Rd., Suite 200 Mt. Laurel, NJ 08054	(877) 39-8150 www.streamenergy.net
Constellation Energy 900A Lake Street, Suite 2 Ramsey, NJ 07446	(877) 997-9995 www.constellation.com	**Liberty Power Holdings, LLC 3000 Atrium Way Suite 273 Mt. Laurel, NJ 08054**	(866) 769-3799 www.libertypowercorp.com	**Systrum Energy** 1 Bergen Blvd. Fairview N.J 07022	(877) 797-8786 www.systrumenergy.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.com	**Linde Energy Services** 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.linde.com	**UGI Energy Services, Inc. d/b/a GASMARK 224 Strawbridge Drive Suite 107 Moorestown, NJ 08057**	(856) 273-9995 www.ugienergyservices.com
Direct Energy Business, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(888) 925-9115 www.directenergybusiness.com	**Marathon Power LLC** 302 Main Street Paterson, NJ 07505	(718) 435-2200 www.mecny.com	**Verde Energy USA, Inc.** 50 East Palisades Avenue Englewood, NJ 07631	(800) 388-3862 www.lowcostpower.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com	**NATGASCO, Inc.** 532 Freeman St. Orange, NJ 07050	(973) 678-1800 x. 251 www.supremeenergyinc.com	**Xoom Energy New Jersey, LLC** 744 Broad Street Newark, NJ 07102	888-997-8979 www.xoomenergy.com
DTE Energy Supply, Inc. One Gateway Center, Suite 2600 Newark, NJ 07102	877-332-2450 www.dtesupply.com	**NJ Gas & Electric** 1 Bridge Plaza fl. 2 Fort Lee, NJ 07024	(866) 568-0290 www.NJGandE.com	**YEP Energy** 89 Headquarters Plaza North #1463 Morristown, NJ 07960	855-363-7736 www.yepenergyNJ.com
		North American Power and Gas, LLC 222 Ridgedale Avenue Cedar Knolls, NJ 07927	(888) 313-9086 www.napower.com		

APPENDIX E: GLOSSARY AND METHOD OF CALCULATIONS

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

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

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

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

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

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

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

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

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

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

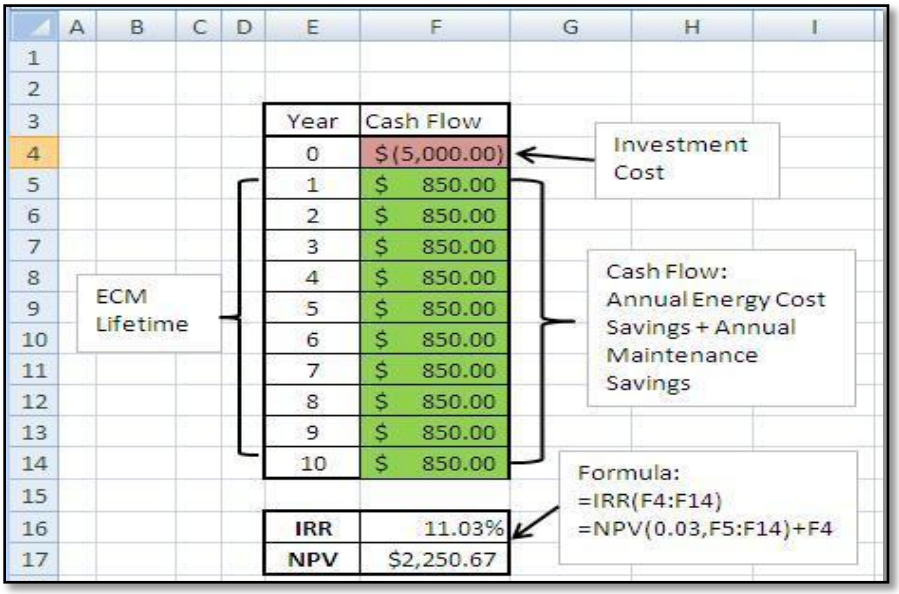
Calculation References

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

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

Excel NPV and IRR Calculation

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



Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume $608/Megawatt hour consumed per year for a maximum of 15 years; added to annual energy cost savings for a period of 15 years. (Megawatt hour used is rounded to nearest 1,000 kWh)
Assumptions:	A Solar Pathfinder device is used to analyze site shading for the building and determine maximum amount of full load operation based on available sunlight. When the Solar Pathfinder device is not implemented, amount of full load operation based on available sunlight is assumed to be 1,180 hours in New Jersey.

Total lifetime PV energy cost savings =
kWh produced by panel * [$/kWh cost * 25 years + $608/Megawatt hour /1000 * 15 years]

ECM and Equipment Lifetimes

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

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

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

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

New Jersey Clean Energy Program Commercial Equipment Life Span

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

APPENDIX F: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Cherry Hill/New Bridge

Building ID: 3220176
For 12-month Period Ending: April 30, 2012[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 16, 2012

Facility	Facility Owner	Primary Contact for this Facility
Cherry Hill/New Bridge 410 Bogert Rd. River Edge, NJ 07661	N/A	N/A

Year Built: 1948
Gross Floor Area (ft²): 109,558

Energy Performance Rating[2] (1-100) 56

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	2,444,568
Natural Gas (kBtu)[4]	2,776,066
Total Energy (kBtu)	5,220,634
Energy Intensity[4]	
Site (kBtu/ft²/yr)	48
Source (kBtu/ft²/yr)	101
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	494
Electric Distribution Utility	
Public Service Electric & Gas Co	
National Median Comparison	
National Median Site EUI	51
National Median Source EUI	107
% Difference from National Median Source EUI	-6%
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 G: 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 60%** of the retrofit costs, including equipment cost and installation costs.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 100 kW** within 12 months of applying (the 100 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 H: 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	36 New occupancy sensors to be installed with incentives	7,920	720	7,200	16,962	4	0	5.8	0	2,544	15	38,164	2.8	530	35	24	19,739	25,786
2	Retro-commissioning	30,291	0	30,291	54,282	2	2,715	15.7	1,820	15,594	12	187,131	1.9	518	43	51	119,280	127,119
	Total	**38,211**	**720**	**37,491**	**71,244**	**5**	**2,715**	**21.5**	**1,820**	**18,139**	**27**	**225,295**	**2.1**	**1,048**	**78**	**75**	**139,019**	**152,905**

APPENDIX I: PREVENTATIVE MAINTENANCE PLAN

Facility operation and maintenance requirements cover a wide range of services to ensure that building systems operate as required to meet the demands of the facility and the occupants that these systems serve. To ensure continuous, problem free operation it is imperative that building operators maintain a consistent preventative maintenance plan. While not all problems can be avoided, a well thought out maintenance plan can reduce unexpected equipment failures, extend the lifetime of equipment and alleviate occupant complaints. A well rounded preventive maintenance plan consists of scheduled maintenance requirements (varying by equipment) that provide a basis for performing maintenance procedures including adjustment, calibration or replacement of wear and tear parts and an overall investigation of equipment condition and operation.

Preventive Maintenance typically provides significant benefits such as:

- Lower overall operation and maintenance costs
- Reduced equipment down time
- Improved equipment lifetime
- Maintain performance efficiency of operating equipment
- Lower replacement costs through longer equipment life
- Improve occupant comfort, health and safety.

The following list provides a general guidance for estimating minimum preventative maintenance frequency for typical equipment found within commercial buildings. It is necessary for owners and operators to consult manufacturer operations and maintenance manuals for specific requirements to ensure all warranties are maintained.

Heating Systems	Frequency (Per Year)
Boilers	4
Boiler water treatment	3 (heating season)
Expansion tanks	2
Condenser pumps	4
Deaerator tank	1
Steam traps & valves	3
Valves & actuators	3
Fuel tanks & distribution	1
Heat exchangers	2
Terminal/package units	2
Fin tubes/radiators	2
Dampers/draft control	4
Ductwork & insulation	2
Piping & insulation	2
Control sensors	2
Air Handling Systems	**Frequency**

	(Per Year)
Air handling units	4
Unit ventilators	4
Fans	2
Fire dampers	1
Filters	2
Humidifiers	2
Cooling Systems	**Frequency (Per Year)**
Condensing units	2
Expansion Tanks	2
Heat exchangers	2
Water treatment	1
Water filtration	2
Piping & insulation	2
Valves & actuators	3
Control sensors	2
Packaged A/C units	4

Chillers: oil levels and operation	26 (cooling season)
Chillers: tubes	1
CHW Pumps	2
Heat pumps	2

Mechanical Controls	Frequency (Per Year)
Compressors	4
Pneumatic valves/levers	2
Pneumatic tubing	2
Electronic controls	4

Plumbing Systems	Frequency (Per Year)
Cold/Hot water piping	1
Water heaters	2
Piping insulation	2
Circulation pumps	4
Sump pumps	6
Valves and traps	6

Lighting Systems	Frequency (Per Year)
Fluorescent fixtures	2
Incandescent fixtures	4
HID fixtures	2
Emergency lighting	12
Exterior lighting	2
Occupancy controls	2
Daylight controls	2
Other controls	2

Roof Systems	Frequency (Per Year)
Roofing membranes	2
Insulation	2
Paving and ballast paving	1
Equipment curbs/supports	2
Expansion/seismic joints	1
Drains, gutters, etc.	12
Flashing and trim	2
Roof openings	4
Parapet caps	2

Exterior Wall Systems	Frequency (Per Year)
Facade integrity	2
Cladding/sheathing	1
Doors	3
Window systems	2
Louvers and screens	1
Expansion/seismic joints	3
Insulation	1
Protective coating	1
Sealants	2

Power Distribution Systems	Frequency (Per Year)
Power Panels	3
Transformers	1
Wiring	1
Substation	1
Switchgear	1
Overcurrent protection	1

Conveying Systems	Frequency (Per Year)
Elevator & Escalator Motors and Drives	2

APPENDIX J: METHOD OF ANALYSIS

Assumptions and tools

Energy modeling tool:	Established/standard industry assumptions
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