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January 7, 2013

Local Government Energy Program
Energy Audit Final Report

Catherine E. Doyle Elementary School

250 Wood-Ridge Avenue
Wood-Ridge, NJ 07075

Project Number: LGEA105

Table of Contents

EXECUTIVE SUMMARY

The Catherine E. Doyle Elementary School is a 47,670 ft^2 single-story, kindergarten to 5th grade school, with a partial basement. The school is comprised of an original building built in 1952, an addition built in 1993, and another addition built in 2004. The original 1952 section currently houses several classrooms, gymnasium/all-purpose room, prep kitchen, nurse's office, and the boiler room located in the basement. The 1993 addition extended the north end hallway with four classrooms. In 2004, two restrooms, a media center, and five additional classrooms were added to the north end of the building. The following tables provide a comparison of the current building energy usage based on the period from April 2011 through March 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/ft^2/yr)	Source Energy Use Intensity (kBtu/ft^2/yr)	Joint Energy Consumption (MMBtu/yr)
Current	433,253	31,905	$97,861	97.9	174	4,669
Proposed	386,933	29,395	$85,393	89.4	157	4,260
Savings	46,320	2,510	$12,469*	8.6	17	409
% Savings	10.7%	7.9%	12.7%	8.8%	9.6%	8.8%
*Includes operation and maintenance savings						

SWA has entered energy information about the Catherine E. Doyle Elementary School facility into the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy Benchmarking system. The ENERGY STAR Energy Performance Rating was calculated to be 5. The building has a Site Energy Utilization Intensity of 98 kBtu/ ft^2/yr compared to the National Median of 56 kBtu/ ft^2/yr, for similar schools. This demonstrates a large potential for energy savings.

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	$11,327	1.8	$20,079	125,620
5-10 Year	$474	6.8	$3,221	2,894
>10 year	$668	13.6	$9,063	6,823
Total	$12,469	2.6	$32,362	135,337

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

- Replace old motors with NEMA premium efficiency models
- Service steam traps
- Install 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 new purchases are made
- Use smart electric power strips
- Create an energy educational program

There may be energy procurement opportunities for the Catherine E. Doyle Elementary School to reduce annual utility costs. Preceding the expiration of any third-party supplier contract, SWA recommends that the Wood-Ridge Board of Education further explore opportunities of purchasing electricity and natural gas from other third-party suppliers in order to continue paying the lowest utility price for the Catherine E. Doyle Elementary School.

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 269 trees to absorb CO_2 from the atmosphere.

Energy Conservation Measure Implementation

SWA recommends that Catherine E. Doyle Elementary School implement the following Energy Conservation Measures using an appropriate Incentive Program for reduced capital cost:

Recommended ECMs	Incentive Program (APPENDIX G for details)
Upgrade 4 incandescent lamps to CFLs	N/A
Retro-commissioning	N/A
Upgrade 49 Lighting Controls with Occupancy Sensors	Direct Install, Smart Start
Retrofit 11 T12 Fixtures with Electronic Ballasts and T8 Lamps	Direct Install, Smart Start
Replace 16 Mercury Vapor Fixtures with High Output T5 Fixtures	Direct Install, Smart Start
Upgrade 13 High Pressure Sodium (HPS) Fixtures to Pulse Start Metal Halide (PSMH)	Direct Install, Smart Start

Appendix H contains an Energy Conservation Measures table

INTRODUCTION

Launched in 2008, the Local Government Energy Audit (LGEA) program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The program will subsidize up to 100% of the cost of the audit. The Board of Public Utilities (BPU) 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 Catherin E. Doyle Elementary School at 250 Wood-Ridge Avenue, Wood-Ridge, NJ. The process of the audit included a facility visit on October 2nd, 2012, 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 Catherine E. Doyle Elementary School to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures.

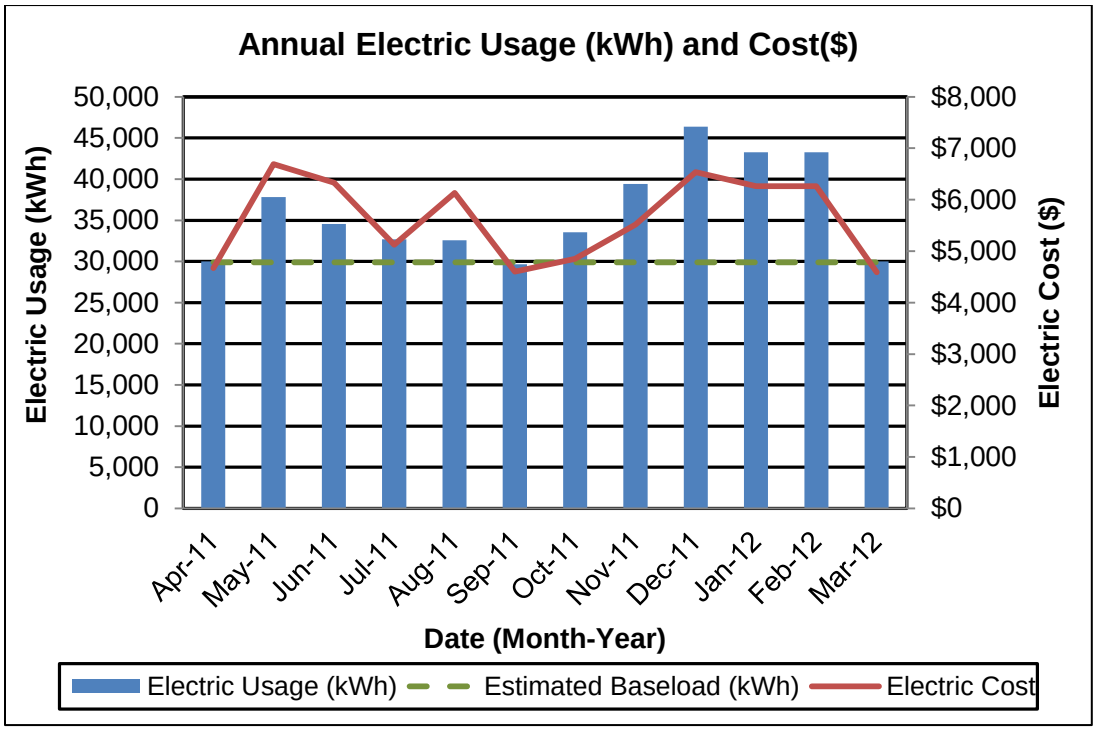
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

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

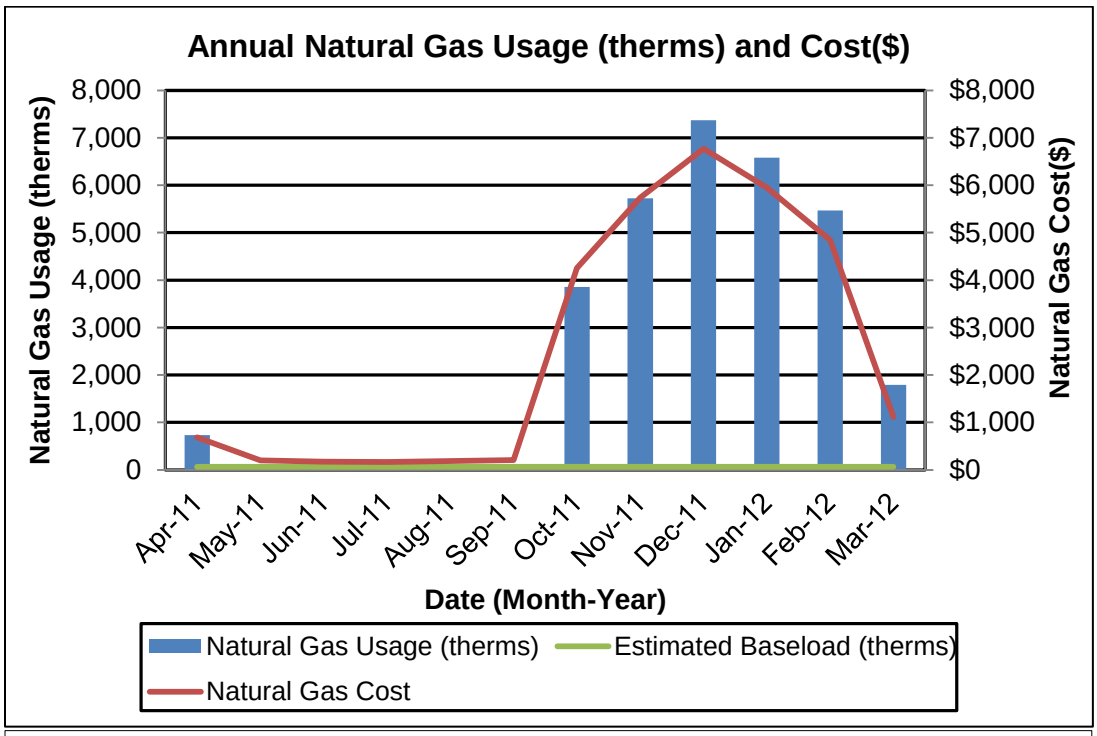
Electricity – The school is currently served by one electric meter. The school purchases electricity from a third-party supplier which is currently South Jersey Energy. Public Service Electric & Gas (PSE&G) is responsible for electricity transmission and distribution. Electricity was purchased at an average aggregated rate of $0.156/kWh and the school consumed 433,253 kWh, or $67,569 of electricity, for the analyzed billing period. The annual monthly peak demand was 105.6 kW in the months of January and February, while the average monthly demand was 103 kW.

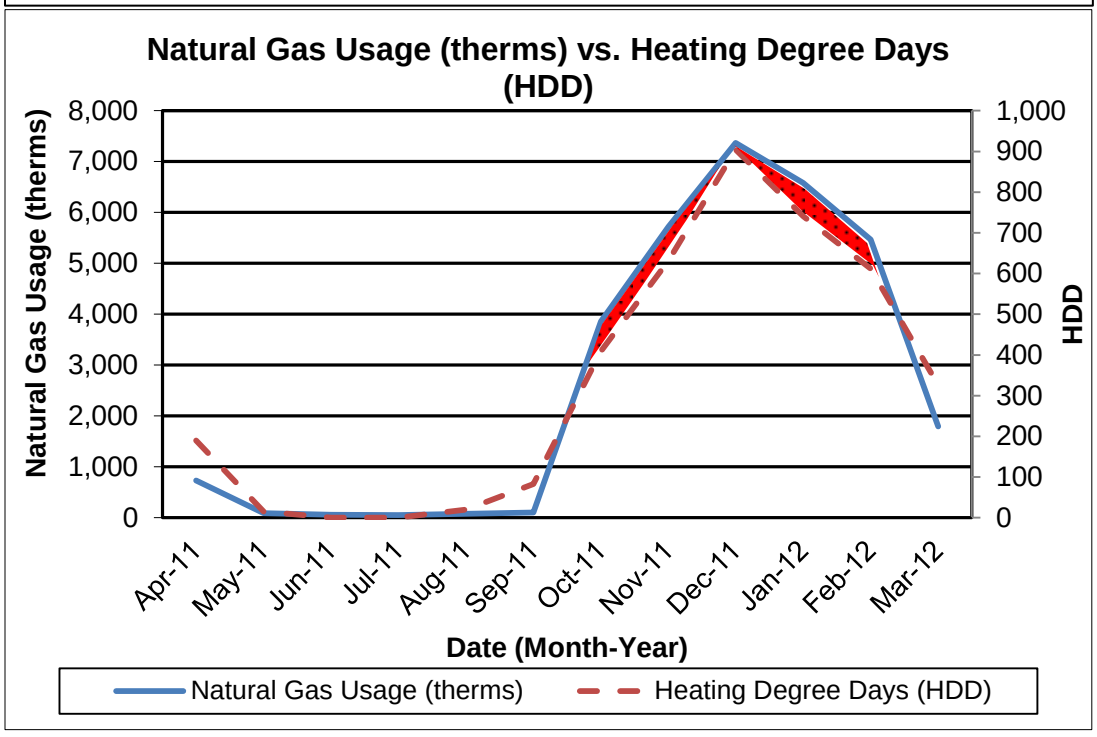
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the school. The baseline usage for the facility is approximately 29,901 kWh. The spike in electric usage in December is likely caused by electric heat consumption.



Natural gas – The school is served by two natural gas meters and currently purchases natural gas from Public Service Electric & Gas (PSE&G) 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 $0.949/therm and the school consumed 31,905 therms, or $30,292 of natural gas, for the analyzed billing period. 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 school. The non-heating gas baseload for the school is approximately 64 therms. As expected, usage peaks in the winter months in conjunction with the operation of the gas-fired hot water heating boiler. The monthly natural gas costs also peak in the winter months in correlation with the increased natural gas usage.



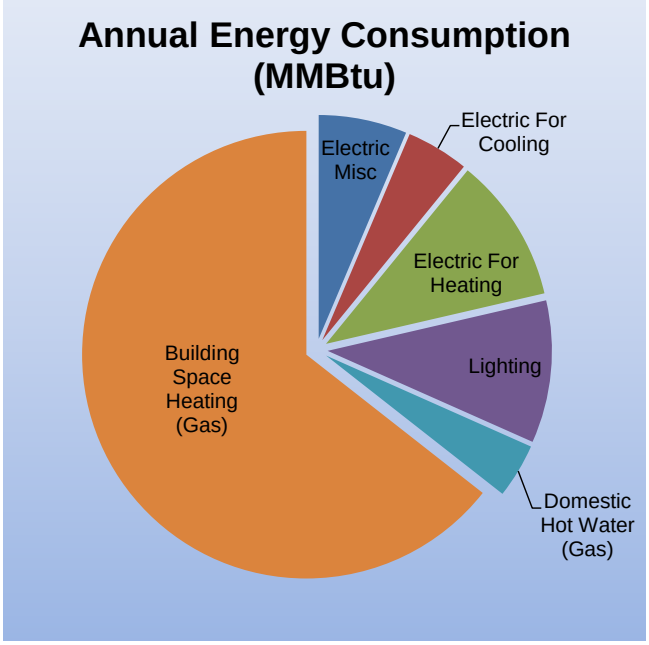


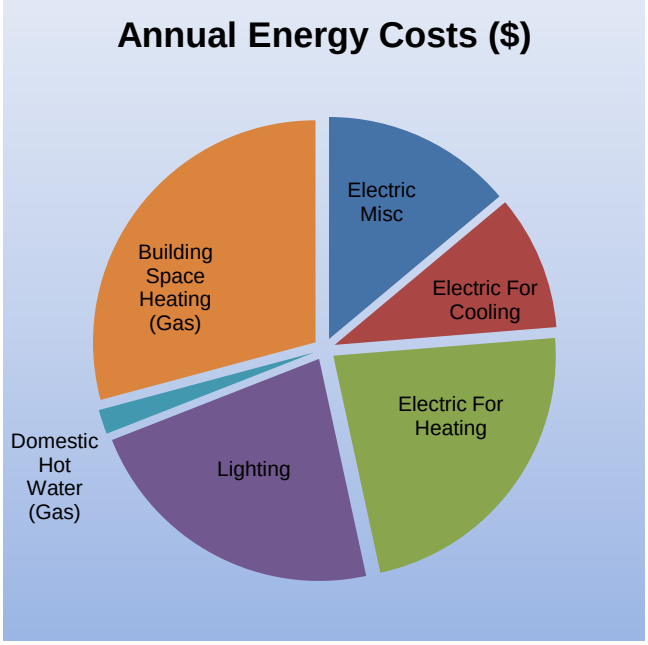
The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base

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 a curve similar to the HDD curve. Excess natural gas consumption between October and February is shown by the natural gas curve rising above the HDD curve.

The following graphs, pie charts, and table show energy use for Catherine E. Doyle Elementary School based on utility bills for the analyzed billing period. Note: electrical cost at $46/MMBtu of energy is over 5 times as expensive as natural gas at $9/MMBtu.

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Misc	297	6%	$13,597	14%	46
Electric For Cooling	210	5%	$9,617	10%	46
Electric For Heating	490	10%	$22,394	23%	46
Lighting	481	10%	$21,961	22%	46
Domestic Hot Water (Gas)	184	4%	$1,744	2%	9
Building Space Heating (Gas)	3,007	64%	$28,548	29%	9
Totals	4,669	100%	$97,861	100%	
Total Electric Usage	1,478	32%	$67,569	69%	46
Total Gas Usage	3,191	68%	$30,292	31%	9
Totals	4,669	100%	$97,861	100%	

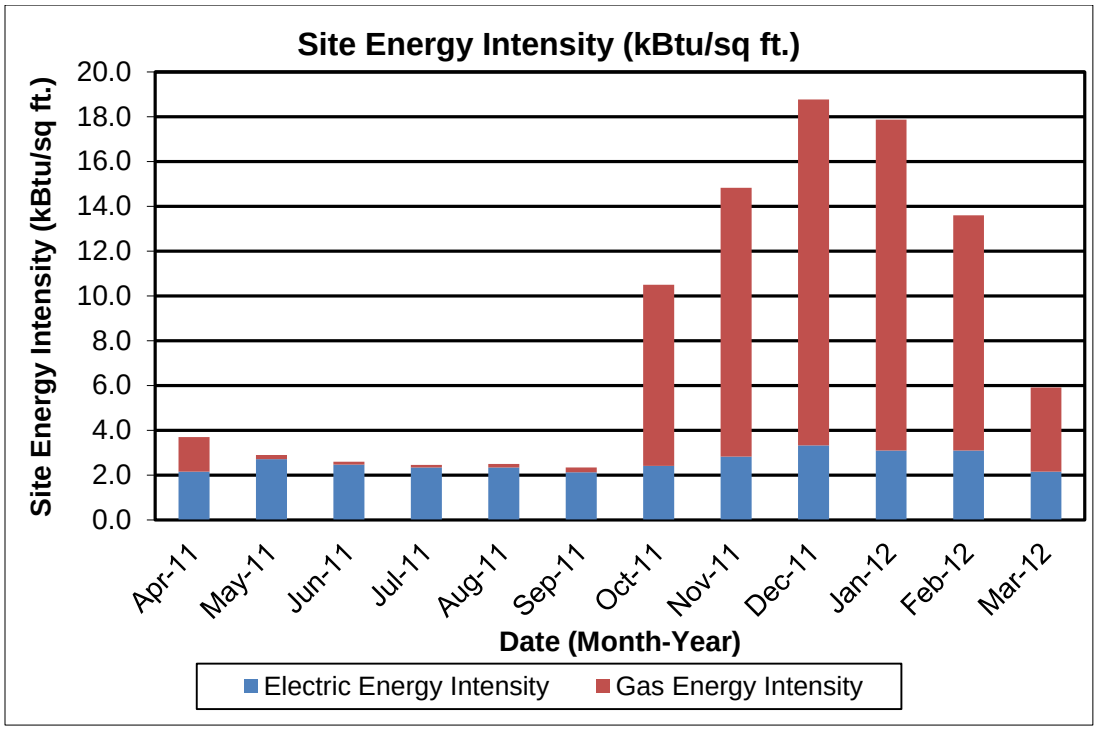




Energy Benchmarking

SWA has entered energy information about the school in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager energy benchmarking system. This school facility is categorized as a "K-12 School" space type. The ENERGY STAR® Portfolio Manager calculated the Energy Performance Rating to be 5. 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 98 kBtu/ ft^2/yr compared to the National Median of 56 kBtu/ ft^2/yr 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. Due to insufficient data in the 2007 survey, Portfolio Manager continues to use data provided by the 2003 survey. 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 school buildings. This 100 point scale determines how well the building performs relative to other buildings across the country, regardless of climate and other differentiating factors.



Per the LGEA program requirements, SWA has assisted the Catherine E. Doyle Elementary School in creating an ENERGY STAR® Portfolio Manager account and sharing the 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 Catherine E. Doyle Elementary School (user name of "[redacted]" with a password of "[redacted]") and TRC Energy Services (user name of [redacted]).

Tariff analysis

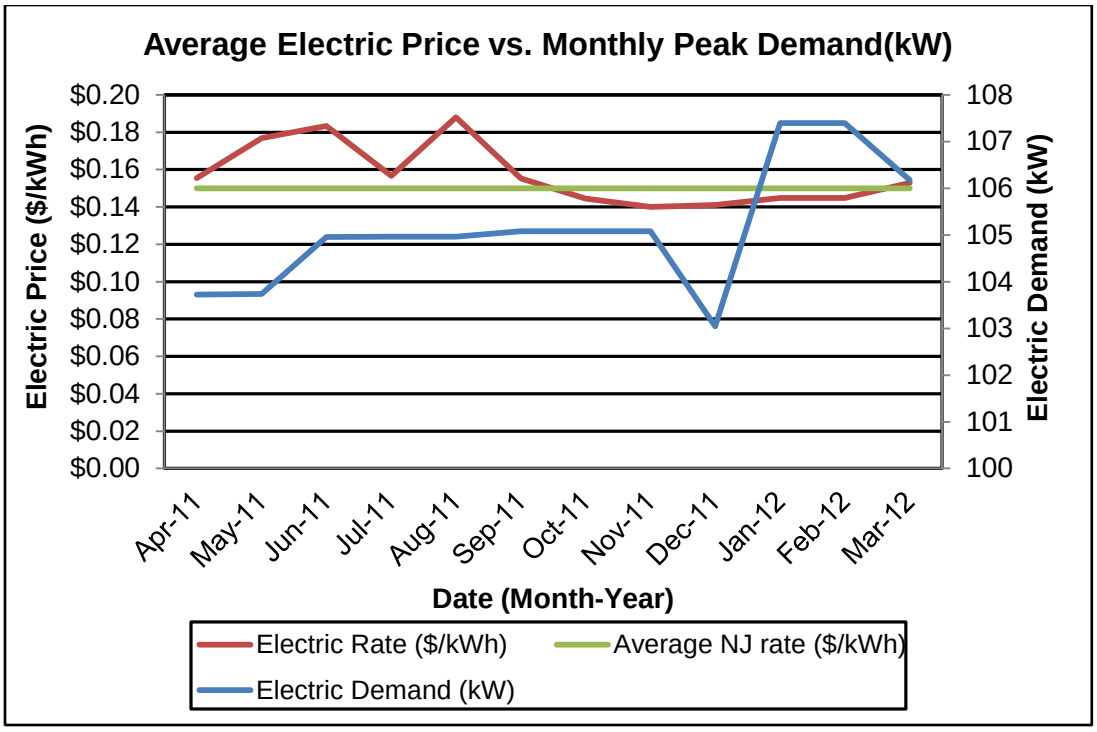
Tariff analysis can help determine if the school is paying the lowest rate possible for electric and gas service. Tariffs are typically assigned to buildings based on size and building type. Rate fluctuations are expected during periods of peak usage. Natural gas prices often increase during winter months since 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 Catherine E. Doyle Elementary School. The school is currently paying a general service gas (GSG) rate and large volume gas (LVG) service rate. These service rates include fixed costs such as the delivery service charge of $10.52 and $97.29, respectively. Other monthly charges include a societal benefits charge and distribution charge, and are calculated based on therm usage. The monthly distribution charge is also based on therm usage; however, it is comprised of two rates which vary for the first 1,000 therms used, and therm usage in excess of 1,000 therms. The electric use for the building is direct-metered and purchased at a general light and power (GLP) 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.

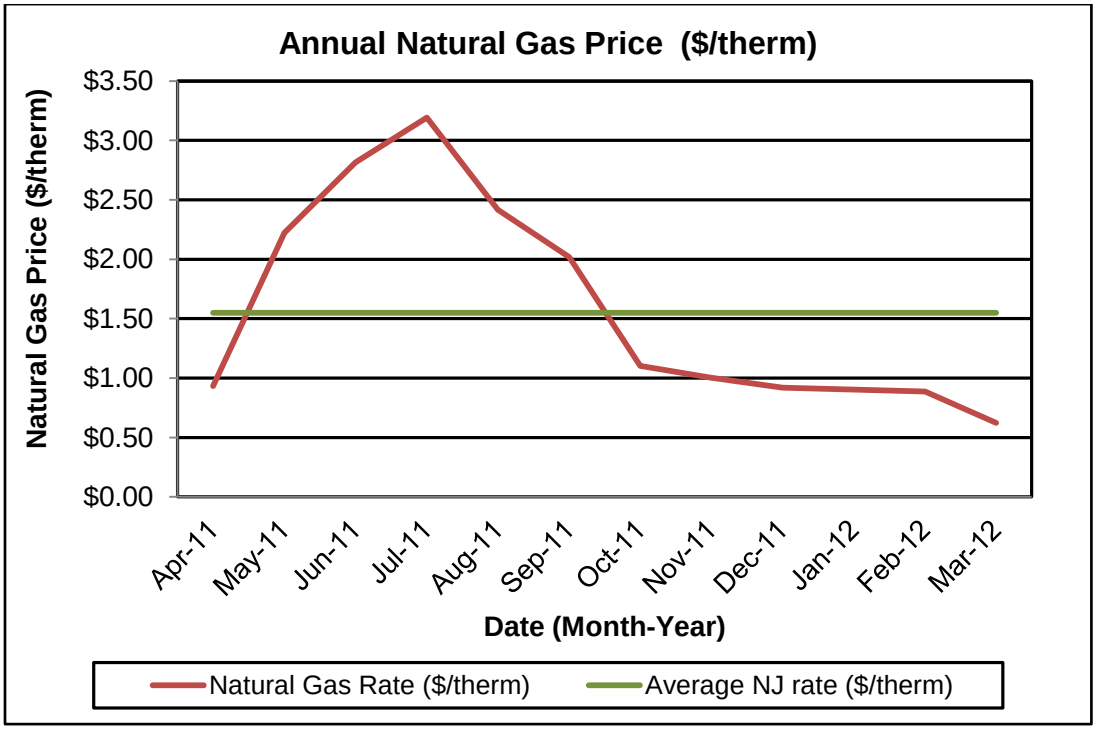
Energy Procurement strategies

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 the school pays a competitive rate of $0.156/kWh. The school annual electric utility costs are $2,581 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 26% over the analyzed billing period. Electric rate fluctuations in the winter and spring can be attributed to a combination of demand charges, market rate changes and actual and estimated meter readings. SWA recommends switching third-suppliers at the end of the existing contract, or negotiating a better rate with the current third-party supplier, HESS.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while the School pays a rate of $0.949/therm. The school pays a competitive rate for natural gas compared to the NJ State average for commercial buildings. Natural gas bill analysis shows fluctuations over the analyzed billing 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.



Preceding the expiration of any third-party supplier contract, SWA recommends that the Wood-Ridge Board of Education further explore opportunities of purchasing electricity and natural gas from other third-party suppliers in order to pay the lowest utility price for the Catherine E. Doyle Elementary School. Appendix D contains a complete list of third-party energy suppliers for the Catherine E. Doyle Elementary School 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 a visit from SWA on Tuesday, October 2nd, 2012, the following data was collected and analyzed.

Building Characteristics

The Catherine E. Doyle Elementary School is a 47,670 ft^2 single-story, kindergarten to 5th grade school, with a partial basement. The school is comprised of an original building built in 1952, an addition built in 1993, and another addition built in 2004. The original 1952 section currently houses several classrooms, gymnasium/all-purpose room, prep kitchen, nurse's office, and the boiler room located in the basement. The 1993 addition extended the north end hallway with four classrooms. In 2004, two restrooms, a media center, and five additional classrooms were added to the north end of the building.

South Façade

Partial North Façade

East Façade

Northwest Façade

Building Occupancy Profiles

Occupancy is approximately 500 students and 35 faculty members from 8:30 AM to 3:00 PM Monday through Friday. The school operates during the summer between the hours of 7:00 AM and 6:30 PM. The school's cleaning crews are in the building until 11:30 PM.

Building Envelope

Due to unfavorable weather conditions (min. 18 deg. F delta-T in/outside and no/low wind), no exterior envelope infrared (IR) images were taken during the field audit.

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 detailed visual analysis, as far as accessibility and weather conditions allowed at the time of the field audit.

Exterior Walls

The exterior wall construction of the entire facility is mostly constructed of brick veneer, over concrete block with an unconfirmed level of detectable insulation. The interior is mostly painted concrete masonry units (CMU), painted gypsum board, and tiles. The original mechanical room still has an unfinished brick finish.

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall fair condition with only 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:

Poorly installed unit ventilator grill compromises building air-tightness

Roof

The roof is a combination hip and valley, and open gable type roofs, with an asphalt shingle finish. The roof above the original 1952 section and the 1993 addition are reported to be 15-20 years old. The roof above the 2004 is a hip type roof and has not been replaced. The gymnasium extension is a flat roof with a parapet. This roof was not accessible at the time of the visit and was not visually inspected.

Roofs, related flashing, gutters and downspouts were inspected during the field audit with limited access. They were reported to be in overall fair condition.

Base

The building's base is composed of a below grade floor with a perimeter footing, 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. Awning type windows with non-insulated metal frame clear single glazing with interior roller blinds. The windows are located throughout the classrooms and offices in the 1952 section.

2. Single-hung type windows with a non-insulated aluminum frame, low-E coated double glazing with interior roller blinds. The windows are located throughout the classrooms in the 1993 section.

3. Glass block type windows with no frame. The windows sit above the awning windows, and are located throughout the classrooms and offices in the 1952 section.

Windows, shading devices, sill, 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 poor condition with signs of energy compromising issues.

The following specific window problems were identified:

Non-insulated metal frame with single-glazing provides poor insulation to the building

Exterior doors

The building contains several different types of exterior doors:

1. Aluminum type doors with clear single glazing and a non-insulated aluminum door frame. These doors are located at the emergency exits throughout the 1952 and 1993 section. There was no weather-stripping found at the southeast emergency exit; combined with poorly fitted vestibule doors, the building's air-tightness is compromised and allows warm air to escape (see images below).

2. Aluminum type doors with clear double glazing and a non-insulated aluminum door frame. These doors are located in the gymnasium extension.

3. Solid metal type exterior doors with a non-insulated metal frame. They are located in the mechanical room.

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 poor condition with signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific door problem spots were identified:

Exterior door at the southeast end lacks weather-stripping (R) and vestibule doors can no longer be shut completely (L)

Building air-tightness

Overall the field auditors found the building to not be adequately air-tight with numerous areas if suggested improvements, as described in more detail earlier in this section.

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.

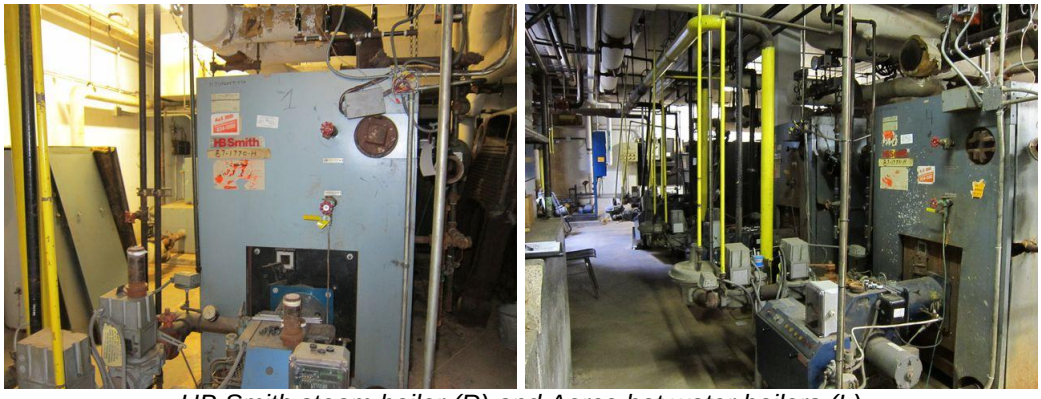
Mechanical Systems

Heating Ventilation Air Conditioning

Most spaces in the Catherine E. Doyle Elementary School are mechanically ventilated, heated and cooled. The school has one mechanical room housing boilers, pumps, motors and controls. The heating, ventilating and air conditioning (HVAC) equipment is described below.

Equipment

There are four cast iron H.B. Smith gas-fired steam boilers, located in the basement level of the original 1952 building which heats the original 1952 building, and the 2004 addition. The gas-fired boilers each have a 3,208 MBH capacity and were installed in 1986. The boilers produce steam which is delivered to unit ventilators and radiators throughout the 1952 building. Nesbitt unit ventilators are located in all 1952 section classrooms. The unit ventilators operate in fan mode and provide fresh air into the school, when the heating system is not in operation. The radiators are located in perimeter offices, restrooms, vestibules and hallways. Hot water from a steam to hot water heat exchanger is used to heat the 2004 addition, also utilizing unit ventilators. Unit ventilators in the 2004 addition are manufactured by Airedale, are equipped with compressors for cooling, and are connected to the school's building management system (BMS). Additionally, a make up air unit is used to supply outdoor air into the boy's and girl's bathroom. The unit is controlled by the BMS and works in conjunction with the exhaust fans. The 1993 section is heated through electric McQuay unit ventilators. The gymnasium/all-purpose room is equipped with a gas-fired roof mounted heating and ventilation unit. This unit only operates during the heating season and is controlled by the school's BMS.



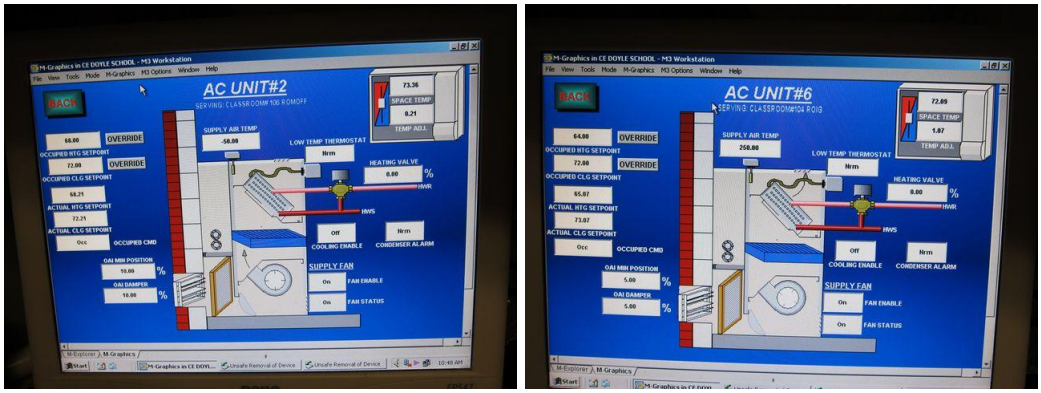
HB Smith steam boiler (R) and Aerco hot water boilers (L)

The school does not have a central cooling plant. Cooling is available through unit ventilators in the 1993 and 2004 additions, and window air-conditioning units in select rooms and offices. The window AC units are mounted through winter season.

Typical window mounted AC units, permanently installed

Controls

Unit ventilators in the 1952 building are manually controlled. Building staff controls the operation of the unit ventilators which run during school hours. Unit ventilators in the 1993 addition are also manually controlled within the classroom, through the built-in control panel. The 2004 addition, gymnasium extension and boiler system are controlled by the school's building management system (BMS). The school utilizes a Johnson Controls M3 Workstation BMS, which is capable of monitoring room temperatures, adjusting setpoints, setting operation schedules and controlling the boilers. At the time of the visit, the BMS showed temperature readings that are likely caused by calibration errors, such as incorrect temperature readings.



AC Unit #2 and #6 showed a supply air temperature of -50°F and 250°F, respectively

Domestic Hot Water

The building contains one gas-fired Lochnivar boiler and an 80 gallon Lochnivar storage tank, for domestic hot water (DHW). DHW is provided to restrooms and sinks in the 1952 section, and restrooms in the 2004 section, and is delivered at 110°F. The system appeared to be in good condition; however, all pipes were lacking proper insulation.

Gas-fired domestic hot water heater with storage tank. Note: all pipes for this system lacked proper insulation

Electrical systems

Lighting

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 – The interior lighting is predominantly electronically ballasted T8 fluorescent lamped fixtures. It is unknown when the T8 lamped fixtures were installed. The hallways, classrooms and offices are illuminated using recessed and ceiling suspended T8 fixtures. Several fixtures in the back stage area, and in the basement mechanical room and storage rooms, were found to be inefficient T12 fixtures. These fixtures still use outdated magnetic ballast technology and consume more electricity. No areas appeared to be vastly over-illuminated. Lighting in the all purpose room is comprised of several high bay high pressure sodium fixtures.

Typical interior T8 lighting

Typical high bay high pressure sodium fixture

Exit Lights - Exit signs throughout the school were found to be efficient LED types.

Typical LED exit signs

Exterior Lighting - The exterior lighting surveyed during the energy audit was found to be a combination of high pressure sodium and CFL fixtures. Exterior lighting is controlled by both photocells and timers.

Typical wall pack high pressure sodium fixtures

Appliances and process

SWA 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 from the rest of the building’s energy usage based on utility analysis. Devices are available to power down such plug loads, providing energy savings.

Typical refrigerators found throughout the school

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

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

Existing systems

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

Evaluated Systems

Solar Photovoltaic

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

Based on the utility analysis and a study of roof conditions, the Catherine E. Doyle Elementary School are not good candidates for a photovoltaic panels.

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

Geothermal

The 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

The 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 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	**Upgrade 4 incandescent lamps to CFLs**
ECM 2	**Retro-commissioning**
ECM 3	**Upgrade 49 Lighting Controls with Occupancy Sensors**
ECM 4	**Retrofit 11 T12 Fixtures with Electronic Ballasts and T8 Lamps**
ECM 5	**Replace 16 Mercury Vapor Fixtures with High Output T5 Fixtures**
ECM 6	**Upgrade 13 High Pressure Sodium (HPS) Fixtures to Pulse Start MH (PSMH)**

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: Upgrade 4 incandescent lamps to CFLs

The building is equipped with fixtures containing inefficient incandescent lamps. SWA recommends that each incandescent lamp be replaced with a more efficient Compact Fluorescent Lamp (CFL). CFLs are capable of providing equivalent or better light output while using less power when compared to incandescent, halogen and metal halide fixtures. CFL lamps produce the same lumen output with less wattage than incandescent lamps and last up to five times longer. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the maintenance department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:

Estimated installed cost: $63 (includes $16 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
$63	894	0	0	0.1	$609	$749	5	$3,743	0.1	5,841%	1,168%	1,188%	$3,242	1,600

Assumptions: SWA calculated the savings for this measure using the lighting inventory and the billing analysis. SWA also assumed 2 hours/day to replace aging burnt out lamps.

Rebates/financial incentives:

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

Please see APPENDIX G for more information on Incentive Programs.

ECM #2: Retro-commissioning

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

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

The goals of RCx include:

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

Project cost:
Estimated project cost: $9,534
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
$9,534	15,283	0	4,754	11.1	$1,820	$6,587	12	$79,044	1.4	729%	61%	69%	$53,544	79,766

Assumptions: SWA calculated the estimated ECM cost at $0.20/ ft^2, 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 G for more information on Incentive Programs.

ECM #3: Upgrade 49 Lighting Controls with Occupancy Sensors

The building contains several 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 ultrasonic lighting sensors include sound detection as a means to controlling lighting operation.

Installation cost:

Estimated installed cost: $9,800 (includes $2,940 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	24,070	5	0	1.7	$0	$3,755	15	$56,324	2.6	475%	32%	38%	$33,318	43,097

Assumptions: SWA calculated the savings for this measure using the lighting inventory and the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – SmartStart – Wall-mounted occupancy sensors ($20 per occupancy sensor) – Maximum incentive amount is $980

Please see APPENDIX G for more information on Incentive Programs.

ECM #4: Retrofit 11 T12 Fixtures with Electronic Ballasts and T8 Lamps

The existing lighting contains inefficient T12 fluorescent fixtures with magnetic ballasts, located in the backstage area. SWA recommends replacing each existing fixture with more efficient, T8 fluorescent lamps and electronic ballasts. T8 fixtures with electronic ballasts provide equivalent or better light output while reducing energy consumption by 30% when compared to T12 fixtures with magnetic ballasts. T8 fixtures also provide better lumens for less wattage when compared to incandescent, halogen and metal halide fixtures. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the maintenance department on a scheduled, longer timeline than otherwise performed by a contractor. SWA recommends retrofitting the existing fixtures to reduce material costs.

Installation cost:

Estimated installed cost: $792 (includes $477of 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
$682	646	0	0	0.0	$136	$236	15	$3,544	2.9	420%	28%	34%	$2,034	1,157

Assumptions: SWA calculated the savings for this measure using the lighting inventory and the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – Direct Install program (Up to 70% of installed costs)
- NJ Clean Energy – SmartStart program – T8 fixtures with electronic ballasts ($10 per fixture – Maximum incentive amount is $110

Please see APPENDIX G for more information on Incentive Programs.

ECM #5: Replace 16 Mercury Vapor Fixtures with High Output T5 Fixtures

The existing lighting consists of high bay mercury vapor fixtures, located in the auditorium and gymnasium. SWA recommends replacing the higher wattage mercury vapor fixtures with T5 lamps and electronic ballasts which offer the advantages of mercury vapor, but minimize the disadvantages. They produce higher light output both initially and over time, operate more efficiently, produce whiter light, and turn on and re-strike faster. Due to these characteristics, energy savings can be realized via one-to-one substitution of lower-wattage systems, or by taking advantage of higher light output and reducing the number of fixtures required in the space. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:

Estimated installed cost: $3,221 (includes $1,520 of labor)
Source of cost estimate: RS Means

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo.	therms, 1st yr savings	kBtu/sq. ft., 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$3,221	1,616	0	0	0.1	$222	$474	15	$7,107	6.8	121%	8%	12%	$2,281	2,894

Assumptions: SWA calculated the savings for this measure using the lighting inventory and the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – SmartStart program – High Bay T5 fixtures with electronic ballasts ($16 per fixture) – Maximum incentive amount $256

Please see APPENDIX G for more information on Incentive Programs.

ECM #6: Upgrade 13 High Pressure Sodium (HPS) Fixtures to Pulse Start MH (PSMH)

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

Installation cost:

Estimated installed cost: $9,063 (includes $1,950 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
$9,063	3,811	1	0	0.3	$74	$668	15	$10,022	13.6	11%	1%	1%	-$1,164	6,823

Assumptions: SWA calculated the savings for this measure using the lighting inventory and the billing analysis. Existing light fixtures are assumed to operate 12 hours per day.

Rebates/financial incentives:

- NJ Clean Energy – Smart Start - $25 per fixture – Maximum incentive amount is $325

Please see APPENDIX G 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. 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 Catherine E. Doyle Elementary School.

- Replace all windows with ENERGY STAR certified windows. ENERGY STAR certified windows provide improved insulation, and reduced thermal heat gain in the summer months and heat loss in the winter months. SWA estimates $72,739 to replace all the single-hung, fixed, awning, and hopper type windows in the main building. A detailed building energy model would be required to calculate energy and cost savings.

- The roof above the 1952 and 1993 sections is made up of asphalt shingles. The roof was reported to be 15-20 years old and is reaching is end of useful life. SWA recommends upgrading the existing roof with increased insulation and new shingles. 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. SWA estimates the roof replacement to cost $118,990 based on the total footprint of the building, excluding the 2004 addition. Accurate energy savings calculations would require the use of advanced building modeling software, which is outside the scope of this project.

- The existing unit ventilators have reached their end of useful life. SWA recommends replacing the existing unit ventilators, which would provide operate more efficiently and reduce maintenance costs. Accurate energy savings calculations would require the use of advanced building modeling software, which is outside the scope of this project. Implementation costs are estimated to be $62,385, for 14 - 750 CFM unit ventilators.

- Replace the existing hot water boilers with new cast iron boilers – During the field audit, SWA inspected the existing heating equipment, which consists of four cast iron boilers. The expected service life of a hot water boiler is 20 years, which the existing boilers have exceeded. SWA recommends replacing the existing boilers with newer energy efficient models. The demolition and installation costs are estimated to be $168,907. Due to the high replacement costs, the increased efficiency will not provide an attractive payback.

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 or costs.

- Service steam traps – Assure that all steam traps are functioning as intended. Over time steam traps fail, thus blocking flow and/or causing an imbalance in the steam system. Routine maintenance or servicing helps to identify faulty steam traps, or potential deficiencies in the system, and provides an opportunity to repair or replace the faulty traps. The steam trap

servicing can be conducted by in-house maintenance with a short payback, or may be combined with retro-commissioning.

- Replace motors with NEMA premium efficiency models – SWA observed several hot water pump motors that were not NEMA premium efficiency models and are beyond their useful lifetime. Since these motors have been maintained well, SWA recommends replacing them with high efficiency models as part of routine O&M the next time that they fail. This measure can be conducted by in-house maintenance staff.

- Install water-efficient fixtures and controls – Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consumption fixtures/appliances will reduce energy consumption for water heating, while also decreasing water/sewer bills. This measure can be conducted by in-house maintenance staff with little investment, and yield a short payback.

- Inspect and replace cracked/ineffective caulk. This measure can be conducted by in-house maintenance staff with little investment, and yield a short payback.

- Inspect and maintain sealants at all windows for airtight performance. This measure can be conducted by in-house maintenance staff with little investment, and yield a short payback.

- Inspect and maintain weather-stripping around all exterior doors and roof hatches. This measure can be conducted by in-house maintenance staff with little investment, and yield a short payback.

- SWA recommends that the building considers purchasing the most energy-efficient equipment, including ENERGY STAR® labeled appliances, when equipment is installed or replaced. ENERGY STAR® appliances meet stricter standards compared to standard appliances. Stricter standards include exceeding Federal minimum efficiencies and reduced environmental impact. More information can be found in the “Products” section of the ENERGY STAR® website at: http://www.energystar.gov.

- Consider the use of 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 professionals 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

Building System	Description	Model #	Fuel	Location	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating	Boiler #4, Gas-fired hot water boiler; 15 max psi; 3208 MBH max. input; 2865 MBH output; 89.3% nominal efficiency	HB Smith: m/n 28-15; s/n N86-228	Natural Gas	Boiler Room	Whole Building	1986	0%
Heating	Boiler #3, Gas-fired hot water boiler; 15 max psi; 3208 MBH max. input; 2865 MBH output; 89.3% nominal efficiency	HB Smith: m/n 28-15; s/n N86-227	Natural Gas	Boiler Room	Whole Building	1986	0%
Heating	Boiler #2, Gas-fired hot water boiler; 15 max psi; 3208 MBH max. input; 2865 MBH output; 89.3% nominal efficiency	HB Smith: m/n 28-15; s/n N86-226	Natural Gas	Boiler Room	Whole Building	1986	0%
Heating	Boiler #1, Gas-fired hot water boiler; 15 max psi; 3208 MBH max. input; 2865 MBH output; 89.3% nominal efficiency	HB Smith: m/n 28-15; s/n N86-225	Natural Gas	Boiler Room	Whole Building	1986	0%
Heating	Vacuum Return Pump Motor, 3 HP, 3450 RPM, 82.5% NEMA Nom. Eff.	Baldor	Electric	Boiler Room	1932 Section	1986	0%
Heating	Condensate Pump Motor, 5 HP, 3450 RPM, 68% NEMA Nom. Eff.	Baldor	Electric	Boiler Room	1932 Section	1986	0%
Heating	Power Flame Burner; 5250 MBH max. input	Power Flame: m/n C3-G0-25B; s/n 098636161	Natural Gas	Boiler Room	Whole Building	1986	0%
Heating	Power Flame Burner; 5250 MBH max. input	Power Flame: m/n C3-G0-25B	Natural Gas	Boiler Room	Whole Building	1986	0%
Heating	Power Flame Burner; 5250 MBH max. input	Power Flame: m/n C3-G0-25B	Natural Gas	Boiler Room	Whole Building	1986	0%
Heating	Power Flame Burner; 5250 MBH max. input	Power Flame: m/n C3-G0-25B	Natural Gas	Boiler Room	Whole Building	1986	0%
DHW	Gas-fired hot water heater	Lochinvar: *nameplace unavailable*	Natural Gas	Boiler Room	Whole Building	2004	47%
DHW	Hot water storage tank: 80 gallon capacity	Lochinvar: m/n RJS080; s/n HF 15211028	-	Boiler Room	Whole Building	2004	47%
Cooling	Air-cooled condensing unit: R-22; 18,500 BTUH; 10.6 EER	Mitsubishi: m/n PU18EK	Electric	Outdoor	Classroom	2004	47%
Heating/ Cooling	AC-1 - Air handling unit; *nameplate unavailable*	*Airdale, nameplate unavailable*	Electric	Room 105	Room 105	2004	47%
Heating/ Cooling	AC-2 - Air handling unit; *nameplate unavailable*	*Airdale, nameplate unavailable*	Electric	Room 106	Room 106	2004	47%
Heating/ Cooling	AC-3 - Air handling unit; *nameplate unavailable*	*Airdale, nameplate unavailable*	Electric	Room 107	Room 107	2004	47%
Heating/ Cooling	AC-4 - Air handling unit; *nameplate unavailable*	*Airdale, nameplate unavailable*	Electric	Room 108	Room 108	2004	47%
Heating/ Cooling	AC-5- Air handling unit; *nameplate unavailable*	*Airdale, nameplate unavailable*	Electric	Room 108	Room 108	2004	47%
Heating/ Cooling	AC-6 - Air handling unit; *nameplate unavailable*	*Airdale, nameplate unavailable*	Electric	Room 104	Room 104	2004	47%
Heating/ Cooling	AC-7 - Air handling unit; *nameplate unavailable*	*Airdale, nameplate unavailable*	Electric	Room 103	Room 103	2004	47%
Heating/ Cooling	AC-8 - Air handling unit; *nameplate unavailable*	*Airdale, nameplate unavailable*	Electric	Room 103	Room 103	2004	47%
Heating/ Cooling	AC-9 - Air handling unit; *nameplate unavailable*	*Airdale, nameplate unavailable*	Electric	Room 103	Room 103	2004	47%
Heating	H&V-1 - Heating and ventilation unit: *nameplate unavailable*	*nameplate unavailable*	Electric & Natural Gas	Gymnasium	Gymnasium	1986	0%
Ventilation	MUA-1 - Make-up air unit: *nameplate unavailable*	*nameplate unavailable*	Electric		Boys and Girls Bathrooms	1986	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: 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	Classroom (1)	Recessed Parabolic	E	4'T8	11	2	32	Sw	17	190	10	814	2,629	C	Recessed Parabolic	4'T8	E	OS	11	2	32	13	190	10	814	1972	0	657	657
2	1	Classroom (2)	Recessed Parabolic	E	4'T8	11	2	32	Sw	17	190	10	814	2,629	C	Recessed Parabolic	4'T8	E	OS	11	2	32	13	190	10	814	1972	0	657	657
3	1	Classroom (3)	Recessed Parabolic	E	4'T8	11	2	32	Sw	17	190	10	814	2,629	C	Recessed Parabolic	4'T8	E	OS	11	2	32	13	190	10	814	1972	0	657	657
4	1	Classroom (4)	Recessed Parabolic	E	4'T8	8	2	32	Sw	17	190	10	592	1,912	C	Recessed Parabolic	4'T8	E	OS	8	2	32	13	190	10	592	1434	0	478	478
5	1	Storage Closet (4 Storage Closet)	Ceiling Suspended	E	4'T8	2	2	32	Sw	2	190	10	148	56	N/A	Ceiling Suspended	4'T8	E	Sw	2	2	32	2	190	10	148	56	0	0	0
6	1	Classroom (5)	Recessed Parabolic	E	4'T8	6	2	32	Sw	17	190	10	444	1,434	C	Recessed Parabolic	4'T8	E	OS	6	2	32	13	190	10	444	1076	0	359	359
7	1	Bathroom (5 Bathroom)	Ceiling Mounted	E	2'T8	1	2	17	Sw	2	190	4	38	14	N/A	Ceiling Mounted	2'T8	E	Sw	1	2	17	2	190	4	38	14	0	0	0
8	1	Classroom (6)	Recessed Parabolic	E	4'T8	13	2	32	Sw	17	190	10	962	3,107	C	Recessed Parabolic	4'T8	E	OS	13	2	32	13	190	10	962	2330	0	777	777
9	1	Storage Closet (6 Storage Closet)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	190	10	74	28	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	190	10	74	28	0	0	0
10	1	Classroom (7)	Recessed Parabolic	E	4'T8	13	2	32	Sw	17	190	10	962	3,107	C	Recessed Parabolic	4'T8	E	OS	13	2	32	13	190	10	962	2330	0	777	777
11	1	Storage Closet (7 Storage Closet)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	190	10	74	28	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	190	10	74	28	0	0	0
12	1	Classroom (8)	Recessed Parabolic	E	4'T8	13	2	32	Sw	17	190	10	962	3,107	C	Recessed Parabolic	4'T8	E	OS	13	2	32	13	190	10	962	2330	0	777	777
13	1	Storage Closet (8 Storage Closet)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	190	10	74	28	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	190	10	74	28	0	0	0
14	1	Classroom (9)	Recessed Parabolic	E	4'T8	13	2	32	Sw	17	190	10	962	3,107	C	Recessed Parabolic	4'T8	E	OS	13	2	32	13	190	10	962	2330	0	777	777
15	1	Storage Closet (9 Storage Closet)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	190	10	74	28	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	190	10	74	28	0	0	0
16	1	Classroom (10)	Recessed Parabolic	E	4'T8	11	2	32	Sw	17	190	10	814	2,629	C	Recessed Parabolic	4'T8	E	OS	11	2	32	13	190	10	814	1972	0	657	657
17	1	Classroom (11)	Recessed Parabolic	E	4'T8	11	2	32	Sw	17	190	10	814	2,629	C	Recessed Parabolic	4'T8	E	OS	11	2	32	13	190	10	814	1972	0	657	657
18	1	Classroom (12)	Recessed Parabolic	E	4'T8	11	2	32	Sw	17	190	10	814	2,629	C	Recessed Parabolic	4'T8	E	OS	11	2	32	13	190	10	814	1972	0	657	657
19	1	Classroom (13)	Recessed Parabolic	E	4'T8	11	2	32	Sw	17	190	10	814	2,629	C	Recessed Parabolic	4'T8	E	OS	11	2	32	13	190	10	814	1972	0	657	657
20	1	Classroom (14)	Recessed Parabolic	E	4'T8	12	2	32	Sw	17	190	10	888	2,868	C	Recessed Parabolic	4'T8	E	OS	12	2	32	13	190	10	888	2151	0	717	717
21	1	Classroom (15)	Recessed Parabolic	E	4'T8	12	2	32	Sw	17	190	10	888	2,868	C	Recessed Parabolic	4'T8	E	OS	12	2	32	13	190	10	888	2151	0	717	717
22	1	Classroom (16)	Recessed Parabolic	E	4'T8	12	2	32	Sw	17	190	10	888	2,868	C	Recessed Parabolic	4'T8	E	OS	12	2	32	13	190	10	888	2151	0	717	717
23	1	Classroom (17)	Recessed Parabolic	E	4'T8	12	2	32	Sw	17	190	10	888	2,868	C	Recessed Parabolic	4'T8	E	OS	12	2	32	13	190	10	888	2151	0	717	717
24	1	Classroom (18)	Recessed Parabolic	E	4'T8	11	2	32	Sw	17	190	10	814	2,629	C	Recessed Parabolic	4'T8	E	OS	11	2	32	13	190	10	814	1972	0	657	657
25	1	Classroom (19)	Recessed Parabolic	E	4'T8	11	2	32	Sw	17	190	10	814	2,629	C	Recessed Parabolic	4'T8	E	OS	11	2	32	13	190	10	814	1972	0	657	657
26	1	Classroom (104)	Recessed Parabolic	E	4'T8	10	3	32	Sw	17	190	15	1,110	3,585	C	Recessed Parabolic	4'T8	E	OS	10	3	32	13	190	15	1110	2689	0	896	896
27	1	Classroom (104)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	17	190	10	148	478	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	2	2	32	13	190	10	148	359	0	120	120
28	1	Classroom (105)	Recessed Parabolic	E	4'T8	10	3	32	Sw	17	190	15	1,110	3,585	C	Recessed Parabolic	4'T8	E	OS	10	3	32	13	190	15	1110	2689	0	896	896
29	1	Classroom (105)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	17	190	10	148	478	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	2	2	32	13	190	10	148	359	0	120	120
30	1	Classroom (106)	Recessed Parabolic	E	4'T8	10	3	32	Sw	17	190	15	1,110	3,585	C	Recessed Parabolic	4'T8	E	OS	10	3	32	13	190	15	1110	2689	0	896	896
31	1	Classroom (106)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	17	190	10	148	478	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	2	2	32	13	190	10	148	359	0	120	120
32	1	Classroom (107)	Recessed Parabolic	E	4'T8	14	2	32	Sw	17	190	10	1,036	3,346	C	Recessed Parabolic	4'T8	E	OS	14	2	32	13	190	10	1036	2510	0	837	837
33	1	Classroom (107)	Recessed Parabolic	E	4'T8 U-Shaped	1	2	32	Sw	17	190	10	74	239	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	1	2	32	13	190	10	74	179	0	60	60
34	1	Classroom (108)	Recessed Parabolic	E	4'T8	10	3	32	Sw	17	190	15	1,110	3,585	C	Recessed Parabolic	4'T8	E	OS	10	3	32	13	190	15	1110	2689	0	896	896
35	1	Classroom (108)	Recessed Parabolic	E	4'T8 U-Shaped	10	2	32	Sw	17	190	10	740	2,390	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	10	2	32	13	190	10	740	1793	0	598	598
36	1	Bathroom (Bathroom)	Recessed Parabolic	E	4'T8	1	2	32	OS	17	190	10	74	239	N/A	Recessed Parabolic	4'T8	E	OS	1	2	32	17	190	10	74	239	0	0	0
37	1	Bathroom Men (Boys Bathroom)	Recessed Parabolic	E	4'T8	4	2	32	Sw	17	190	10	296	956	C	Recessed Parabolic	4'T8	E	OS	4	2	32	13	190	10	296	717	0	239	239
38	1	Bathroom Women (Girls Bathroom)	Recessed Parabolic	E	4'T8	4	2	32	Sw	17	190	10	296	956	C	Recessed Parabolic	4'T8	E	OS	4	2	32	13	190	10	296	717	0	239	239
39	1	Corridor (Bathroom Corridor)	Recessed Parabolic	E	2'T8	1	2	17	Sw	17	190	4	38	123	N/A	Recessed Parabolic	2'T8	E	Sw	1	2	17	17	190	4	38	123	0	0	0
40	1	Media Center (Media Center)	Ceiling Suspended	E	4'T8	20	2	32	Sw	17	190	10	1,480	4,780	C	Ceiling Suspended	4'T8	E	OS	20	2	32	13	190	10	1480	3585	0	1195	1195
41	1	Media Center (Media Center)	Ceiling Suspended	E	4'T8	28	2	32	Sw	17	190	10	2,072	6,693	C	Ceiling Suspended	4'T8	E	OS	28	2	32	13	190	10	2072	5019	0	1673	1673
42	1	Media Center (Media Center)	Recessed	S	CFL	8	1	26	Sw	17	190	0	208	672	C	Recessed	CFL	S	OS	8	1	26	13	190	0	208	504	0	168	168
43	1	Media Center (Media Center)	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
44	1	Media Center (Media Center)	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
45	1	Media Center (Media Center)	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
46	1	Bathroom Men (Boys Bathroom)	Recessed Parabolic	E	4'T8	3	2	32	Sw	17	190	10	222	717	C	Recessed Parabolic	4'T8	E	OS	3	2	32	13	190	10	222	538	0	179	179
47	1	Bathroom Men (Boys Bathroom)	Recessed Parabolic	E	4'T8 U-Shaped	1	2	32	Sw	17	190	10	74	239	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	1	2	32	13	190	10	74	179	0	60	60
48	1	Bathroom Women (Girls Bathroom)	Recessed Parabolic	E	4'T8	3	2	32	Sw	17	190	10	222	717	C	Recessed Parabolic	4'T8	E	OS	3	2	32	13	190	10	222	538	0	179	179
49	1	Bathroom Women (Girls Bathroom)	Recessed Parabolic	E	4'T8 U-Shaped	1	2	32	Sw	17	190	10	74	239	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	1	2	32	13	190	10	74	179	0	60	60
50	1	Staircase (Staircase)	Ceiling Mounted	E	6'T8	1	1	48	Sw	17	190	6	54	174	N/A	Ceiling Mounted	6'T8	E	Sw	1	1	48	17	190	6	54	174	0	0	0
51	1	Office (Maintenance Office)	Ceiling Mounted	E	4'T8	2	2	32	Sw	17	190	10	148	478	C	Ceiling Mounted	4'T8	E	OS	2	2	32	13	190	10	148	359	0	120	120
52	1	Nurse Vestibule (Nurse Vestibule)	Recessed Parabolic	E	2'T8	1	2	17	Sw	17	190	4	38	123	N/A	Recessed Parabolic	2'T8	E	Sw	1	2	17	17	190	4	38	123	0	0	0
53	1	Office (Nurse's Office)	Recessed Parabolic	E	4'T8	8	2	32	Sw	17	190	10	592	1,912	C	Recessed Parabolic	4'T8	E	OS	8	2	32	13	190	10	592	1434	0	478	478
54	1	Principals Office (Principals Office)	Recessed Parabolic	E	4'T8	4	2	32	Sw	17	190	10	296	956	C	Recessed Parabolic	4'T8	E	OS	4	2	32	13	190	10	296	717	0	239	239
55	1	Bathroom (Principals Off. BR)	Ceiling Mounted	S	CFL	1	2	13	Sw	2	190	0	26	10	N/A	Ceiling Mounted	CFL	S	Sw	1	2	13	2	190	0	26	10	0	0	0
56	1	Office (Main Office)	Recessed Parabolic	E	4'T8	2	2	32	Sw	17	190	10	148	478	C	Recessed Parabolic	4'T8	E	OS	2	2	32	13	190	10	148	359	0	120	120
57	1	Lobby (Main Lobby)	Ceiling Mounted	E	4'T8	4	2	32	Sw	17	190	10	296	956	N/A	Ceiling Mounted	4'T8	E	Sw	4	2	32	17	190	10	296	956	0	0	0
58	1	Staircase (Staircase)	Ceiling Mounted	E	2'T8	2	2	17	Sw	17	190	4	76	245	N/A	Ceiling Mounted	2'T8	E	Sw	2	2	17	17	190	4	76	245	0	0	0
59	1	Staircase (Staircase)	Exit Sign	S	LED	1	1	5	N	17	365	1	6	34	N/A	Exit Sign	LED	S	N	1	1	5	17	365	1	6	34	0	0	0
60	1	Lobby (Gym Lobby)	Ceiling Mounted	E	2'T8	2	2	17	Sw	17	190	4	76	245	N/A	Ceiling Mounted	2'T8	E	Sw	2	2	17	17	190	4	76	245	0	0	0
61	1	Lobby (Gym Lobby)	Exit Sign	S	LED	1	1	5	N	17	365	1	6	34	N/A	Exit Sign	LED	S	N	1	1	5	17	365	1	6	34	0	0	0
62	1	Gymnasium (All Purpose/Gym)	High Bay	S	MV	16	1	150	Sw	17	190	24	2,784	8,992	CFL	High Bay	CFL	S	OS	16	1	100	13	190	0	1600	3876	3824	1292	5116
63	1	Gymnasium (All Purpose/Gym)	Exit Sign	S	LED	6	1	5	N	17	365	1	33	205	N/A	Exit Sign	LED	S	N	6	1	5	17	365	1	33	205	0	0	0
64	1	Kitchen (Kitchen)	Recessed Parabolic	E	4'T8	4	3	32	Sw	17	190	15	444	1,434	C	Recessed Parabolic	4'T8	E	OS	4	3	32	13	190	15	444	1076	0	359	359
65	1	Stage (Stage)	Wall Mounted	M	4'T12	2	2	40	Sw	17	190	24	208	672	T8	Wall Mounted	4'T8	E	Sw	2	2	32	17	190	10	148	478	194	0	194
66	1	Stage (Stage)	Wall Mounted	M	4'T12	4	2	40	Sw	17	190	24	416	1,344	T8	Wall Mounted	4'T8	E	Sw	4	2	32	17	190	10	296	956	388	0	388
67	1	Stage (Stage)	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
68	1	Stage (Stage)	Ceiling Mounted	E	Circline - T8	2	1	32	Sw	17	190	5	74	239	N/A	Ceiling Mounted	Circline - T8	E	Sw	2	1	32	17	190	5	74	239	0	0	0
69	1	Vestibule (Vestibule)	Ceiling Mounted	E	4'T8	2	1	32	Sw	17	190	5	74	239	C	Ceiling Mounted	4'T8	E	OS	2	1	32	13	190	5	74	179	0	60	60
70	1	Corridor (Corridor)	Exit Sign	S	LED	1	1	5	N	17	365	1	6	34	N/A	Exit Sign	LED	S	N	1	1	5	17	365	1	6	34	0	0	0

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
71	1	Bathroom Men (Boys Bathroom)	Ceiling Mounted	E	4'T8	1	2	32	Sw	17	190	10	74	239	C	Ceiling Mounted	4'T8	E	OS	1	2	32	13	190	10	74	179	0	60	60
72	1	Bathroom Women (Girls Bathroom)	Ceiling Mounted	E	4'T8	1	2	32	Sw	17	190	10	74	239	C	Ceiling Mounted	4'T8	E	OS	1	2	32	13	190	10	74	179	0	60	60
73	1	Bathroom (Faculty Bathroom)	Ceiling Mounted	E	4'T8	1	2	32	Sw	17	190	10	74	239	C	Ceiling Mounted	4'T8	E	OS	1	2	32	13	190	10	74	179	0	60	60
74	1	Office (Faculty Office)	Ceiling Mounted	E	4'T8	4	2	32	Sw	17	190	10	296	956	C	Ceiling Mounted	4'T8	E	OS	4	2	32	13	190	10	296	717	0	239	239
75	1	Copy Room (Copy Room)	Ceiling Mounted	E	4'T8	2	2	32	Sw	17	190	10	148	478	C	Ceiling Mounted	4'T8	E	OS	2	2	32	13	190	10	148	359	0	120	120
76	1	Storage Rm (Storage Room)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	190	10	74	28	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	190	10	74	28	0	0	0
77	1	Hallway (Hallway)	Recessed Parabolic	E	4'T8	19	2	32	Sw	17	190	10	1,406	4,541	N/A	Recessed Parabolic	4'T8	E	Sw	19	2	32	17	190	10	1406	4541	0	0	0
78	1	Hallway (Hallway)	Recessed Parabolic	E	4'T8	28	2	32	Sw	17	190	10	2,072	6,693	N/A	Recessed Parabolic	4'T8	E	Sw	28	2	32	17	190	10	2072	6693	0	0	0
79	1	Hallway (Hallway)	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
80	1	Hallway (Hallway)	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
81	1	Hallway (Hallway)	Recessed Parabolic	E	4'T8	6	2	32	Sw	17	190	10	444	1,434	N/A	Recessed Parabolic	4'T8	E	Sw	6	2	32	17	190	10	444	1434	0	0	0
82	1	Hallway (Hallway)	Recessed Parabolic	E	2'T8	4	2	17	Sw	17	190	4	152	491	N/A	Recessed Parabolic	2'T8	E	Sw	4	2	17	17	190	4	152	491	0	0	0
83	1	Hallway (Hallway)	Recessed Parabolic	E	2'T8	13	2	17	Sw	17	190	4	494	1,596	N/A	Recessed Parabolic	2'T8	E	Sw	13	2	17	17	190	4	494	1596	0	0	0
84	1	Hallway (Hallway)	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
85	Bsmt	Boiler Rm (Boiler Room)	Ceiling Suspended	E	4'T8	4	2	32	Sw	2	190	10	296	112	N/A	Ceiling Suspended	4'T8	E	Sw	4	2	32	2	190	10	296	112	0	0	0
86	Bsmt	Boiler Rm (Boiler Room)	Ceiling Mounted	M	8'T12	3	1	80	Sw	2	190	20	300	114	T8	Ceiling Mounted	8'T8	E	Sw	3	1	59	2	190	7	198	75	39	0	39
87	Bsmt	Boiler Rm (Boiler Room)	Exit Sign	S	LED	1	1	5	Sw	24	365	1	6	48	N/A	Exit Sign	LED	S	Sw	1	1	5	24	365	1	6	48	0	0	0
88	Bsmt	Storage Rm (Storage Room)	Ceiling Suspended	E	4'T8	2	2	32	Sw	2	190	10	148	56	N/A	Ceiling Suspended	4'T8	E	Sw	2	2	32	2	190	10	148	56	0	0	0
89	Bsmt	Storage Rm (Storage Room)	Ceiling Mounted	M	8'T12	2	1	80	Sw	2	190	20	200	76	T8	Ceiling Mounted	8'T8	E	Sw	2	1	59	2	190	7	132	50	26	0	26
90	Bsmt	Storage Rm (Storage Room)	Ceiling Suspended	E	4'T8	8	2	32	Sw	2	190	10	592	225	N/A	Ceiling Suspended	4'T8	E	Sw	8	2	32	2	190	10	592	225	0	0	0
91	Bsmt	Storage Rm (Storage Room)	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
92	Ext	Exterior (Exterior Lighting)	Pole Mounted	S	MV	4	1	100	PC	12	365	16	464	2,032	CFL	Pole Mounted	CFL	S	PC	4	1	65	12	365	0	260	1139	894	0	894
93	Ext	Exterior (Exterior Lighting)	Spotlight	S	Quartz Halogen	1	2	100	PC	12	365	40	240	1,051	N/A	Spotlight	Quartz Halogen	S	PC	1	2	100	12	365	40	240	1051	0	0	0
94	Ext	Exterior (Exterior Lighting)	Wall Mounted	S	HPS	1	1	200	PC	12	365	40	240	1,051	PSMH	Wall Mounted	PSMH	S	PC	1	1	125	12	365	25	150	657	394	0	394
95	Ext	Exterior (Exterior Lighting)	Wallpack	S	HPS	1	1	150	PC	12	365	30	180	788	PSMH	Wallpack	PSMH	S	PC	1	1	100	12	365	20	120	526	263	0	263
96	Ext	Exterior (Exterior Lighting)	Wallpack	S	HPS	1	1	150	PC	12	365	30	180	788	PSMH	Wallpack	PSMH	S	PC	1	1	100	12	365	20	120	526	263	0	263
97	Ext	Exterior (Exterior Lighting)	Wallpack	S	HPS	2	1	150	PC	12	365	30	360	1,577	PSMH	Wallpack	PSMH	S	PC	2	1	100	12	365	20	240	1051	526	0	526
98	Ext	Exterior (Exterior Lighting)	Wallpack	S	HPS	1	1	150	PC	12	365	30	180	788	PSMH	Wallpack	PSMH	S	PC	1	1	100	12	365	20	120	526	263	0	263
99	Ext	Exterior (Exterior Lighting)	Wall Mounted	S	HPS	1	1	200	PC	12	365	40	240	1,051	PSMH	Wall Mounted	PSMH	S	PC	1	1	125	12	365	25	150	657	394	0	394
100	Ext	Exterior (Exterior Lighting)	Wallpack	S	HPS	1	1	150	PC	12	365	30	180	788	PSMH	Wallpack	PSMH	S	PC	1	1	100	12	365	20	120	526	263	0	263
101	Ext	Exterior (Exterior Lighting)	Wall Mounted	S	HPS	1	1	200	PC	12	365	40	240	1,051	PSMH	Wall Mounted	PSMH	S	PC	1	1	125	12	365	25	150	657	394	0	394
102	Ext	Exterior (Exterior Lighting)	Sconce	S	CFL	2	1	26	PC	12	365	0	52	228	N/A	Sconce	CFL	S	PC	2	1	26	12	365	0	52	228	0	0	0
103	Ext	Exterior (Exterior Lighting)	Recessed	S	CFL	1	1	26	PC	12	365	0	26	114	N/A	Recessed	CFL	S	PC	1	1	26	12	365	0	26	114	0	0	0
104	Ext	Exterior (Exterior Lighting)	Sconce	S	CFL	2	1	26	PC	12	365	0	52	228	N/A	Sconce	CFL	S	PC	2	1	26	12	365	0	52	228	0	0	0
105	Ext	Exterior (Exterior Lighting)	Wallpack	S	HPS	1	1	150	PC	12	365	30	180	788	PSMH	Wallpack	PSMH	S	PC	1	1	100	12	365	20	120	526	263	0	263
106	Ext	Exterior (Exterior Lighting)	Ceiling Mounted	S	HPS	1	1	150	PC	12	365	30	180	788	PSMH	Ceiling Mounted	PSMH	S	PC	1	1	100	12	365	20	120	526	263	0	263
107	Ext	Exterior (Exterior Lighting)	Wallpack	S	HPS	1	1	150	PC	12	365	30	180	788	PSMH	Wallpack	PSMH	S	PC	1	1	100	12	365	20	120	526	263	0	263
108	Ext	Exterior (Exterior Lighting)	Wallpack	S	HPS	1	1	150	PC	12	365	30	180	788	PSMH	Wallpack	PSMH	S	PC	1	1	100	12	365	20	120	526	263	0	263
Totals:						566	185	4,905				1,244	44,103	140,816						566	185	4,087			1,015	41,495	106,280	9,174	25,362	34,536

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

Proposed Lighting Summary Table			
Total Gross Floor Area (SF)	47,670		
Average Power Cost ($/kWh)	0.1560		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	14,691	9,986	**4,704**
Exterior Power (watts)	3,354	2,280	**1,074**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	126,126	96,293	**29,832**
Lighting Power (watts)	40,749	39,215	**1,534**
Lighting Power Density (watts/SF)	0.85	0.82	**0.03**
Estimated Cost of Fixture Replacement ($)	7,889		
Estimated Cost of Controls Improvements ($)	9,600		
Total Consumption Cost Savings ($)	**6,282**		

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 C: 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 (Hydro chlorofluorocarbons):

- 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

PSE&G ELECTRIC SERVICE TERRITORY
Last Updated: 10/24/12

*CUSTOMER CLASS - R – RESIDENTIAL C – COMMERCIAL I –INDUSTRIAL

Supplier	Telephone & Web Site	*Customer Class
AEP Energy, Inc. 309 Fellowship Road, Fl. 2 Mount Laurel, NJ 08054	(866) 258-3782 www.aepenergy.com	C/I ACTIVE
Alpha Gas and Electric, LLC 641 5th Street Lakewood, NJ 08701	(855) 553-6374 www.alphagasandelectric.com	R/C ACTIVE
Ambit Northeast, LLC 103 Carnegie Center Suite 300 Princeton, NJ 08540	(877)-30-AMBIT (877) 302-6248 www.ambitenergy.com	R/C ACTIVE
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com	C ACTIVE
Amerigreen Energy, Inc. 1463 Lamberton Road Trenton, NJ 08611	888-423-8357 www.amerigreen.com	R/C ACTIVE
AP Gas & Electric, LLC 10 North Park Place, Suite 420 Morristown, NJ 07960	(855) 544-4895 www.apge.com	R/C/I ACTIVE
Astral Energy LLC 16 Tyson Place Bergenfield, NJ 07621	(201) 384-5552 www.astralenergyllc.com	R/C/I ACTIVE
Barclays Capital Services, Inc. 70 Hudson Street Jersey City, NJ 07302-4585	(888) 978-9974 www.group.barclays.com	C ACTIVE
BBPC, LLC d/b/a Great Eastern Energy 116 Village Blvd. Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateasternenergy.com	C/I ACTIVE
Champion Energy Services, LLC 72 Avenue L Newark, NJ 07105	(877) 653-5090 www.championenergyservices.com	R/C/I ACTIVE

Choice Energy, LLC 4257 US Highway 9, Suite 6C Freehold, NJ 07728	888-565-4490 www.4choiceenergy.com	**R/C** **ACTIVE**
Clearview Electric, Inc. 505 Park Drive Woodbury, NJ 08096	(888) CLR-VIEW (800) 746-4702 www.clearviewenergy.com	**R/C/I** **ACTIVE**
Commerce Energy, Inc. 7 Cedar Terrace Ramsey, NJ 07446	1-866-587-8674 www.commerceenergy.com	**R** **ACTIVE**
ConEdison Solutions Cherry Tree Corporate Center 535 State Highway Suite 180 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com	**C/I** **ACTIVE**
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(866) 237-7693 www.constellation.com	**R/C/I** **ACTIVE**
Constellation Energy 900A Lake Street, Suite 2 Ramsey, NJ 07446	(877) 997-9995 www.constellation.com	**R** **ACTIVE**
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.com	**C** **ACTIVE**
Direct Energy Business, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(888) 925-9115 www.directenergybusiness.com	**C/I** **ACTIVE**
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 348-4193 www.directenergy.com	**R** **ACTIVE**
Discount Energy Group, LLC 811 Church Road, Suite 149 Cherry Hill, New Jersey 08002	(800) 282-3331 www.discountenergygroup.com	**R/C** **ACTIVE**
Dominion Retail, Inc. d/b/a Dominion Energy Solutions 395 Route #70 West Suite 125 Lakewood, NJ 08701	(866) 275-4240 www.dom.com/products	**R/C** **ACTIVE**

DTE Energy Supply, Inc. One Gateway Center, Suite 2600 Newark, NJ 07102	(877) 332-2450 www.dtesupply.com	**C/I** **ACTIVE**
Energy.me Midwest LLC 90 Washington Blvd Bedminster, NJ 07921	(855) 243-7270 www.energy.me	**R/C/I** **ACTIVE**
Energy Plus Holdings LLC 309 Fellowship Road East Gate Center, Suite 200 Mt. Laurel, NJ 08054	(877) 866-9193 www.energypluscompany.com	**R/C** **ACTIVE**
Ethical Electric Benefit Co. d/b/a Ethical Electric 100 Overlook Center, 2nd Fl. Princeton, NJ 08540	(888) 444-9452 www.ethicalelectric.com	**R/C** **ACTIVE**
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07962	(800) 977-0500 www.fes.com	**C/I** **ACTIVE**
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com	**R/C/I** **ACTIVE**
GDF SUEZ Energy Resources NA, Inc. 333 Thornall Street Sixth Floor Edison, NJ 08837	(866) 999-8374 www.gdfsuezenergyresources.com	**C/I** **ACTIVE**
Glacial Energy of New Jersey, Inc. 75 Route 15 Building E Lafayette, NJ 07848	(888) 452-2425 www.glacialenergy.com	**C/I** **ACTIVE**
Global Energy Marketing LLC 129 Wentz Avenue Springfield, NJ 07081	(800) 542-0778 www.globalp.com	**C/I** **ACTIVE**
Green Mountain Energy Company 211 Carnegie Center Drive Princeton, NJ 08540	(866) 767-5818 www.greenmountain.com/commercial-home	**C/I** **ACTIVE**

Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com	**C/I** **ACTIVE**
HIKO Energy, LLC 655 Suffern Road Teaneck, NJ 07666	(888) 264-4908 www.hikoenergy.com	**R/C** **ACTIVE**
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	**R/C/I** **ACTIVE**
Hudson Energy Services, LLC 7 Cedar Street Ramsey, New Jersey 07446	(877) Hudson 9 www.hudsonenergyservices.com	**C** **ACTIVE**
IDT Energy, Inc. 550 Broad Street Newark, NJ 07102	(877) 887-6866 www.idtenergy.com	**R/C** **ACTIVE**
Independence Energy Group, LLC 3711 Market Street, 10th Fl. Philadelphia, PA 19104	(877) 235-6708 www.chooseindependence.com	**R/C** **ACTIVE**
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com	**C/I** **ACTIVE**
Keil & Sons, Inc. d/b/a Systrum Energy 1 Bergen Blvd. Fairview, NJ 07022	(877) 797-8786 www.systrumenergy.com	**R/C/I** **ACTIVE**
Liberty Power Delaware, LLC 1973 Highway 34, Suite 211 Wall, NJ 07719	(866) 769-3799 www.libertypowercorp.com	**C/I** **ACTIVE**
Liberty Power Holdings, LLC 1973 Highway 34, Suite 211 Wall, NJ 07719	(866) 769-3799 www.libertypowercorp.com	**C/I** **ACTIVE**

Linde Energy Services 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.linde.com	**C/I** **ACTIVE**
Marathon Power LLC 302 Main Street Paterson, NJ 07505	(888) 779-7255 www.mecny.com	**R/C/I** **ACTIVE**
MXenergy Electric Inc. 900 Lake Street Ramsey, NJ 07446	(800) 785-4374 www.mxenergy.com	**R/C/I** **ACTIVE**
NATGASCO, Inc. 532 Freeman St. Orange, NJ 07050	(973) 678-1800 x. 251 www.supremeenergyinc.com	**R/C** **ACTIVE**
NextEra Energy Services New Jersey, LLC 651 Jernee Mill Road Sayreville, NJ 08872	(877) 528-2890 Commercial (800) 882-1276 Residential www.nexteraenergyservices.com	**R/C/I** **ACTIVE**
New Jersey Gas & Electric 1 Bridge Plaza fl. 2 Fort Lee, NJ 07024	(866) 568-0290 www.NJGandE.com	**R/C** **ACTIVE**
Noble Americas Energy Solutions The Mac-Cali Building 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.noblesolutions.com	**C/I** **ACTIVE**
North American Power and Gas, LLC 222 Ridgedale Avenue Cedar Knolls, NJ 07927	(888) 313-9086 www.napower.com	**R/C/I** **ACTIVE**
Palmco Power NJ, LLC One Greentree Centre 10,000 Lincoln Drive East, Suite 201 Marlton, NJ 08053	(877) 726-5862 www.PalmcoEnergy.com	**R/C/I** **ACTIVE**
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) ENERGY-9 (363-7499) www.pepco-services.com	**C/I** **ACTIVE**
Plymouth Rock Energy, LLC 338 Maitland Avenue Teaneck, NJ 07666	(855) 32-POWER (76937) www.plymouthenergy.com	**R/C/I** **ACTIVE**

PPL Energy Plus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com	**C/I** **ACTIVE**
Public Power & Utility of New Jersey, LLC 39 Old Ridgebury Rd. Suite 14 Danbury, CT 06810	(888) 354-4415 www.ppandu.com	**R/C/I** **ACTIVE**
Reliant Energy 211 Carnegie Center Princeton, NJ 08540	(877) 297-3795 (877) 297-3780 www.reliant.com/pjm	**R/C/I** **ACTIVE**
ResCom Energy LLC 18C Wave Crest Ave. Winfield Park, NJ 07036	(888) 238-4041 http://rescomenergy.com	**R/C/I** **ACTIVE**
Respond Power LLC 10 Regency CT Lakewood, NJ 08701	(877) 973-7763 www.respondpower.com	**R/C/I** **ACTIVE**
South Jersey Energy Company 1 South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 266-6020 www.southjerseyenergy.com	**C/I** **ACTIVE**
Sperian Energy Corp. 1200 Route 22 East, Suite 2000 Bridgewater, NJ 08807	(888) 682-8082	**R/C/I** **ACTIVE**
S.J. Energy Partners, Inc. 208 White Horse Pike, Suite 4 Barrington, N.J. 08007	(800) 695-0666 www.sjnaturalgas.com	**R/C** **ACTIVE**
Spark Energy, L.P. 2105 CityWest Blvd., Ste 100 Houston, Texas 77042	(800) 441-7514 www.sparkenergy.com	**R/C/I** **ACTIVE**
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com	**C/I** **ACTIVE**
Starion Energy PA Inc. 101 Warburton Avenue Hawthorne, NJ 07506	(800) 600-3040 www.starionenergy.com	**R/C/I** **ACTIVE**
Stream Energy 309 Fellowship Rd., Suite 200 Mt. Laurel, NJ 08054	(877) 39-8150 www.streamenergy.net	**R** **ACTIVE**

UGI Energy Services, Inc. d/b/a GASMARK 224 Strawbridge Drive Suite 107 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com	**C/I** **ACTIVE**
Verde Energy USA, Inc. 50 East Palisades Avenue Englewood, NJ 07631	(800) 388-3862 www.lowcostpower.com	**R/C/I** **ACTIVE**
Viridian Energy 2001 Route 46, Waterview Plaza Suite 310 Parsippany, NJ 07054	(866) 663-2508 www.viridian.com	**R/C/I** **ACTIVE**
Xoom Energy New Jersey, LLC 744 Broad Street Newark, NJ 07102	(888) 997-8979 www.xoomenergy.com	**R/C/I** **ACTIVE**
YEP Energy 89 Headquarters Plaza North #1463 Morristown, NJ 07960	(855) 363-7736 www.yepenergyNJ.com	**R/C/I** **ACTIVE**
Your Energy Holdings, LLC One International Boulevard Suite 400 Mahwah, NJ 07495-0400	(855) 732-2493 www.thisisyourenergy.com	**R/C/I** **ACTIVE**

Back to the main supplier page

PSE&G GAS SERVICE TERRITORY
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*CUSTOMER CLASS - R – RESIDENTIAL C – COMMERCIAL I - INDUSTRIAL

Supplier	Telephone & Web Site	*Customer Class
Ambit Northeast, LLC 103 Carnegie Center Suite 300 Princeton, NJ 08540	(877)-30-AMBIT (877) 302-6248 www.ambitenergy.com	**R/C** **ACTIVE**
Astral Energy LLC 16 Tyson Place Bergenfield, NJ 07621	888-850-1872 www.astralenergyllc.com	**R/C/I** **ACTIVE**
BBPC, LLC Great Eastern Energy 116 Village Blvd. Suite 200 Princeton, NJ 08540	888-651-4121 www.greateasternenergy.com	**C/I** **ACTIVE**
Clearview Electric Inc. **d/b/a Clearview Gas** 1744 Lexington Ave. Pennsauken, NJ 08110	800-746-4720 www.clearviewenergy.com	**R/C** **ACTIVE**
Colonial Energy, Inc. 83 Harding Road Wyckoff, NJ 07481	845-429-3229 www.colonialgroupinc.com	**C/I** **ACTIVE**
Commerce Energy, Inc. 7 Cedar Terrace Ramsey, NJ 07746	(888) 817-8572 www.commerceenergy.com	**R** **ACTIVE**
Compass Energy Services, Inc. 1085 Morris Avenue, Suite 150 Union, NJ 07083	866-867-8328 908-638-6605 www.compassenergy.net	**C/I** **ACTIVE**
ConocoPhillips Company 224 Strawbridge Drive, Suite 107 Moorestown, NJ 08057	800-646-4427 www.conocophillips.com	**C/I** **ACTIVE**
Consolidated Edison Energy, Inc. **d/b/a Con Edison Solutions** 535 State Highway 38, Suite 140 Cherry Hill, NJ 08002	888-686-1383 x2130 www.conedenergy.com	

Consolidated Edison Solutions, Inc. Cherry Tree Corporate Center 535 State Highway 38, Suite 140 Cherry Hill, NJ 08002	888-665-0955 www.conedsolutions.com	**C/I** **ACTIVE**
Constellation NewEnergy-Gas Division, LLC 900A Lake Street, Suite 2 Ramsey, NJ 07466	(800) 900-1982 www.constellation.com	**C/I** **ACTIVE**
Direct Energy Business, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	888-925-9115 www.directenergy.com	**C/I** **ACTIVE**
Direct Energy Services, LLP 120 Wood Avenue, Suite 611 Iselin, NJ 08830	866-348-4193 www.directenergy.com	**R** **ACTIVE**
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	800-805-8586 www.gesc.com	**R/C/I** **ACTIVE**
UGI Energy Services, Inc. d/b/a GASMARK 224 Strawbridge Drive, Suite 107 Moorestown, NJ 08057	856-273-9995 www.ugienergyservices.com	**C/I** **ACTIVE**
Global Energy Marketing, LLC 129 Wentz Avenue Springfield, NJ 07081	800-542-0778 www.globalp.com	**C/I** **ACTIVE**
Great Eastern Energy 116 Village Blvd., Suite 200 Princeton, NJ 08540	888-651-4121 www.greateastern.com	**C/I** **ACTIVE**
Greenlight Energy 330 Hudson Street, Suite 4 Hoboken, NJ 07030	718-204-7467 www.greenlightenergy.us	**C** **ACTIVE**
Hess Energy, Inc. One Hess Plaza Woodbridge, NJ 07095	800-437-7872 www.hess.com	**C/I** **ACTIVE**
Hess Small Business Services, LLC One Hess Plaza Woodbridge, NJ 07095	888-494-4377 www.hessenergy.com	**C/I** **ACTIVE**
HIKO Energy, LLC 655 Suffern Road Teaneck, NJ 07666	(888) 264-4908 www.hikoenergy.com	**R/C** **ACTIVE**

Hudson Energy Services, LLC 7 Cedar Street Ramsey, NJ 07446	877- Hudson 9 www.hudsonenergyservices.com	**C** **ACTIVE**
IDT Energy, Inc. 550 Broad Street Newark, NJ 07102	877-887-6866 www.idtenergy.com	**R/C** **ACTIVE**
Integrys Energy Services – Natural Gas, LLC 99 Wood Avenue South Suite #802 Iselin, NJ 08830	800-536-0151 www.integrysenergy.com	**C/I** **ACTIVE**
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	800-927-9794 www.intelligentenergy.org	**R/C/I** **ACTIVE**
Keil & Sons, Inc. **d/b/a Systrum Energy** 1 Bergen Blvd. Fairview, NJ 07022	1-877-797-8786 www.systrumenergy.com	**R/C/I** **ACTIVE**
Major Energy Services, LLC 10 Regency CT Lakewood, NJ 08701	888-625-6760 www.majorenergy.com	**R/C/I** **ACTIVE**
Marathon Power LLC 302 Main Street Paterson, NJ 07505	888-779-7255 www.mecny.com	**R/C/I** **ACTIVE**
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	800-828-9427 www.metromediaenergy.com	**C** **ACTIVE**
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	888-53-Metro www.metroenergy.com	**R/C** **ACTIVE**
MxEnergy, Inc. 900 Lake Street Ramsey, NJ 07446	800-758-4374 www.mxenergy.com	**R/C/I** **ACTIVE**
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	800-840-4GAS www.natgasco.com	**C** **ACTIVE**
New Energy Services LLC 101 Neptune Avenue Deal, New Jersey 07723	800-660-3643 www.newenergyservicesllc.com	**R/C/I** **ACTIVE**

New Jersey Gas & Electric 1 Bridge Plaza, Fl. 2 Fort Lee, NJ 07024	866-568-0290 www.NJGandE.com	**R/C** **ACTIVE**
Noble Americas Energy Solutions The Mac-Cali Building 581 Main Street, 8th fl. Woodbridge, NJ 07095	877-273-6772 www.noblesolutions.com	**C/I** **ACTIVE**
North American Power & Gas, LLC d/b/a North American Power 197 Route 18 South Ste. 3000 East Brunswick, NJ 08816	(888) 313-9086 www.napower.com	**R/C/I** **ACTIVE**
Palmco Energy NJ, LLC One Greentree Centre 10,000 Lincoln Drive East, Suite 201 Marlton, NJ 08053	877-726-5862 www.PalmcoEnergy.com	**R/C/I** **ACTIVE**
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	800-363-7499 www.pepco-services.com	**C/I** **ACTIVE**
Plymouth Rock Energy, LLC 338 Maitland Avenue Teaneck, NJ 07666	855-32-POWER (76937) www.plymouthenergy.com	**R/C/I** **ACTIVE**
PPL EnergyPlus, LLC 811 Church Road - Office 105 Cherry Hill, NJ 08002	800-281-2000 www.pplenergyplus.com	**C/I** **ACTIVE**
Respond Power LLC 10 Regency CT Lakewood, NJ 08701	(877) 973-7763 www.respondpower.com	**R/C/I** **ACTIVE**
South Jersey Energy Company 1 South Jersey Plaza, Route 54 Folsom, NJ 08037	800-266-6020 www.southjerseyenergy.com	**C/I** **ACTIVE**
S.J. Energy Partners, Inc. 208 White Horse Pike, Suite 4 Barrington, NJ 08007	800-695-0666 www.sjnaturalgas.com	**R/C** **ACTIVE**
Spark Energy Gas, L.P. 2105 CityWest Blvd, Ste 100 Houston, Texas 77042	800-411-7514 www.sparkenergy.com	**R/C/I** **ACTIVE**
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	855-466-2842 www.spragueenergy.com	**C/I** **ACTIVE**

Stuyvesant Energy LLC 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	800-640-6457 www.stuyfuel.com	**C** **ACTIVE**
Stream Energy New Jersey, LLC 309 Fellowship Road Suite 200 Mt. Laurel, NJ 08054	(973) 494-8097 www.streamenergy.net	**R/C** **ACTIVE**
Systrum Energy 1 Bergen Blvd. Fairview, NJ 07022	877-797-8786 www.systrumenergy.com	**R/C/I** **ACTIVE**
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	800-557-1121 www.woodruffenergy.com	**R/C/I** **ACTIVE**
Woodruff Energy US LLC 73 Water Street, P.O. Box 777 Bridgeton, NJ 08302	856-455-1111 800-557-1121 www.woodruffenergy.com	**C/I** **ACTIVE**
Xoom Energy New Jersey, LLC 744 Broad Street Newark, NJ 07102	888-997-8979 www.xoomenergy.com	**R/C/I** **ACTIVE**
Your Energy Holdings, LLC One International Boulevard Suite 400 Mahwah, NJ 07495-0400	(855) 732-2493 www.thisisyourenergy.com	**R/C/I** **ACTIVE**

Back to main supplier information page

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.

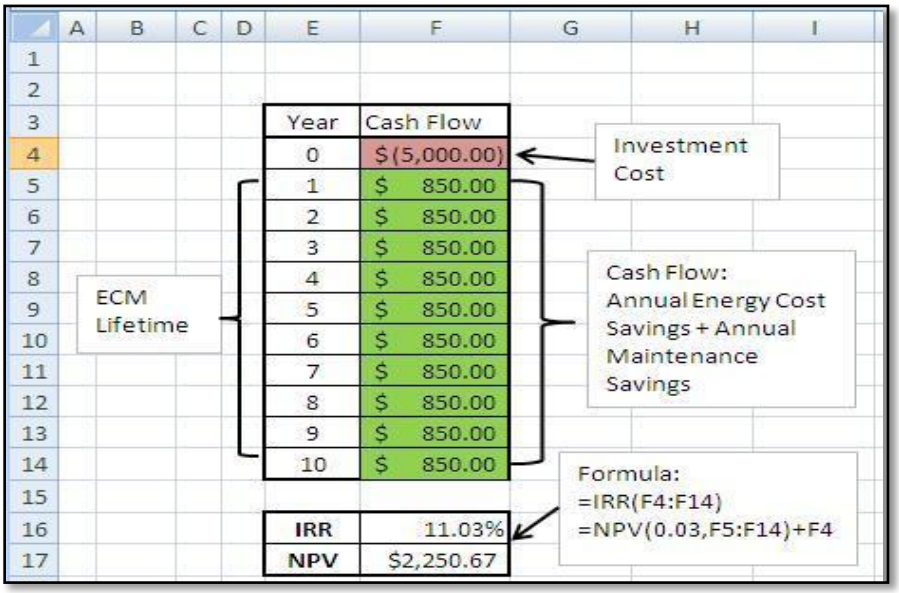
Calculation References

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
Wood-Ridge BOE - Catherine E. Doyle School

Building ID: 3280636
For 12-month Period Ending: March 31, 2012[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: November 20, 2012

Facility
Wood-Ridge BOE - Catherine E. Doyle School
250 Wood-Ridge Avenue
Wood-Ridge, NJ 07075

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1952
Gross Floor Area (ft²): 47,670

Energy Performance Rating[2] (1-100) 5

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	1,478,389
Natural Gas (kBtu)[4]	3,190,502
Total Energy (kBtu)	4,668,891

Energy Intensity[4]	
Site (kBtu/ft²/yr)	98
Source (kBtu/ft²/yr)	174

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	379

Electric Distribution Utility
Public Service Electric & Gas Co

National Median Comparison	
National Median Site EUI	56
National Median Source EUI	100
% Difference from National Median Source EUI	74%
Building Type	K-12 School

Stamp of Certifying Professional

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

Certifying Professional
N/A

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**

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.

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

Direct Install 2012 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
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies

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.

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.

Utility Sponsored Programs

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

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	Upgrade 4 Incandescent lamps to CFLs	63	0	63	894	0	0	0.1	609	749	5	3,743	0.1	5,841	1,168	1,188	3,242	1,600
2	Retro-commissioning	9,534	0	9,534	15,283	0	4,754	11.1	1,820	6,587	12	79,044	1.4	729	61	69	53,544	79,766
3	Install 49 occupancy sensors	10,780	980	9,800	24,070	5	0	1.7	0	3,755	15	56,324	2.6	475	32	38	33,318	43,097
4	Retrofit 11 T12 fixtures with electronic ballasts and T8 lamps	792	110	682	646	0	0	0.0	136	236	15	3,544	2.9	420	28	34	2,034	1,157
5	Replace 16 Mercury Vapor Fixtures with High Output T5 Fixtures	3,477	256	3,221	1,616	0	0	0.1	222	474	15	7,107	6.8	121	8	12	2,281	2,894
6	13 New PSMH fixtures to be installed with incentives	9,388	325	9,063	3,811	1	0	0.3	74	668	15	10,022	13.6	11	1	1	-1,164	6,823

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 I: 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.