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Local Government Energy Program
Energy audit report

For

Absecon Board of Education
Absecon, NJ 08201

Project Number: LGEA12

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INTRODUCTION

On June 8th & 9th, Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment for the Absecon Board of Education. The audit included a review of the Emma C. Attales Middle School and the Ashton Marsh Elementary School, both of which are located on the same site in Absecon, NJ. The two schools are connected through a common entry lobby / administrative office area.

For purposes of this report, the two buildings are jointly referred to as the Absecon School Building. As requested by the Absecon Board of Education, this report combines the audit findings for both Emma C. Attales Middle School and H. Ashton Marsh Elementary School. Current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the buildings.

The Emma Attales Middle School building was built in 1958 and houses the Absecon Board of Education, as well as the Middle School. Several upgrades to the infrastructure and mechanical systems have occurred over the years, with major renovations in 1961 and 1968. The building consists of 63,671 square feet of conditioned main space and an attached 4,000 square foot conditioned modular classroom building, which was added in 1970. The building houses approximately 20 Board of Education employees, 55 teachers and 415 students during school hours and when school is in session. Sometimes, sport activities continue in the gym after hours and on weekends. A few times a year adult classes and community meetings take place in the evening.

The H. Ashton Marsh Elementary School building was built in 1988 and houses approximately 55 teachers and 415 elementary school students during school hours and when school is in session. The building consists of 77,377 square feet of conditioned space. Sometimes, sport activities continue in the gym after hours and on weekends. A few times a year adult classes and community meetings take place in the evening. The cafeteria, located off the main lobby, is also used for community events.

The school buildings are normally operated on weekdays from 7:00 am to 3:30 pm.

The goal of this energy audit is to provide sufficient information to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the buildings.

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Attales Middle School and Ashton Marsh Elementary School buildings, jointly referred to in this report as the Absecon School Building, located at 800 Ireland Avenue; Absecon NJ 08201. The Absecon School Building is a one story building with a combined floor area of 141,048 square feet and an attached 4,000 square foot modular building. The two buildings have separate mechanical systems but are physically connected through a common entry lobby / administrative office area

Based on the field visits performed by the SWA staff on June 8th & 9th, 2009 and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric use.

In 2008, the most recent year, the Absecon School building consumed approximately 1,318,093 kWh or $192,546 worth of electricity and 27,028 therms or $44,543 worth of natural gas. The joint energy consumption for two schools, including both electricity and natural gas, was 7,330 MMBtus of energy that cost a total of $237,089.

SWA benchmarked the Absecon School building using the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The combined building performance rating for the two buildings is a score of 70. The Absecon School would need to decrease energy (natural gas or electric use or a combination thereof) use by 5% to reach the Energy Star benchmark rating of 75.

Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). After energy efficiency improvements are made, future utility bills can be added to the Portfolio Manager and the site energy use can be compared to the year 2008 baseline.

The average annual peak electrical demand for the Absecon School building is 371 kW. Electrical demand is that portion of the consumer's bill for electric service based on the consumer's maximum electric capacity use and is calculated based on the billing demand charges under the applicable rate. The Absecon Board of Education, therefore, should also consider applying for the Pay for Performance (P4P) NJ Clean Energy program. School buildings with an average annual peak demand over 200 kW are eligible to participate.

The P4P Energy Reduction Plan must define a comprehensive package of measures capable of reducing the existing energy consumption of your building by 15% or more. Incentives ranging from $5,000 to $50,000 are available based on approximately $0.10 per square foot. Eligibility is contingent upon moving forward with a complete Energy Reduction Plan, prepared by an approved Program Partner. The Absecon School may have some opportunity to decrease energy consumption associated with space air conditioning during the summer.

Based on the assessment of the Absecon School building, SWA has separated the recommendations into three categories. These are summarized as follows:

Category I Recommendations: Capital Improvements - Upgrades not directly associated with energy savings

- Water Heater Replacement - The existing 1,300 gal domestic water heater, which serves the Ashton Marsh Elementary School, has been reasonably well-maintained but it has reached the end of its useful life and needs to be replaced. The existing equipment is inefficient relative to newer technology and,

based on discussions with building staff, appears to be over-sized for the hot water demand in the building. SWA recommends installing a more efficient water heater that has been appropriately sized to meet the building demand. A design professional should be consulted to determine the proper equipment and configuration appropriate for this upgrade.

Category II Recommendations: Operations and Maintenance– Low Cost / No Cost Measures

- Controls Optimization - SWA recommends that the schedules for all rooftop equipment and heat pumps serving large public spaces, such as the gymnasiums, be reviewed and optimized. During periods when the spaces are not occupied, the equipment may be shut-off or controlled to minimize the amount of fresh air conditioned by the equipment. Energy and cost savings associated with this recommendation will vary, depending upon the current occupancy schedules and means of control utilized.
- Weather Stripping / Air Sealing - SWA observed that exterior door weather-stripping was beginning to deteriorate. Doors should be observed annually for deficient weather-stripping and replaced as needed.
- Water Efficient Fixtures & Controls - Adding controlled on / off timers on all lavatory faucets is a cost-effective way to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and / or low-flow fixtures to reduce water consumption. Retrofitting with more efficient water-consumption fixtures and appliances will save both energy and money through reduced energy consumption for water heating, while also decreasing water and sewer bills.
- Energy Star labeled appliances such as refrigerators should replace older energy inefficient equipment.
- Create an educational program that teaches both students and their teachers how to minimize their energy use in the classroom. For more information please visit: http://www1.eere.energy.gov/education/

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

At this time, SWA recommends a total of **4** Energy Conservation Measures (ECMs) for the Absecon School Building, summarized in the following table. The total investment cost for these ECMs with incentive is **$237,738**. SWA estimates a first year savings of **$77,071** with a simple payback of **3.1 years**. SWA estimates that implementing the recommended ECMs will reduce the carbon footprint of the Absecon School building by **288,842 lbs of CO_2.**

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

Specifically, the building could qualify for $940 for installing the recommended wall-mounted occupancy sensors and $640 for replacing Exit signs with LED type fixtures. The Absecon School Building could also take advantage of incentives based on the installation of a photovoltaic (PV) system. Currently, the New Jersey Office of Clean Energy offers a Renewable Energy Incentive program that would pay $5,000 for the installation of a 5kW PV system. There is also an incentive that issues a Solar Renewable Energy Certificate for every 1,000kWh (1MWh) of electricity generated that can be sold or traded for the current market rate of electricity. $3,600 of SRECs may be received annually; however it requires proof of performance, application approval and negotiations with the utility. Wind Upfront Incentive Program, Expected performance buy-down (EPBB) is modeled on an annual kWh production of 1-16,000 kWh and may pay $3.20/kWh upfront incentive level. However, it requires proof of performance, application approval and negotiations with the utility. There is also a utility-sponsored loan program through Atlantic City Electric that would allow the building to pay for the installation of the PV or Wind system through a loan issued by Atlantic City Electric.

The following table summarizes the proposed Energy Conservation Measures (ECM) and their economical relevance.

PROPOSED													
ECM #	ECM description	Installed Cost		1st year energy savings					SPP	LoM	Lifetime	ROI, %	Annual Carbon Reduced (lbs of CO2)
		Estimate $	Source	Use	Unit	Demand /mo	Unit	Savings / year $			Cost Savings $		
1	Retro-Commissioning	$145,048	Similar Projects	131,809 2,703	kWh therms	37.3 -	kW -	23,704	6.1	12	233,155	5.1	212,202
2.1	replace 32 Exit fluorescent with LED with INCENTIVES	$5,760	RS Means, Lit Search, NJ Clean Energy Program	4,205	kWh	1.2	kW	614	9.4	20	8,967	2.8	5,761
2.2	replace 47 occupancy sensor with INCENTIVES	$4,230	RS Means, Lit Search, NJ Clean Energy Program	8,363	kWh	2.4	kW	1,221	3.5	12	12,010	15.3	11,457
2.3	replace both gym Metal Halide lamps with T5s	$11,000	RS Means, Lit Search, NJ Clean Energy Program	19,360	kWh	5.5	kW	2,827	3.9	20	41,285	13.8	26,523
2.4	replace 85 incandescent lamps to CFL	$1,700	RS Means, Lit Search, NJ Clean Energy Program	5,112	kWh	1.4	kW	746	2.3	7	4,615	24.5	7,003
3	Install 5 kW Wind System with INCENTIVE ($3.20/kWh upfront)	$40,000	Similar Projects	13,000	kWh	5.0	kW	43,498	0.9	25	740,831	70.1	17,810
4	Install 5 kW PV System (with $1/W INCENTIVE and $600/1MWh SREC)	$30,000	Similar Projects	5,902	kWh	5.0	kW	4,462	6.7	25	75,989	6.1	8,086
	Total Proposed	**$237,738**	**-**	**-**	**-**	**57.8**	**kW**	**$77,071**	**3.1**	**16**	**969,686**	**18.8**	**288,842**

CONSIDERED													
ECM #	ECM description	Installed Cost		1st year energy savings					SPP	LoM	Lifetime	ROI, %	Annual Carbon Reduced (lbs of CO2)
		Estimate $	Source	Use	Unit	Demand /mo	Unit	Savings / year $			Cost Savings $		
2.5	replace school internal lights: T12s to T8s, Incandescent to CFLs, metal halide to T5s, Exit fluorescents to LED, occupancy sensors for some offices with INCENTIVES (incl. 75% labor)	219,705	RS Means, Lit Search, NJ Clean Energy Program	79,113	kWh	21.4	kW	10,464	21.0	20	152,838	-1.5	108,385

Definitions:
SPP – Simple Payback (years)
LoM: Life of Measure (years)
ROI: Return on Investment (%)

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

1. HISTORIC ENERGY CONSUMPTION

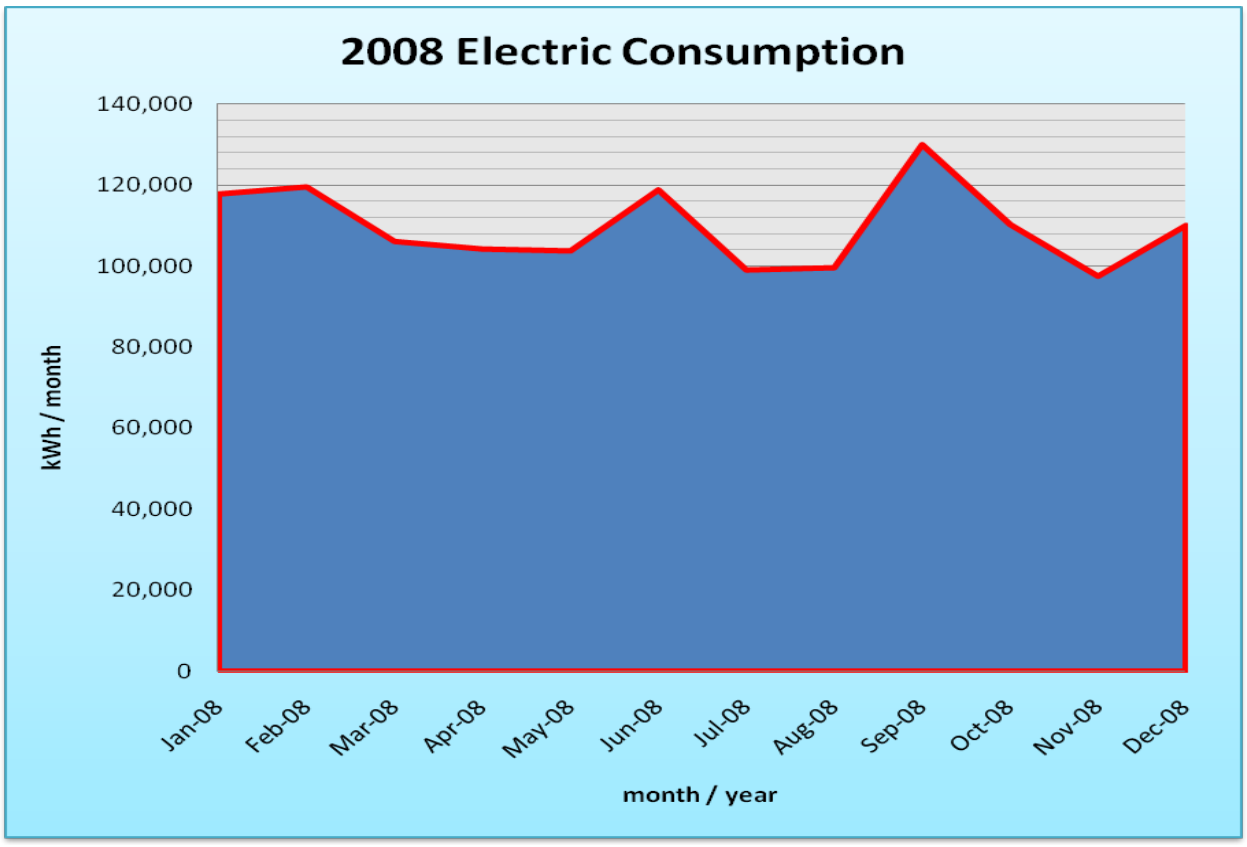
1.1. Energy usage and cost analysis

SWA analyzed utility bills from July 2006 through March 2009 that were received from the utilities supplying the Absecon School building with electric and natural gas.

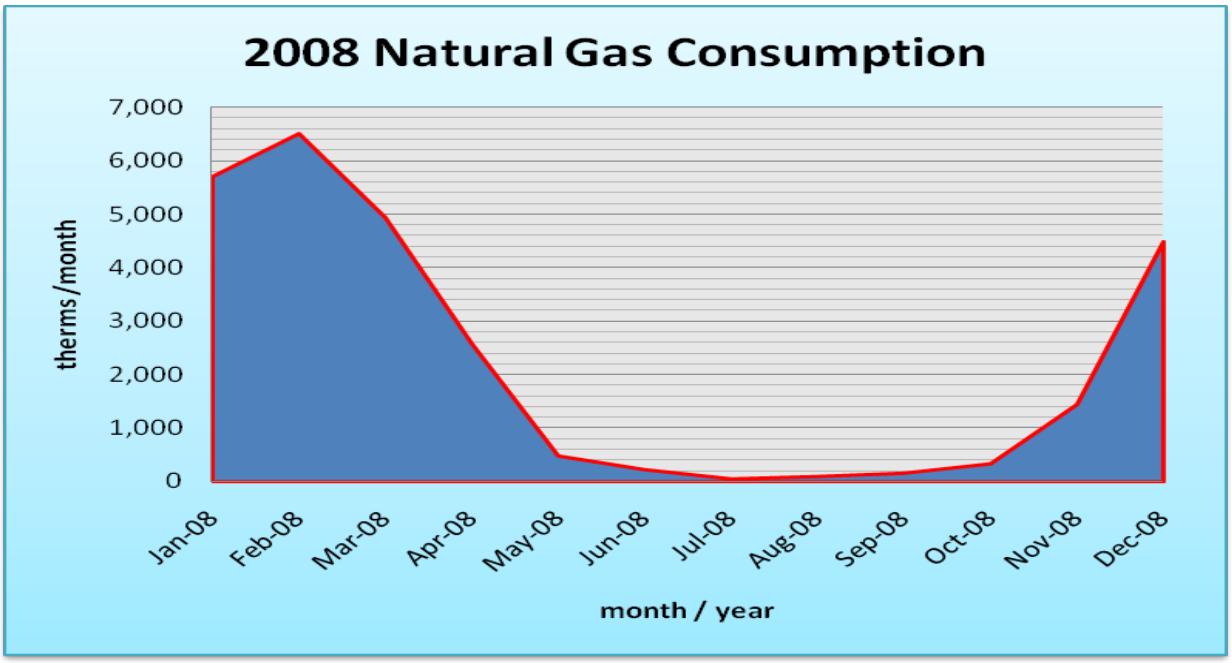
Electricity - The two schools that comprise the Absecon School building are currently served by a single electric meter. The Absecon School building currently buys electricity from Atlantic City Electric at **an average rate of $0.146/kWh** based on 12 months of utility bills for 2008. The Absecon School building purchased **approximately 1,318,093 kWh or $192,546 worth of electricity** in the previous year.

Natural Gas - The two schools that comprise the Absecon School Building are currently served by 3 separate meters for natural gas. The Absecon School building currently buys natural gas from South Jersey Gas with Pepco supplying the natural gas at **an average aggregated rate of $1.65/therm** based on 12 months worth of utility bills for 2008. The Absecon School building purchased **approximately 27,028 therms or $44,543 worth of natural gas** in the previous year.

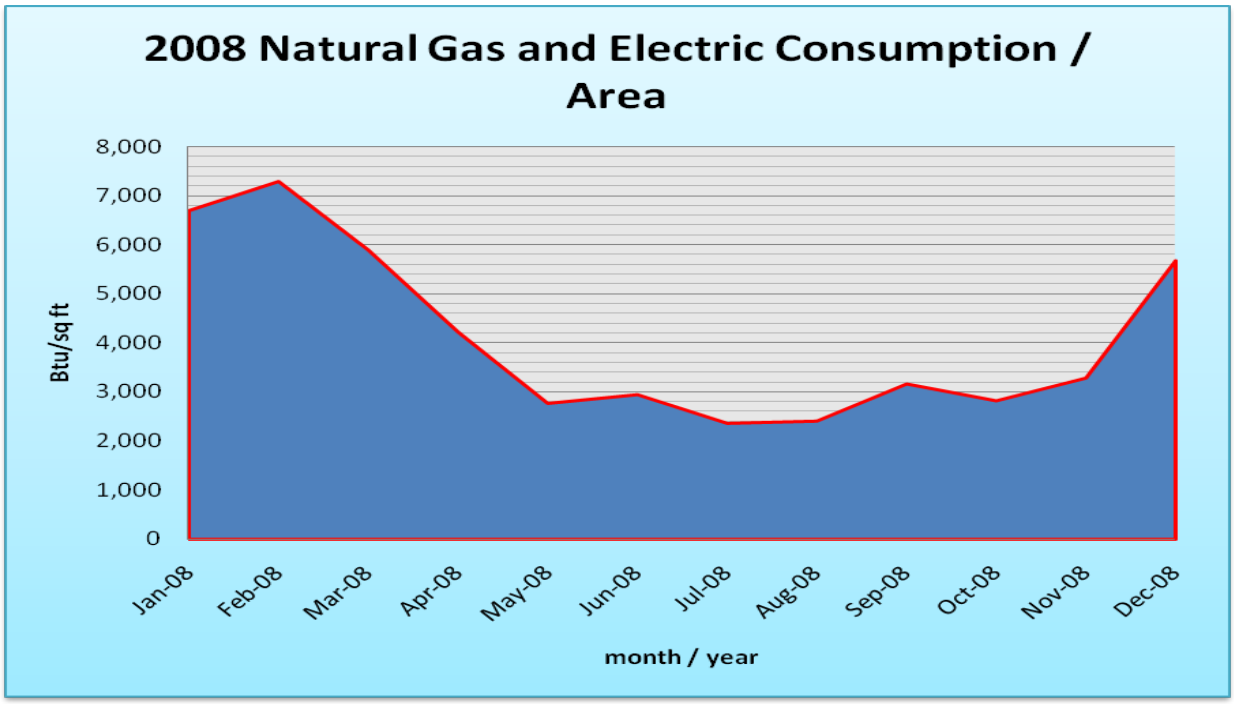
The following chart shows electricity use for the Absecon School building based on utility bills for the 12 month period of January 2008 – December 2008.



The following chart shows combined natural gas consumption for all three meters serving the Absecon School building, based on utility bills for the 12 month period of January 2008 - December 2008.



The following chart shows combined natural gas and electric consumption in Btu/ft2 for the Absecon School Building, based on utility bills for the 12 month period of January 2008 - December 2008.



1.2. Utility rate

The Absecon School Building currently purchases electricity from Atlantic City electric at a general service market rate for electricity use (kWh) with a separate (kW) demand charge. The Absecon School Building currently pays an average rate of approximately $0.146/kWh based on 12 months of utility bills for 2008.

The Absecon School Building currently purchases natural gas supply from Pepco at a general service market rate for natural gas (therms). South Jersey Gas acts as the transport company. There are 3 gas meters that provide natural gas service to the Absecon School Building currently. The average aggregated rate (supply and transport) for all three meters is approximately of $1.65/therm based on based on 12 months of utility bills for 2008.

1.3. Energy benchmarking

The Absecon School building information and utility data were entered into the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy benchmarking system. The combined building performance rating for the two buildings is a score of 70. The Absecon School would need to decrease energy (natural gas or electric use or a combination thereof) use by 5% to reach the Energy Star benchmark rating of 75.

Buildings achieving an Energy Star rating of 75 or higher and professionally verified to meet current indoor environmental standards are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance to students, parents, taxpayers, and employees. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification to the United States Green Building Council (USGBC). The site energy use intensity for the Absecon School Building is 51 kBtu/sq.ft./year. After energy efficiency improvements are made, future utility bills can be added to the Portfolio Manager and the site energy use intensity for a different time period can be compared to the year 2008 baseline to track the resulting impact on energy consumption over time. SWA recommends that the Absecon School create a Portfolio Manager account at the link below. When an account is created, SWA can share the Absecon School Building facilities information and allow future data to be added and tracked using the benchmarking tool.

http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Absecon BOE

Building ID: 1763536
For 12-month Period Ending: January 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 06, 2009

Facility
Absecon BOE
800 Ireland Avenue
Absecon, NJ 08201

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1958
Gross Floor Area (ft²): 145,048

Energy Performance Rating[2] (1-100) 70

Site Energy Use Summary[3]	
Electricity (kBtu)	4,496,739
Natural Gas (kBtu)[4]	2,832,837
Total Energy (kBtu)	7,329,576

Energy Intensity[5]	
Site (kBtu/ft²/yr)	51
Source (kBtu/ft²/yr)	124

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	836

Electric Distribution Utility
Atlantic City Electric Co

National Average Comparison	
National Average Site EUI	61
National Average Source EUI	150
% Difference from National Average Source EUI	-17%
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[6] **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. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The Absecon School Building consists of three single-story attached school buildings: Emma C. Attales Middle School (63,671 sq ft), Ashton Marsh Elementary School (77,377 sq ft), and a modular classroom building (4,000 sq ft). The Emma C. Attales Middle School building, built in 1958 and renovated several times, and the Ashton Marsh Elementary School building, added on in 1988, consist mostly of classrooms, gymnasiums, cafeteria, library, practice rooms and administrative offices.

2.2. Building occupancy profiles

The peak occupancy for the Absecon School Building is approximately 110 teachers / administrators and 830 students at any given time during weekdays, while school is in session, September through June. During the summer months, 20 employees continue administrative work and about 50 students and teachers attend classes in the modular building. Evening and community events occur periodically afterhours and weekend. The building is typically occupied from 7:30 AM to 3:00 PM on weekdays only, throughout the entire year. The gymnasiums are used 7:30 AM to 6:00 PM and the library often stays open late to 10:00 PM for board meetings.

2.3. Building envelope

2.3.1. Exterior Walls

The exterior walls consist of 8" CMU blocks with either a brick veneer (Emma C. Attales Middle School) or a split face block finish (Ashton Marsh Elementary School). Due to warm temperature conditions at the time of the field visits, insulation levels could not be verified with help of infrared technology. If desired, the school could contract a separate envelope inspection during cooler months.

Overall, exterior and interior finishes of the envelope were found to be in age-appropriate, good condition, However, some signs of water problems caused by incorrectly installed or aged roof flashing were detected (for more / recommendation on this issue see 2.3.2 Roof section).

2.3.2. Roof

The roofs of both schools vary in type and finishes. Most areas are flat, constructed of a dark colored modified bitumen finish with and without a gravel layer. The 3-4:12 sloped roofs are constructed of either a light colored 8-year-old EPDM membrane, dark colored asphalt shingles or standing seam metal roofing. The specified 4" foam insulation over the steel decking could not be verified on flat roofs and the visual R-19 fiberglass batts under sloped roofs is inadequate. As mentioned under 2.3.1 Exterior Walls, a separate envelope inspection could be conducted during cooler months. SWA suggests basing further insulation related improvement discussions on the outcome of those future findings.

Flashing issues were identified mostly around the perimeter of the Ashton Marsh Elementary School. Upon further inspection, the installed cap flashing seams on the parapets show signs of leakage. This can be seen on exterior wall surfaces as vertical lines. Identified problems like flashing or other water related issues are pointed out in this report simply since any moisture inside exterior walls can have substantial effect on insulation and other energy related issues.

The same cap flashing seam leakage issue can also be attributed to signs of water seepage behind installed gutters. Other caulked end-seams were also found to be failing.

Gutters were also found to be either full of organic debris or other objects such as tennis balls or stones. Some gutters' seams were found to be leaking and in other areas downspouts were found to be disconnected from the gutters.



On the low sloping asphalt shingle roof area an extensive amount of scattered unused roofing nails were found laying on the shingles. Any foreign object should be removed from the asphalt shingle roof due to its potential for premature failure of the shingles and voiding all warranties.

SWA recommends fixing parapet cap flashing and gutter seams where signs of leakage are visible. Rather than fixing flashing problems such as the ones described above with silicon or other type of caulk, SWA recommends industry standard practices such as joints using a concealed splice plate with 2 beads of sealant ¼" wide on each side of the joint.

2.3.3. Base

The building's base is a 4" concrete slab-on grade a perimeter footing. There were no reported problems with water penetration or moisture. The slab edge or perimeter insulation could not be verified and should be confirmed at the time of the above recommended insulation inspection during cooler months for usable infrared data evaluation.

2.3.4. Windows

The building contains fixed and casement aluminum-framed windows with low-E coated double-glazing. SWA recommends operable commercial blinds wherever missing to alter the amount of natural light that is allowed to enter each room to improve thermal and / or glair control. The skylights in the building were said to be leaking, at least one and should be re-flashed. Glare was also mentioned as one of the concerns from teachers and could be dealt with by professionally installed retrofit window foils applied to the inside where necessary.

2.3.5. Exterior doors

The aluminum framed exterior doors were observed to be in good condition except for missing or worn weather-stripping. Some visible gaps were noticed that allow conditioned air to escape the building. SWA recommends that the exterior doors of the building be weather-stripped in order to decrease the amount of conditioned air that is lost around each door. SWA also recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. Tight seals around the doors will help ensure that the building is kept continuously tight and insulated.

The weather-stripping observed at the Absecon School buildings was intact but worn out in some areas and no longer performing as expected. See representative pictures below.

2.3.6. Building air tightness

Based on a visual inspection, the Absecon School Building was observed to be a relatively well-sealed building with the exception of the exterior doors. There were no major observed deficiencies of air tightness within the building besides the exterior doors. Classroom occupants should be made aware more often to keep doors closed since the corridors are not air-conditioned nor heated to the same temperature levels.

2.4. HVAC Systems

2.4.1. Heating (Ventilation, and Air Conditioning - HVAC)

Emma Attales Middle School

In the Emma Attales Middle School, pumps re-circulate hot water through approximately 40 fan coil units serving the classrooms and six additional units serving the corridors. Each fan coil unit contains a heating / cooling coil, fan assembly, damper, filter, and controls within a metal cabinet located on the outside wall of each classroom. Outdoor air is brought directly into the cabinets via grilles located on the outside wall of the classrooms. The fan coil units are designed to mix room air with outside air, condition the air as necessary, and deliver it to the classrooms through grilles located in the top of the fan coil unit. The proportion of outside air is controlled by the position of the fresh air dampers.

Separately, classroom air is purged via rooftop exhaust fans. In the winter, water is heated by 7 HydroTherm (net rating 1.9 MM Btu/hr) hot water boiler modules. In the summer, a 30% propylene glycol solution is valved to go through a 100 Ton chiller (with 2 compressors) for cooling.

The Emma Attales Middle School building contains 4 rooftop units (RTUs) that provide both cooling for some of the common areas and offices. Two stand alone RTUs with 20 Ton Direct Expansion (DX) coils for cooling and natural gas furnaces for heating the gymnasium. Separately, two similar 3 Ton RTUs are used to cool / heat the men' and women' locker rooms.

Ashton Marsh Elementary School

The Ashton Marsh Elementary School has a heat pump system which is being upgraded this year, summer of 2009. This section of the building is primarily heated and cooled via fan coil heat pump units. Each unit contains a heat pump, fan assembly, dampers, filter, and controls within a metal cabinets located on the outside wall of classrooms. This heat pump system operates at all times, with larger Florida heat pumps used for the bigger common spaces. The system water circulation is through the classroom and common area (~60) unit fan coils.

Water temperature for the loop is maintained by two A.O. Smith hot water boilers and compressor hot refrigerant with the associated cooling tower fans shut down and its pumps on recirculation. In the summer, the water flow is reversed with the compressor refrigerant cooling the recirculation water with the cooling tower fans on and removing heat (as a heat sink source) generated by the compressors. With the compressors operating all winter and summer, for this climate zone, the electric use is higher for cooling and heating in the Ashton Marsh Elementary School building than the Emma Attales Middle School.

The Absecon School Building does not have much flexibility in terms of energy reduction from the current set up of heating and cooling systems. SWA evaluated replacing the existing recently installed heating system and recommends that existing system is left intact. However there may be opportunities to contain the summer cooling to only areas that will be used by the summer programs per an advanced agreed upon schedule. SWA also recommends retro-commissioning the HVAC equipment and especially the associated controls to insure that they are operating at the design efficiency.

2.4.2. Cooling

The Absecon School building uses practically the same system, described previous Heating 2.4.1 section, to cool most of the common areas and classrooms except for the corridors.

Emma Attales Middle School

In the Emma Attales Middle School, pumps re-circulate a 30% propylene glycol solution through approximately 40 fan coil units serving the classrooms. Each fan coil unit contains a heating / cooling coil, fan assembly, dampers, filter, and controls within a metal cabinets located on the outside wall of classrooms. Outdoor air is brought directly into the cabinets via grilles located on the outside wall of the classrooms. The fan coil units are designed to mix room air with outside air, condition the air as necessary, and deliver it to the classrooms through grilles located in the top of the fan coil unit. The proportion of outside air is controlled by the position of the fresh air dampers.

Separately, classroom air is purged via rooftop exhaust fans. In the summer, a 30% propylene glycol solution is valved to go through a 100 Ton chiller (with 2 compressors) for cooling.

The Emma Attales Middle School building contains 4 rooftop units (RTUs) that provide both cooling for some of the common areas and offices. Two stand alone RTUs with 20 Ton Direct Expansion (DX) coils for cooling the gymnasium. Separately, two similar 3 Ton RTUs are used to cool the men' and women' locker rooms.

Ashton Marsh Elementary School

The Ashton Marsh Elementary School has a heat pump system which is being upgraded this year, summer of 2009. This section of the building is in general cooled via fan coil heat pump units. Each fan coil unit contains a heat pump, fan assembly, dampers, filter, and controls within a metal cabinets located on the outside wall of classrooms. This heat pump system operates at all times with larger Florida pumps used for the bigger common spaces. The system water recirculation is through the classroom and common area (~60) unit fan coils.

In the summer, the compressor refrigerant cools the recirculation water with the cooling tower fans on and removing heat (as a heat sink source) generated by the compressors. With the compressors operating all winter and summer, for this climate zone, the electric use is higher for cooling and heating in the Ashton Marsh Elementary School building than the Emma Attales Middle School.

2.4.3. Ventilation

The Absecon School building uses rooftop units (in the Emma Attales Middle School) and rooftop exhaust fans to purge building air. Classroom fresh air is provided via the through-the-wall unit fan coil and heat pump units. The RTUs in the Emma Attales Middle School also pull fresh air from the outside in order to provide adequate ventilation in the building spaces they are servicing.

2.4.4. Domestic Hot Water

There are two Domestic Hot Water heaters in the Absecon School building.

In the Emma C. Attales Middle School there is a newer five year old 75 gal natural gas-fired 0.3 MBH unit. The 75 gal DHW heater also supports the shower facilities.

In the Ashton Marsh Elementary School there is a 20 year old 1,300 gal natural gas-fired 1.4 MBH unit. The 1,300 gal installed tank for the elementary school appears to be much oversized with the sinks in every classroom not being used as often as designed. SWA recommends replacing this 1,300 gal unit, which is at the end of its useful life, with a newer conservatively sized and much smaller (per indications by Absecon School Maintenance Department) condensing hot water heater that is more energy efficient, rather than wait for a catastrophic failure of the 1,300 gal unit. Before installing a new DHW heater, SWA recommends that a clip-on (ultrasonic) flow meter be put on the DHW header to record hot water flow for about a month's time during school peak use and confirm needed DHW size.

More efficient water-consuming fixtures and appliances save both energy and money through reduced energy consumption for water heating, as well decreased water and sewer bills. SWA recommends adding controlled on- / off- timers on all lavatory faucets to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and / or low-flow fixtures to reduce hot water consumption. In addition, routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy.

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting - The Absecon School building currently consists of mostly T12 fluorescent fixtures with magnetic ballasts with a few areas already retrofitted with T8 fixtures. Based on measurements of lighting levels for each space, there are not any vastly over-lighted areas. SWA recommends replacing T12 lighting including magnetic ballasts whenever possible with T8 lighting and electronic ballasts. As this option may not be very cost effective, the changeover could take place as fixtures break down and are taken out of service. SWA also recommends installing occupancy sensors in bathrooms, offices and areas that are occupied only part of the day. Since bathrooms are used sporadically throughout the day and lighting is commonly left on far beyond the necessary hours of operation, SWA recommends installing occupancy sensors with time delay and acoustic capabilities. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion or sound is detected within a set time period. The building also has a number of flood lights with incandescent bulbs. SWA recommends replacing all incandescent bulbs with CFLs. SWA recommends replacing the gymnasium metal halide lighting with T5 lighting for energy savings and additional safety. See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

Exit Lights - The building has a mixture of 5W LED exit signs and 20W fluorescent exit signs installed. SWA recommends replacing all fluorescent exit signs with newer LED exit signs.

Exterior Lighting - The exterior lighting was surveyed during the building audit: 70 watt perimeter and 150 watt high pressure sodium lamps. Since this lighting is mainly for Safety as well as for Security, SWA has deemed it not cost effective to replace exterior lighting at this time. All exterior lighting is controlled by timers. There is not any immediate need to upgrade this lighting or timer, however, SWA recommends that the building maintenance adjust the timer at least twice per year in order to make sure that the timer stays current with Daylight Savings Time.

2.5.2. Appliances and process

Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. For example, Energy Star refrigerators use as little as

315 kWh / yr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Look for the Energy Star label when replacing appliances and equipment, including: window air conditioners, refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov.

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

Educating both students and staff is a great way for schools to save energy while raising awareness about the importance of energy-efficiency. Prizes and challenges can be used to get classes involved in finding creative ways to reduce and monitor energy usage throughout the school. There are many free resources available to help Students, Parents, and School Administrators incorporate energy into school curricula and every day activities. The US Department of Energy offers free information for hosting energy efficiency educational programs and K-12 lesson plans, for more information please visit: http://www1.eere.energy.gov/education/ . NJ Clean Energy will also be coming out soon with a Teach Program for students, teachers and school maintenance staff.

2.5.3. Elevators

The Absecon School building is single story buildings and therefore does not contain any elevator equipment.

2.5.4. Others electrical systems

There aren't currently any other electrical systems installed at this Absecon School Building except for the backup 100 kV generator driven on natural gas. It backs up critical school lighting, servers, etc.

3. EQUIPMENT LIST

Inventory

Building System	Description	Model #	Fuel	Space served	Estimated Remaining useful life %
Ashton Marsh Elementary School					
Heating / Cooling					
	60 through wall unit fan coils	Trane Fan Coil UV	Electric	Elementary School	50%
	exhaust fans	various manufacturers	Electric	Elementary School	50%
	2 hot water boilers	AO Smith with Powerflame burners	Natural Gas	Elementary School	25%
	2 water circulation pumps	with 7.5 HP Baldor motor H3311	Electric	Elementary School	50%
	2 heat pumps (in upgrade construction)	25 HP Florida Pumps	Electric	Elementary School	100%, are being upgraded
	computer based Building Management System controlling heating / cooling	-	Electric	Elementary School	50%
	Cooling Tower (in upgrade construction)	BAC	Electric	Elementary School	100%
Domestic Hot Water	1 Patterson Kelly 1,300 gal system	PK-1,300	Natural Gas / Electric recirculation pump	Elementary School	0% (This unit still operates but has outlived its life expectancy and no longer performs efficiently.)
Generator (Emergency)	100 kVA, also supporting the recirculation pumps and 1/3 of the lights	-	Electric / Natural Gas	Elementary and Middle Schools	50%
Lighting	See details - Appendix A	-	Electric	whole school	varies, average 25%

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.

Building System	Description	Model #	Fuel	Space served	Estimated Remaining useful life %
Emma Attales Middle School					
Heating / Cooling	Mechanical equipment listed below was recently replaced				
	40 through wall unit fan coils	Trane Fan Coil UV	Electric	Middle School	70%
	6 unit heaters	Trane	Electric	Middle School	70%
	11 exhaust fans	various manufacturers	Electric	Middle School	70%
	7 hot water boilers	Hydrotherm MG 2895 with Powerflame burners	Natural Gas	Middle School	75%
	2 water circulation pumps with VFDs	with 7.5 HP Baldor motor H3311	Electric	Middle School (except gym and locker rooms)	75%
	2 RTUs with coils for heating and cooling servicing the gymnasium	Trane Voyager TSCX-DX, YCH151C4HOBA	Electric / Natural Gas	Middle School Gym	80%
	2 RTU servicing the boys and girls locker rooms	Trane - 3 Ton - RH A1eH2B0004	Electric / Natural Gas	Middle School	80%
	1 x 100 Ton air cooled chiller with 2 compressors (R-22 refrigerant)	Trane RTAA0904 XQ01 A300GQBF	Electric	Middle School (except gym and locker rooms)	75%
	computer based Building Management System controlling heating / cooling	-	Electric	Middle School	75%
Domestic Hot Water	1 x 75 gal system	300M Btu/hr Hydrojet	Natural Gas	Middle School	70%
Lighting	See details - Appendix A	-	Electric	whole school	varies, average 30%

4. ENERGY CONSERVATION MEASURES

Based on the assessment of the Absecon School building, SWA has separated the recommendations into three categories. These are summarized as follows:

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

Category I Recommendations: Capital Improvements

- Water Heater Replacement – The existing 1,300 gal domestic water heater, which serves the Ashton Marsh Elementary School, has been reasonably well-maintained but it has reached the end of its useful life and needs to be replaced. This recommendation cannot be cost justified by energy savings alone. However, the age and condition of the equipment warrant attention and this recommendation is intended to provide guidance to help the building management staff prioritize upgrades within the facility. The existing equipment is inefficient relative to newer technology and, based on discussions with building staff, appears to be over-sized for the hot water demand in the building. SWA recommends installing a more efficient water heater that has been appropriately sized to meet the building demand. A design professional should be consulted to determine the proper equipment and configuration appropriate for this upgrade.

Category II Recommendations: Operations and Maintenance

- Controls Optimization - SWA recommends that the schedules for all rooftop equipment and heat pumps serving large public spaces, such as the gymnasiums, be reviewed and optimized. During periods when the spaces are not occupied, the equipment may be shut-off or controlled to minimize the amount of fresh air conditioned by the equipment. The cost and effort associated with implementation of this recommendation will depend upon the capabilities of the existing building automation control system. Energy and cost savings associated with this recommendation will vary, depending upon the current occupancy schedules and means of control utilized.
- Weather Stripping / Air Sealing - SWA observed that exterior door weather-stripping in places was beginning to deteriorate. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected and any missing or deteriorated caulking should be re-caulked to provide an unbroken seal around the window frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.
- Water Efficient Fixtures & Controls - Adding controlled on / off timers on all lavatory faucets is a cost-effective way to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and / or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consumption fixtures / appliances will save both energy and money through reduced energy consumption for water heating, while also decreasing water / sewer bills.
- Energy Star labeled appliances such as refrigerators should replace older energy inefficient equipment.
- Smart power electric strips with occupancy sensors should be used to power down computer equipment when left unattended for extended periods of time.

- Create an educational program that teaches both students and their teachers how to minimize their energy use in the classroom. The US Department of Energy offers free information for hosting energy efficiency educational programs and K-12 lesson plans, for more information please visit: http://www1.eere.energy.gov/education/

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description
1	**Undertake retro-commissioning of building systems and controls to optimize performance.**
2	**Upgrade school lighting: incandescent to CFLs, occupancy sensors for some offices, metal halide to T5s, Exit fluorescents to LED and T12 magnetic fixtures to T8 electronic fixtures**
3	**Install a 5kW Wind system will reduce annual electric consumption and demand as well as become an educational tool for the school**
4	**Install a 5kW PV system will reduce annual electric consumption and demand as well as become an educational tool for the school**

ECM#1: *Retro-Commissioning*

Description:

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

Since the systems at the Absecon School are undergoing or have recently undergone renovations, SWA recommends undertaking retro-commissioning to optimize system operation following completion of the upgrades. This should include a review of existing operational parameters for both new and older installed equipment. In particular, SWA observed potential energy savings associated with optimizing the scheduled operating hours and outdoor air fraction of rooftop equipment serving large public areas, such as the gymnasiums. During retro-commissioning, the heat pump loop temperatures should also be reviewed to identify opportunities for optimizing system performance.

Installation cost:

Estimated installed cost: $145,048
Source of cost estimate: Similar projects

Economics (without incentives):

ECM description	Installed Cost		1st year energy savings					SPP	LoM	Lifetime	ROI %	Annual Carbon Reduced (lbs of CO2)
	Estimate $	Source	Use	Unit	Demand /mo	Unit	Savings / year $			Cost Savings $		
Retro-Commissioning	$145,048	Similar Projects	131,809	kWh	37.3	kW	23,704	6.1	12	233,155	5.1	212,202
			2,703	therms	-	-						

Assumptions: Since the two building sections share a single electric meter, it is difficult to determine the amount of electric energy used for heating and cooling the Ashton Marsh Elementary School and the Emma Attales Middle School individually. Based on utility bills, SWA estimated the heating and cooling energy consumption. Typical savings for retro-commissioning range from 5-20%, as a percentage of the total space conditioning consumption. SWA assumed 10% savings. Estimated costs for retro-commissioning range from $0.50-$2.00 per square foot. SWA assumed $1.00 per square foot and a total square footage of 145,048 for both buildings.

Rebates/financial incentives:

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

Options for funding ECM:

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

ECM#2: *Upgrade existing lighting*

Description:

On the day of the site visit, SWA completed a lighting inventory of the Absecon School Buildings (see Appendix A). The existing lighting consists of many T12 fluorescent fixtures with magnetic ballasts, fluorescent EXIT signs and some incandescent flood lights. Many of the lights in the Emma Attales Middle School appear to have been partially upgraded recently to T8 fixtures and LED lighted Exit signs. SWA has performed an evaluation of upgrading all the T12 magnetic ballast fixtures to T8 electronic ballast fixtures, fluorescent EXIT signs with LED lighted EXIT signs, incandescent bulbs to CFLs and installing occupancy sensors in offices that may be left unoccupied a considerable amount of time throughout the day. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Absecon School Board may decide to perform this work with in-house resources from its Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor, to gain savings. SWA recommends at a minimum that the incandescent bulbs be replaced with CFLs, occupancy sensors be installed in a number of offices and the Metal Halide lamps in both gymnasiums be replaced with T5 electronic ballast fixtures. See Appendix A for recommendations.

Linear fluorescent fixtures are commonly used to replace metal halide and mercury vapor fixtures in indoor lighting applications. Replacing metal halide or mercury vapor lighting systems with linear fluorescent lighting fixtures will save energy and cost for the school. A mercury-vapor lamp is a gas discharge lamp which uses mercury in an excited state to produce light. The arc discharge is generally confined to a small fused quartz arc tube mounted within a larger borosilicate glass bulb. The outer bulb may be clear or coated with a phosphor; in either case, the outer bulb provides thermal insulation, protection from ultraviolet radiation, and a convenient mounting for the fused quartz arc tube. Mercury vapor lamps (and their relatives) are often used because they are relatively efficient. A closely-related lamp design called the metal halide lamp uses various other elements in an amalgam with the mercury. Mercury vapor and metal halide lamps are used for general illumination in gymnasiums, and many industrial and other areas. These lamps can be identified by their characteristic intense bluish or whitish emissions and ellipsoidal bulb shape with a short cylindrical glass protrusion. These lamps can pose a potential actinic ultraviolet radiation hazard should the outer glass envelope of the lamp break and the lamp continue to operate. The inner quartz envelope of the lamp can transmit appreciable ultraviolet radiation. Whenever practicable, install lamp housings for mercury vapor and metal halide lamps which contain either a glass filter or other mechanical barrier to protect the lamp from breakage. This is especially important for areas where contact with the lamp is likely. Whenever practicable, install self-extinguishing lamps in indoor areas. The non-extinguishing lamps should be limited to outdoor use or installation within a glass enclosed fixture. Periodically check mercury vapor and metal halide lamps to ensure that the outer glass envelope has not been broken when such lamps are not installed within fixtures containing an additional glass filter.

Installation cost:

Estimated installed cost: $265,815
Source of cost estimate: RS *Means; Published and established costs*

Economics (Some of the options considered without incentives):

ECM description	Installed Cost		1st year energy savings					SPP	LoM	Lifetime	ROI, %	Annual Carbon Reduced (lbs of CO2)
	Estimate $	Source	Use	Unit	Demand /mo	Unit	Savings / year $			Cost Savings $		
replace 85 incandescent lamps to CFL	1,700	RS Means, Lit Search, NJ Clean Energy Program	5,112	kWh	1.4	kW	746	2.3	7	4,615	24.5	7,003
replace both gym metal halide lamps with T5s	11,000	RS Means, Lit Search, NJ Clean Energy Program	19,360	kWh	5.5	kW	2,827	3.9	20	41,285	13.8	26,523
replace school internal lights: T12s to T8s, Incandescent to CFLs, mercury vapor to T5s, Exit fluorescents to LED, occupancy sensors for some offices (incl. 65% labor)	253,115	RS Means, Lit Search	79,113	kWh	21.4	kW	11,369	22.3	20	166,053	-1.7	108,385

Economics (Options considered with incentives):

ECM description	Installed Cost		1st year energy savings					SPP	LoM	Lifetime	ROI, %	Annual Carbon Reduced (lbs of CO2)
	Estimate $	Source	Use	Unit	Demand / mo	Unit	Savings / year $			Cost Savings $		
replace 47 occupancy sensor with INCENTIVES	4,230	RS Means, Lit Search, NJ Clean Energy Program	8,363	kWh	2.4	kW	1,221	3.5	12	12,010	15.3	11,457
replace 32 Exit fluorescent with LED with INCENTIVES	5,760	RS Means, Lit Search, NJ Clean Energy Program	4,205	kWh	1.2	kW	614	9.4	20	8,967	2.8	5,761
replace school internal lights: T12s to T8s, Incandescent to CFLs, metal halide to T5s, Exit fluorescents to LED, occupancy sensors for some offices with INCENTIVES (incl. 75% labor)	219,705	RS Means, Lit Search, NJ Clean Energy Program	79,113	kWh	21.4	kW	10,464	21.0	20	152,838	-1.5	108,385

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

Rebates/financial incentives:

NJ Clean Energy - Wall Mounted occupancy sensors ($20 per control)
Maximum incentive amount is $940.

NJ Clean Energy - LED Exit signs ($10-$20 per fixture)
Maximum incentive amount is $640.

NJ Clean Energy - Prescriptive Lighting Incentive, Incentive based on installing T5 or T8 lamps with electronic ballasts in existing facilities ($10-$30 per fixture, depending on quantity of lamps). Maximum incentive amount is $31,830.

Options for funding the Lighting ECM:

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

ECM#3: *Install 5kW Wind system*

Please see section 5: RENEWABLE AND DISTRIBUTED ENERGY MEASURES

ECM#4: *Install 5kW PV system*

Please see section 5: RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There aren't currently any existing renewable energy systems.

5.2. Wind

ECM#3: *Install 5kW Wind system*

Description:

Wind power production may be applicable for the Absecon School Building location, because of the thermal winds generated in the area. Currently, the Absecon School Building does not use any renewable energy systems. Updated renewable energy systems such as "magnetic" vertical axis wind turbines (MVAWT) can be mounted on building roofs offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc… being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Wind systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. SWA presents below the economics, however does not recommend at this time installing a 5kW Wind system to offset electrical demand for the building and reduce the annual net electric consumption for the building, because there are insufficient guaranteed incentives for NJ rebates at this time to justify the investment. The Absecon School building is also not eligible for a 30% federal tax credit. The Absecon School Building may consider applying for a grant and / or engage a Wind Power generator / leaser who would install the Wind system and then sell the power at a reduced rate.

There are many possible locations for a 5kW Wind system installation on top of the building ample roof area. The supplier would need to first determine via recorded analysis at the proposed location(s) consistency and wind speeds available. Area winds of 10 mph will run turbines smoothly and capture the needed power. This is a roof-mounted wind turbine (used for generating electricity) that spins around a vertical axis like a merry-go-round instead of like a windmill, as do more traditional horizontal axis wind turbines (HAWTs). A typical 5kW MVAWT wind system has a 20 ft diameter turbine by 10 ft tall.

The installation of a renewable Wind power generating system could serve as a good educational tool and exhibit for the school. **It is very important that Wind measurements and recordings are taken at the chosen location for at least a couple of months to assure that sufficient wind and speed is available for proper operation and to meet incentive requirements.**

Installation cost:

Estimated installed cost: $40,000
Source of cost estimate: Similar projects

Economics (with incentives):

ECM description	Installed Cost		1st year energy savings					SPP	LoM	Lifetime	ROI %	Annual Carbon Reduced (lbs of CO2)
	Estimate $	Source	Use	Unit	Demand /mo	Unit	Savings / year $			Cost Savings $		
Install 5 kW Wind System with INCENTIVE ($3.20/kWh upfront)	$40,000	Similar Projects	13,000	kWh	5.0	kW	43,498	0.9	25	740,831	70.1	17,810

Assumptions: SWA estimated the cost and savings of the system based on past wind projects. SWA projected physical dimensions based on a 5kW-Enviro Energies turbine system. **SWA assumes that the relatively low height (~30 ft) compared to the taller horizontal axis turbines is acceptable to the NJ BPU as long as the average documented annual wind speed is 11 mph at the hub.**

Rebates/financial incentives:

NJ Clean Energy - Renewable Energy Incentive Program, Incentive at this time only for vertically spinning high altitude turbines
http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program

NJ Clean Energy - Wind Upfront Incentive Program, Expected performance buy-down (EPBB) is modeled on an annual kWh production of 1-16,000 kWh for a $3.20/kWh upfront incentive level. This has been incorporated in the above costs, however it requires proof of performance, application approval and negotiations with the utility.

Options for funding ECM:

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

5.3. Solar Photovoltaic

ECM#4: *Install 5kW PV system*

Description:

Currently, the Absecon School Building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels, can be mounted on the building roofs, and can offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc… being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. SWA presents below the economics, however does not recommend at this time installing a 5kW PV system to offset electrical demand for the building and reduce the annual net electric consumption for the building, because there are insufficient guaranteed incentives from NJ rebates at this time to justify the investment. The Absecon School Building is also not eligible for a 30% federal tax credit. The Absecon School Building may consider applying for a grant and / or engage a PV generator / leaser who would install the PV system and then sell the power at a reduced rate. Atlantic City Electric provides the ability to buy SRECs at $600 / MWh or best market offer.

There are many possible locations for a 5kW PV installation on the building roofs or a fenced area on the school grounds. A commercial multi-crystalline 123 watt panel (17.2 volts, 7.16 amps) has 10.7 square feet of surface area (11.51 watts per square foot). A 5kW system needs approximately 41 panels which would take up 435 square feet.

The installation of a renewable Solar Photovoltaic power generating system could serve as a good educational tool and exhibit for the school.

Installation cost:

Estimated installed cost: $30,000
Source of cost estimate: Similar projects

Economics (with some incentives):

ECM description	Installed Cost		1st year energy savings					SPP	LoM	Lifetime	ROI %	Annual Carbon Reduced (lbs of CO2)
	Estimate $	Source	Use	Unit	Demand /mo	Unit	Savings / year $			Cost Savings $		
Install 5 kW PV System (with $1/W INCENTIVE and $600/1MWh SREC)	$30,000	Similar Projects	5,902	kWh	5.0	kW	4,462	6.7	25	75,989	6.1	8,086

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

Rebates/financial incentives:

NJ Clean Energy - Renewable Energy Incentive Program, Incentive based on $1.00 / watt Solar PV application. Incentive amount for this application is $5,000.
http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program

NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. $3,600 has been incorporated in the above costs, however it requires proof of performance, application approval and negotiations with the utility.

Options for funding ECM:

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

5.4. Solar Thermal Collectors

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

5.5. Combined Heat and Power

Description:

CHP is not applicable for these buildings because of existing split system cooling and HW boiler. A new heating / cooling fan coil system has been installed in the last couple of years in the Emma Attales Middle School and the Ashton Marsh Elementary School heat pump system is being upgrade this summer of 2008.

5.6. Geothermal

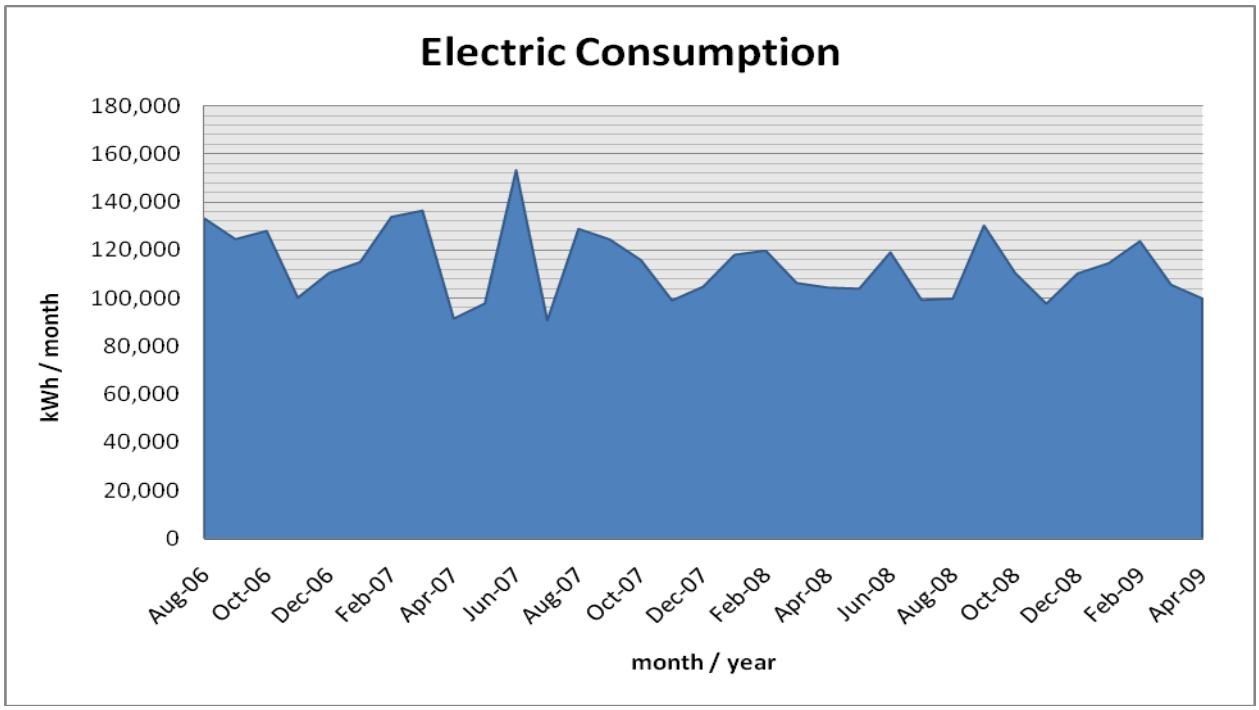
Description:

Geothermal is not applicable for these buildings because it would not be cost effective to change to a geothermal system at this location.

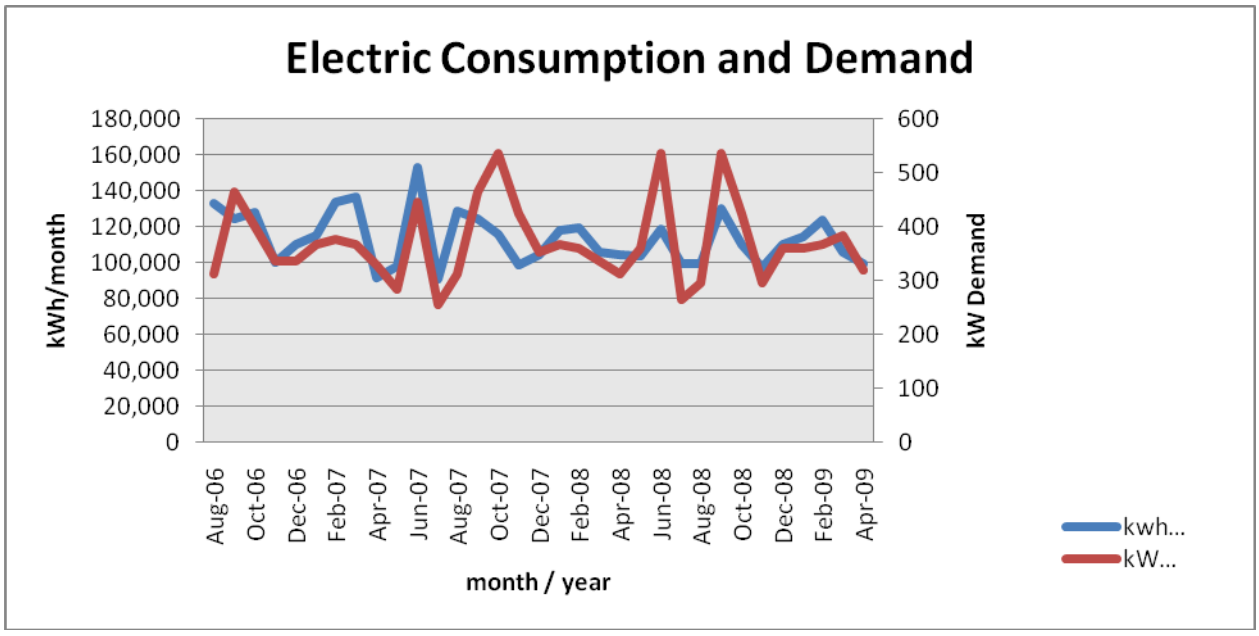
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load profiles

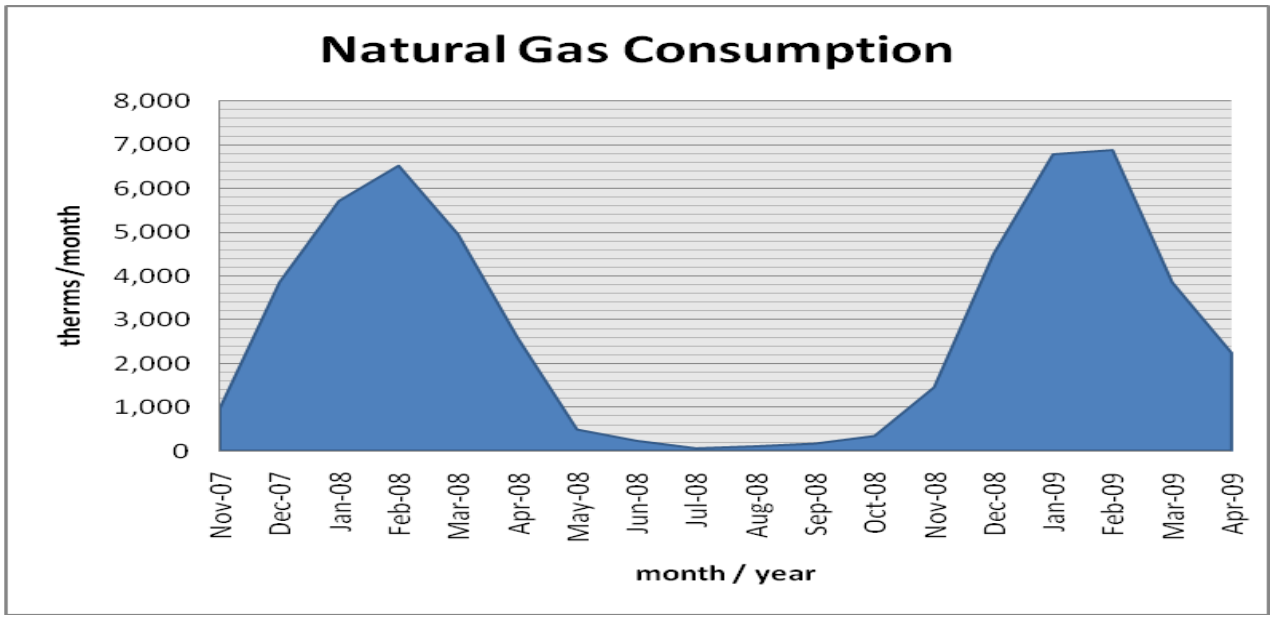
The following are charts that show the annual electric and natural gas load profiles for the Emma C. Attales Middle School and Ashton Marsh Elementary School building.

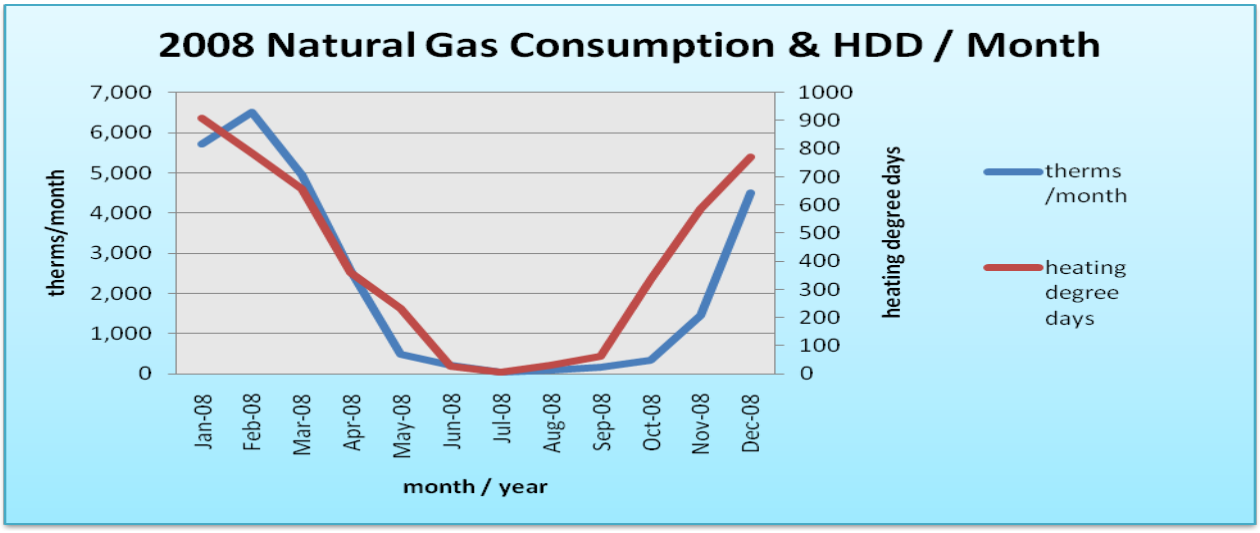


Also note below how the electrical Demand peaks follow the electrical consumption peaks.



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

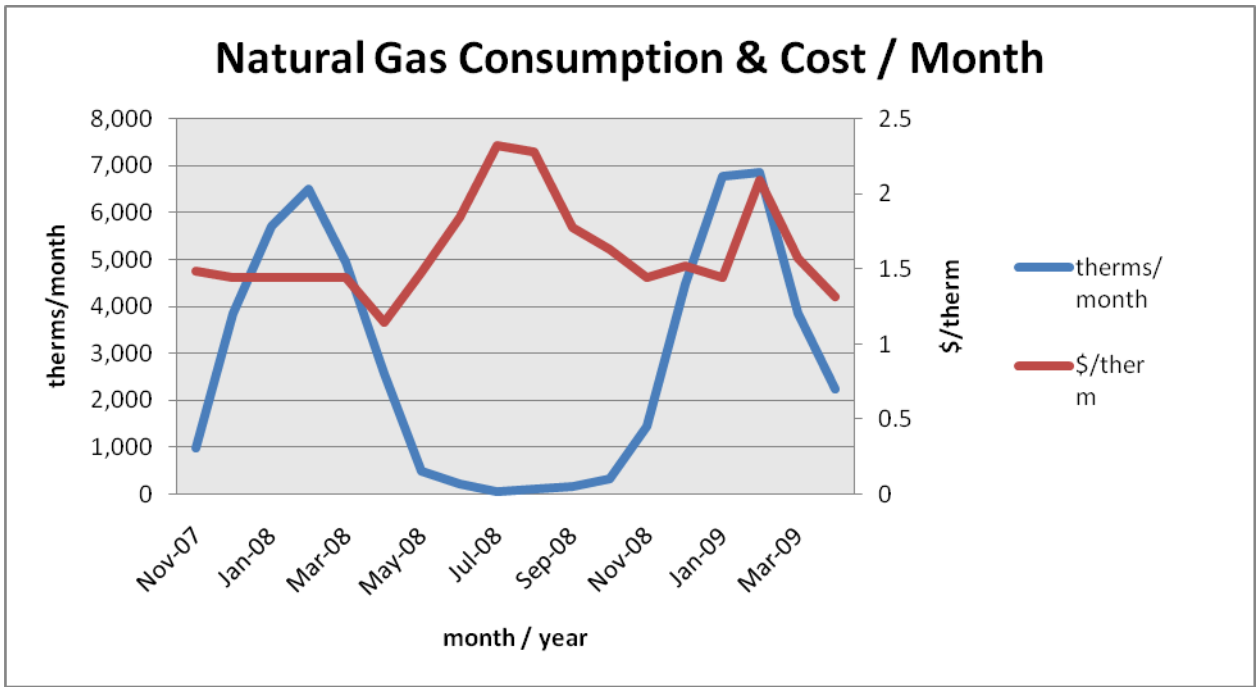




6.2. Tariff analysis

Currently, natural gas is provided to the Emma C. Attales Middle School and Ashton Marsh Elementary School building via 3 gas meters with South Jersey Gas acting as a transport company. Gas supply was switched from Hess Corporation to Pepco Inc. in mid May of 2008. Natural gas is purchased for the 3 gas meters from South Jersey Gas and is provided through Pepco Inc. at a general service rate. The general service rate for natural gas charges a market-rate price based on usage and the Absecon billing does not breakdown demand costs. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the natural gas prices increase during the heating months when natural gas is used by the hot water boiler units. The high gas price per therm fluctuations shown on the following chart may be due to high energy costs that occurred in 2008 and low

use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months.

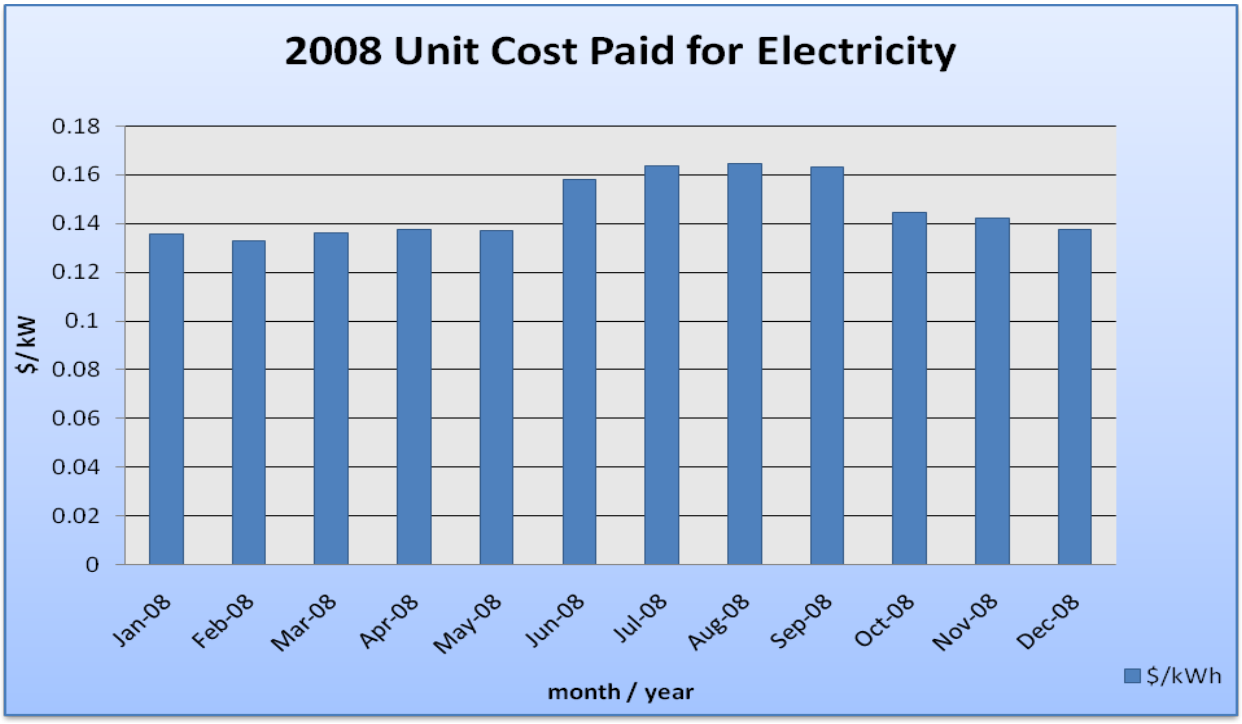


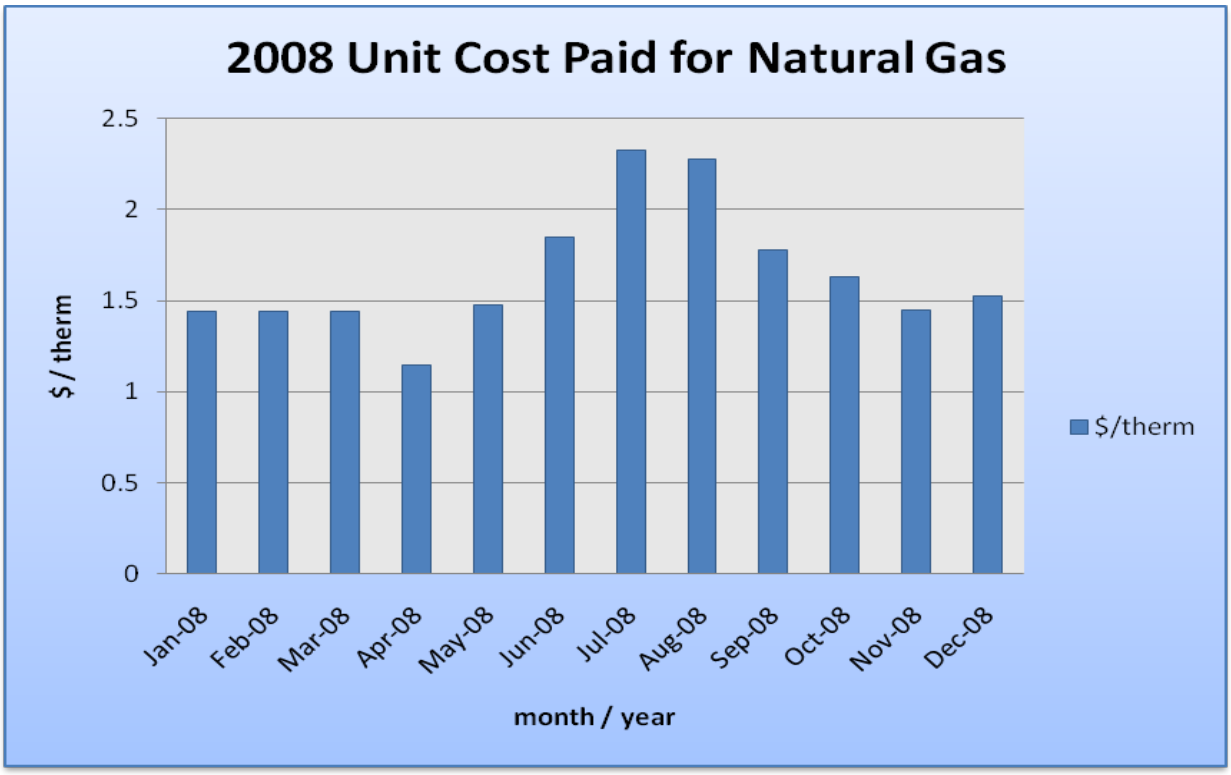
The school buildings are direct-metered (via a single meter) and currently purchase electricity from Atlantic City Electric at a general service rate. The general service rate for electric charges are market-rate prices based on usage and the Absecon Schools billing does not show a breakdown of demand costs. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the electricity prices increase during the cooling months when electricity is used by the rooftop air-handling units.

6.3. Energy Procurement strategies

The Absecon Schools receive natural gas via 3 incoming meters. One company, Pepco Inc., supplies the gas, another, South Jersey Gas, transports it. There isn't and ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner. Electricity is also purchased directly for the Absecon Schools from Atlantic City Electric without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations of 24% over the most recent 12 month period. Natural gas bill analysis shows fluctuations of 61% over the most recent 12 month period. Some of these fluctuations may have been caused by the mid May switch between natural gas suppliers, other may be due to unusual high and escalating energy costs in 2008. SWA recommends that the Absecon Board of Education further explore opportunities of purchasing both natural gas and electricity from ESCOs in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Absecon schools. Appendix B contains a complete list of third party energy suppliers for Absecon service area. The Absecon Board of Education may want to consider partnering with other school districts, municipalities, townships and communities to aggregate a substantial electric and natural gas use for better leveraging in negotiations with ESCOs and of improving the pricing structures. This sort of activity is happening in many parts of the country and in New Jersey. Also, the Absecon School building would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this

time to shed a minimum of 100 kW electric demand when requested by the utility during peak demand periods, which is the typical threshold for considering this option. This adjustment could be achieved by rewiring the 100 kVA generator connections to the building and negotiating reimbursements with the utility company. The following charts show the Absecon Schools monthly spending for energy in 2008.





7. METHOD OF ANALYSIS

7.1. Assumptions and tools

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

7.2. Disclaimer

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

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

Appendix A: Lighting study

ASHTON MARSH ELEMENTARY SCHOOL Existing Lighting Conditions														Proposed Lighting									
#	Bldg	Flr	Location in Building	Measured Lighting Level in Foot-candles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/ Lamp	Hrs/ Day	Energy Use (Watt hours/ day)	Controls	Day-lighting possible ?	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/ Lamp	Hrs/ Day	Energy Use (Watt hours/ day)	Controls	Total Power (Watts)
1	E	ML	Entranceway near Middle School	30	4' linear T12	magnetic	15	2	Fluorescent	34	11	11220	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	11	8415	Switch	960
2	E	ML	Entranceway near Middle School	30	Flood Lights	-	7	2	Flood	65	11	10010	Switch	No	Flood Lights	-	7	2	R30 Reflector CFL flood	15	11	2310	Switch	210
3	E	ML	Entranceway near Middle School	30	Fluorescent Exit Sign	-	1	1	Fluorescent	20	24	480	None	No	LED Exit Sign	-	1	1	LED	5	24	120	None	5
4	E	ML	Library - Room 105	30	26W PL Fluorescent Lights	-	28	1	Fluorescent	26	14	10192	Switch	No	26W PL Fluorescent Lights	-	28	1	Fluorescent	26	14	10192	Switch	728
5	E	ML	Library - Room 105	30	Fluorescent Exit Sign	-	2	1	Fluorescent	20	24	960	None	No	LED Exit Sign	-	2	1	LED	5	24	240	None	10
6	E	ML	Library - Room 105	30	4' linear T12	magnetic	13	2	Fluorescent	34	14	12376	Switch	No	4' linear T8	electronic	13	2	Fluorescent	32	14	9282	Switch	832
7	E	ML	Library - Room 105	30	26W PL Fluorescent Lights	-	5	1	Fluorescent	26	14	1820	Switch, accent lighting	No	26W PL Fluorescent Lights	-	5	1	Fluorescent	26	14	1820	Switch, accent lighting	130
8	E	ML	Room 104 - AV Room	65	4' linear T12	magnetic	4	4	Fluorescent	34	8	4352	Switch	No	4' linear T8	electronic	4	4	Fluorescent	32	5	2122	occupancy sensor	512
9	E	ML	Room 103 - Computer Resource Room	40	4' linear T12	magnetic	6	4	Fluorescent	34	8	6528	Switch	No	4' linear T8	electronic	6	4	Fluorescent	32	8	4896	Switch	768
10	E	ML	Room 101 - Library	30	Fluorescent Exit Sign	-	2	1	Fluorescent	20	24	960	None	No	LED Exit Sign	-	2	1	LED	5	24	240	None	10
11	E	ML	Room 101 - Library	30	4' linear T12	magnetic	14	2	Fluorescent	34	14	13328	Switch	No	4' linear T8	electronic	14	2	Fluorescent	32	14	9996	Switch	896
12	E	ML	Room 101 - Library	30	2' U-shaped T12	magnetic	15	2	Fluorescent	34	14	14280	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	14	10710	Switch	960
13	E	ML	Room 101 - Library	30	26W PL Fluorescent Lights	-	15	1	Fluorescent	26	14	5460	Switch	No	26W PL Fluorescent Lights	-	15	1	Fluorescent	26	14	5460	Switch	390
14	E	ML	Room 101 - Library	30	4' linear T12	magnetic	8	2	Fluorescent	34	14	7616	Switch	No	4' linear T8	electronic	8	2	Fluorescent	32	14	5712	Switch	512
15	E	ML	Library Office - Work/Room	75	4' linear T12	magnetic	4	4	Fluorescent	34	14	7616	Switch	No	4' linear T8	electronic	4	4	Fluorescent	32	9	3713	occupancy sensor	512
16	E	ML	Cafeteria	20	4' linear T12	magnetic	48	6	Fluorescent	34	7	68544	Switch	No	4' linear T8	electronic	48	6	Fluorescent	32	7	51408	Switch	9216
17	E	ML	Cafeteria	20	Flood Lights	-	48	1	Flood	65	7	21840	Switch	No	Flood Lights	-	48	2	R30 Reflector CFL flood	15	7	10080	Switch	1440
18	E	ML	Cafeteria	20	Fluorescent Exit Sign	-	3	1	Fluorescent	20	24	1440	None	No	LED Exit Sign	-	3	1	LED	5	24	360	None	15
19	E	ML	Room 109	62	4' linear T12	magnetic	8	4	Fluorescent	34	8	8704	Switch	No	4' linear T8	electronic	8	4	Fluorescent	32	8	6528	Switch	1024
20	E	ML	Hallway by Library	15	26W PL Fluorescent Lights	-	18	1	Fluorescent	26	8	3744	Switch	No	26W PL Fluorescent Lights	-	18	1	Fluorescent	26	8	3744	Switch	468
21	E	ML	Hallway by Library	15	26W PL Fluorescent Lights	-	13	1	Fluorescent	26	8	2704	Switch	No	26W PL Fluorescent Lights	-	13	1	Fluorescent	26	8	2704	Switch	338
22	E	ML	Trophy Display Cases in Hallway by Library	-	26W PL Fluorescent Lights	-	4	1	Fluorescent	26	8	832	Switch	No	26W PL Fluorescent Lights	-	4	1	Fluorescent	26	8	832	Switch	104
23	E	ML	Gym	22	400W metal-halides	-	24	1	Fluorescent	400	11	105600	Switch	No	200 watt 4 bulb T5 lamps	electronic	24	4	Fluorescent	50	11	52800	Switch	4800
24	E	ML	Gym	22	Fluorescent Exit Sign	-	4	1	Fluorescent	20	24	1920	None	No	LED Exit Sign	-	4	1	LED	5	24	480	None	20
25	E	ML	Gym - Office	60	4' linear T12	magnetic	2	4	Fluorescent	34	8	2176	Switch	No	4' linear T8	electronic	2	4	Fluorescent	32	5	1061	occupancy sensor	256
26	E	ML	Gym - Storage	14	4' linear T12	magnetic	2	2	Fluorescent	34	1	136	Switch	No	4' linear T8	electronic	2	2	Fluorescent	32	1	102	Switch	128
27	E	ML	Gym - Old Locker Room - little office off of gym	40	4' linear T12	magnetic	2	4	Fluorescent	34	8	2176	Switch	No	4' linear T8	electronic	2	4	Fluorescent	32	5	1061	occupancy sensor	256
28	E	ML	Gym - Hall by old locker room	28	2' U-shaped T12	magnetic	2	4	Fluorescent	34	11	2992	Switch	No	4' linear T8	electronic	2	4	Fluorescent	32	11	2244	Switch	256
29	E	ML	Gym - 2nd little office off of gym	60	4' linear T12	magnetic	2	4	Fluorescent	34	8	2176	Switch	No	4' linear T8	electronic	2	4	Fluorescent	32	5	1061	occupancy sensor	256
30	E	ML	Room 100 - Main Office	20	4' linear T12	magnetic	4	4	Fluorescent	34	8	4352	Switch	No	4' linear T8	electronic	4	4	Fluorescent	32	8	3264	Switch	512
31	E	ML	Room 100 - Main Office	20	26W PL Fluorescent Lights	-	9	1	Fluorescent	26	8	1872	Switch	No	26W PL Fluorescent Lights	-	9	1	Fluorescent	26	8	1872	Switch	234
32	E	ML	Principal's Office	80	4' linear T12	magnetic	3	4	Fluorescent	34	8	3264	Switch	No	4' linear T8	electronic	3	4	Fluorescent	32	5	1591	occupancy sensor	384
33	E	ML	Principal's Office	80	60W incandescent	-	3	1	Incandescent	60	8	1440	Switch	No	20 watt CFL	-	3	1	CFL	20	5	702	occupancy sensor	60
34	E	ML	Principal's Office	80	Flood Lights	-	2	1	Flood	65	8	1040	Switch	No	Flood Lights	-	2	2	R30 Reflector CFL flood	15	5	488	occupancy sensor	60
35	E	ML	Principal's Office	80	20W CFL	-	1	1	CFL	20	8	160	Switch	No	20W CFL	-	1	1	CFL	20	5	100	Switch	20
36	E	ML	Room 202 - Conference Room	32	4' linear T12	magnetic	14	2	Fluorescent	34	8	7616	Switch	No	4' linear T8	electronic	14	2	Fluorescent	32	5	3713	occupancy sensor	896
37	E	ML	Room 202 - Conference Room	32	36" linear T12	magnetic	4	2	Fluorescent	30	8	1920	Switch	No	4' linear T8	electronic	4	2	Fluorescent	32	5	936	occupancy sensor	256
38	E	ML	Room 202 - Conference Room	32	Flood Lights	-	10	1	Flood	65	8	5200	Switch	No	Flood Lights	-	10	2	R30 Reflector CFL flood	15	5	1500	occupancy sensor	300
39	E	ML	Room 201	30	4' linear T12	magnetic	5	4	Fluorescent	34	8	5440	Switch	No	4' linear T8	electronic	5	4	Fluorescent	32	8	4080	Switch	640
40	E	ML	Room 201 - Psychologist	37	2' U-shaped T12	magnetic	4	2	Fluorescent	34	8	2176	Switch	No	4' linear T8	electronic	4	2	Fluorescent	32	5	1061	occupancy sensor	256
41	E	ML	Room 201 - Learning Disabilities Teacher Consultant	43	2' U-shaped T12	magnetic	4	2	Fluorescent	34	8	2176	Switch	No	4' linear T8	electronic	4	2	Fluorescent	32	5	1061	occupancy sensor	256
42	E	ML	Room 201 - Child Studies Room	74	2' U-shaped T12	magnetic	4	2	Fluorescent	34	8	2176	Switch	No	4' linear T8	electronic	4	2	Fluorescent	32	5	1061	occupancy sensor	256
43	E	ML	Room 201 - Break/Copy Room	25	2' U-shaped T12	magnetic	2	2	Fluorescent	34	8	1088	Switch	No	4' linear T8	electronic	2	2	Fluorescent	32	5	530	occupancy sensor	128
44	E	ML	Room 201 - Social Worker	40	2' U-shaped T12	magnetic	4	2	Fluorescent	34	8	2176	Switch	No	4' linear T8	electronic	4	2	Fluorescent	32	5	1061	occupancy sensor	256
45	E	ML	Front door by Main Office	22	4' linear T12	magnetic	20	2	Fluorescent	34	11	14960	Switch	No	4' linear T8	electronic	20	2	Fluorescent	32	11	11220	Switch	1280
46	E	ML	Front door by Main Office	22	Fluorescent Exit Sign	-	4	1	Fluorescent	20	24	1920	None	No	LED Exit Sign	-	4	1	LED	5	24	480	None	20

ASHTON MARSH ELEMENTARY SCHOOL Existing Lighting Conditions														Proposed Lighting								
#	Bldg	Flr	Location in Building	Measured Lighting Level in Foot-candles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/ Lamp	Hrs/ Day	Energy Use (Watt hours/ day)	Controls	Day-lighting possible ?	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/ Lamp	Hrs/ Day	Energy Use (Watt hours/ day)	Controls	Total Power (Watts)
47	E	ML	Front door by Main Office	22	Flood Lights	-	5	1	Flood	65	11	3575	Switch	No	**Flood Lights**	-	**5**	**2**	**R30 Reflector CFL flood**	**15**	**11**	**1650**	**Switch**	**150**
48	E	ML	Front door by Main Office	22	20W CFL	-	5	1	CFL	20	11	1100	Switch	No	20W CFL	-	5	1	CFL	20	11	1100	Switch	100
49	E	ML	Nurse's Office	30	4' linear T12	magnetic	4	4	Fluorescent	34	8	4352	Switch	No	**4' linear T8**	**electronic**	**4**	**4**	**Fluorescent**	**32**	**5**	**2122**	**occupancy sensor**	**512**
50	E	ML	Nurse's Office	30	2' U-shaped T12	magnetic	3	2	Fluorescent	34	8	1632	Switch	No	**4' linear T8**	**electronic**	**3**	**2**	**Fluorescent**	**32**	**5**	**796**	**occupancy sensor**	**192**
51	E	ML	Nurse's Office	30	4' linear T12	magnetic	6	2	Fluorescent	34	8	3264	Switch	No	**4' linear T8**	**electronic**	**6**	**2**	**Fluorescent**	**32**	**5**	**1591**	**occupancy sensor**	**384**
52	E	ML	Hallway	40	26W PL Fluorescent Lights	-	3	1	Fluorescent	26	8	624	Switch, sconces	No	26W PL Fluorescent Lights	-	3	1	Fluorescent	26	8	624	Switch, sconces	78
53	E	ML	Hallway	40	Flood Lights	-	5	1	Flood	65	8	2600	Switch	No	**Flood Lights**	-	**5**	**2**	**R30 Reflector CFL flood**	**15**	**8**	**1200**	**Switch**	**150**
54	E	ML	Hallway by Windows in Courtyard	40	Flood Lights	-	6	1	Flood	65	8	3120	Switch	Yes	**Flood Lights**	-	**7**	**2**	**R30 Reflector CFL flood**	**15**	**8**	**1680**	**Switch**	**210**
55	E	ML	Hallway by Windows in Courtyard	40	26W PL Fluorescent Lights	-	3	1	Fluorescent	26	8	624	Switch, sconces	Yes	26W PL Fluorescent Lights	-	3	1	Fluorescent	26	8	624	Switch, sconces	78
56	E	ML	Hallway by Windows in Courtyard	40	Fluorescent Exit Sign	-	1	1	Fluorescent	20	24	480	None	No	**LED Exit Sign**	-	**1**	**1**	**LED**	**5**	**24**	**120**	**None**	**5**
57	E	ML	Room 210 - Music	54	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**32**	**8**	**7344**	**Switch**	**1152**
58	E	ML	Hallway by Music Room	20	2' U-shaped T12	magnetic	10	2	Fluorescent	34	8	5440	Switch	No	**4' linear T8**	**electronic**	**10**	**2**	**Fluorescent**	**32**	**8**	**4080**	**Switch**	**640**
59	E	ML	Hallway by Music Room	20	Fluorescent Exit Sign	-	2	1	Fluorescent	20	24	960	None	No	**LED Exit Sign**	-	**2**	**1**	**LED**	**5**	**24**	**240**	**None**	**10**
60	E	ML	Coed Handicap Restroom	12	4' linear T12	magnetic	2	2	Fluorescent	34	8	1088	Switch	No	**4' linear T8**	**electronic**	**2**	**2**	**Fluorescent**	**32**	**5**	**530**	**occupancy sensor**	**128**
61	E	ML	Mechanical Room	14	4' linear T12	magnetic	13	2	Fluorescent	34	4	3536	Switch	No	**4' linear T8**	**electronic**	**13**	**2**	**Fluorescent**	**32**	**4**	**2652**	**Switch**	**832**
62	E	ML	Storage across from Mechanical Room	13	2' U-shaped T12	magnetic	5	2	Fluorescent	34	1	340	Switch	No	**4' linear T8**	**electronic**	**5**	**2**	**Fluorescent**	**32**	**1**	**255**	**Switch**	**320**
63	E	ML	Storage across from Mechanical Room	13	Fluorescent Exit Sign	-	1	1	Fluorescent	20	24	480	None	No	**LED Exit Sign**	-	**1**	**1**	**LED**	**5**	**24**	**120**	**None**	**5**
64	E	ML	Storage across from Mechanical Room	13	LED Exit Sign	-	1	1	LED	5	24	120	None	No	LED Exit Sign	-	1	1	LED	5	24	120	None	5
65	E	ML	General Storage Room	14	4' linear T12	magnetic	6	2	Fluorescent	34	1	408	Switch	No	**4' linear T8**	**electronic**	**6**	**2**	**Fluorescent**	**32**	**1**	**306**	**Switch**	**384**
66	E	ML	Maintenance	36	4' linear T12	magnetic	10	2	Fluorescent	34	8	5440	Switch	No	**4' linear T8**	**electronic**	**10**	**2**	**Fluorescent**	**32**	**8**	**4080**	**Switch**	**640**
67	E	ML	Director of Buildings and Grounds	37	4' linear T12	magnetic	2	4	Fluorescent	34	8	2176	Switch	No	**4' linear T8**	**electronic**	**2**	**4**	**Fluorescent**	**32**	**5**	**1061**	**occupancy sensor**	**256**
68	E	ML	Girl's Room	23	4' linear T12	magnetic	5	2	Fluorescent	34	8	2720	Switch	No	**4' linear T8**	**electronic**	**5**	**2**	**Fluorescent**	**32**	**5**	**1326**	**occupancy sensor**	**320**
69	E	ML	Boy's Room	23	4' linear T12	magnetic	5	2	Fluorescent	34	8	2720	Switch	No	**4' linear T8**	**electronic**	**5**	**2**	**Fluorescent**	**32**	**5**	**1326**	**occupancy sensor**	**320**
70	E	ML	Room 510	36	4' linear T12	magnetic	8	3	Fluorescent	34	8	6528	Switch	No	**4' linear T8**	**electronic**	**8**	**3**	**Fluorescent**	**32**	**8**	**4896**	**Switch**	**768**
71	E	ML	Hallway by Room 510	18	2' U-shaped T12	magnetic	15	2	Fluorescent	34	8	8160	Switch	No	**4' linear T8**	**electronic**	**15**	**2**	**Fluorescent**	**32**	**8**	**6120**	**Switch**	**960**
72	E	ML	Storage	10	4' linear T12	magnetic	2	2	Fluorescent	34	1	136	Switch	No	**4' linear T8**	**electronic**	**2**	**2**	**Fluorescent**	**32**	**1**	**102**	**Switch**	**128**
73	E	ML	Room 500	36	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**33**	**8**	**7344**	**Switch**	**1188**
74	E	ML	Room 509	55	4' linear T12	magnetic	8	3	Fluorescent	34	8	6528	Switch	No	**4' linear T8**	**electronic**	**8**	**3**	**Fluorescent**	**34**	**8**	**4896**	**Switch**	**816**
75	E	ML	Room 501	37	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**35**	**8**	**7344**	**Switch**	**1260**
76	E	ML	Room 508	55	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**36**	**8**	**7344**	**Switch**	**1296**
77	E	ML	Room 507	40	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**37**	**8**	**7344**	**Switch**	**1332**
78	E	ML	Room 506	58	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**38**	**8**	**7344**	**Switch**	**1368**
79	E	ML	Room 503	50	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**39**	**8**	**7344**	**Switch**	**1404**
80	E	ML	Room 502	52	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**40**	**8**	**7344**	**Switch**	**1440**
81	E	ML	Storage	12	4' linear T12	magnetic	2	2	Fluorescent	34	1	136	Switch	No	**4' linear T8**	**electronic**	**2**	**2**	**Fluorescent**	**41**	**1**	**102**	**Switch**	**164**
82	E	ML	Room 505	38	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**42**	**8**	**7344**	**Switch**	**1512**
83	E	ML	Room 504	60	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**43**	**8**	**7344**	**Switch**	**1548**
84	E	ML	Hallway near Room 400	22	2' U-shaped T12	magnetic	6	2	Fluorescent	34	8	3264	Switch	No	**4' linear T8**	**electronic**	**6**	**2**	**Fluorescent**	**44**	**8**	**2448**	**Switch**	**528**
85	E	ML	Room 404	40	4' linear T12	magnetic	4	3	Fluorescent	34	8	3264	Switch	No	**4' linear T8**	**electronic**	**4**	**3**	**Fluorescent**	**45**	**8**	**2448**	**Switch**	**540**
86	E	ML	Room 405	43	4' linear T12	magnetic	4	3	Fluorescent	34	8	3264	Switch	No	**4' linear T8**	**electronic**	**4**	**3**	**Fluorescent**	**46**	**8**	**2448**	**Switch**	**552**
87	E	ML	Room 403	42	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**32**	**8**	**7344**	**Switch**	**1152**
88	E	ML	Room 402	46	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**32**	**8**	**7344**	**Switch**	**1152**
89	E	ML	Room 401	50	4' linear T12	magnetic	6	3	Fluorescent	34	8	4896	Switch	No	**4' linear T8**	**electronic**	**6**	**3**	**Fluorescent**	**32**	**8**	**3672**	**Switch**	**576**
90	E	ML	Room 400	50	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**32**	**8**	**7344**	**Switch**	**1152**
91	E	ML	Room 409	44	4' linear T12	magnetic	4	3	Fluorescent	34	8	3264	Switch	No	**4' linear T8**	**electronic**	**4**	**3**	**Fluorescent**	**32**	**8**	**2448**	**Switch**	**384**
92	E	ML	Room 407	48	4' linear T12	magnetic	4	3	Fluorescent	34	8	3264	Switch	No	**4' linear T8**	**electronic**	**4**	**3**	**Fluorescent**	**32**	**8**	**2448**	**Switch**	**384**
93	E	ML	Hallway	21	2' U-shaped T12	magnetic	14	2	Fluorescent	34	8	7616	Switch	No	**4' linear T8**	**electronic**	**14**	**2**	**Fluorescent**	**32**	**8**	**5712**	**Switch**	**896**
94	E	ML	Room 305	42	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**32**	**8**	**7344**	**Switch**	**1152**
95	E	ML	Room 304	44	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	**4' linear T8**	**electronic**	**12**	**3**	**Fluorescent**	**32**	**8**	**7344**	**Switch**	**1152**
96	E	ML	Coed Handicap Restroom	25	4' linear T12	magnetic	1	2	Fluorescent	34	8	544	Switch	No	**4' linear T8**	**electronic**	**1**	**2**	**Fluorescent**	**32**	**5**	**265**	**occupancy sensor**	**64**

ASHTON MARSH ELEMENTARY SCHOOL Existing Lighting Conditions														Proposed Lighting									
#	Bldg	Flr	Location in Building	Measured Lighting Level in Foot-candles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/ Lamp	Hrs/ Day	Energy Use (Watt hours/ day)	Controls	Day-lighting possible ?	Fixture Type	Ballast Type	No. of Fixtures	No of Lamps	Type of Lamp	Watts/ Lamp	Hrs/ Day	Energy Use (Watt hours/ day)	Controls	Total Power (Watts)
97	E	ML	C-2 - Custodial Closet	35	4' linear T12	magnetic	1	2	Fluorescent	34	1	68	Switch	No	4' linear T8	electronic	1	2	Fluorescent	32	1	51	Switch	64
98	E	ML	Light fixtures above each door in Hallway	-	26W PL Fluorescent Lights	-	28	1	Fluorescent	26	8	5824	Switch	No	26W PL Fluorescent Lights	-	28	1	Fluorescent	26	8	5824	Switch	728
99	E	ML	Room 303	40	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	4' linear T8	electronic	12	3	Fluorescent	32	8	7344	Switch	1152
100	E	ML	Room 302	40	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	4' linear T8	electronic	12	3	Fluorescent	32	8	7344	Switch	1152
101	E	ML	Room 306	40	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	4' linear T8	electronic	12	3	Fluorescent	32	8	7344	Switch	1152
102	E	ML	Room 307	70	4' linear T12	magnetic	8	3	Fluorescent	34	8	6528	Switch	No	4' linear T8	electronic	8	3	Fluorescent	32	8	4896	Switch	768
103	E	ML	Room 308	64	4' linear T12	magnetic	8	3	Fluorescent	34	8	6528	Switch	No	4' linear T8	electronic	8	3	Fluorescent	32	8	4896	Switch	768
104	E	ML	Room 301	60	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	4' linear T8	electronic	12	3	Fluorescent	32	8	7344	Switch	1152
105	E	ML	Closet between 300 and 301	30	4' linear T12	magnetic	2	2	Fluorescent	34	1	136	Switch	No	4' linear T8	electronic	2	2	Fluorescent	33	1	102	Switch	132
106	E	ML	Room 309	40	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	4' linear T8	electronic	12	3	Fluorescent	32	8	7344	Switch	1152
107	E	ML	Room 310	61	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	4' linear T8	electronic	12	3	Fluorescent	32	8	7344	Switch	1152
108	E	ML	Room 300	60	4' linear T12	magnetic	12	3	Fluorescent	34	8	9792	Switch	No	4' linear T8	electronic	12	3	Fluorescent	32	8	7344	Switch	1152
109	E	ML	Boy's Room	50	4' linear T12	magnetic	5	2	Fluorescent	34	8	2720	Switch	No	4' linear T8	electronic	5	2	Fluorescent	32	5	1326	occupancy sensor	320
110	E	ML	Girl's Room	50	4' linear T12	magnetic	5	2	Fluorescent	34	8	2720	Switch	No	4' linear T8	electronic	5	2	Fluorescent	32	5	1326	occupancy sensor	320
111	E	ML	Room 203 - Art Room	45	4' linear T12	magnetic	8	3	Fluorescent	34	8	6528	Switch	No	4' linear T8	electronic	8	3	Fluorescent	32	8	4896	Switch	768
112	E	ML	Room 203 - Art Room	45	2' U-shaped T12	magnetic	7	2	Fluorescent	34	8	3808	Switch	No	4' linear T8	electronic	7	2	Fluorescent	32	8	2856	Switch	448
113	E	ML	Room 203 - Art Room - Storage	45	4' linear T12	magnetic	2	2	Fluorescent	34	8	1088	Switch	No	4' linear T8	electronic	2	2	Fluorescent	32	5	530	occupancy sensor	128
114	E	ML	Room 208	50	4' linear T12	magnetic	9	3	Fluorescent	34	8	7344	Switch	No	4' linear T8	electronic	9	3	Fluorescent	32	8	5508	Switch	864
115	E	ML	Room 208 - Bath	40	4' linear T12	magnetic	1	2	Fluorescent	34	8	544	Switch	No	4' linear T8	electronic	1	2	Fluorescent	32	5	265	occupancy sensor	64
116	E	ML	Hallway	21	2' U-shaped T12	magnetic	12	2	Fluorescent	34	8	6528	Switch	No	4' linear T8	electronic	12	2	Fluorescent	32	8	4896	Switch	768
117	E	ML	Room 205	38	4' linear T12	magnetic	9	3	Fluorescent	34	8	7344	Switch	No	4' linear T8	electronic	9	3	Fluorescent	32	8	5508	Switch	864
118	E	ML	Room 205 - Bath	40	4' linear T12	magnetic	1	2	Fluorescent	34	8	544	Switch	No	4' linear T8	electronic	1	2	Fluorescent	32	5	265	occupancy sensor	64
119	E	ML	Room 207	40	4' linear T12	magnetic	9	3	Fluorescent	34	8	7344	Switch	No	4' linear T8	electronic	9	3	Fluorescent	32	8	5508	Switch	864
120	E	ML	Room 207	40	2' U-shaped T12	magnetic	3	2	Fluorescent	34	8	1632	Switch	No	4' linear T8	electronic	3	2	Fluorescent	32	8	1224	Switch	192
121	E	ML	Room 206	42	4' linear T12	magnetic	9	3	Fluorescent	34	8	7344	Switch	No	4' linear T8	electronic	9	3	Fluorescent	32	8	5508	Switch	864
122	E	ML	Room 206	42	2' U-shaped T12	magnetic	3	2	Fluorescent	34	8	1632	Switch	No	4' linear T8	electronic	3	2	Fluorescent	32	8	1224	Switch	192
123	E	ML	Closet between 206 and 207	45	4' linear T12	magnetic	1	2	Fluorescent	34	1	68	Switch	No	4' linear T8	electronic	1	2	Fluorescent	33	1	51	Switch	66
124	E	ML	Closet between 204 and 205	45	4' linear T12	magnetic	1	2	Fluorescent	34	1	68	Switch	No	4' linear T8	electronic	1	2	Fluorescent	34	1	51	Switch	68
125	E	ML	Room 204	45	4' linear T12	magnetic	9	3	Fluorescent	34	8	7344	Switch	No	4' linear T8	electronic	9	3	Fluorescent	32	8	5508	Switch	864
126	E	ML	Room 204	45	2' U-shaped T12	magnetic	3	2	Fluorescent	34	8	1632	Switch	No	4' linear T8	electronic	3	2	Fluorescent	33	8	1224	Switch	198
127	E	ML	Large Skylit Area	100	4' linear T12	magnetic	16	1	Fluorescent	34	10	5440	Switch	Yes	4' linear T8	electronic	16	1	Fluorescent	34	10	4080	Switch	544
128	E	ML	Staff/Kitchen	10	32W CFL	-	6	1	CFL	32	8	1536	Switch	No	32W CFL	-	6	1	CFL	32	8	1536	Switch	192
129	E	ML	Staff/Kitchen - Office	30	4' linear T12	magnetic	2	4	Fluorescent	34	8	2176	Switch	No	4' linear T8	electronic	2	4	Fluorescent	32	5	1020	occupancy sensor	256
130	E	ML	Kitchen - Serving Area	30	2' U-shaped T12	magnetic	8	2	Fluorescent	34	8	4352	Switch	No	4' linear T8	electronic	8	2	Fluorescent	33	8	3264	Switch	528
131	E	ML	Kitchen - Cooler	25	32W CFL	-	1	1	CFL	32	1	32	Switch	No	32W CFL	-	1	1	CFL	32	1	32	Switch	32
132	E	ML	Kitchen - Back Area	25	4' linear T12	magnetic	12	4	Fluorescent	34	8	13056	Switch	No	4' linear T8	electronic	12	4	Fluorescent	32	5	6365	occupancy sensor	1536
133	E	ML	Staff Locker Room	36	4' linear T12	magnetic	2	2	Fluorescent	34	8	1088	Switch	No	4' linear T8	electronic	2	2	Fluorescent	32	5	530	occupancy sensor	128
134	E	ML	Stage	6	4' linear T12	magnetic	6	2	Fluorescent	34	10	4080	Switch	No	4' linear T8	electronic	6	2	Fluorescent	32	7	1989	occupancy sensor	384
135	E	ML	Stage	5	LED Exit Sign	-	1	1	LED	5	24	120	None	No	LED Exit Sign	-	1	1	LED	5	24	120	None	5
Totals												821,441										553,967		
E - Elementary School																								
ML - Main Level																								
annual consumption (kWh)												164,288										110,793		
estimated cost ($/year)					existing							$23,600										$15,921		
Middle School total light power (Watt)					96,026																			85,610
Middle School light power density((Watt/sq ft)					1.24																			1.11
Proposed Annual Savings (kWh)																						53,495		
Proposed Annual Cost Savings ($)																						$7,887		
Proposed Investment ($)																						$184,900		

EMMA ATTALES MIDDLE SCHOOL Existing Lighting Conditions														Proposed Lighting								
#	Bldg	Flr	Location in Building	Measured Lighting Level in Foot-candles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/ Lamp	Hrs/ Day	Energy Use (Watt hours/ day)	Controls	Day-lighting possible ?	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/ Lamp	Hrs/ Day	Energy Use (Watt hours/ day)	Controls	Total Power (Watts)
1	M	ML	Room 717	72	4' linear T12	magnetic	7	4	Fluorescent, Econo-wire type bulbs, 34W	34	8	7616	Switch	No	4' linear T8	electronic	7	4	Fluorescent	32	8	5331	Switch	896
2	M	ML	Room 717 - Bath	74	2' u-shaped T8	magnetic	1	2	Fluorescent	32	8	512	Switch	No	2' u-shaped T8	electronic	1	2	Fluorescent	32	8	384	Switch	64
3	M	ML	Room C-3; Custodial Closet	17	4' linear T12	magnetic	2	2	Fluorescent	34	1	136	Switch	No	4' linear T8	electronic	2	2	Fluorescent	32	1	96	Switch	128
4	M	ML	Custodial Closet	10	20W CFL	-	1	1	Fluorescent	20	1	20	Switch	No	20W CFL	-	1	1	Fluorescent	20	1	20	Switch	20
5	M	ML	Custodial Closet	10	4' linear T12	magnetic	1	2	Fluorescent	34	1	68	Switch	No	4' linear T8	electronic	1	2	Fluorescent	32	1	48	Switch	64
6	M	ML	Girl's Room	63	4' linear T12	magnetic	4	4	Fluorescent	34	8	4352	Switch	No	4' linear T8	electronic	4	4	Fluorescent	32	5	1280	occupancy sensor	512
7	M	ML	Boy's Room	70	4' linear T12	magnetic	4	4	Fluorescent	34	8	4352	Switch	No	4' linear T8	electronic	4	4	Fluorescent	32	5	1280	occupancy sensor	512
8	M	ML	Room 716	47	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
9	M	ML	Room 714	36	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
10	M	ML	Room 713	31	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
11	M	ML	Room 712	33	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
12	M	ML	Modular - 803	43	4' linear T12	magnetic	14	2	Fluorescent	34	8	7616	Switch	No	4' linear T8	electronic	14	2	Fluorescent	32	8	5331	Switch	896
13	M	ML	Modular - 803	43	Fluorescent Exit Sign	-	1	1	Fluorescent	20	24	480	None	No	LED Exit Sign	-	1	1	LED	5	24	120	None	5
14	M	ML	Modular - 802	44	4' linear T12	magnetic	14	2	Fluorescent	34	8	7616	Switch	No	4' linear T8	electronic	14	2	Fluorescent	32	8	5331	Switch	896
15	M	ML	Modular - 802	44	Fluorescent Exit Sign	-	1	1	Fluorescent	20	24	480	None	No	LED Exit Sign	-	1	1	LED	5	24	120	None	5
16	M	ML	Modular - 801	17	4' linear T12	magnetic	14	2	Fluorescent	34	8	7616	Switch	No	4' linear T8	electronic	14	2	Fluorescent	32	8	5331	Switch	896
17	M	ML	Modular - 801	17	Fluorescent Exit Sign	-	1	1	Fluorescent	20	24	480	None	No	LED Exit Sign	-	1	1	LED	5	24	120	None	5
18	M	ML	Modular - 800	16	4' linear T12	magnetic	14	2	Fluorescent	34	8	7616	Switch	No	4' linear T8	electronic	14	2	Fluorescent	32	8	5331	Switch	896
19	M	ML	Modular - 800	16	Fluorescent Exit Sign	-	1	1	Fluorescent	20	24	480	None	No	LED Exit Sign	-	1	1	LED	5	24	120	None	5
20	M	ML	Modular - Bath	23	60W Incandescent	-	1	1	Incandescent	60	8	480	Switch	No	20 watt CFL	-	1	1	CFL	20	5	218	occupancy sensor	20
21	M	ML	Modular - Hallway	23	20W CFL	-	1	1	CFL	20	8	160	Switch	No	20W CFL	-	1	1	CFL	20	8	160	Switch	20
22	M	ML	Hallway by Rooms 712-713	27	2' U-shaped T12	magnetic	13	2	Fluorescent	34	8	7072	Switch	No	4' linear T8	electronic	13	2	Fluorescent	32	8	4950	Switch	832
23	M	ML	Hallway by Rooms 712-713	27	LED Exit Sign	-	1	1	LED	5	24	120	Photosensor on ext. light at end of this hallway is broken	No	LED Exit Sign	-	1	1	LED	5	24	120	Photosensor on ext. light at end of this hallway is broken	5
24	M	ML	Room 711	42	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
25	M	ML	Room 710	52	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
26	M	ML	Room 709	46	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
27	M	ML	Room 708	35	4' linear T8	electronic	6	2	Fluorescent	32	8	3072	Switch	No	4' linear T8	electronic	6	2	Fluorescent	32	8	3072	Switch	384
28	M	ML	Room 707	38	4' linear T8	electronic	6	2	Fluorescent	32	8	3072	Switch	No	4' linear T8	electronic	6	2	Fluorescent	32	8	3072	Switch	384
29	M	ML	Room 706	38	4' linear T8	electronic	9	2	Fluorescent	32	8	4608	Switch	No	4' linear T8	electronic	9	2	Fluorescent	32	8	4608	Switch	576
30	M	ML	Room 705	37	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
31	M	ML	Room 704	60	2' U-shaped T8	electronic	5	2	Fluorescent	32	8	2560	Switch	No	2' U-shaped T8	electronic	5	2	Fluorescent	32	8	2560	Switch	320
32	M	ML	Room 704 - Bath	55	2' U-shaped T8	electronic	2	2	Fluorescent	32	8	1024	Switch	No	2' U-shaped T8	electronic	2	2	Fluorescent	32	5	466	occupancy sensor	128
33	M	ML	Mechanical Room	32	4' linear T8	electronic	4	2	Fluorescent	32	4	1024	Switch	No	4' linear T8	electronic	4	2	Fluorescent	32	4	1024	Switch	256
34	M	ML	Room 703	32	4' linear T8	electronic	8	4	Fluorescent	32	8	8192	Switch	No	4' linear T8	electronic	8	4	Fluorescent	32	8	8192	Switch	1024
35	M	ML	Board of Education Main Area/Work Room	75	4' linear T8	electronic	2	4	Fluorescent	32	8	2048	Switch	No	4' linear T8	electronic	2	4	Fluorescent	32	8	2048	Switch	256
36	M	ML	BoE - Director of Curriculum	80	4' linear T12	magnetic	4	4	Fluorescent	34	8	4352	Switch	No	4' linear T8	electronic	4	4	Fluorescent	32	5	1280	occupancy sensor	512
37	M	ML	BoE - Board Secretary	60	4' linear T12	magnetic	6	3	Fluorescent	34	8	4896	Switch	No	4' linear T8	electronic	6	3	Fluorescent	32	5	2220	occupancy sensor	576
38	M	ML	BoE - Superintendent	62	4' linear T12	magnetic	6	4	Fluorescent	34	8	6528	Switch	No	4' linear T8	electronic	6	4	Fluorescent	32	5	2970	occupancy sensor	768
39	M	ML	BoE - Lobby	40	2' U-shaped T12	magnetic	3	2	Fluorescent	34	8	1632	Switch	No	4' linear T8	electronic	3	2	Fluorescent	32	8	1142	Switch	192
40	M	ML	BoE - Conference Room	41	4' linear T12	magnetic	6	3	Fluorescent	34	8	4896	Switch	No	4' linear T8	electronic	6	3	Fluorescent	32	5	2220	occupancy sensor	576
41	M	ML	Room 701	70	4' linear T12	magnetic	4	4	Fluorescent	34	8	4352	Switch	No	4' linear T8	electronic	4	4	Fluorescent	32	8	3846	Switch	512
42	M	ML	Room 701 - Office Hallway	20	2' U-shaped T12	magnetic	3	2	Fluorescent	34	8	1632	Switch	No	4' linear T8	electronic	3	2	Fluorescent	32	5	743	occupancy sensor	192
43	M	ML	Principal's Office	50	4' linear T12	magnetic	4	3	Fluorescent	34	8	3264	Switch	No	4' linear T8	electronic	4	3	Fluorescent	32	5	1485	occupancy sensor	384
44	M	ML	Storage - Next to Room 701	20	4' linear T12	magnetic	1	2	Fluorescent	34	1	68	Switch	No	4' linear T8	electronic	1	2	Fluorescent	32	1	48	Switch	64
45	M	ML	Hallway with Room 705 and 706	22	2' U-shaped T12	magnetic	10	2	Fluorescent	34	8	5440	Switch	No	4' linear T8	electronic	10	2	Fluorescent	32	8	3888	Switch	640
46	M	ML	Hallway with Room 705 and 706	22	Fluorescent Exit Sign	-	3	1	Fluorescent	20	24	1440	None	No	LED Exit Sign	-	3	1	LED	5	24	360	None	15

EMMA ATTALES MIDDLE SCHOOL Existing Lighting Conditions															Proposed Lighting									
#	Bldg	Flr	Locabon in Building	Measured Lighting Level in Foot-candles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/ Lamp	Hrs/ Day	Energy Use (Watt hours/ day)	Controls	Day-lighting possible ?	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/ Lamp	Hrs/ Day	Energy Use (Watt hours/ day)	Controls	Total Power (Watts)
47	M	ML	Hallwar with Room 705 and 706	22	LED Exit Sign	-	1	1	LED	5	24	120	None	No	LED Exit Sign	-	1	1	LED	5	24	120	None	5
48	M	ML	Copy Room	90	4' linear T12	magnetic	4	4	Fluorescent	34	8	4352	Switch	No	4' linear T8	electronic	4	4	Fluorescent	32	5	1980	occupancy sensor	512
49	M	ML	Main Office	72	4' linear T12	magnetic	10	4	Fluorescent	34	8	10880	Switch	No	4' linear T8	electronic	10	4	Fluorescent	32	8	7616	Switch	1280
50	M	ML	Hallway by Gym and Main Office	42	2' U-shaped T12	magnetic	25	2	Fluorescent	34	11	18700	Switch	No	4' linear T8	electronic	25	2	Fluorescent	32	11	13090	Switch	1600
51	M	ML	Hallway by Gym and Main Office	42	Fluorescent Exit Sign	-	3	1	Fluorescent	20	24	1440	None	No	LED Exit Sign	-	3	1	LED	5	24	360	None	15
52	M	ML	Hallway by Gym and Main Office	42	LED Exit Sign	-	1	1	Fluorescent	5	24	120	None	No	LED Exit Sign	-	1	1	Fluorescent	5	24	120	None	5
53	M	ML	Girl's Room by Gym	35	4' linear T12	magnetic	3	2	Fluorescent	34	11	2244	Switch	No	4' linear T8	electronic	3	2	Fluorescent	32	7	1021	occupancy sensor	192
54	M	ML	Girl's Locker Room by Gym	35	4' linear T12	magnetic	12	3	Fluorescent	34	11	13464	Switch	No	4' linear T8	electronic	12	3	Fluorescent	32	7	6126	occupancy sensor	1152
55	M	ML	Girl's Locker Room by Gym	35	20W CFL	-	4	1	CFL	20	11	880	Switch	No	20W CFL	-	4	1	CFL	20	7	400	occupancy sensor	80
56	M	ML	Boy's Room by Gym	35	4' linear T12	magnetic	3	2	Fluorescent	34	11	2244	Switch	No	4' linear T8	electronic	3	2	Fluorescent	32	7	1021	occupancy sensor	192
57	M	ML	Boy's Locker Room by Gym	35	4' linear T12	magnetic	12	3	Fluorescent	34	11	13464	Switch	No	4' linear T8	electronic	12	3	Fluorescent	32	7	6126	occupancy sensor	1152
58	M	ML	Boy's Locker Room by Gym	35	20W CFL	-	4	1	CFL	20	11	880	Switch	No	20W CFL	-	4	1	CFL	20	7	400	occupancy sensor	80
59	M	ML	Gym	90	400W Metal Halide	-	20	1	Metal Halide	400	11	88000	Switch	No	200 watt 4 bulb T5 lamps	electronic	20	4	Fluorescent	50	11	44000	Switch	4000
60	M	ML	Gym	90	Fluorescent Exit Sign	-	4	1	Fluorescent	20	24	1920	None	No	LED Exit Sign	-	4	1	LED	5	24	480	none	20
61	M	ML	Room 601 - Art Room	30	4' linear T12	magnetic	20	3	Fluorescent	34	8	16320	Switch	No	4' linear T8	electronic	20	3	Fluorescent	32	8	11424	Switch	1920
62	M	ML	Room 601 - Closet	30	4' linear T12	magnetic	2	2	Fluorescent	34	1	136	Switch	No	4' linear T8	electronic	2	2	Fluorescent	32	1	95	Switch	128
63	M	ML	Room 602	46	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
64	M	ML	Room 603	31	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
65	M	ML	Room 604	45	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
66	M	ML	Room 605	45	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
67	M	ML	Room 606	45	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	No	4' linear T8	electronic	15	2	Fluorescent	32	8	7680	Switch	960
68	M	ML	Room 607	45	4' linear T8	electronic	24	3	Fluorescent	32	8	12288	Switch	No	4' linear T8	electronic	24	2	Fluorescent	32	8	12288	Switch	1536
69	M	ML	Room 608	35	4' linear T8	electronic	30	2	Fluorescent	32	8	15360	Switch	No	4' linear T8	electronic	30	2	Fluorescent	32	8	15360	Switch	1920
70	M	ML	Room 609	40	4' linear T8	electronic	12	3	Fluorescent	32	8	9216	Switch	No	4' linear T8	electronic	12	3	Fluorescent	32	8	9216	Switch	1152
71	M	ML	Room 610	32	4' linear T8	electronic	24	2	Fluorescent	32	8	12288	Switch	No	4' linear T8	electronic	24	2	Fluorescent	32	8	12288	Switch	1536
72	M	ML	Room 610 - Closet	50	4' linear T8	electronic	4	4	Fluorescent	32	1	512	Switch	No	4' linear T8	electronic	4	4	Fluorescent	32	1	512	Switch	512
73	M	ML	Hallway with Room 602 and 603	12-Oct	2' U-shaped T12	magnetic	27	2	Fluorescent	32	8	13824	Switch	No	4' linear T8	electronic	27	2	Fluorescent	32	8	9677	Switch	1728
74	M	ML	Room 611	36	4' linear T8	electronic	18	2	Fluorescent	32	8	9216	Switch	No	4' linear T8	electronic	18	2	Fluorescent	32	8	9216	Switch	1152
75	M	ML	Room 611 - Closet	40	4' linear T8	electronic	2	4	Fluorescent	32	1	256	Switch	No	4' linear T8	electronic	2	4	Fluorescent	32	1	256	Switch	256
76	M	ML	Room 612	35	4' linear T12	magnetic	8	3	Fluorescent	34	8	6528	Switch	No	4' linear T8	electronic	8	3	Fluorescent	32	8	4570	Switch	768
77	M	ML	Room 613	35	4' linear T12	magnetic	8	3	Fluorescent	34	8	6528	Switch	No	4' linear T8	electronic	8	3	Fluorescent	32	8	4570	Switch	768
78	M	ML	C-6 - Custodial Closet	9	4' linear T12	magnetic	2	2	Fluorescent	34	1	136	Switch	No	4' linear T8	electronic	2	2	Fluorescent	32	1	95	Switch	128
Totals												482,528										354,439		
M - Middle School																								
ML - Main Level																								
annual consumption (kWh)												96,506										70,888		
estimated cost ($/year)					estimated							$13,866										$10,187		
Middle School total light power (Watt)					56,251																			50,705
Middle School light power density(Watt/sq ft)					0.83																			0.75
Proposed Annual Savings (kWh)																						25,618		
Proposed Annual Cost Savings ($)																						$3,681		
Proposed Investment ($)																						$68,215		

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

CONECTIV POWER DELIVERY SERVICE TERRITORY

Hess Corporation
1 Hess Plaza, Woodbridge, NJ 07095, (800) 437-7872, www.hess.com
American Powernet Management, LP
437 North Grove St., Berlin, NJ 08009, (877) 977-2636, www.americanpowernet.com
BOC Energy Services, Inc.
575 Mountain Avenue, Murray Hill, NJ 07974, (800) 247-2644, www.boc.com
Commerce Energy, Inc.
4400 Route 9 South, Suite100, Freehold, NJ 07728, (800) 556-8457, www.commerceenergy.com
ConEdison Solutions
Cherry Tree Corporate Center, 535 State Highway 38, Cherry Hill, NJ 08002, (888) 665-0955
www.conedsolutions.com
Constellation NewEnergy, Inc.
900A Lake Street, Suite 2, Ramsey, NJ 07446, (888) 635-0827, www.newenergy.com
Direct Energy Services, LLC
120 Wood Avenue, Suite 611, Iselin, NJ 08830, (866) 547-2722, www.directenergy.com
FirstEnergy Solutions Corp.
300 Madison Avenue, Morristown, NJ 07962, (800) 977-0500, www.fes.com
Glacial Energy of New Jersey, Inc.
207 LaRoche Avenue, Harrington Park, NJ 07640, (877) 569-2841, www.glacialenergy.com
Integrys Energy Services, Inc.
99 Wood Ave, South, Suite 802, Iselin, NJ 08830, (877) 763-9977, www.integrysenergy.com
Liberty Power Delaware, LLC
Park 80 West, Plaza II, Suite, 200Saddle Brook, NJ 07663, (866) 769-3799, www.libertypowercorp.com
Liberty Power Holdings, LLC
Park 80 West, Plaza II, Suite, 200Saddle Brook, NJ 07663, (866) 769-3799, www.libertypowercorp.com
Pepco Energy Services, Inc.
112 Main St., Lebanon, NJ 08833, (800) ENERGY-9 (363-7499), www.pepco-services.com
PPL EnergyPlus, LLC
811 Church Road, Cherry Hill, NJ 08002, (800) 281-2000, www.pplenergyplus.com
Sempra Energy Solutions
The Mac-Cali Building, 581 Main Street, 8th fl., Woodbridge, NJ 07095, (877) 273-6772
(800) 2- SEMPRA, www.semprasolutions.com
South Jersey Energy Company
One South Jersey Plaza, Route 54, Folsom, NJ 08037, (800) 756-3749, www.southjerseyenergy.com
Strategic Energy, LLC
55 Madison Avenue, Suite 400, Morristown, NJ 07960, (888) 925-9115, www.sel.com
Suez Energy Resources NA, Inc.
333 Thornall Street 6th Floor, Edison, NJ 08837, (888) 644-1014, www.suezenergyresources.com
UGI Energy Services, Inc.
704 East Main Street, Suite 1, Moorestown, NJ 08057, (856) 273-9995, www.ugienergyservices.com

SOUTH JERSEY GAS SERVICE TERRITORY

Cooperative Industries
412-420 Washington Avenue, Belleville, NJ 07109, 800-6-BUYGAS (6-289427), www.cooperativenet.com
Direct Energy Services, LLP
120 Wood Avenue, Suite 611, Iselin, NJ 08830, 866-547-2722, www.directenergy.com
Gateway Energy Services Corp.
44 Whispering Pines La ne, Lakewood, NJ 08701,800-805-8586, www.gesc.com
UGI Energy Services, Inc.
704 East Main Street, Suite 1, Moorestown, NJ 08057, 856-273-9995, www.ugienergyservices.com
Great Eastern Energy
116 Village Riva, Suite 200, Princeton, NJ 08540, 888-651-4121, www.greateastern.com
Hess Energy, Inc.
One Hess Plaza, Woodbridge, NJ 07095, 800-437-7872, www.hess.com
Intelligent Energy
2050 Center Avenue, Suite 500, Fort Lee, NJ 07024, 800-724-1880, www.intelligentenergy.org
Metromedia Energy, Inc.
6 Industrial Way, Eatontown, NJ 07724, 877-750-7046, www.metromediaenergy.com
MxEnergy, **Inc.**
510 Thornall Street, Suite 270, Edison, NJ 088327, 800-375-1277, www.mxenergy.com
NATGASCO (Mitchell Supreme)
532 Freeman Street, Orange, NJ 07050, 800-840-4GAS, www.natgasco.com
Pepco Energy Services, Inc.
112 Main Street, Lebanon, NJ 08833, 800-363-7499, www.pepco-services.com
PPL EnergyPlus, LLC
811 Church Road - Office 105, Cherry Hill, NJ 08002, 800-281-2000, www.pplenergyplus.com
South Jersey Energy Company
One South Jersey Plaza, Route 54, Folsom, NJ 08037, 800-756-3749, www.sjindustries.com/sje.htm
Woodruff Energy
73 Water Street, Bridgeton, NJ 08302, 800- 557-1121, www.woodruffenergy.com