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Local Government Energy Program
Energy audit report

For

Union County Educational Services Commission (UCESC)
Hillcrest Academy South & Lambert's Mill Academy
1571 Lamberts Mill Rd
Westfield, NJ 07090

Project Number: LGEA17

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INTRODUCTION

On July 16th, 2009, Steven Winter Associates, Inc. (SWA) performed a field visit and assessment of the Hillcrest Academy South and Lambert's Mill Academy building located in Union County, NJ. Current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

The Hillcrest Academy South and Lambert's Mill Academy building was completely renovated in 1997 before moving into the building. The Hillcrest Academy South and Lambert's Mill Academy building is two stories and consists of a total floor area of 58,000 square feet. Hillcrest Academy South currently has 80 students and 15 staff people and Lambert's Mill Academy has 60 students and 20 staff people.

Energy data and building information collected in the field were analyzed to determine the baseline energy performance of each building. Using spreadsheet-based calculation methods, SWA estimated the energy and cost savings associated with the installation of each of the recommended energy conservation measures. The findings for the building are summarized in this report.

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 building.

EXECUTIVE SUMMARY

This document contains the energy audit report for the Hillcrest Academy South and Lambert's Mill Academy building located at 1571 Lambert's Mill Rd, Westfield, NJ 07090. The Hillcrest Academy South and Lambert's Mill Academy building is a two story building. Based on the field visit performed by Steven Winter Associates (SWA) staff on July 16th, 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 usage.

In the most recent full year of data collected (March 2008 through March 2009), the UCESC building consumed 732,320 kWh or $126,738 worth of electricity and 50,904 therms or $61,368 worth of natural gas. The average aggregated cost of electricity was calculated to be $0.17/kWh and the average aggregated cost of natural gas was calculated to be $1.63/therm. With electricity and gas combined, the building consumed 7,589 MMBtus of energy at a total cost of $188,106.

SWA benchmarked Hillcrest Academy South and Lambert's Mill Academy building using the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The Portfolio Manager generated a benchmark score of 6 for the building, when compared to a national average. The benchmark rating is based on the facility's source energy use, level of business activity, and geographical location. The Portfolio Manager is also capable of generating a site energy use intensity number using 2008 as a baseline year.

In order to compare commercial buildings equitably, the *Portfolio Manager* ratings convey the consumption of each type of energy in a single common unit. The EPA uses source energy to represent the total amount of raw fuel required to operate the building. The site energy use intensity for the Hillcrest Academy South and Lambert's Mill Academy building is 128 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 changes in energy consumption associated with the energy improvements.

SWA evaluates Energy Conservation Measures (ECMs) based on cost-effectiveness. For this project there were several measures that did not have a positive return-on-investment but are essential to the efficient operation of the building. This building specifically has dampness problems within the building envelope and is currently not able to mitigate the proper amount of moisture. There are several major obstacles to being able to correct the moisture problems. SWA recommends that first all building envelope-related problems are addressed before moving forward with HVAC system-related measures. UCESC should consider first replacing the roof by adding insulation and installing a light-colored reflective membrane over the insulation. A lack of insulation on the roof leads to uneven temperatures between the plenum and the interior spaces, which can ultimately lead to comfort complaints as well as condensation forming within the building shell. Since this building was originally used as a factory/warehouse, the building contains a large plenum above the drop-tile ceiling of the school. Insulating the roof would solve part of the problem, but the walls of the plenum that are exposed to the outside air will also need to be insulated. UCESC should consult with the roofing contractors for feasible options for adding insulation to the walls of the plenum as well as the roof, to create a well-sealed envelope. Creating this envelope will essentially bring the plenum into the conditioned area of the building and allow the building to be conditioned uniformly and reduce the risk of condensation forming in the plenum or in the ceiling tiles.

There are also approximately 5 rooftop exhaust fans that are broken or in need of maintenance to operate correctly. These exhaust fans need to be fixed as part of the integral ventilation system of the building but will ultimately increase energy costs since bringing them back into operation will include consuming power for them to operate. The rooftop exhaust system for this building can help remove stale, humid air. If the building is not exhausting itself properly; heavy, moist air is trapped inside the building and the building becomes positively pressurized. When a building is positively pressurized and is not designed to be, air is brought into the building faster than the building can exhaust it. Eventually, the building is not "breathing" properly and is not able to exhaust humidity as well as contaminants in the air.

According to UCESC building staff, the condensers for the individual unit ventilators are over-sized. In addition to over-sized condensers; cooling coils within the units may be wrongly sized as well as dampers responsible for balancing fresh air with re-circulated air may not be operating correctly. Unit ventilators that are used for heating and cooling, also help maintain the correct levels of moisture in air that is allowed to enter the building envelop. These unit ventilators are adding to the moisture problem by not de-humidifying the air properly as it enters perimeter classrooms. SWA recommends hiring a contractor to perform maintenance and control optimization on each unit ventilator as well as evaluate future options for replacing or re-designing the units. By properly sealing the building, mitigating moist and stale air with exhaust fans, and correcting the unit ventilators, moisture problems can be relieved. It is important that moisture problems within a building are addressed before they lead to equipment failure, cosmetic wall or ceiling damage and even mold problems. Recommendations that may not be cost-effective should be included in the scope of work while also integrating recommended Energy Conservation Measures (ECMs).

SWA recommends a total of 5 Energy Conservation Measures (ECMs) for Hillcrest Academy South and Lambert's Mill Academy building. The total investment cost for these ECMs is **$185,548**. SWA estimates a first year savings of **$27,870** with a simple payback of **6.7 years**. SWA also estimates that Hillcrest Academy South and Lambert's Mill Academy building will be able to reduce their carbon footprint by **131,030 lbs of CO2 annually.** SWA also recommends that UCESC contacts third party energy suppliers in order to negotiate a lower electricity and natural gas rate. Comparing the current electricity and natural gas rates to average utility rates of similar type buildings in New Jersey, it may be possible to save up to $0.02/kWh and up to $0.08/therm, which would have equated to $18,719 for the past 12 months.

There are various incentives that Hillcrest Academy South and Lambert's Mill Academy building could apply for that could also help lower the cost of installing the ECMs. SWA recommends that the UCESC applies 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.

When pursuing incentives through the SmartStart program, SWA encourages building managers to contact the program provider to obtain more detailed information on the program guidelines and request pre-approval for all planned upgrades. At the time of this report, lighting would be eligible for an incentive of up to $7,100 and photovoltaic panels would be eligible for an incentive of up to $20,000 with the addition of an estimated 23 Solar Renewable Energy Credits (SRECs) earned per year.

Should the 1571 Lamberts Mill Road building decide to implement the capital improvements suggested in this report, SWA recommends that UCESC enroll the building in the New Jersey Clean Energy Program's Pay for Performance program. The Pay for Performance program or "P4P" a program set-up to create financial incentives for buildings to do a detailed building audit and also implement measures that were studied as part of the energy audit. The P4P program currently accepts LGEA participants that are not currently also receiving incentives as part of the Federal block grant program.

For further information on both custom and prescriptive incentives, please visit:

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/equipment-incentives/equi

The New Jersey Clean Energy website also provides information on an upcoming Direct-Install program that would be applicable to this project. The Direct-Install program is aimed at commercial buildings with an average annual demand of less than 200kW. This program is designed to offset up to 80% of the cost of replacing equipment nearing the end of its useful lifecycle with high efficiency alternatives. This program could help offset the cost of replacing the entire heating system. This program has not officially been released but can be followed online at:

http://www.njcleanenergy.com/commercial-industrial/programs/programs

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

SCOPE OF WORK – SUMMARY TABLE

ECM Table including Incentives

ECM #	ECM description	Installed Cost: Estimated Cost ($)	Source	Electric Savings: Consumption		Electric Savings: Demand		Fuel Savings: Natural Gas		Cost Savings ($)	Simple Payback (SPP)	Life of Measure (LoM)	Lifetime Cost Savings ($)	Return on Invest (ROI)	Annual Carbon Reduction (lbs of CO2)
1	Upgrade existing lighting	$ 9,275	RS Means	7,957	kWh	0	kW	0	Therms	$ 1,353	6.9	25	$ 23,038	5.9%	14,247
2	Upgrade central control system and install programmat	$ 13,191	RS Means	7,350	kWh	0	kW	1,154	Therms	$ 3,131	4.2	10	$ 26,433	10.0%	25,881
3	Unit ventilator maintenance and control optimization	$ 18,869	RS Means	112	kWh	0	kW	1,640	Therms	$ 2,692	7.0	10	$ 22,733	2.0%	18,278
4	Replace 225 kVA transformer	$ 24,213	RS Means	16,953	kWh	11	kW	0	Therms	$ 2,882	8.4	32	$ 57,193	4.3%	30,354
5	Install a roof-mounted 20kW photovoltaic system	$ 120,000	RS Means	23,608	kWh	16	kW	0	Therms	$ 17,813	6.7	20	$ 260,178	5.8%	42,270
	Total Scope of Work	**$ 185,548**	**-**	**55,980**	**-**	**27.0**	**-**	**2,794**		**$ 27,870**	**6.7**		**$ 389,575**		**131,030**

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
Carbon Dioxide per unit Electriciy =	1.7905	lbs of CO2/kWh
Carbon Dioxide per unit of Fuel =	11.023	lbs of CO2/unit fuel
Average Electric Rate =	**0.17**	$/kWh
Average Fuel Rate =	**1.63**	$/Therm

1. HISTORIC ENERGY CONSUMPTION

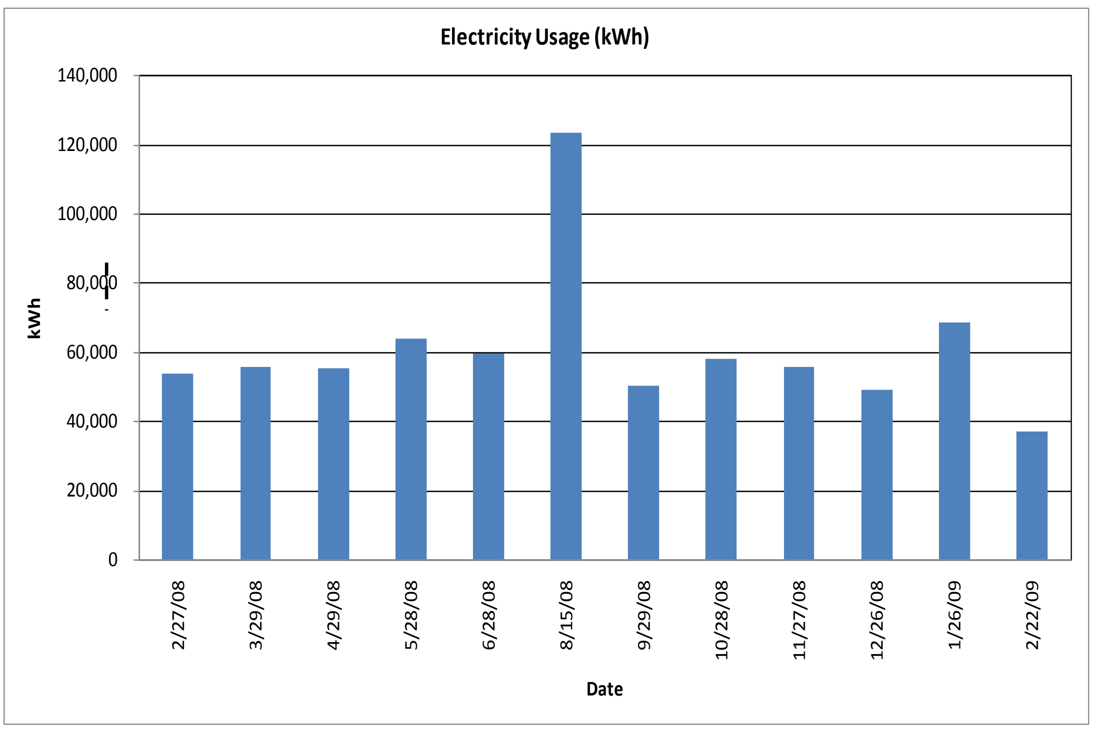
1.1. Energy usage and cost analysis

SWA received and analyzed utility bills from March 2008 through March 2009 that were received from UCESC.

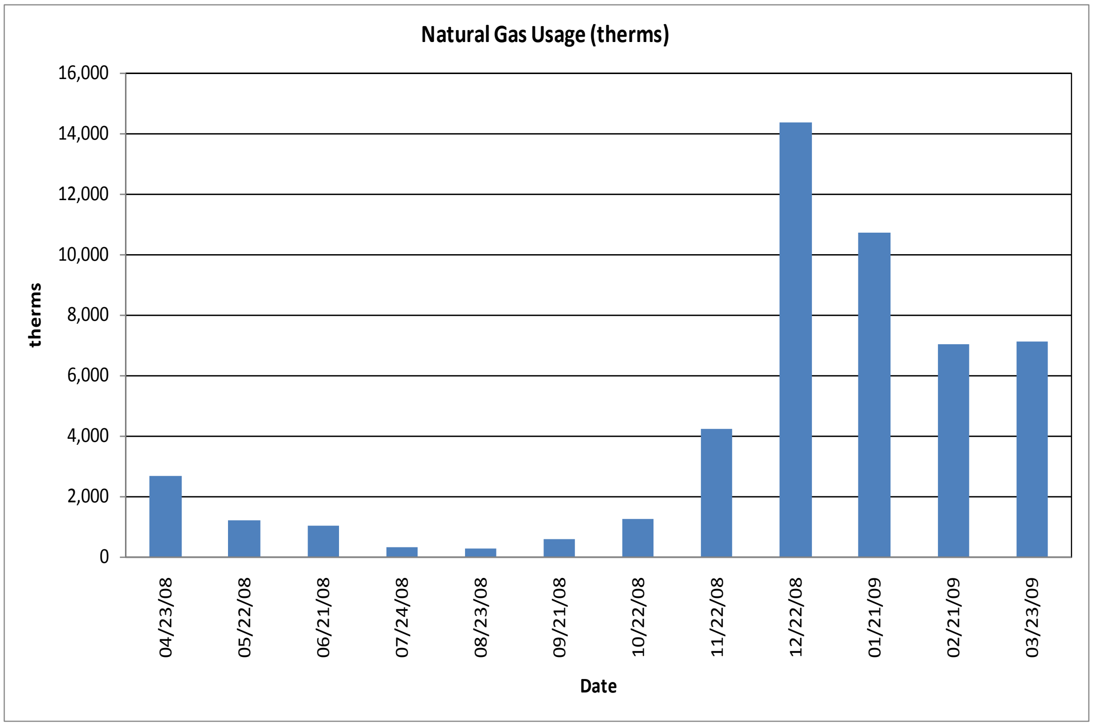
Electricity – The Hillcrest Academy South and Lambert's Mill Academy building has one electric meter for incoming electricity supply. The building purchases electricity from PSE&G at **an average aggregated rate of $0.17/kWh** based on March 2008 through March 2009 electric bills. The building purchased **approximately 732,320 kWh or $126,738 worth of electricity from March 2008 through March 2009.** Based on the same time period, the building also has **an average monthly demand of 212.7 kW and monthly peak demand of 324.8 kW.**

Natural Gas – The Hillcrest Academy South and Lambert's Mill Academy building has one gas meter for incoming natural gas from Elizabethtown Gas. Between March 2008 and March 2009, the building purchased **approximately 50,904 therms or $61,368 worth of natural gas.** To account for the additional costs associated with transportation and delivery fees, an average total gas rate of $1.63 per therm was assumed in this report.

The following chart shows electricity usage for the UCESC Building based on utility bills for the 2008-2009 billing period.



The following chart shows the natural gas usage for the UCESC Building based on utility bills for the year March 2008 to March 2009.



In the above chart, the natural gas usage follows a heating trend as expected. During the summer it is clear that the natural gas usage is very minimal which reflects that heat is not being used and the DHW load is minimal.

1.2. Utility rate

Hillcrest Academy South and Lambert's Mill Academy building currently buys electricity from PSE&G and gas from Elizabethtown Gas at the general service rate. The general service rate is a typical rate where customers pay for natural gas based on usage and electricity based on usage with the addition of an electrical charge demand. Hillcrest Academy South and Lambert's Mill Academy building uses PSE&G account #07 51 296 048 14 and Elizabethtown Gas account #8531937870, both for the service address of 1571 Lamberts Mill Road, Westfield, NJ. Electricity for the building was billed at an average rate of **$0.17/kWh.** Natural Gas for the building was billed at an average rate of **$1.63/therm.**

1.3. Energy benchmarking

The Hillcrest Academy South and Lambert's Mill Academy building information and utility data were entered into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. SWA has shared the Portfolio Manager account with the UCESC Board and recommends that the UCESC Board maintain the Portfolio Manager account at the link below to 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
UCESC - Westlake

Building ID: 1792001
For 12-month Period Ending: February 28, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: September 29, 2009

Facility
UCESC - Westlake
1571 Lamberts Mill Road
Scotch Plains, NJ 07076

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 2009
Gross Floor Area (ft²): 58,000

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	2,370,196
Natural Gas (kBtu)[4]	5,082,050
Total Energy (kBtu)	7,452,246
Energy Intensity[5]	
Site (kBtu/ft²/yr)	128
Source (kBtu/ft²/yr)	228
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	631
Electric Distribution Utility	
PSE&G - Public Service Elec & Gas Co	
National Average Comparison	
National Average Site EUI	78
National Average Source EUI	138
% Difference from National Average Source EUI	66%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

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

Certifying Professional
N/A

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

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, PE facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The building was converted from an old warehouse into a school 12 years ago (1997) when UCESC took possession of the building. The building has one story above grade with a total floor area of 58,000 square feet. The building was built, slab on grade, housing two academies, administrative offices, cafeterias, gyms, mechanical rooms, various storage rooms, and restrooms. Lamberts Mill Academy is located closest to the road with a stucco façade entrance, while Hillcrest Academy South is located in the back portion of the building with a brick exterior.

2.2. Building occupancy profiles

Hillcrest Academy South currently has 80 students and 15 staff people and Lambert's Mill Academy has 60 students and 20 staff people. Both academies are public schools, part of the Union County Educational Services Commission. The administrative offices are operated during the normal business hours of 9:00am to 5pm. Both academies operate from 9am to 3:15pm September through July 31st.

2.3. Building envelope

2.3.1. Exterior walls

This building consists of two parts, the steel and masonry original warehouse now housing the Hillcrest Academy, and the steel framed Lamberts Mill Academy part constructed with an EIFS (Exterior Insulation Finishing System). Due to warm temperature conditions at the time of the field visits, insulation levels could also not be verified with help of infrared technology. If desired, the school could contract a separate envelope inspection during cooler months to determine necessary insulation repairs or upgrades.

Overall, exterior and interior wall finishes of the envelope were found to be in age-appropriate, good condition with no major signs of unusual water, air leakage or other energy compromising damage.


Typical Partial Exterior Elevation

2.3.2. Roof

The flat roof of the building was recently replaced with a dark colored EPDM rubber membrane. The roof surface appeared to be in age appropriate, fair-good condition overall. No leaks were mentioned to the auditors at the time of the field visit and no signs of roof leakage were detected. In an effort to get the maximum life expectancy out of the roofing material installed, SWA recommends following/continuing the installer's or manufacturer's recommended maintenance and inspection schedule. 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.

EPDM rubber membrane roofing in fair condition

Aluminum Corner Flashing/ EPDM Detail

Close-Up View

Additional roof/ ceiling related issues: Due to the change of use from warehouse to a single story school, there is a significant ceiling cavity large enough to accommodate an entire second floor. There was no insulation detected between the steel decking and the ceiling tiles. This contributes to substantial temperature differences between the ceiling cavity and conditioned space. Even though the cavity could be considered semi-conditioned due to the lack of ceiling tile insulation, the amount of air within the cavity is large enough to act as a heat sink. Because the roof assembly reaches high temperatures as the dark EPDM membrane attracts the sun, there is a great temperature differential between the cooled rooms below and the space above the ceiling tiles. As a result the ceiling tiles are buckling due to the change of temperature and humidity on either side of the ceiling surface. Besides aesthetics, there is an extraordinary heating and cooling loss due to the lack of an air barrier and necessary insulation. SWA recommends insulating the roof to a total R-38 in addition to condition the ceiling cavity area to prevent future tile buckling.

Plenum between roof and ceiling tiles *Image showing ceiling tiles buckling from humidity*

2.3.3. Base

The building's base is 6" concrete slab on grade. There were no reported problems with water penetration or moisture.

2.3.4. Windows

The double-pane windows appear to be in good condition with no obvious penetrations and with sufficient caulking and sealing around the frame.

Double Pane Windows in good condition

2.3.5. Exterior doors

The entrance ways for the Hillcrest Academy South and Lambert's Mill Academy building consists of a mixture of insulated steel doors set on a metal frame or double pane glass doors with insulated metal frames. The frames of these doors are poor insulators and allow expensive, conditioned air to leak out of the building. The door frames appeared to be in good conditioned. SWA recommends maintaining weather-stripping around all of the doors of the building in order to prevent conditioned air from leaking outside of the building. Weather-stripping should be checked at least once a year and replaced as soon as signs of deterioration start to show.

Double doors in good condition, in need of weather-stripping

2.3.6. Building air tightness

The Hillcrest Academy South and Lambert's Mill Academy building appeared to have relatively tight building envelope. Regular maintenance should be performed to maintain efficient seals in order to keep conditioned air from leaking outside the building, such as weather-stripping doors and caulking around window framing.

2.4. HVAC systems

2.4.1. Heating

The 1571 Lamberts Mill Road building uses a mix of rooftop units and a hot water system to supply heat throughout the entire building. The 13 rooftop units act as gas-fired furnaces and provide warm air to classrooms, offices, the gymnasium, the cafeteria and hallways that are located in the core portion of the building. The entire rooftop HVAC system is ducted through the plenum to force conditioned outside air into the building allowing for heat and fresh air to reach all of the core portions. Each area that receives air via the ducted system, also contain return air ducts that feed back to the air handling units. All of these units were installed in 2001 when a major HVAC renovation was completed. All of these units were in age appropriate condition and were operating as expected.

The hot water heating system at the 1571 Lamberts Mill Road building consists of two H B smith cast iron boilers with an input of 1,352,000 Btuh each and a nameplate efficiency of 80%. Usage is alternated every 3.5 days between each boiler. These units feed a hot water system with two pumps that provide hot water to the 25 unit ventilators located in perimeter classrooms around the building. Each unit contains a heating coil, cooling coil, fan assembly, dampers, filters and controls within a metal cabinet located on the outside walls of perimeter classrooms. Each unit is provided cooling by a dedicated condenser located on the roof, directly over each unit. Outdoor air is brought directly into the cabinets via grilles located on the outside wall of the classrooms. The unit ventilators are designed to mix room air with outside air, condition the air as necessary, and deliver it to the classrooms through grilles located on top of the unit ventilators. The proportion of outside air is controlled by the position of fresh air dampers. Supply air is brought in through the unit ventilators and then exhausted return ducts in each classroom and eventually purged by rooftop exhaust fans.

The building contains a Trane Tracer Summit controls system that contains no digital interface. Settings and system status can only be read when the controls contractor is present with a laptop to serve as a graphical interface. According to building staff, control set points are adjusted only seasonally or when a technician is called into the field. Thermostats are located in offices and interior rooms that allow the occupants to adjust the temperature by up to 6°F. SWA recommends that the central controls system is upgraded to a better system with a local graphical interface. This system should be installed with proper set points such as an outdoor temperature reset and nighttime setback. Ideally, this system would be set up to operate for typical building operations but could also be manually over-ridden if needed by building maintenance staff. Also, programmable thermostats could be added to allow localized control over each room. If only a portion of the system were being used on any particular day, then programmable thermostats could help reduce heating/cooling in rooms that were not currently being operated.

2.4.2. Cooling

The Hillcrest Academy South and Lambert's Mill Academy building is cooled similar to the way that it is heated. The same rooftop units used for heating and ventilation also provide cooling to rooms located in the core of the building which includes classrooms, offices and hallways. The perimeter classrooms rely on unit ventilators for heating, cooling and ventilation. Each unit ventilator has a corresponding condenser located on the roof directly above the unit. According to building staff, the condensers are oversized for the unit ventilators and are inefficient. It is also possible that the cooling coil within each unit is wrongly sized. When condensers are oversized, temperatures fluctuate constantly and the units are not able to wring moisture out of the air. Since the building is currently used as a school but originally consisted of warehouse/factory space, the HVAC system may have been sized incorrectly. Since this building originally had large ceilings and a plenum was created for a drop-tile ceiling, condensers may have been wrongly sized based on volume. Also, the dampers inside each unit ventilator may not be controlling the proportion of outside air versus re-circulated air. SWA recommends that UCESC hires a mechanical design firm to properly size the system and determine if a further work scope is necessary for comfort complaints within the building.

Generally, the unit ventilators were well maintained but some contained dampers that appeared to be clogged and signs of condensation were seen at the bottom of the unit.

The activity room and gymnasium are currently not conditioned. Building management showed concerns that these areas were not currently cooled, especially since these rooms are often used for assemblies, graduations and other ceremonies. The unit is currently controlled together with the lights for this room, by an occupancy sensor. There have been many complaints that the unit is loud and provides distractions during events in the gymnasium.

2.4.3. Ventilation

The Hillcrest Academy South and Lambert's Mill Academy building uses both the rooftop units and unit ventilators to provide fresh air to the building. It appears that enough fresh air is brought into the building; however, there is not enough stale air exhausted from the building. Building ventilation relies on a balance of incoming fresh air and exhausting stale air. Exhaust fans remove stale air while helping induce fresh air into the building. At least three exhaust fans located on the roof were not in operation due to mechanical failure. According to building drawings, each exhaust fan may be responsible for exhausting several classrooms through a ducted system. If one exhaust fan is not working, four or more rooms are potentially not achieving a balance between supply air and return air. When supply air is continually brought into the building without an equal amount of air properly being exhausted, the building becomes positively pressurized and becomes a trap for stale air and moisture. Humid and stale air corresponds to complaints that the building is damp and stuffy.

Building maintenance staff pointed out that a majority of ceiling tiles appear to be sagging and are unsure of the cause. It appears that the "sagging" of the ceiling tiles is due to ceiling tiles becoming saturated from humidity and ultimately sagging in their frame due to the excess weight. Part of the problem is also that the ceiling plenum is not currently insulated. Large differences on either side of the ceiling can create condensation that is also absorbed by the ceiling tiles. There are two options to correct the problem of humidity and stale air in the building:

- The first option would be to have the entire system go through testing and balancing, in which a contractor would come out to the building and perform maintenance on each individual source of ventilation and exhaust. This would also result in any equipment that was not performing as expected, to be replaced. This first option would be the least expensive however; it would only correct an immediate problem and not address the larger flaws of the building. The building performs poorly due to the fact that it was originally a warehouse that was turned into a school. As part of the transformation into a school, many walls were added and distribution within the building was not re-designed to accommodate the needs of a school. Much of the equipment located throughout the building and on the roof is original to the building and are nearing the end of their useful lifetime.

- SWA recommends a second option which would address and correct many of the inherit problems of the building. SWA recommends that the entire building is converted to rooftop units to supply heating, air-condition and ventilation to each space via ductwork. This would include removing all unit ventilators and properly sealing any penetrations on the exterior walls from these units. It would also include replacing any rooftop units that are no longer performing as intended, adding more units to supply air to each room, adding exhaust fans to properly exhaust stale air and also adding ductwork to be sure that each space is supplied with air as well as exhausted of stale air. One major benefit of this second option would be that the roof itself could also be addressed at the same time. As each section is retrofitted, rigid insulation could be added to the roof in order to form a better thermal seal on the building. A reflective roof surface could also be added to prevent solar heat gain and also seal all equipment properly. Equipment that still operated appropriately could remain and still be used. This option would be considerably more expensive than the first option; however it would also address many major energy problems as well as comfort problems that the building is having.

2.4.4. Domestic Hot Water

Domestic Hot Water for the building is provided by a natural gas-fired, atmospheric water heater with an input of 250,000 Btuh and a storage capacity of 100 gallons. The thermal efficiency of this unit is stated on the model nameplate to be 80% efficient. The unit was installed within the last 5 years and appears in good operating condition. There have been no complaints with the amount of hot water delivered to faucets and temperature settings indicated that hot water was leaving the heater at approximately 121°F.

It is not cost-effective to replace the existing water heating equipment with higher efficiency equipment. However, higher efficiency water heating equipment will save energy and should be strongly considered upon replacement of the equipment. Energy saving appliances bearing the ENERGY STAR label should be selected to ensure efficiency performance. Incentives may be available to offset any added costs for the installed equipment.

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 that the aerators in all sinks are retrofitted with low-flow aerators that constrict the volume of water allowed to flow out of the faucets during the time it takes to wash hands, wash dishes, etc. Most of the faucets found in the classrooms had 2.0gpm aerators, while restroom aerators had 0.5gpm aerators. SWA recommends installing 0.5gpm aerators on all faucets in the building. 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 – Most of the lighting within the Hillcrest Academy South and Lambert's Mill Academy building consisted of efficient T8 lighting with electronic ballasts. Lighting in the gymnasium in both schools can be updated from metal halide bulbs to the more efficient T5 fluorescent lighting, while increasing quality of light. The gymnasium is often used for events such as assemblies or graduation. The color of lighting in the gymnasium is not consistent, with some lights glowing pinkish and providing poor quality of lighting at the floor. SWA recommends that T5 fluorescent lighting is installed to reduce energy savings but also increase the quality of light. Due to ductwork located below the ceiling that blocks some light and also causes large shadows to be cast, SWA recommends that new light fixtures are hung slightly lower to overcome the obstruction from the ductwork.

Gymnasium Metal Halide lighting

SWA recommends occupancy sensors for all bathrooms and closets throughout the building. Installing occupancy sensors should help to decrease kWh as lights may be unintentionally left on when unoccupied. Another area that may benefit from occupancy sensors are all storage areas, such as the majority of the basement.

Exit Signs – All of the exit signs in the Hillcrest Academy South and Lambert's Mill Academy building were observed to have already been fitted with LED exit signs.

Exterior Lighting – The lighting for the exterior of the building was observed on the day of the audit and would not be cost-effective to upgrade at this time. Exterior lighting is controlled by one timer located in the mechanical room in the basement. The timer is set to turn the lights on at 8pm and off at 9pm in the summer and 5pm to 9pm in the winter. SWA recommends checking timers on all lighting to verify these hours are correct. Exterior lighting was on during SWA's visit, as noted in the image below.

Exterior lighting on during daylight hours

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 315kwh/yr. The refrigerator in the image below uses 1022 kWh/yr, a savings of $113 per year. 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

Appliances such as televisions, air-conditioners, computers, etc. should all be purchased with energy consumption in mind. Replacing purchased equipment for energy efficiency is most likely not cost-effective but if Energy Star and other energy efficient options are always considered; energy consumption can be maintained throughout the entire use of the building.

Building staff should ensure that all appliances are always shut off when rooms are not in use. Computers and other appliances should be shut down, or at least their screens should be when not in use for extended periods of time.

2.5.3. Elevators

The Hillcrest Academy South and Lambert's Mill Academy building is a one story building and does not contain an elevator.

2.5.4. Other electrical systems

The Hillcrest Academy South and Lambert's Mill Academy building contains a two dry-type electrical transformers located in the boiler room that handle all incoming electrical supply for the building. These transformers vary in size; one older, large 225 kVA transformer and one newer, small 30 kVA. The smaller 30 kVA transformer was installed in July of 2007 and conforms to newer efficiency standards and thus would not be cost-effective to upgrade. The older 225 kVA transformer is at least 20 years old and is considered inefficient by today's transformer efficiency standards. The current transformer has an efficiency of 96.5%. SWA recommends replacing the new 225 kVA transformer to conform to newer efficiency standards which would be approximately 99.1%.

3. EQUIPMENT LIST

	Lambert's Mill Academy (Lower Roof)					
Building System	**Description**	**Physical Location**	**Make/ Model**	**Fuel**	**Space served**	**Estimated Remaining useful life %**
Heating	Boiler #1, H B Smith - Cast iron sectional hot water boiler, built in 1997, Object capacity 1,352,000 Btuh input	Main floor - mechanical room	H B Smith, Model #19-Series-9, Serial #P97-601-P	Natural Gas	All areas	52%
Heating	Boiler #2, H B Smith - Cast iron sectional hot water boiler, built in 1997, Object capacity 1,352,000 Btuh input	Main floor - mechanical room	H B Smith, Model #19-Series-9, Serial #P97-602-P	Natural Gas	All areas	52%
Heating	Burner #1, PowerFlame Burner, Minimum 600 MBH, Maximum 1223 MBH, 1/3 HP motor	Main floor - mechanical room	PowerFlame Burner, Model #JR30A-12HBS-9, Serial #079725166	Natural Gas	All areas	52%
Heating	Burner #2, PowerFlame Burner, Minimum 600 MBH, Maximum 1223 MBH, 1/3 HP motor	Main floor - mechanical room	PowerFlame Burner, Model #JR30A-12HBS-9, Serial #079725167	Natural Gas	All areas	52%
HVAC Controls	Trane - Tracer Summit control panel	Main floor - mechanical room	Trane Tracer Summit, Model #BMTW006AA0A02 240A78600, Serial #E00H15005, DCM Serial #E00H15188	Electricity	All areas	60%
Heating/Cooling	AC-8; Forced air furnace with cooling unit, Trane Voyager, Heating Input: 205,000 Btuh, Heating Output: 166,000 Btuh, R22, MFG date: 8/2001	Lower Roof	Trane Voyager, Model #YCD090D4HCBE, Serial #Z35101236D	Electric/Natural Gas	Lambert's Mill Academy	68%
Heating/Cooling	AC-7; Forced air furnace with cooling unit, Trane Voyager, Heating Input: 250,000 Btuh, Heating Output: 203,000 Btuh, R22, MFG date: 8/2001	Lower Roof	Trane Voyager, Model #YCD150C4HCCA, Serial #Z34102848D	Electric/Natural Gas	Lambert's Mill Academy	68%
Heating/Cooling	AC-6; Forced air furnace with cooling unit, Trane Voyager, Heating Input: 350,000 Btuh, Heating Output: 284,000 Btuh, R22, MFG date: 8/2001	Lower Roof	Trane Voyager, Model #YCD210C4HCCA, Serial #Z35101714D	Electric/Natural Gas	Lambert's Mill Academy	68%
Cooling	Condensor #1 (for unit ventilators), Trane High Efficiency, R22	Lower Roof	Trane High Efficiency, Model Climatuff	Electric	Lambert's Mill Academy	52%
Cooling	Condensor #2 (for unit ventilators), Trane High Efficiency, R22	Lower Roof	Trane High Efficiency, Model Climatuff	Electric	Lambert's Mill Academy	52%
Cooling	Condensor #3 (for unit ventilators), Trane High Efficiency, R22	Lower Roof	Trane High Efficiency, Model Climatuff	Electric	Lambert's Mill Academy	52%
Cooling	Condensor #4 (for unit ventilators), Trane High Efficiency, R22, only unit running on day of audit	Lower Roof	Trane High Efficiency, Model Climatuff	Electric	Lambert's Mill Academy	52%
Cooling	Condensor #5 (for unit ventilators), Trane High Efficiency, R22	Lower Roof	Trane High Efficiency, Model Climatuff	Electric	Lambert's Mill Academy	52%
Cooling	Condensor #6 (for unit ventilators), Trane High Efficiency, R22	Lower Roof	Trane High Efficiency, Model Climatuff	Electric	Lambert's Mill Academy	52%
Distribution System	Fan coil units per each perimeter classroom, Trane thermostats (non-programmable)	Main floor - perimeter rooms	Brand unavailable	Electric/Hot Water	All areas	30%
Ventilation	Exhaust fan #1, nameplate missing, unit was not running	Lower Roof	NA, Nameplate missing	Electric	Lambert's Mill Academy	0%
Ventilation	Exhaust fan #2, Penn Ventilator, unit was running	Lower Roof	Penn Ventilator, Model #DR12/RC12	Electric	Lambert's Mill Academy	20%
Ventilation	Exhaust fan #3, PennBarry, Tag# Fan1, 946 Fan RPM, 1/4 HP, unit was running	Lower Roof	PennBarry, Model #DX11B, Serial #E09UZ94303	Electric	Lambert's Mill Academy	20%
Ventilation	Exhaust fan #4, Dayton, 1550 Fan RPM, 1/10 HP, unit was not running	Lower Roof	Dayton Power-roof ventilator, Model #3L401	Electric	Lambert's Mill Academy	20%
Ventilation	Exhaust fan #5, Dayton, 1550 Fan RPM, 1/10 HP, unit was not running	Lower Roof	Dayton Power-roof ventilator, Model #3L401	Electric	Lambert's Mill Academy	20%
Ventilation	Exhaust fan #6, Penn Ventilator, unit was running	Lower Roof	Penn Ventilator, Model #DR12/RC12	Electric	Lambert's Mill Academy	20%

Ventilation	Exhaust fan #7, Penn Ventilator, unit was running	Lower Roof	Penn Ventilator, Model #DR8/RC8	Electric	Lambert's Mill Academy	20%
Ventilation	Exhaust fan #8, Penn Ventilator, unit was running	Lower Roof	Penn Ventilator, Model #-01	Electric	Lambert's Mill Academy	20%
Ventilation	Exhaust fan #9, Penn Ventilator, Tag # CEF-3, unit was running	Lower Roof	Penn Ventilator, Model #DX11B	Electric	Lambert's Mill Academy	20%
Ventilation	Exhaust fan #10, Penn Ventilator, Tag #EF 3,4, unit was running	Lower Roof	Penn Ventilator, Model #DX11B	Electric	Lambert's Mill Academy	20%
Ventilation	Exhaust fan #11, Penn Ventilator, Tag # EF-2, unit was running	Lower Roof	Penn Ventilator, Model #DX12B	Electric	Lambert's Mill Academy	20%
Domestic Hot Water	A. O Smith Master-Fit, Atmospheric natural gas water heater with draft inducer, Input 250,000 Btuh, Capacity 100.0 gallons, Recovery 242.40 gal/hr, Thermal efficiency 80%	Main floor - mechanical room	A O Smith, Model #BTR 250A 118, Serial #K07M001595	Natural Gas	All areas	40%
Heating	Belimo HW valve	Main floor - mechanical room	Belimo, Model #AF 24-SR US	Electric	All areas	40%
Heating	HW Circulator Pump #1, Armstrong, 1.5HP	Main floor - mechanical room	Armstrong, Model #H-68-BF, Serial #6.75 9706	Electric	All areas	10%
Heating	HW Circulator Pump #2, Armstrong, 1.5HP	Main floor - mechanical room	Armstrong, Model #H-68-3, Serial #000 0	Electric	All areas	10%
Domestic Hot Water	Taco cartridge circulator, 1/25th HP, 3250 RPM	Main floor - mechanical room	Taco, Model #007-BF4	Electric	All areas	40%
Domestic Hot Water	Taco clock-timer aquastat for circulator	Main floor - mechanical room	Taco, Model #265	Electric	All areas	40%
Domestic Hot Water	Hatco Booster water heater, 15.0 kW, 140F setpoint	Main floor - kitchen	Hatco Compact Series, Model #C-15, Serial #9627880528	Electric	Kitchen	20%
Lighting	See details appendix A	-	-	-	-	-
Lighting	Tork pin-type exterior lighting timer, Lights are on from 4pm to 6am	Main floor - mechanical room	Tork, Model #T920L	Electric	Exterior lights	60%
Lighting	Tork pin-type exterior lighting timer, Lights are on from 6pm to 6am	Main floor - mechanical room	Tork, Model #TZ300L	Electric	School Sign	60%
Electric Distribution	Eaton/Cutler-Hammer Dry-type distribution transformer, 7/17/07, 30 kVa	Main floor - mechanical room	Eaton/Cutler-Hammer Series A, Catalog #V48M28T30EE, Serial #J07G00849	Electric	All areas	93%
Electric Distribution	Cutler-Hammer/Westinghouse Dry-type distribution transformer, Class AA, Type 2 enclosed, 3-phase, 225.0 kVa, 4.7% impedance, 96.5% efficient	Main floor - mechanical room	Westinghouse, Style #V48M28E22B, Serial #J95 D1007	Electric	All areas	22%

	Lambert's Mill Academy (Upper Roof)					
Building System	**Description**	**Physical Location**	**Make/ Model**	**Fuel**	**Space served**	**Estimated Remaining useful life %**
Heating	Trane gas-fired outdoor unit heater, Tag #KMA-1, 7/23/1997, Input 600,000 Btuh, Output 480,000 Btuh	Upper Roof	Trane, Model #GRAA60GFJBON 7CF105C0LRT, Serial #A97E37119	Electric/Natural Gas	Hillcrest Academy	48%
Heating	Captive-Aire Systems, Inc. Gas burning direct-fired heater for use with integral group primary safety controls, 4200 CFM, 1129 RPM, Input min. 15,000 Btuh, Input max. 317,520 Btuh	Upper Roof	Captive-Aire Systems, Inc., Model #NHMUA 2-12-12, Serial #82878-40	Electric/Natural Gas	Hillcrest Academy	48%
Heating	HV-1; Trane gas-fired outdoor unit heater, Input 800,000 Btuh, Output 640,000 Btuh, 7/23/97, 15HP motor, Airflow 5000-13500 CFM	Upper Roof	Trane, Model #GRAA80PFJB0N 3JU105H0ELQT, Serial #A97E37118	Electric/Natural Gas	Hillcrest Academy	48%
Heating	HV-2; Trane gas-fired outdoor unit heater, Input 800,000 Btuh, Output 640,000 Btuh, 8/13/97, 3 HP motor, Airflow 5000-8000 CFM	Upper Roof	Trane, Model #GRAA80PFHB0N 7CF102A0ELQT, Serial #A97F36577	Electric/Natural Gas	Hillcrest Academy	48%
Heating	MUA-1; Trane gas-fired outdoor unit heater, Input 350,000 Btuh, Output 280,000 Btuh, Airflow 1900-5700 CFM, 7/23/97	Upper Roof	Trane, Model #GRAA35GFHB0N 1LF1C2A0, Serial #A97F37326	Electric/Natural Gas	Hillcrest Academy	48%
Heating/Cooling	AC-1; Trane combination cooling and heating unit, 6/1/97, R22	Upper Roof	Trane, Model #YCD210C4HGBA, Serial #M24104567D	Electric/Natural Gas	Hillcrest Academy	48%
Heating/Cooling	AC-2; Trane combination cooling and heating unit, 6/1997, R22	Upper Roof	Trane, Model #YCD300B4HGEA, Serial #M24104575D	Electric/Natural Gas	Hillcrest Academy	48%
Heating/Cooling	AC-3; Trane combination cooling and heating unit, 6/1997, R22	Upper Roof	Trane, Model #YCD180B4HGEA, Serial #M24104560D	Electric/Natural Gas	Hillcrest Academy	48%
Heating/Cooling	AC-4; Trane combination cooling and heating unit, 6/1997, R22	Upper Roof	Trane, Model #YCD240B4HGEA, Serial #M24104570D	Electric/Natural Gas	Hillcrest Academy	48%
Heating/Cooling	AC-5; Trane Combination cooling and heating unit, 6/1997, R22	Upper Roof	Trane, Model #YCD150C4HGBA, Serial #M24105468D	Electric/Natural Gas	Hillcrest Academy	48%
Cooling	Two (2) Trane rooftop air conditioner, R22, 1/4 HP motor	Upper Roof	Trane, Model #2TTA0048A4000A A, Serial #7303M873F	Electricity	Hillcrest Academy	48%
Cooling	Eleven (11) Trane High Efficiency Condensors, 1997, lined on the perimeter	Upper Roof	Trane High Efficiency, Model #NA	Electricity	Hillcrest Academy	48%
Ventilation	Exhaust fan #1, PowerLine large exhaust fan, 35,226 CFM, 524 RPM, 5 HP motor, unit was not running	Upper Roof	PowerLine, Model #54DR8P	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust fan #2, Penn Ventilator, Tag #EF6, unit was not running	Upper Roof	Penn Ventilator, Model #DX08D	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust fan #3, Penn Ventilator power ventilator for restaurant (kitchen) exhaust, Tag #CEF, unit was not running	Upper Roof	Penn Ventilator, Model #FX13BFT	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust fan #4, Penn Ventilator, Tag #CEF-2, unit was running	Upper Roof	Penn Ventilator, Model #DX11B	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust fan #5, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust fan #6, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #7, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #8, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #9, Penn Ventilator, Tag #EF-5	Upper Roof	Penn Ventilator, Model #DX14B	Electricity	Hillcrest Academy	20%

Ventilation	Exhaust Fan #10, Commercial Products Group, square top exhaust, no nameplate, unit was not running	Upper Roof	NA, nameplate missing	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #11, Penn Ventilator, Tag #CEF-1, unit was running	Upper Roof	Penn Ventilator, Model #DX11B	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #12, Penn Ventilator, unit was not running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #13, Penn Ventilator, unit was not running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #14, Penn Ventilator, unit was not running	Upper Roof	Penn Ventilator, Model #DR20/RC20	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #15, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #DR20/RC20	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #16, Penn Ventilator, unit was not running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #17, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #DR29	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #18, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #DR29	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #19, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #20, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #21, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #22, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #23, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #24, Penn Ventilator, Tag #GEF-3, unit was running	Upper Roof	Penn Ventilator, Model #DX11B	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #25, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #DX14B	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #26, Penn Ventilator, unit was running	Upper Roof	Penn Ventilator, Model #DX14B	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #27, Penn Ventilator, Tag #FAN 1, 1/4 HP motor, unit was running	Upper Roof	Penn Ventilator, Model #DX11B	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #28, Penn Ventilator, Tag #GEF-1,2, unit was running with clunking sounds and a lot of vibration	Upper Roof	Penn Ventilator, Model #DX11B	Electricity	Hillcrest Academy	20%
Ventilation	Exhaust Fan #29, Penn Ventilator, unit was not running	Upper Roof	Penn Ventilator, Model #FR-10	Electricity	Hillcrest Academy	20%

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

4. ENERGY CONSERVATION MEASURES

Based on the assessment of this building, SWA has separated the investment opportunities into three categories of recommendations:

Category I Recommendations: Capital Improvements

- Preventative maintenance contract – Hiring a local contractor with expertise in energy efficiency and knowledge in similar type buildings to perform routine preventative maintenance can ensure that all systems operate correctly in the building. Due to the age of the building and the age of the systems within the building, there are many pieces of equipment that are nearing the end of their lifetime. Setting up a preventative maintenance contract can extend the life of existing equipment. Preventative maintenance can also reduce maintenance costs by addressing concerns before they become costly problems.
- Replace roof and add insulation – SWA recommends that as part of a capital improvement plan, that UCESC replace the roof of the entire building. Approximately 6 inches of rigid insulation (or a minimal insulation value of R-38) should be added in order to help prevent the loss of warm conditioned air from the building. A light colored, reflective surface should be installed in order to reduce the amount of solar heat gain that penetrates into the building. The rigid insulation should form proper drainage planes so that standing water is not allowed on the roof surface. The parapet as well as all mechanical equipment should be sealed well to the roof surface to prevent future water leaks.
- Install lighting occupancy sensors – Occupancy sensors should be installed in smaller rooms such as closets and bathrooms. These occupancy sensors may decrease energy usage on a daily basis but are not quantified due to the sporadic use of smaller rooms in school buildings. Occupancy sensors help to reduce the risk of lights being left on for extended periods of time such as nights and weekends.
- Convert HVAC to complete rooftop system – As an alternative to testing and balancing the entire HVAC system could be upgraded to a rooftop-based system. There are obvious problems with the design of the HVAC system as it is now. The unit ventilators are not properly heating, cooling or ventilating. UCESC could further investigate the option of removing all unit ventilators and converting to an entire forced air, rooftop based HVAC system. The building was original designed as a factory/warehouse and although some HVAC equipment has been replaced and all of the equipment has been reasonably maintained, the distribution system has not been effective. The roof cavity between the ceiling and the roof would allow more distribution ducts to be added. This measure would ideally be completed in conjunction with replacing the roof and adding roof insulation. If UCESC moves forward with this recommendation, SWA recommends that 6” of rigid insulation is added to the roof (minimum R-38). Installing this roof would require that existing equipment would be lifted and sealed properly to a newer roof membrane. A reflective, light-colored roof surface should be applied in order to reduce the amount of solar radiation that is allowed to enter the building through the roof surface. UCESC would need to hire an engineering design firm to properly size new equipment as well as extend the distribution ductwork in order to provide supply and return air to each space. This is a capital intensive measure and was not included as an Energy Conservation Measure below as it would not have a positive return on investment. This option would be an alternative to ECM-2 and ECM-3 listed below. Replacing the existing system with an entirely new system would address energy efficiency, health and safety, and also comfort concerns.

Category II Recommendations: Operations and Maintenance

- Replace exhaust fans – Approximately 5 of the rooftop exhaust fans need to be replaced at this point in time. The remaining rooftop exhaust fans are nearing the end of their useful lifetime. Exhaust air is important for this building in order to remove stale, humid air from the building. When the building exhaust system is not functioning as designed, stale air can become trapped in the building. For a building like this, when moisture is a problem, the exhaust fans prevent the building from ridding itself of humid, stale air and essentially not allow the building to dry itself from the inside out. Installation cost savings can be achieved if rooftop exhaust fans are addressed at the same time as the replacing the roof. Replacing exhaust fans will increase energy usage since fan power is increased and more air will be exhausted from the building. Exhaust fan replacement is recommended for the proper ventilation of the building as well as health and comfort concerns.

- Weather Stripping/Air Sealing - SWA observed that exterior door weather-stripping 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 frame. 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-effect 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-consuming fixtures and appliances will save both energy and money through reduced energy consumption for water heating, while also decreasing water and sewer bills.

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description
1	**Upgrade 25 metal halides to T5 fluorescent pendant fixtures**
2	**Install 21 occupancy sensors**
3	**Upgrade central control system and install programmable thermostats**
4	**Unit ventilator maintenance and control optimization**
5	**Replace 225 kVA transformer**
6	**Install 20kW Photovoltaic system**

ECM#1: *Upgrade 25 metal halides to pulse start metal halide fixtures*

Description:

The Hillcrest Academy South and Lambert's Mill Academy building contains approximately 25 fixtures in gymnasiums that can benefit from new T5 fluorescent, pendant light fixtures. The gymnasium and activity room lighting currently consists of 400W metal halide bulbs. Metal halide bulbs are traditionally used in schools but use an excessive amount of electricity and provide poor quality light. The quality of metal halide bulbs also diminish over time and can alter the color of light produced as the bulb ages. The spaces that contain metal halide bulbs are dim and contain bulbs that give off slightly different colors. SWA observed that sum lights gave off a typical white color while other gave off orange or pinkish colors. Also, these metal halide fixtures are hung so that ductwork located below the ceiling blocks some light and causes large shadows to be cast. SWA recommends that these fixtures are upgraded to newer, T5 lighting fixtures and are also hung low enough to clear the ducts without interfering with gymnasium activities. Newer T5 light fixtures that are meant for commercial applications contain four T5 linear bulbs that are approximately 2' in length. These fixtures use much less power and also provide a better quality of light that does not diminish over time. In comparison, 400W metal halide fixtures consume 454W of power when used while the recommended T5 fixtures only consume 228W of power. When these fixtures are installed, it is also recommended that they are left on an occupancy sensor; however, they should no longer be connected with the gymnasium HVAC system.

Installation cost:

Estimated installed cost: $4,931
Source of cost estimate: RS *Means*

Economics:

ECM #	ECM description	Cost Source	Est. installed cost, $	Est. incentives, $	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
ECM #1																			
1	Upgrade 25 metal halides to T5 fluorescent pendant fixtures	RSMeans	$12,031	$7,100	$4,931	9,670	2.0	0	0.6	$253	$1,897	15	$22,321	2.6	352.7%	23.5%	38.2%	$17,714	17,314

Assumptions: SWA calculated the savings for this measure using information collected during the field visit and analysis of historical utility consumption information.

Rebates/financial incentives:

NJ Clean Energy – Prescriptive Lighting Incentive, Incentive based on installing T5 high bay fixtures ($16-$284 per fixture)
Maximum incentive amount is $7,100

Options for funding ECM:

This project may benefit from enrolling in either the NJ Pay-for-Performance program or the NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/home/home

ECM#2: *Install 21 occupancy sensors*

Description:

The Hillcrest Academy South and Lambert's Mill Academy building contains many smaller rooms that are used sporadically throughout the day. A majority of these rooms such as offices, closets and mechanical rooms can benefit from installing an occupancy sensor. It is important that these occupancy sensors are installed in an ideal location, where they can sense any slight motion in the room. Installing occupancy sensors in corners, too close to doorways or at an incorrect heights will not allow the sensor to detect motion easily. Each sensor has a delay timer setting that should be adjusted for each room. This delay timer controls how long it will take a light to shut off via the sensor after no motion is detected. It is important that the delay settings are set correct to prevent lights from constantly shutting off when the room is still in use and also to minimize the amount of time that lights are allowed to remain on after all occupants have left a room. SWA recommends installing a total of 21 occupancy sensors throughout the Lambert's Mill Road building. A complete lighting schedule including occupancy sensors has been attached in Appendix A of this report. Savings for sensors are shown by adjusting the runtime hours of applicable light fixtures.

Installation cost:

Estimated installed cost: $9,275 (including incentives)
Source of cost estimate: RS *Means*

Economics:

ECM #2																			
ECM #	ECM description	Cost Source	Est. installed cost, $	Est. incentives, $	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
2	Install 21 occupancy sensors	RSMeans	$4,620	$420	$4,200	8,356	1.7	0	0.5	$0	$1,421	15	$16,715	3.0	298.0%	19.9%	33.4%	$12,758	14,961

Assumptions: SWA calculated the savings for this measure using information collected during the field visit and analysis of historical utility consumption information.

Rebates/financial incentives:

NJ Clean Energy Lighting Controls – Wall mounted occupancy sensors ($20 per control)
Maximum incentive amount is $420.

Options for funding ECM:

This project may benefit from enrolling in either the NJ Pay-for-Performance program or the NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/home/home

ECM#3: *Upgrade central control system and install programmable thermostats*

Description:

The Hillcrest Academy South and Lambert's Mill Academy building currently has a Trane Tracer Summit control system. This control system is currently responsible for alternating use between each boiler as well as controlling the heating of the boilers based on season. The control system consists of a terminal located in the boiler room with no graphic display. Controls for the boiler are set by calling a third-party controls contractor to either change set points remotely or come to the site and change settings with a laptop plugged into the control panel. SWA recommends that an upgraded controls system install that provides local access to controls and parameters. Building maintenance staff can be properly trained to operate a control system that would allow for better control over daily operations. A new building control system should have an outdoor temperature reset based on a sensor installed at the building as well as nightly setbacks. In addition to a central control, office areas that currently have thermostatic control should be upgraded with programmable thermostats. Programmable thermostats can help spaces be setback during nights, weekends and holidays as well as provide occupants with a degree of comfort control.

Installation cost:

Estimated installed cost: $13,191
Source of cost estimate: RS *Means*

Economics:

ECM #3																					
ECM #	ECM description	Cost Source	Est. installed cost, $	Est. incentives, $	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
3	Upgrade central control system and install programmable thermostats	RSMeans	$13,191	$0	$13,191	1,154	0.2	0	0.1	$0	$196	10	$1,657	67.2	-87.4%	-8.7%	-14.7%	($10,849)	2,066

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit, and billing analysis. Savings were estimated by assuming system would contain a local outdoor temperature reset as well as thermostat setbacks in office areas.

Rebates/financial incentives:

There are currently no incentives for this measure.

Options for funding ECM:

This project may benefit from enrolling in either the NJ Pay-for-Performance program or the NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/home/home

ECM#4: *Unit ventilator maintenance and control optimization*

Description:

There are several problems that lead to dampness within the building at 1571 Lambert's Mill Road. A portion of the problem is resulting from the unit ventilators located in the perimeter classrooms. These unit ventilators each contain a dedicated condenser located directly above the unit on the roof. Building staff informed SWA that it was well-known that the condensers are oversized for the units. When condensers are over-sized, the unit has a hard time responding to fluctuating temperature and results in not being able to wring moisture out of the air effectively. In addition to the condenser being over-sized, the cooling coil within the unit may also be sized wrong. As a first step, SWA recommends that a contractor is hired to perform maintenance on each individual unit ventilator. Maintenance should include testing to make sure the damper that regulates outdoor air is functioning properly and timers are properly set to turn the unit on and off as building schedules permit. Maintenance on these units will assure that they are working properly and will also optimize controls. As a second step, the hired contractor should be able to determine if it is necessary for more work to be performed on these units in the future such as replacing the condensers and/or cooling coil within the unit.

Installation cost:

Estimated installed cost: $18,869
Source of cost estimate: RS *Means*

Economics:

ECM #4																				
ECM #	ECM description	Cost Source	Est. installed cost, $	Est. incentives, $	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
4	Unit ventilator maintenance and control optimization	RSMeans	$18,869	$0	$18,869	112	0.0	1,640	2.8	$0	$2,692	15	$31,680	7.0	67.9%	4.5%	6.3%	$4,548	18,278

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit, and billing analysis. RSMeans was used to estimate a cost on a per unit basis. An extra cost of 25% was added to the entire scope of work to account for additional work required by some individual units. Savings are based on reducing run time of each unit ventilator and providing more effective control.

Rebates/financial incentives:

There are currently no incentives for this measure.

Options for funding ECM:

This project may benefit from enrolling in either the NJ Pay-for-Performance program or the NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/home/home

ECM#5: *Replace 225 kVA transformer*

Description:

The recommended measure consists of disconnecting and removing the existing distribution transformer and installing a new unit compliant with DOE's latest standards of high efficiency transformers. The design should include load calculations and sizing of the new system in order to achieve the best possible efficiency for this application.

Installation cost:

Estimated installed cost: $24,213
Source of cost estimate: RS *Means*

Economics:

ECM #5																				
ECM #	ECM description	Cost Source	Est. installed cost, $	Est. incentives, $	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
5	Replace 225 kVA transformer	RSMeans	$24,213	$0	$24,213	16,953	3.5	0	1.0	$0	$2,882	25	$49,085	8.4	102.7%	4.1%	11.0%	$25,972	30,354

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit, and billing analysis. Savings are calculated based on the current efficiency of 96.5% and the efficiency performance of a new, high efficiency model (source DOE/EERE) sized to the existing capacity. While this assumption is conservative, re-sizing the equipment could lead to achieving further savings.

Rebates/financial incentives:

There are currently no incentives for this measure.

Options for funding ECM:

This project may benefit from enrolling in either the NJ Pay-for-Performance program or the NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/home/home

ECM#6: ***Install a roof-mounted 20kW photovoltaic system***

(See section 5.2 below)

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There are currently no existing renewable energy systems.

5.2. Solar Photovoltaic

ECM#6: *Install a roof-mounted 20kW photovoltaic system*

Description:

The recommended measure consists of installing a 20kW Photovoltaic system on the roof of the building. It has been determined that this project is a good candidate for a photovoltaic system based on available roof area as well as a high baseload energy usage as well as a large average peak demand. If UCESC decides to move forward with a roof replacement, a solar installer should be consulted as part of the new roof design. Installed costs may be able to be reduced if the photovoltaic system is incorporated into the design of the roof. The size of the system was determined based on roughly 1,700 square feet available of roof area. Mechanical equipment located on the roof prohibited the analysis of a larger photovoltaic system. A solar installer may be able to maximize the system based on design of the system and optimizing the available roof area.

Installation cost:

Estimated installed cost: $120,000 (including incentives)
Source of cost estimate: RS *Means*

Economics:

ECM #6																				
ECM #	ECM description	Cost Source	Est. installed cost, $	Est. incentives, $	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
6	Install 20kW Photovoltaic system	RSMeans	$140,000	$20,000	$120,000	23,608	23.0	0	1.4	$0	$17,813	15	$209,611	6.7	74.7%	5.0%	14.3%	$190,187	42,270

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit, and billing analysis. The system is sized based on available roof area and would provide electricity much below the baseload of the building. Based on electricity usage alone, a larger system can be installed. Solar Renewable Energy Credits (SRECs) have been estimated at $600/MWh generated. Installation cost includes an incentive of $1/watt installed.

Rebates/financial incentives:

Solar installation program ($1 per watt installed).
Maximum solar incentive $20,000

Market-rate SRECs (assuming SREC=$600)
Maximum incentive assuming 23 SRECs earned per year is $13,800.

Options for funding ECM:

This project may benefit from enrolling in either the NJ Pay-for-Performance program or the NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/home/home

5.3. Solar Thermal Collectors

Solar thermal collectors are not cost effective for this project and are not recommended due to the low amount of domestic hot water use throughout the building.

5.4. Combined Heat and Power

CHP is not applicable to this project because of the HVAC system type and limited domestic hot water usage.

5.5. Geothermal

Geothermal is not applicable to this project because it would require modifications to the existing heat distribution system, which would not be cost effective.

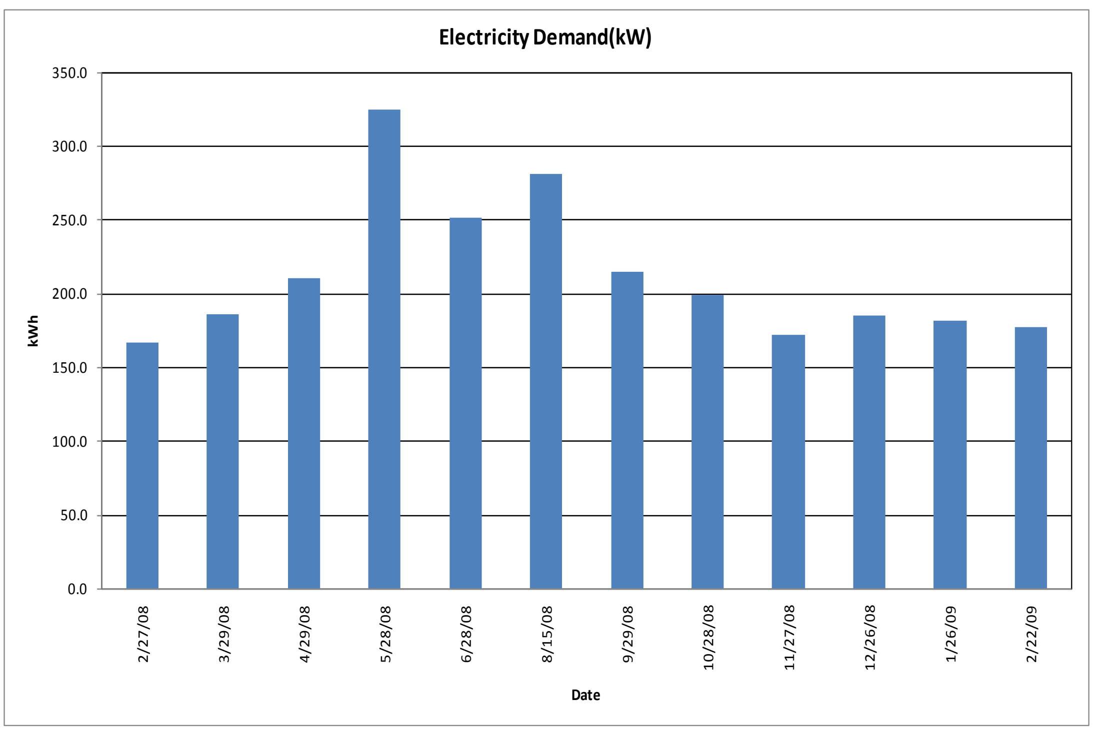
5.6. Wind

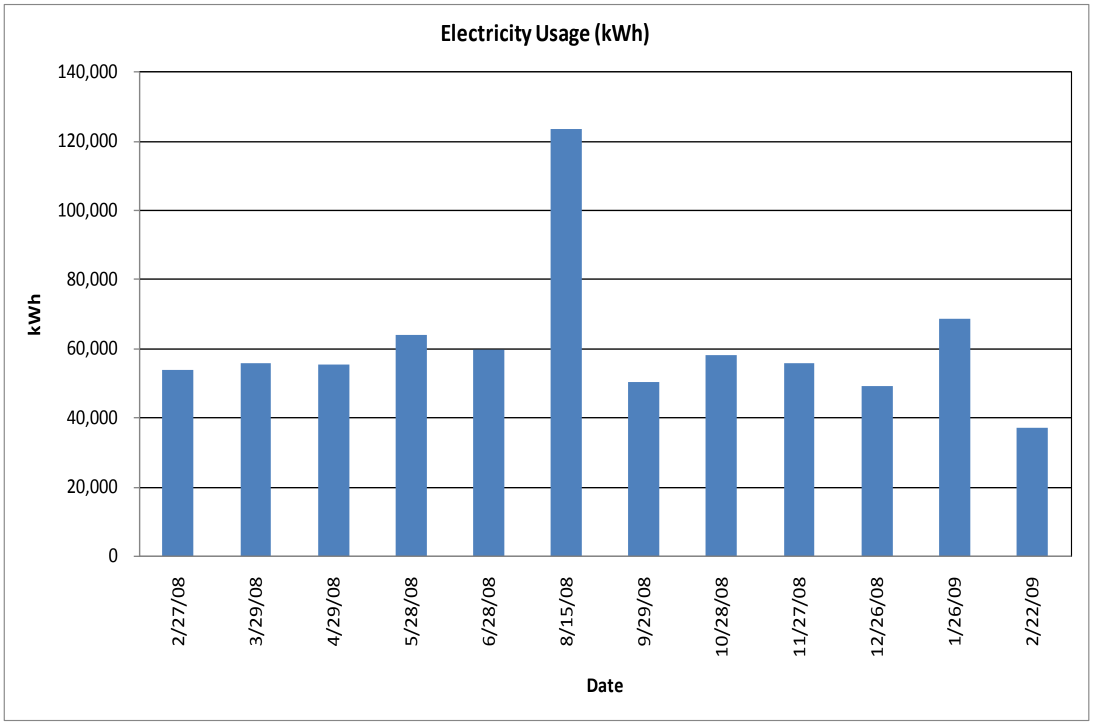
Wind power production is not appropriate for this location because required land is not available for the wind turbine. Also, the available wind energy resource is very low.

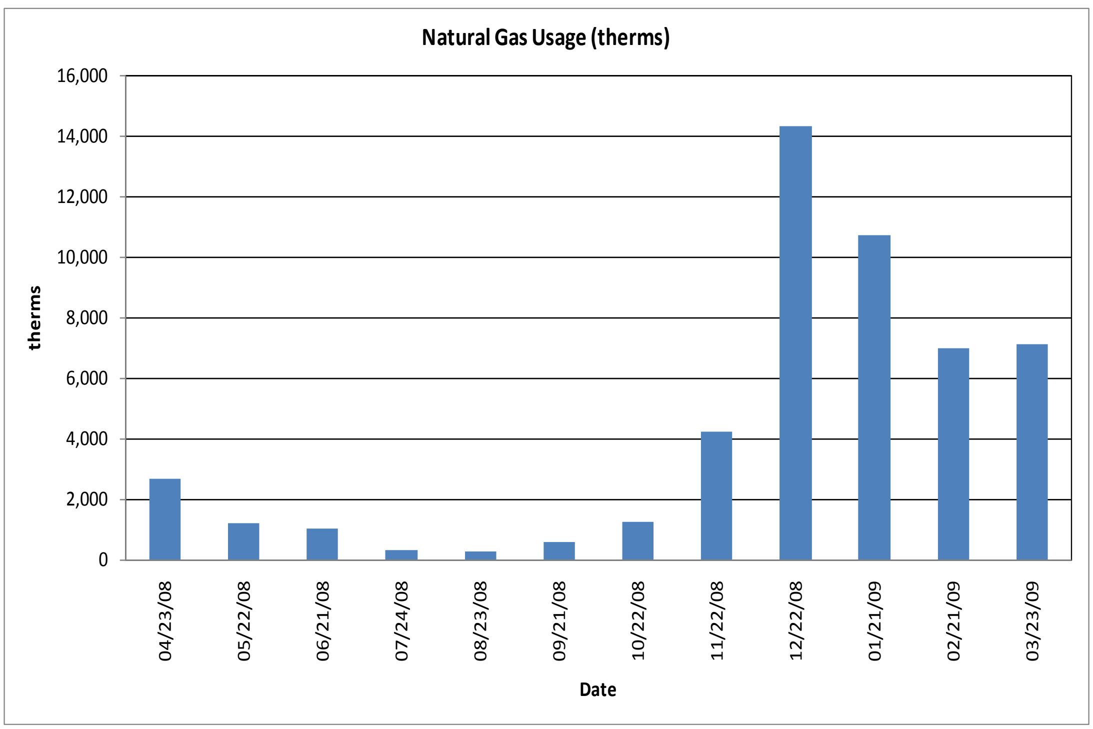
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load profiles

The average electrical peak demand for the previous year was 212.7 kW and the maximum peak demand was 324.8 kW. The electric and gas load profiles for this project are presented in the following charts. The first chart shows electric demand (in kW) for the previous 12 months and the other two charts show electric and gas usage (in kWh), respectively.







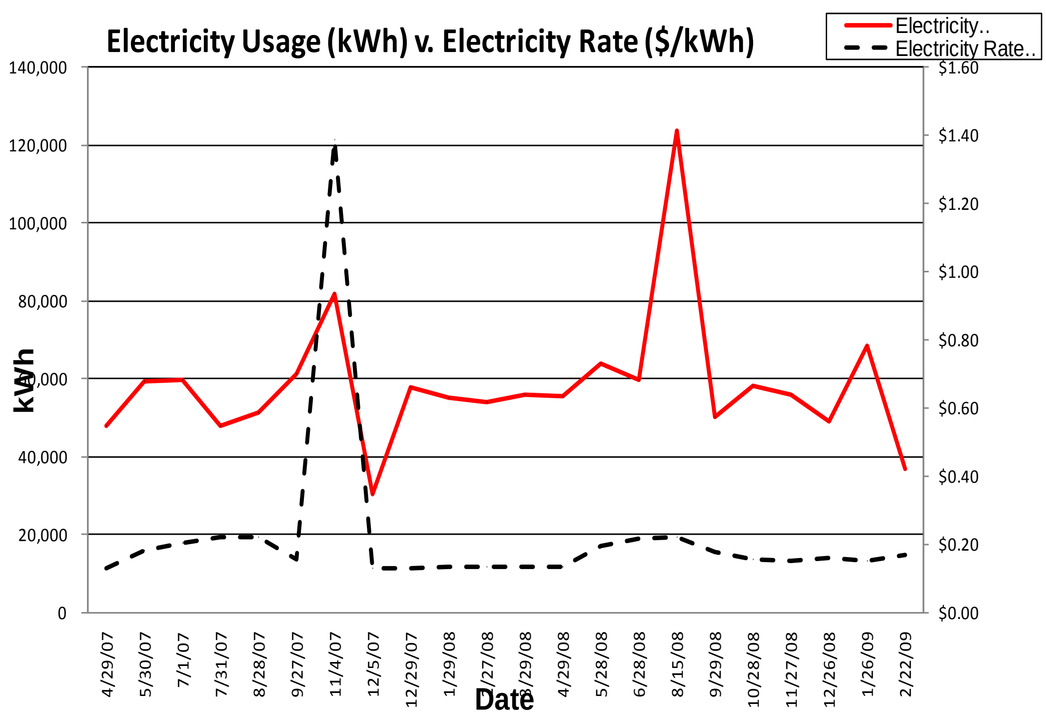
6.2. Tariff analysis

The Hillcrest Academy South and Lambert's Mill Academy building currently buys electricity from PSE&G at the general service rate, which charges customers based on the market rate of electricity usage as well as monthly peak demand. Gas is purchased from Elizabethtown Gas at the BGSS service rate which charges customers based on the market rate of natural gas usage. General Service rates are appropriate for this building due to its size.

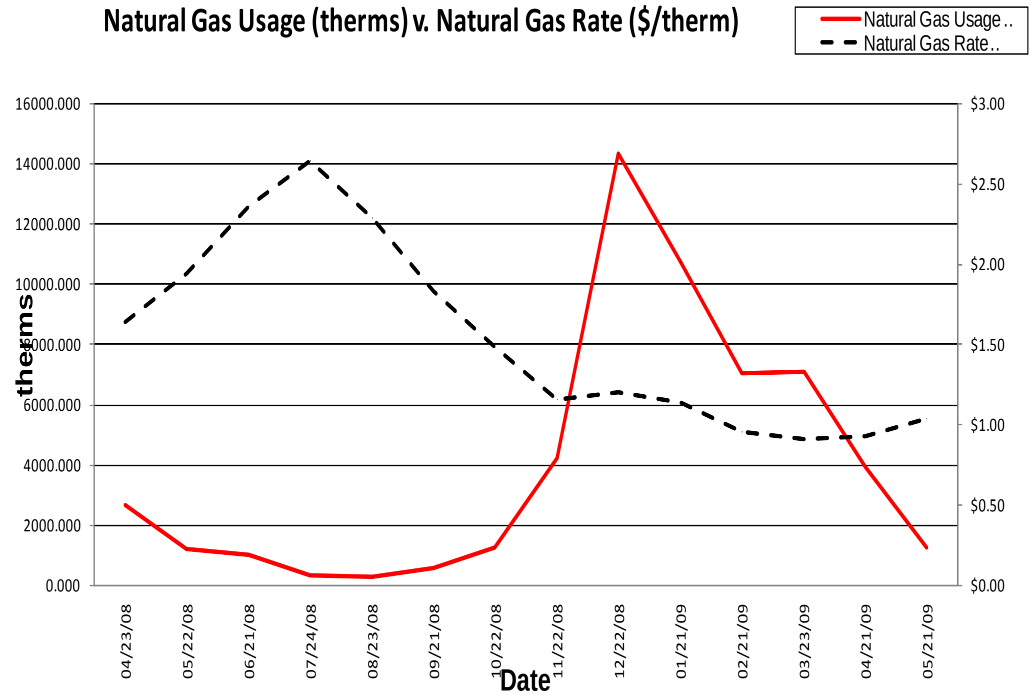
6.3. Energy Procurement strategies

Billing analysis shows price fluctuations of over 20% over the course of the year for the building electrical and natural gas accounts. Customers that have a large variation in monthly billing rates can often reduce the costs associated with energy procurement by selecting a third party energy supplier. Contact the NJ Energy Choice Program for further information on Energy Services Companies (ESCOs) that can act as third party energy suppliers. Purchasing electricity from an ESCO can reduce electric rate fluctuation and ultimately reduce the annual cost of energy for the school. Appendix B contains a complete list of third party energy suppliers.

Currently, New Jersey commercial buildings of similar type pay $0.150/kWh for electricity and $1.55/therm for natural gas. Currently, the electricity rate for the Lambert's Mill Road building is $.17/kWh which means there is a potential cost savings of $14,646 per year. The current natural gas rate for the Lambert's Mill Road building is $1.63/therm which means there is a potential cost savings of $4,072 per year. A large cost savings potential for both electricity and natural gas exists, however this involves contacting third party suppliers and negotiating utility rates. SWA recommends that UCESC further explore opportunities of purchasing electricity and natural gas from third party energy suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Lambert's Mill Road building. Appendix B contains a complete list of third party energy suppliers for UCESC service area. USESC may want to consider partnering with other school districts, municipalities, townships and communities to aggregate 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.



Electricity prices reflect electricity usage



Natural gas prices fluctuate as expected with usage

The building could be eligible for enrollment in a Demand Response Program because the minimum electric demand each month greatly exceeds 50 kW, which is the typical threshold for considering this option.

7. METHOD OF ANALYSIS

7.1. Assumptions and methods

Energy modeling method:	Spreadsheet-based calculation methods
Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data)
	RS Means 2009 (Building Construction Cost Data)
	RS Means 2009 (Mechanical Cost Data)
	Note: Cost estimates also based on utility bill analysis and prior experience with similar projects.

7.2. Disclaimer

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

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

Appendix A: Lighting study

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	GF	Admin. Office	Parabolic	E	4'T8	6	3	32	S	8	261	10	586	1,328	C	Parabolic	4'T8	E	OS	6	3	32	6	261	10	586	996	0	332	332
2	GF	Gymnasium	HID	N	MH	16	1	400	S	6	261	54	6,454	11,375	N/A	Parabolic	2'T5	E	S	16	4	50	6	261	7	3,207	5,187	6,189	0	6,189
3	GF	Gymnasium	Exit Sign	N	LED	4	1	5	N	24	365	1	21	210	N/A	Exit Sign	LED	N	N	4	1	5	24	365	1	21	210	0	0	0
4	GF	Admin. Office	Parabolic	E	4'T8	6	1	32	S	8	261	3	195	438	N/A	Parabolic	4'T8	E	S	6	1	32	8	261	3	195	438	0	0	0
5	GF	Admin. Office	Exit Sign	N	LED	4	1	5	N	24	365	1	21	210	N/A	Exit Sign	LED	N	N	4	1	5	24	365	1	21	210	0	0	0
6	GF	Admin. Office	Parabolic	E	4'T8	2	1	32	S	8	261	3	67	146	N/A	Parabolic	4'T8	E	S	2	1	32	8	261	3	67	146	0	0	0
7	GF	Admin. Office	Parabolic	E	4'T8	1	3	32	S	8	261	10	106	221	N/A	Parabolic	4'T8	E	S	1	3	32	8	261	10	106	221	0	0	0
8	GF	Gymnasium	HID	N	MH	9	1	400	S	6	261	54	3,654	6,399	N/A	Parabolic	2'T5	E	S	9	4	50	6	261	7	1,807	2,917	3,481	0	3,481
9	GF	Gymnasium	Exit Sign	N	LED	3	1	5	N	24	365	1	16	158	N/A	Exit Sign	LED	N	N	3	1	5	24	365	1	16	158	0	0	0
10	GF	Bathroom Men 69	Parabolic	E	4'T8	4	3	32	S	7	261	10	394	775	N/A	Parabolic	4'T8	E	S	4	3	32	7	261	10	394	775	0	0	0
11	GF	Weight Room 76	Parabolic	E	4'T8	7	3	32	S	2	261	10	682	387	N/A	Parabolic	4'T8	E	S	7	3	32	2	261	10	682	387	0	0	0
12	GF	Small Office 76	Parabolic	E	4'T8	2	3	32	S	2	261	10	202	111	N/A	Parabolic	4'T8	E	S	2	3	32	2	261	10	202	111	0	0	0
13	GF	Utility Rm 62	Parabolic	E	4'T8	3	2	32	S	2	261	6	198	110	N/A	Parabolic	4'T8	E	S	3	2	32	2	261	6	198	110	0	0	0
14	GF	Closet 60	Parabolic	E	4'T8	1	2	32	S	2	261	6	70	37	N/A	Parabolic	4'T8	E	S	1	2	32	2	261	6	70	37	0	0	0
15	GF	Utility Rm 59	Parabolic	E	4'T8	2	2	32	S	2	261	6	134	73	N/A	Parabolic	4'T8	E	S	2	2	32	2	261	6	134	73	0	0	0
16	GF	Storage 58	Parabolic	E	4'T8	2	2	32	S	2	261	6	134	73	N/A	Parabolic	4'T8	E	S	2	2	32	2	261	6	134	73	0	0	0
17	GF	Hallway	Parabolic	E	4'T8	4	3	32	S	9	261	10	394	996	N/A	Parabolic	4'T8	E	S	4	3	32	9	261	10	394	996	0	0	0
18	GF	Hallway	Exit Sign	N	LED	4	1	5	N	24	365	1	21	210	N/A	Exit Sign	LED	N	N	4	1	5	24	365	1	21	210	0	0	0
19	GF	Hallway	Parabolic	E	8'T8	12	3	59	S	9	261	19	2,143	5,525	N/A	Parabolic	8'T8	E	S	12	3	59	9	261	19	2,143	5,525	0	0	0
20	GF	Hallway	Exit Sign	N	LED	4	1	5	N	24	365	1	21	210	N/A	Exit Sign	LED	N	N	4	1	5	24	365	1	21	210	0	0	0
21	GF	Hallway	Parabolic	E	8'T8	16	1	59	N	9	261	6	950	2,443	N/A	Parabolic	8'T8	E	N	16	1	59	9	261	6	950	2,443	0	0	0
22	GF	Hallway	Exit Sign	N	LED	4	1	5	N	24	365	1	21	210	N/A	Exit Sign	LED	N	N	4	1	5	24	365	1	21	210	0	0	0
23	GF	Classroom 52	Parabolic	E	4'T8	9	3	32	S	7	261	10	874	1,743	N/A	Parabolic	4'T8	E	S	9	3	32	7	261	10	874	1,743	0	0	0
24	GF	Classroom 78	Parabolic	E	4'T8	2	2	32	S	7	261	6	134	256	N/A	Parabolic	4'T8	E	S	2	2	32	7	261	6	134	256	0	0	0
25	GF	Mechanical Rm 80	Parabolic	E	4'T8	11	2	32	S	2	261	6	710	402	N/A	Parabolic	4'T8	E	S	11	2	32	2	261	6	710	402	0	0	0
26	GF	Mechanical Rm	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
27	GF	Bathroom	Parabolic	E	4'T8	1	2	32	S	7	261	6	70	128	N/A	Parabolic	4'T8	E	S	1	2	32	7	261	6	70	128	0	0	0
28	GF	Classroom 84	Parabolic	E	4'T8	8	3	32	S	7	261	10	778	1,549	N/A	Parabolic	4'T8	E	S	8	3	32	7	261	10	778	1,549	0	0	0
29	GF	Classroom	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
30	GF	Classroom 51	Parabolic	E	4'T8	9	3	32	S	7	261	10	874	1,743	N/A	Parabolic	4'T8	E	S	9	3	32	7	261	10	874	1,743	0	0	0
31	GF	Classroom 50	Parabolic	E	4'T8	9	3	32	S	7	261	10	874	1,743	N/A	Parabolic	4'T8	E	S	9	3	32	7	261	10	874	1,743	0	0	0
32	GF	Classroom 49	Parabolic	E	4'T8	9	3	32	S	7	261	10	874	1,743	N/A	Parabolic	4'T8	E	S	9	3	32	7	261	10	874	1,743	0	0	0
33	GF	Gymnasium 44	Parabolic	E	4'T8	15	3	32	S	7	261	10	1,450	2,905	N/A	Parabolic	4'T8	E	S	15	3	32	7	261	10	1,450	2,905	0	0	0
34	GF	Admin. Office H48	Parabolic	E	4'T8	3	3	32	S	8	261	10	298	664	N/A	Parabolic	4'T8	E	S	3	3	32	8	261	10	298	664	0	0	0
35	GF	Admin. Office H48	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
36	GF	Admin. Office H48	Parabolic	E	4'T8	3	4	32	N	8	261	13	397	883	N/A	Parabolic	4'T8	E	N	3	4	32	8	261	13	397	883	0	0	0
37	GF	Admin. Office H48	Parabolic	E	4'T8	3	4	32	S	8	261	13	397	883	N/A	Parabolic	4'T8	E	S	3	4	32	8	261	13	397	883	0	0	0
38	GF	Laboratory . H45	Parabolic	E	4'T8	2	3	32	S	7	261	10	202	387	N/A	Parabolic	4'T8	E	S	2	3	32	7	261	10	202	387	0	0	0
39	GF	Bathroom Men	Parabolic	E	4'T8	3	3	32	S	7	261	10	298	581	N/A	Parabolic	4'T8	E	S	3	3	32	7	261	10	298	581	0	0	0
40	GF	Classroom H84	Parabolic	E	4'T8	8	3	32	S	7	261	10	778	1,549	N/A	Parabolic	4'T8	E	S	8	3	32	7	261	10	778	1,549	0	0	0
41	GF	Classroom H84	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
42	GF	Janitor Clo. H40	Parabolic	E	4'T8	1	3	32	S	2	261	10	106	55	N/A	Parabolic	4'T8	E	S	1	3	32	2	261	10	106	55	0	0	0
43	GF	Janitor Clo. H40	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
44	GF	Bathroom Women	Parabolic	E	4'T8	3	3	32	S	7	261	10	298	581	N/A	Parabolic	4'T8	E	S	3	3	32	7	261	10	298	581	0	0	0
45	GF	Laboratory H38	Parabolic	E	8'T8	10	3	59	S	7	261	19	1,789	3,581	C	Parabolic	8'T8	E	OS	10	3	59	5.25	261	19	1,789	2,686	0	895	895
46	GF	Hallway	Parabolic	E	8'T8	17	3	59	S	9	261	19	3,028	7,827	N/A	Parabolic	8'T8	E	S	17	3	59	9	261	19	3,028	7,827	0	0	0
47	GF	Hallway	Exit Sign	N	LED	4	1	5	N	24	365	1	21	210	N/A	Exit Sign	LED	N	N	4	1	5	24	365	1	21	210	0	0	0
48	GF	Classroom W35	Parabolic	E	4'T8	13	3	32	S	7	261	10	1,258	2,518	N/A	Parabolic	4'T8	E	S	13	3	32	7	261	10	1,258	2,518	0	0	0
49	GF	Classroom W33	Parabolic	E	4'T8	2	3	32	N	7	261	10	202	387	N/A	Parabolic	4'T8	E	N	2	3	32	7	261	10	202	387	0	0	0
50	GF	Classroom W88	Parabolic	E	4'T8	8	3	32	S	7	261	10	778	1,549	N/A	Parabolic	4'T8	E	S	8	3	32	7	261	10	778	1,549	0	0	0
51	GF	Admin. Office W31	Parabolic	E	4'T8	5	3	32	S	8	261	10	490	1,107	C	Parabolic	4'T8	E	OS	5	3	32	6	261	10	490	830	0	277	277
52	GF	Admin. Office W31	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
53	GF	Bathroom	Parabolic	E	4'T8	1	3	32	N	7	261	10	106	194	N/A	Parabolic	4'T8	E	N	1	3	32	7	261	10	106	194	0	0	0
54	GF	Closet W24	Parabolic	E	4'T8	2	3	32	S	2	261	10	202	111	N/A	Parabolic	4'T8	E	S	2	3	32	2	261	10	202	111	0	0	0
55	GF	Classroom W91	Parabolic	E	4'T8	8	3	32	S	7	261	10	778	1,549	N/A	Parabolic	4'T8	E	S	8	3	32	7	261	10	778	1,549	0	0	0
56	GF	Classroom W91	Parabolic	E	4'T8	8	3	32	S	7	261	10	778	1,549	N/A	Parabolic	4'T8	E	S	8	3	32	7	261	10	778	1,549	0	0	0

57	GF	Classroom W92	Parabolic	E	4'T8	8	3	32	S	7	261	10	778	1,549	N/A	Parabolic	4'T8	E	S	8	3	32	7	261	10	778	1,549	0	0	0
58	GF	Classroom W95	Parabolic	E	4'T8	8	3	32	S	7	261	10	778	1,549	N/A	Parabolic	4'T8	E	S	8	3	32	7	261	10	778	1,549	0	0	0
59	GF	Hallway	Parabolic	E	4'T8	99	3	32	S	9	365	10	9,514	34,473	N/A	Parabolic	4'T8	E	S	99	3	32	9	365	10	9,514	34,473	0	0	0
60	GF	Hallway	Exit Sign	N	LED	8	1	5	N	24	365	1	41	420	N/A	Exit Sign	LED	N	N	8	1	5	24	365	1	41	420	0	0	0
61	GF	Admin. Office w19	Parabolic	E	4'T8	8	4	32	S	8	365	13	1,037	3,294	C	Parabolic	4'T8	E	OS	8	4	32	6	365	13	1,037	2,470	0	823	823
62	GF	Admin. Office w18	Parabolic	E	4'T8	6	3	32	S	8	365	10	586	1,857	C	Parabolic	4'T8	E	OS	6	3	32	6	365	10	586	1,393	0	464	464
63	GF	Admin. Office w18	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
64	GF	Admin. Office w22	Parabolic	E	4'T8	3	3	32	S	8	365	10	298	929	C	Parabolic	4'T8	E	OS	3	3	32	6	365	10	298	696	0	232	232
65	GF	Admin. Office w23	Parabolic	E	4'T8	3	3	32	S	8	365	10	298	929	C	Parabolic	4'T8	E	OS	3	3	32	6	365	10	298	696	0	232	232
66	GF	Bathroom w23	Parabolic	E	4'T8	3	3	32	S	7	365	10	298	812	C	Parabolic	4'T8	E	OS	3	3	32	5.25	365	10	298	609	0	203	203
67	GF	Admin. Office w29	Parabolic	E	4'T8	6	3	32	S	8	365	10	586	1,857	C	Parabolic	4'T8	E	OS	6	3	32	6	365	10	586	1,393	0	464	464
68	GF	Admin. Office w28	Parabolic	E	4'T8	4	3	32	N	8	365	10	394	1,238	C	Parabolic	4'T8	E	OS	4	3	32	6	365	10	394	929	0	310	310
69	GF	Classroom w15	Parabolic	E	4'T8	12	3	32	S	7	365	10	1,162	3,250	N/A	Parabolic	4'T8	E	S	12	3	32	7	365	10	1,162	3,250	0	0	0
70	GF	Classroom w14	Parabolic	E	4'T8	12	3	32	S	7	365	10	1,162	3,250	N/A	Parabolic	4'T8	E	S	12	3	32	7	365	10	1,162	3,250	0	0	0
71	GF	Classroom w13	Parabolic	E	4'T8	12	3	32	S	7	365	10	1,162	3,250	N/A	Parabolic	4'T8	E	S	12	3	32	7	365	10	1,162	3,250	0	0	0
72	GF	Classroom w12	Parabolic	E	4'T8	12	3	32	S	7	365	10	1,162	3,250	N/A	Parabolic	4'T8	E	S	12	3	32	7	365	10	1,162	3,250	0	0	0
73	GF	Classroom w11	Parabolic	E	4'T8	12	3	32	S	7	365	10	1,162	3,250	N/A	Parabolic	4'T8	E	S	12	3	32	7	365	10	1,162	3,250	0	0	0
74	GF	Cafeteria	Parabolic	E	4'T8	15	3	32	N	5	365	10	1,450	2,902	N/A	Parabolic	4'T8	E	N	15	3	32	5	365	10	1,450	2,902	0	0	0
75	GF	Kitchen w03	Parabolic	E	4'T8	15	3	32	S	7	365	10	1,450	4,062	C	Parabolic	4'T8	E	OS	15	3	32	5.25	365	10	1,450	3,047	0	1,016	1,016
76	GF	Kitchen w03	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
77	GF	Classroom w93	Parabolic	E	4'T8	12	3	32	N	7	365	10	1,162	3,250	N/A	Parabolic	4'T8	E	N	12	3	32	7	365	10	1,162	3,250	0	0	0
78	GF	Classroom w94	Parabolic	E	4'T8	12	3	32	S	7	365	10	1,162	3,250	N/A	Parabolic	4'T8	E	S	12	3	32	7	365	10	1,162	3,250	0	0	0
79	GF	Classroom w90	Parabolic	E	4'T8	12	3	32	S	7	365	10	1,162	3,250	N/A	Parabolic	4'T8	E	S	12	3	32	7	365	10	1,162	3,250	0	0	0
80	GF	Classroom w89	Parabolic	E	4'T8	12	3	32	S	7	365	10	1,162	3,250	N/A	Parabolic	4'T8	E	S	12	3	32	7	365	10	1,162	3,250	0	0	0
81	GF	Classroom w89	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
82	GF	Laboratory w86	Parabolic	E	4'T8	12	3	32	S	7	365	10	1,162	3,250	C	Parabolic	4'T8	E	OS	12	3	32	5.25	365	10	1,162	2,437	0	812	812
83	GF	Laboratory w85	Parabolic	E	4'T8	8	3	32	S	7	365	10	778	2,167	C	Parabolic	4'T8	E	OS	8	3	32	5.25	365	10	778	1,625	0	542	542
84	GF	Classroom w75	Parabolic	E	4'T8	6	3	32	S	7	365	10	586	1,625	N/A	Parabolic	4'T8	E	S	6	3	32	7	365	10	586	1,625	0	0	0
85	GF	Classroom w75	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
86	GF	Bathroom w75	Parabolic	E	4'T8	1	3	32	S	7	365	10	106	271	N/A	Parabolic	4'T8	E	S	1	3	32	7	365	10	106	271	0	0	0
87	GF	Admin. Office w72	Parabolic	E	4'T8	3	3	32	S	8	365	10	298	929	C	Parabolic	4'T8	E	OS	3	3	32	6	365	10	298	696	0	232	232
88	GF	Admin. Office w79	Parabolic	E	4'T8	3	3	32	S	8	365	10	298	929	C	Parabolic	4'T8	E	OS	3	3	32	6	365	10	298	696	0	232	232
89	GF	Bathroom Men	Parabolic	E	4'T8	3	3	32	S	7	365	10	298	812	C	Parabolic	4'T8	E	OS	3	3	32	5.25	365	10	298	609	0	203	203
90	GF	Bathroom Women	Parabolic	E	4'T8	3	3	32	S	7	365	10	298	812	C	Parabolic	4'T8	E	OS	3	3	32	5.25	365	10	298	609	0	203	203
91	GF	Classroom W06	Parabolic	E	4'T8	9	3	32	S	7	365	10	874	2,437	N/A	Parabolic	4'T8	E	S	9	3	32	7	365	10	874	2,437	0	0	0
92	GF	Bathroom	Parabolic	E	4'T8	1	3	32	N	7	365	10	106	271	N/A	Parabolic	4'T8	E	N	1	3	32	7	365	10	106	271	0	0	0
93	GF	Meeting Room B24	Parabolic	E	4'T8	4	3	32	S	5	365	10	394	774	N/A	Parabolic	4'T8	E	S	4	3	32	5	365	10	394	774	0	0	0
94	GF	Classroom B23	Parabolic	E	4'T8	6	3	32	N	7	365	10	586	1,625	N/A	Parabolic	4'T8	E	N	6	3	32	7	365	10	586	1,625	0	0	0
95	GF	Classroom B23	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
96	GF	Classroom B31	Parabolic	E	4'T8	9	3	32	S	7	365	10	874	2,437	N/A	Parabolic	4'T8	E	S	9	3	32	7	365	10	874	2,437	0	0	0
97	GF	Classroom B30	Parabolic	E	4'T8	9	3	32	S	7	365	10	874	2,437	N/A	Parabolic	4'T8	E	S	9	3	32	7	365	10	874	2,437	0	0	0
98	GF	Classroom B30	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
99	GF	Classroom B22	Parabolic	E	4'T8	8	3	32	S	7	365	10	778	2,167	N/A	Parabolic	4'T8	E	S	8	3	32	7	365	10	778	2,167	0	0	0
100	GF	Classroom B29	Parabolic	E	4'T8	9	3	32	S	7	365	10	874	2,437	N/A	Parabolic	4'T8	E	S	9	3	32	7	365	10	874	2,437	0	0	0
101	GF	Classroom B28	Parabolic	E	4'T8	9	3	32	S	7	365	10	874	2,437	N/A	Parabolic	4'T8	E	S	9	3	32	7	365	10	874	2,437	0	0	0
102	GF	Classroom B27	Parabolic	E	4'T8	9	3	32	S	7	365	10	874	2,437	N/A	Parabolic	4'T8	E	S	9	3	32	7	365	10	874	2,437	0	0	0
103	GF	Classroom B27	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
104	GF	Classroom B26	Parabolic	E	4'T8	9	3	32	S	7	365	10	874	2,437	N/A	Parabolic	4'T8	E	S	9	3	32	7	365	10	874	2,437	0	0	0
105	GF	Classroom B26	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
106	GF	Classroom B01	Parabolic	E	4'T8	4	3	32	S	7	365	10	394	1,083	N/A	Parabolic	4'T8	E	S	4	3	32	7	365	10	394	1,083	0	0	0
107	GF	Admin. Office B02	Parabolic	E	4'T8	4	3	32	S	8	365	10	394	1,238	C	Parabolic	4'T8	E	OS	4	3	32	6	365	10	394	929	0	310	310
108	GF	Admin. Office B02	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
109	GF	Nurses Station B03	Parabolic	E	4'T8	3	3	32	S	7	365	10	298	812	C	Parabolic	4'T8	E	OS	3	3	32	5.25	365	10	298	609	0	203	203
110	GF	Nurses Station B04	Parabolic	E	4'T8	1	3	32	S	7	365	10	106	271	N/A	Parabolic	4'T8	E	S	1	3	32	7	365	10	106	271	0	0	0
111	GF	Bathroom B05	Parabolic	E	4'T8	1	3	32	S	7	365	10	106	271	N/A	Parabolic	4'T8	E	S	1	3	32	7	365	10	106	271	0	0	0
112	GF	Conference Room B06	Parabolic	E	4'T8	6	3	32	N	5	365	10	586	1,161	C	Parabolic	4'T8	E	OS	6	3	32	3.75	365	10	586	871	0	290	290
113	GF	Conference Room B06	Screw-in	N	CFL	7	1	25	S	5	365	0	175	319	C	Screw-in	CFL	N	OS	7	1	25	3.75	365	0	175	240	0	80	80
114	GF	Conference Room B08	Screw-in	N	CFL	1	3	25	S	5	365	0	75	137	N/A	Screw-in	CFL	N	S	1	3	25	5	365	0	75	137	0	0	0
115	GF	Hallway B10	Parabolic	E	4'T8	3	3	32	S	9	365	10	298	1,045	N/A	Parabolic	4'T8	E	S	3	3	32	9	365	10	298	1,045	0	0	0
116	GF	Admin. Office B11	Screw-in	N	CFL	3	2	25	S	8	365	0	150	438	N/A	Screw-in	CFL	N	S	3	2	25	8	365	0	150	438	0	0	0
117	GF	Admin. Office	Parabolic	E	4'T8	3	2	32	S	8	365	6	198	613	N/A	Parabolic	4'T8	E	S	3	2	32	8	365	6	198	613	0	0	0
118	GF	Admin. Office B12	Parabolic	E	4'T8	3	2	32	S	8	365	6	198	613	N/A	Parabolic	4'T8	E	S	3	2	32	8	365	6	198	613	0	0	0
119	GF	Admin. Office B13	Parabolic	E	4'T8	3	2	32	S	8	365	6	198	613	N/A	Parabolic	4'T8	E	S	3	2	32	8	365	6	198	613	0	0	0
120	GF	Admin. Office B14	Parabolic	E	4'T8	3	2	32	S	8	365	6	198	613	N/A	Parabolic	4'T8	E	S	3	2	32	8	365	6	198	613	0	0	0
121	GF	Admin. Office B16	Parabolic	E	4'T8	3	2	32	S	8	261	6	198	438	N/A	Parabolic	4'T8	E	S	3	2	32	8	261	6	198	438	0	0	0
122	GF	Bathroom	Parabolic	E	4'T8	1	3	32	S	7	261	10	106	194	N/A	Parabolic	4'T8	E	S	1	3	32	7	261	10	106	194	0	0	0
123	GF	Bathroom Men B17	Parabolic	E	4'T8	2	3	32	S	7	261	10	202	387	N/A	Parabolic	4'T8	E	S	2	3	32	7	261	10	202	387	0	0	0
124	GF	Bathroom Men	Screw-in	N	CFL	1	1	25	S	2	261	0	25	13	N/A	Screw-in	CFL	N	S	1	1	25	2	261	0	25	13	0	0	0
125	GF	Utility Rm B18	Parabolic	E	4'T8	1	3	32	S	2	261	10	106	55	N/A	Parabolic	4'T8	E	S	1	3	32	2	261	10	106	55	0	0	0
126	GF	Bathroom Women B18	Parabolic	E	4'T8	2	3	32	S	7	261	10	202	387	N/A	Parabolic	4'T8	E	S	2	3	32	7	261	10	202	387	0	0	0
127	GF	Office B20	Parabolic	E	4'T8	2	3	32	S	8	261	10	202	443	N/A	Parabolic	4'T8	E	S	2	3	32	8	261	10	202	443	0	0	0
128	GF	Hallway B21	Parabolic	E	4'T8	12	3	32	S	9	261	10	1,162	2,988	N/A	Parabolic	4'T8	E	S	12	3	32	9	261	10	1,162	2,988	0	0	0
129	GF	Hallway	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
Totals:						798	315	4,296				1,092	80,796	203,075						798	321	3,596				75,702	185,050	######	#######	18,026

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

Appendix B: Third Party Energy Suppliers (ESCOs)

Third Party Electric Suppliers for PSEG Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for Elizabethtown Gas Co. Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com