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February 9th, 2010

Local Government Energy Program
Energy Audit Report

For

Hunterdon Polytech Career Academy
Building Trades
10 Junction Road
Flemington, NJ 08822

Project Number: LGEA11

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INTRODUCTION

As an approved energy consulting firm under the Local Government Energy Audit Program (LGEA), Steven Winter Associates, Inc. (SWA) was selected to perform an energy audit and assessment for the Hunterdon Polytech Career Academy buildings. The audit included a review of the Main Building as well as the Building Trades building. The buildings are located in Flemington, NJ. A separate energy audit report is issued for each of the referenced buildings.

This report addresses the Hunterdon Polytech Career Academy – Building Trades building located at 10 Junction Road Flemington, NJ. The current conditions and energy-related information were collected in order to analyze and suggest the implementation of building improvements and energy conservation measures.

The Building Trades building, located at 10 Junction Road was built in 2006 in conjunction with the addition of the Culinary wing to the Main building. The Building Trades building consists of a total floor area of 5,913 square feet. The building is operated from 7 AM - 9:30 PM Monday through Thursday and from 7:00 AM – 4:00 PM on Friday. During the summer, the school is only used for a limited amount of classes. The Building Trades building has a maximum occupancy of 40 persons that includes at least 1 faculty member.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Hunterdon Polytech Career Academy to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the building.

Launched in 2008, the LGEA Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize 75% of the cost of the audit. If the net cost of the installed measures recommended by the audit, after applying eligible NJ SmartStart Buildings incentives, exceeds the remaining cost of the audit, then that additional 25% will also be paid by the program. The Board of Public Utilities (BPU's) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

- Section 1 and section 2 of the report cover a description and analysis of the building existing conditions.
- Section 3 provides a detail inventory of major electrical and mechanical systems in the building.
- Sections 4 through 7 provide a description of our recommendations.
- Appendices include further details and information supporting our recommendations.

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Hunterdon Polytech Career Academy – Building Trades building located at 10 Junction Road Flemington, NJ. The building is a single story building with a total floor area of 5,913 square feet. The building opened in 2006 in conjunction with the opening of the culinary wing.

Based on the field visit performed by the SWA staff on July 22nd, 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.

Existing conditions

The Building Trades building shares both an electric meter and gas meter with the Main building. All utility analysis in this report is the result of the combined usage of both buildings.

From April 2008 through April 2009, the period of analysis for this audit, the building consumed 514,026 kWh or $82,076 worth of electricity at an approximate rate of $0.160/kWh and 58,797 therms or $66,768 worth of natural gas at an approximate rate of $1.136 per therm. The joint energy consumption for the building, including both electricity and fossil fuel was 7,634 MMBtus of energy that cost a total of $148,844.

SWA has entered energy information about the Building Trades building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The Main building and the Building Trades building both share a common meter and are part of the same facility, so the buildings have been benchmarked together as a K-12 school. Currently, the building has been rated as a 1 on a scale of 100 when compared to other K-12 schools around the country. This score is very low, however based on the fact that this is a polytechnic school that contains more electric-intensive equipment than most schools, the building performance score is deceptively low. SWA encourages Hunterdon Polytech Career Academy to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time.

Recommendations

Implementing this report's recommendations will reduce use by approximately 0.8 kBtu/ft^{2}yr, which would decrease the building's energy use intensity to 219.9 kBtu/ft^{2}yr.

The Hunterdon Polytech facilities have been reasonably well-maintained. Equipment was observed to be in age-appropriate condition and has a majority of remaining useful lifetime left. SWA recommends a package of measures that includes lighting for this building. In a separate report that includes details regarding recommendations for the Main building, retro-commissioning was recommended. SWA has assumed that when the Main building undergoes retro-commissioning, that the Building Trades building will also be included. Due to the age of this building and the small size, there were few recommendations that could be made regarding energy efficiency. SWA observed operating conditions of the building and has provided a scope of work based on those observations.

Based on the assessment of the building, SWA has separated the recommendations into three categories (See Section 4 for more details). These are summarized as follows:

Category I Recommendations: Capital Improvement Measures

- Increase ductwork for Roof-mounted HVAC units

Category II Recommendations: Operations and Maintenance

- Perform routine maintenance inspections on envelope
- Perform routine maintenance inspections of the roof
- Perform routine maintenance inspections of windows and doors
- Provide water efficient fixtures and controls
- Use Energy Star labeled appliances

Category III Recommendations: Energy Conservation Measures

At this time, SWA highly recommends a total of **2** Energy Conservation Measures (ECMs) for the Main building that is summarized in the following Table 1. The total investment cost for these ECMs with incentives is **$6,357**. SWA estimates a first year savings of **$1,067** with a simple payback of **6.0 years**.

The implementation of all the recommended ECMs would reduce the building electric usage by 6,522 kWh annually, or 1% of the building's current electric consumption. The implementation of all the recommended ECMs would also reduce natural gas usage by 0 therms or 0% of the building's current natural gas consumption. SWA estimates that implementing these ECMs will reduce the carbon footprint of the Building Trades building by **11,678 lbs of CO_2**, which is equivalent to removing approximately 1 car from the roads each year or avoiding the need of 21 trees to absorb the annual CO_2 produced. SWA also recommends that Hunterdon Polytech contacts third party energy suppliers in order to negotiate a lower electricity rate. Comparing the current electric rate to average utility rates of similar type buildings in New Jersey, it may be possible to save up to $0.010/kWh, which would have equated to $5,140 for the past 12 months.

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

The following two tables summarize the proposed Energy Conservation Measures (ECM) and their economic relevance.

Table 1 - Recommended 5-10 Year Payback ECMs																			
ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Install 12 new T5 fluorescent light fixtures	RSMeans, lit search	9,398	3,408	5,990	6,420	1.3	0	0.8	0	1,027	15	12,087	5.8	101.8	6.8	15.1	6,273	11,495
2	Install 2 new LED exit signs	RSMeans, lit search	407	40	367	102	0.0	0	0.0	23	39	15	463	9.3	26.1	1.7	6.6	102	183
	TOTALS	-	**9,805**	**3,448**	**6,357**	**6,522**	**1.3**	**0**	**0.8**	**23**	**1,067**	-	**12,550**	**6.0**	-	-	-	**6,375**	**11,678**

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

1. HISTORIC ENERGY CONSUMPTION

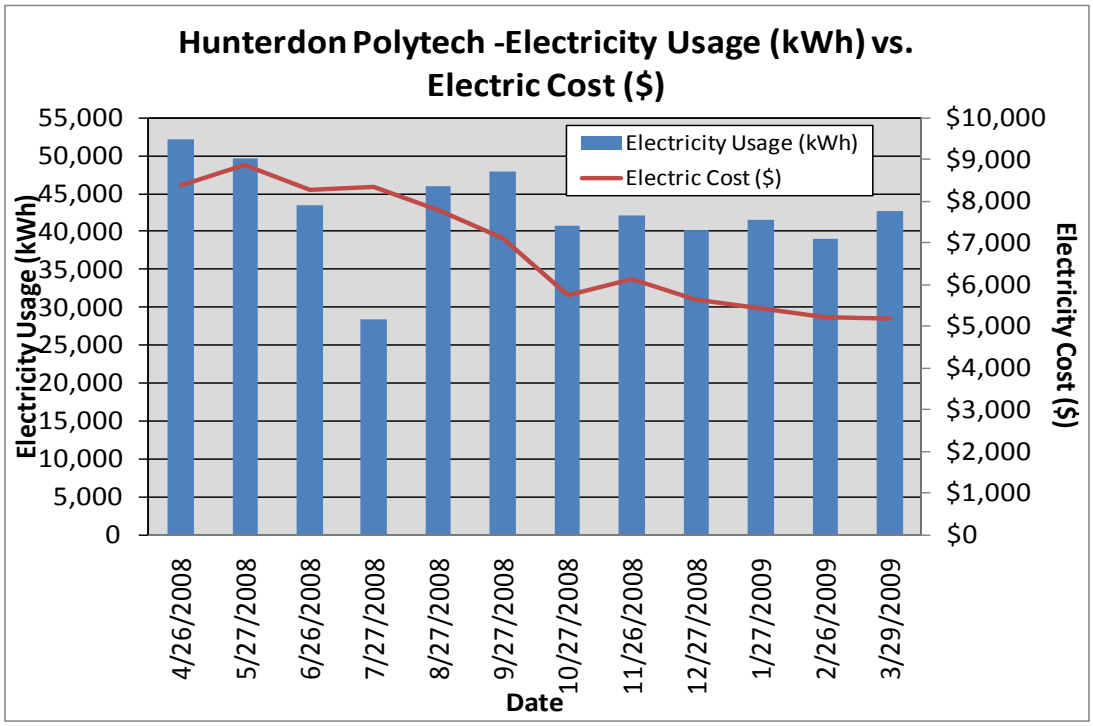
1.1. Energy usage, load profiles and cost analysis

SWA analyzed utility bills from **April 2008 through April 2009**(period of analysis) that were received from the utility companies supplying both the Main building and Building Trades building with electric and natural gas. The Main building and Building Trades building are part of the same facility and share both an electric meter and gas meter. Since the buildings share utility meters, it is not possible to separate out the usage for each building individually. As such, the utility bills have been analyzed per each meter, not by each building.

Electricity – Hunterdon Polytech buys electricity from JCP&L at **an average rate of $0.160/kWh** based on 12 months of utility bills from April 2008 to April 2009. Hunterdon Polytech purchased **approximately 514,026 kWh or $82,076 worth of electricity** in the previous year. The buildings are currently charged for demand (kW) which has been factored into each monthly bill. The electricity meter recorded an **average monthly demand of 125.4 kW** with a **monthly peak demand of 144 kW.**

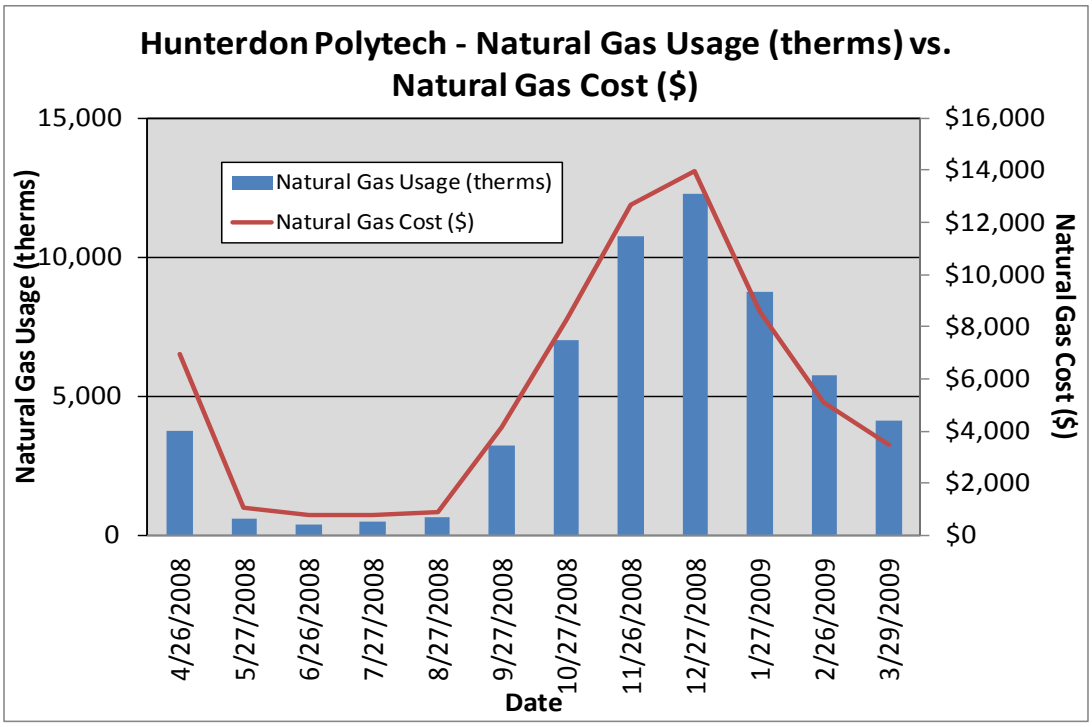
Natural gas – Hunterdon Polytech is currently served by one meter for natural gas. Hunterdon Polytech currently buys natural gas from Elizabethtown Gas at **an average aggregated rate of $1.136/therm** based on 12 months of utility bills for April 2008 to April 2009. Hunterdon Polytech purchased **approximately 58,797 therms or $66,768 worth of natural gas** in the previous year.

The following chart shows electricity use versus cost for Hunterdon Polytech based on utility bills for the 12 month period of April 2008 to April 2009.



Electricity use follows a trend as expected; peaking during the summer months when air conditioning units are used most and decreases during the winter. The cost of electricity fluctuates as expected with usage.

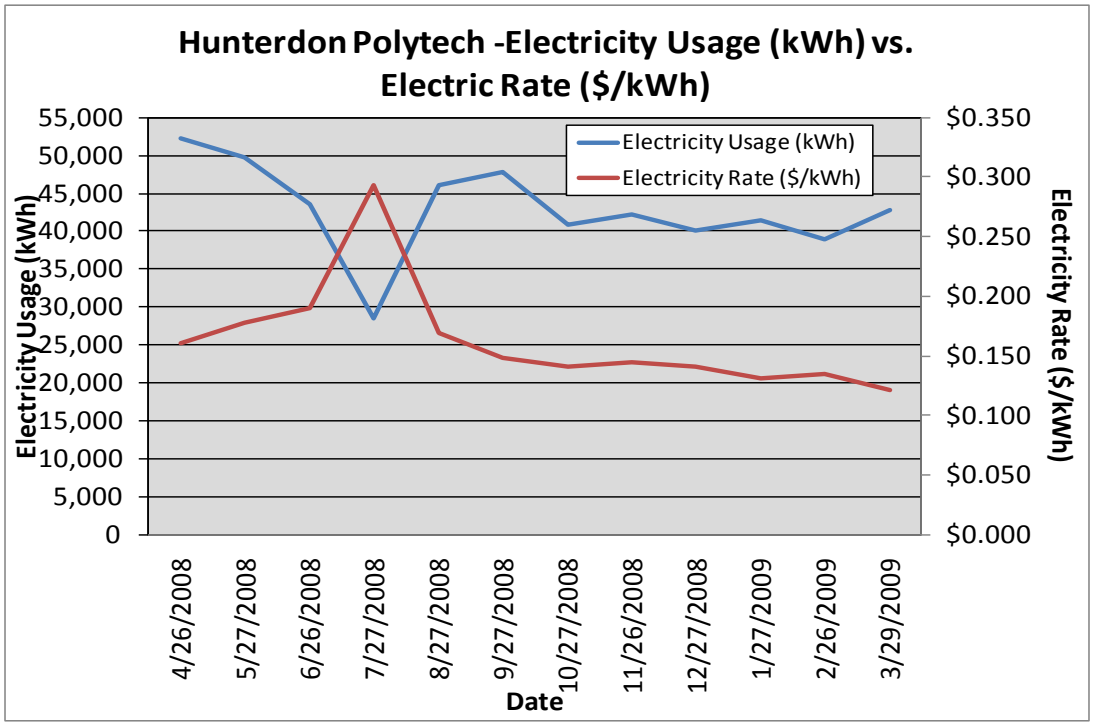
The following is a chart of the natural gas annual load profile for the building versus natural gas costs, peaking in the coldest months of the year and a chart showing natural gas consumption following the "heating degree days" curve.



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

1.2. Utility rate analysis

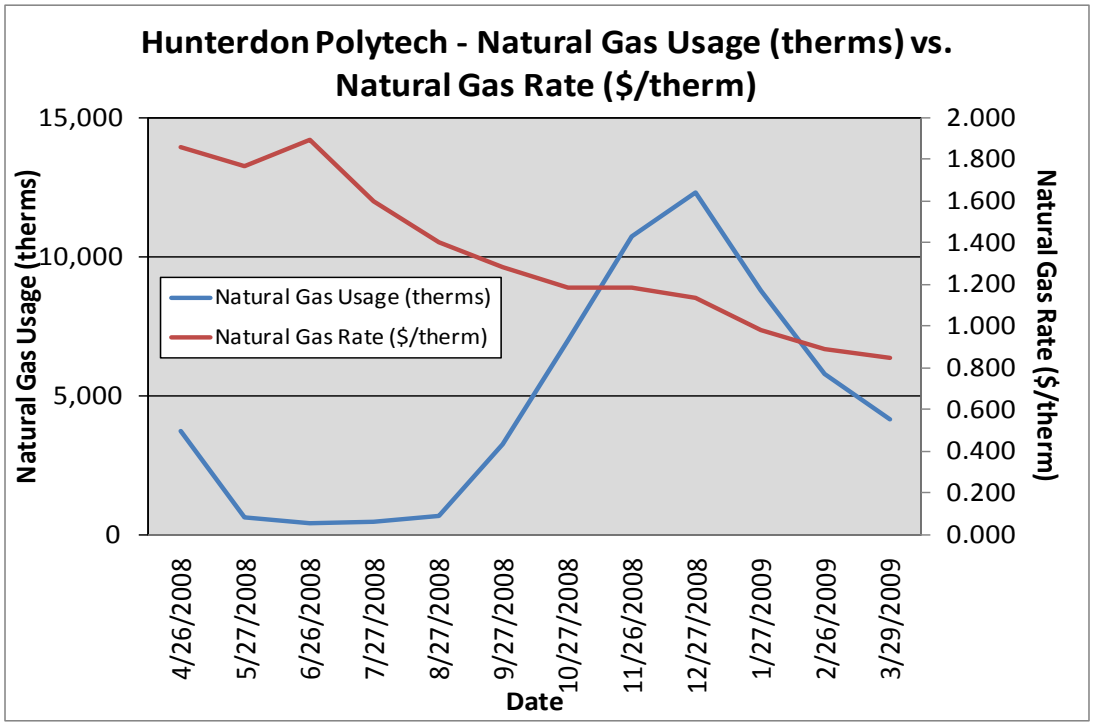
Hunterdon Polytech currently purchases electricity from JCP&L at a general service market rate for electricity use (kWh) including a separate (kW) demand charge that is factored into each monthly bill. Hunterdon Polytech currently pays an average rate of approximately $0.160/kWh based on the 12 months of utility bills of April 2008 to April 2009. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. The electric rate does not show large fluctuations throughout the year except for an anticipated rise in the summer time and small increase in the winter that corresponds to a spike in fuel prices. Based on these observations this appears to be the appropriate rate for the building.



Note: Electricity usage dropped during July when school was not fully in session, Costs increased during this period as a result of seasonal demand charges

Hunterdon Polytech currently purchases natural gas supply from the Elizabethtown Gas at a general service market rate for natural gas (therms). There is one gas meter that provides natural gas service to the both the Main building and Building Trades building currently. The average aggregated rate (supply and transport) for the meter is approximately $1.136/therm based on 12 months of utility bills for April 2008 to April 2009. The suppliers' general service rate for natural gas charges a market-rate price based on use and the Hunterdon Polytech billing does not breakdown demand costs for all periods. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the natural gas prices increase during the summer months when natural gas is only used by the hot water boilers. The high gas price per therm fluctuations in the summer may be due to low use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months.

Some of the minor unusual utility fluctuations that showed up for a couple of months on the utility bills may be due to adjustments between estimated and actual meter readings.



1.3. Energy benchmarking

SWA has entered energy information about both Hunterdon Polytechnic buildings in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The Main building shares a common meter with the Building Trades building and therefore, the buildings have been benchmarked as a single building. The facility received a score of 1 out of 100 when compared to other K-12 schools. This number is deceiving and seems extremely low due to the fact that the school is a technical school with a higher density of electrical equipment as well as including a Building Trades building (technical building) that is separated from the Main building. SWA encourages the Hunterdon Polytech to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time.

The Site Energy Use Intensity is 219.9 kBtu/sq ft yr compared to the national average of a K-12 school consuming 93.0 kBtu/sq ft yr. Implementing this report's recommended Energy Conservations Measures (ECMs) will reduce use by approximately 0.8 kBtu/sqft yr.

Per the LGEA program requirements, SWA has assisted Hunterdon Polytech to create an *Energy Star Portfolio Manager* account and has shared the facility information to allow future data to be added and tracked using the benchmarking tool. SWA is sharing this Portfolio Manager Site information with TRC Energy Services. As per requirements, the account information is provided below:

Username: HunterdonPolytech
Password: HUNTERDON

Also, below is a statement of energy performance generated based on historical energy consumption from the Portfolio Manager Benchmarking tool.

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Hunterdon Co. Vocational School

Building ID: 1765668
For 12-month Period Ending: March 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: September 14, 2009

Facility
Hunterdon Co. Vocational School
10 Junction Rd
Flemington, NJ 08822

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1975
Gross Floor Area (ft²): 34,558

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	1,746,092
Natural Gas (kBtu)[4]	5,853,255
Total Energy (kBtu)	7,599,347

Energy Intensity[5]	
Site (kBtu/ft²/yr)	220
Source (kBtu/ft²/yr)	346

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	577

Electric Distribution Utility
Jersey Central Power & Lt Co

National Average Comparison	
National Average Site EUI	93
National Average Source EUI	146
% Difference from National Average Source EUI	137%
Building Type	K-12 School

Stamp of Certifying Professional

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

Certifying Professional
N/A

Meets Industry Standards[6] **for Indoor Environmental Conditions:**	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

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

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

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The Building Trades building was constructed in conjunction with the Polytech Academy Culinary wing addition project in 2006. The building houses a large shop area together with an office and other miscellaneous supportive rooms. The Building Trades building has a total floor area of 5,913 square feet.

2.2. Building occupancy profiles

The building is operated from 7 AM – 9:30 PM Monday through Thursday and from 7 AM – 4 PM on Friday. During the summer, the school is only used for a limited amount of classes. Hunterdon Polytech employs approximately 25-30 faculty members and contains 250-300 students. The Building Trades building has a maximum occupancy of 40 persons with at least 1 faculty member.

2.3. Building envelope

2.3.1.Exterior Walls

The steel framed exterior walls of most of the building and the shop area consist of painted perforated metal exterior and interior finish panels, filled with R-19 fiberglass batt insulation. There is also some exterior wall area constructed with CMU under brick veneer with 2" rigid insulation panels behind the air space. Due to warm temperature conditions at the time of the field visits, insulation levels could not be verified with help of infrared technology. If desired, the school could contract a separate envelope inspection during cooler months.

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

Typical Building Elevations

2.3.2.Roof

The sloped roof is finished with a dark colored EPDM without a gravel layer and specified to have R10 insulation in the roof.

No current 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 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.

2.3.3. Base

The building's base is a 4-6" concrete slab-on grade with a perimeter footing and specified slab edge insulation. There weren't any reported problems with water penetration or moisture. The slab edge or perimeter insulation could not be verified and should be confirmed at the time of the above recommended insulation inspection during cooler months for usable infrared data evaluation.

2.3.4. Windows

The windows are aluminum framed double paned fixed windows. They appear to be in good condition with no signs of obvious infiltration or water damage. SWA recommends regular maintenance and caulking around perimeter of windows to ensure an air tight and water sealed connection.

2.3.5. Exterior doors

The aluminum framed exterior doors were observed to be in good condition except for missing or worn weather-stripping, including the garage type sectional overhead doors in the various shop areas. SWA recommends that the exterior doors of the building be weather-stripped in order to decrease the amount of conditioned air that is lost around each door. SWA also recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. Tight seals around the doors will help ensure that the building is kept continuously tight and insulated.

Worn Weather Stripping at Shop Side Door

2.3.6. Building air tightness

Based on a visual inspection, the building was observed to be a relatively satisfactorily sealed building. There weren't any major observed deficiencies of air tightness within the building besides

the exterior doors. Classroom occupants should be made aware more often to keep doors closed since the corridors are not air-conditioned nor heated to the same temperature levels.

2.4. HVAC Systems

2.4.1. Heating

The Building Trades building uses a single Trane rooftop unit to provide both heating and cooling. The Trane unit is a gas-fired hot air furnace with combined cooling. The furnace has an output capacity of 64MBH with an AFUE efficiency of 81%. The cooling section uses R22 refrigerant and has a 5 ton cooling capacity with efficiency of 13 SEER. At each door, there is also one gas heater installed above the door.

2.4.2. Cooling

The Building Trades building is cooled using the same rooftop air handling unit that is used for heating. The cooling capacity is 5 tons with an efficiency of 13 SEER. The cooling unit also uses R22 refrigerant.

2.4.3. Ventilation

All of the heating and cooling units introduce fresh air throughout the building. Each unit takes outside air and then filters and conditions it before introducing it to the building. Building exhaust fans help remove stale air and induce fresh air into the building.

2.4.4. Domestic Hot Water

Domestic hot water is provided to the building by an electric domestic hot water heater with 480V service. The electric hot water heater has a two settings allowing it to fire at 4500 or 9000 watts. Due to the small size of the Building Trades building and the low demand for domestic hot water, 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 Building Trades building consisted of either efficient T8 lighting with electronic ballasts or metal halide 400W bulbs. All fluorescent lighting throughout the building is efficient. The metal halide 400W bulbs are used for general lighting and consume a lot of energy. Each fixture containing a 400W metal halide bulb actually consumes 454W of power with the ballast included. SWA recommends replacing each high bay metal halide light with a T5 pendant light containing four 2' T5 bulbs. Newer, T5 high bay pendant fixture provide a better quality light and use approximately 50% less energy. Due to the small size of the building as well as frequency of use, there are no recommended areas for occupancy sensors.

Exit Signs –The exit signs in the Building Trades building are fluorescent exit signs. These lights were observed to contain 20W bulbs in comparison to an LED exit sign that only uses 5W. LED exit signs are always cost-effective since they use such little power and operate 24 hours a day, 365 days a year. See attached existing and proposed lighting schedule in Appendix A.

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.

2.5.2. Appliances

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/hr. 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 Hunterdon Polytech – Building Trades building is a one story building and therefore contains no elevator.

2.5.4. Process and others electrical systems

There are currently no other process or electrical systems present in the building.

3. EQUIPMENT LIST

Inventory

Building System	Description	Physical Location	Model#	Fuel	Space served	Estimated Remaining useful life %
HVAC	Trane roof top unit Nom cooling cap.: 5 ton Heating input: 80 MBH Heating output: 64 MBH Fuel: Natural gas Efficiency: 13 EER; 81 AFUE	Rooftop	YHC060	Electric/gas	All Areas	60%
DHW	480V electric water heater. 4500/9000W power settings.	Mechanical Closet	NC	Electric	All Areas	50%
Dust Collection System	Stern Vent exhaust collector	Sidewall/Ceiling	DKPD 48015-2	Electric	All Areas	80%

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 the Hunterdon Polytech – Main building, SWA has separated the investment opportunities into three recommended categories:

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

Category I Recommendations: Capital Improvements

- Increase ductwork for Roof-mounted HVAC units - The Building Trades building relies on either roof-mounted or ceiling-mounted systems to distribute conditioned air throughout the building. Specifically, the building delivers heat from these units. The warm air is delivered near the top of the high-bay space and the flow is not distributed properly. Since heat rises, much of the warm air never sinks and reaches the teachers or students at ground level. In order to correct this, the units must be ducted to provide warm air at the floor level and let it rise naturally through the space. Based on RSMeans and similar projects, SWA estimates that this will cost approximately $24,000. This building is not recommended as an Energy Conservation Measure since it can only guarantee comfort and not energy savings. If this system is ducted in the future, then it maybe possible that the heating system can be down-sized and control efficiency is maximized if comfort levels are achieved with less heat.

Category II Recommendations: Operations and Maintenance

- Perform routine maintenance inspections on envelope – SWA recommends that biannual inspections of the exterior walls are conducted as part of a preventative maintenance schedule. SWA observed some isolated instances at surface transitions and building corners that were starting to show signs of cracking and slight water damage. At this time, there are no major concerns with the exterior walls that should be addressed. Any weaknesses in the building structure that could allow either water or thermal presentation should be addressed immediately. Properly maintaining the exterior walls will ensure that the vapor barrier as well as insulation levels are not compromised.

- Perform routine maintenance inspections of the roof – SWA recommends that biannual inspections of the roof are conducted as part of a preventative maintenance schedule. At this time, there are no major concerns with the roofing material that should be addressed. Properly maintaining the roof will ensure that the vapor barrier as well as insulation levels are not compromised.

- Perform routine maintenance inspections of windows and doors– SWA recommends that biannual inspections of each window are conducted as part of a preventative maintenance schedule. The windows and doors appeared to be in excellent condition and are not in need of upgrading at this time. Typically, weather-stripping around windows and doors begin to show wear and tear over time. SWA recommends that weather-stripping is repaired or replaced as soon as soon as signs of deterioration are observed. Correcting weather-stripping issues prevent energy cost losses and comfort complaints.

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

- Use Energy Star labeled appliances - such as Energy Star refrigerators that should replace older energy inefficient equipment.

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description of Recommended 5-10 Year Payback ECMs
1	**Install 12 new T5 fluorescent light fixtures**
2	**Install 2 new LED exit signs**

ECM#1: *Install 12 new T5 fluorescent light fixtures*

Description:

The Building Trades building currently contains 12 pendant fixtures for general purpose lighting that contain 400W metal halide bulbs. Each fixture uses 454W of power including the ballasts. Many buildings that contain open areas such as school gymnasiums, cafeterias and warehouses use high-bay general lighting to provide an even spread of light throughout the area. Metal halide fixtures consume a large amount of energy and provide a relatively poor quality light. SWA recommends replacing each pendant fixture with a newer, technology fixture that consists of four T5 fluorescent lights. These fixtures are hung at the same height as metal halides but provide a better quality light while using a fraction of the power. Each T5 fixture consumes approximately 228W of power. This measure will save energy but also provide a better light for the faculty and students to work under. Please see Appendix A for complete existing and proposed lighting schedule.

Installation cost:

Estimated installed cost: $5,990
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Install 12 new T5 fluorescent light fixtures	RS Means, lit search	9,398	3,408	5,990	6,420	1.3	0	0.8	0	1,027	15	12,087	5.8	101.8	6.8	15.1	6,273	11,495

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

Rebates / financial incentives:
NJ Clean Energy – Prescriptive Lighting, T-5 High Bay Fixtures ($16-$284 per fixture).
Incentive amount for this application is $3,408.

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

ECM#2: *Install 2 new LED exit signs*

Description:

The Building Trades building contains two fluorescent exit signs. These signs were observed to contain 20W fluorescent bulbs in comparison to newer LED technology that uses only 5W. SWA recommends LED exit signs since they are always cost-effective since they use such little power and operate 24 hours per day. Please see attached existing and proposed lighting schedule located in Appendix A.

Installation cost:

Estimated installed cost: $367
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2	Install 2 new LED exit signs	RSMeans, lit search	407	40	367	102	0.0	0	0.0	23	39	15	463	9.3	26.1	1.7	6.6	102	183

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes operation cost savings based on avoided bulb replacement when upgrading to lighting that consists of longer rated burn hours.

Rebates / financial incentives:
NJ Clean Energy – LED Exit Signs ($10/$20 per fixture)
Incentive amount for this application is $40.

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

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There are not currently any existing renewable energy systems.

5.2. Wind

A Wind system is not applicable for this building because the area does not have winds of sufficient velocity to justify installing a wind turbine system.

5.3. Solar Photovoltaic

A solar photovoltaic array has been recommended for the Main building that shares a meter with this building.

5.4. Solar Thermal Collectors

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

5.5. Combined Heat and Power

CHP is not applicable for this building because of the existing HVAC system and insufficient domestic hot water use.

5.6. Geothermal

Geothermal is not applicable for this building because current HVAC equipment would need to be completely reconfigured and the total cost of installation would not be cost effective.

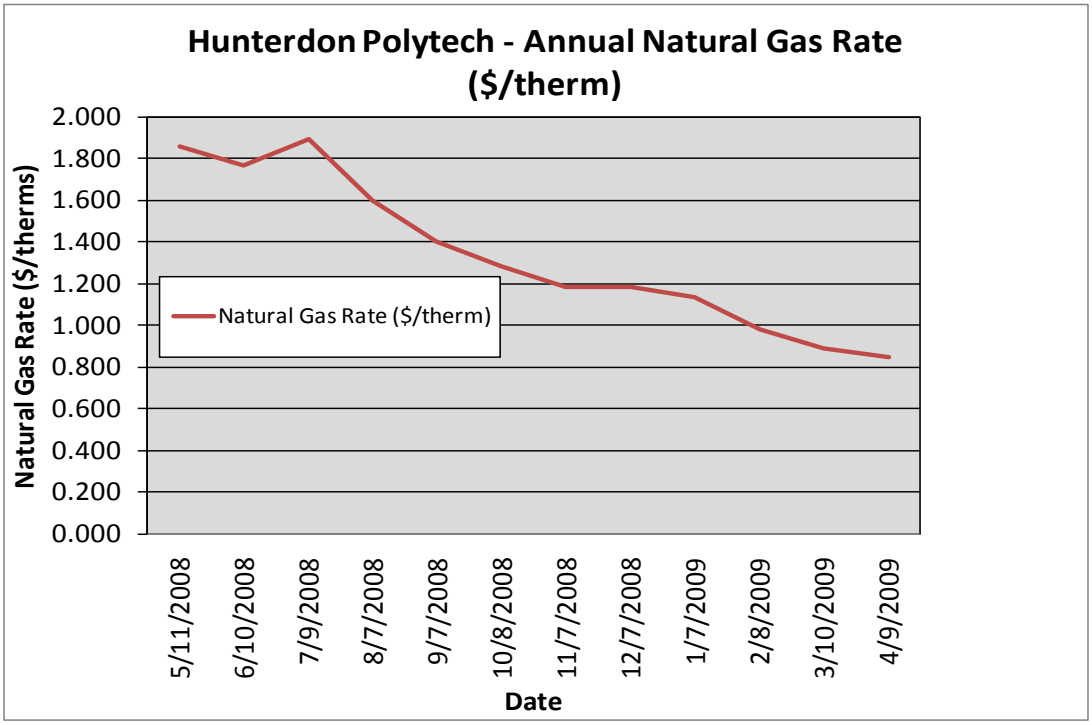
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

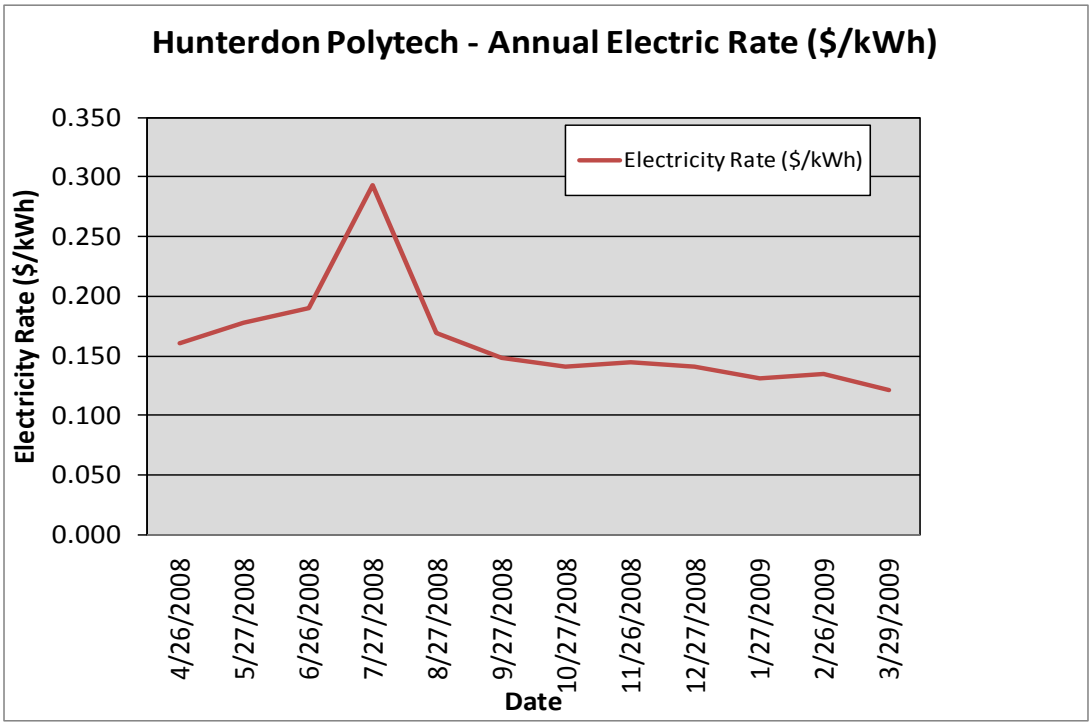
6.1. Energy Purchasing

Hunterdon Polytech receives natural gas via one incoming meter. Elizabethtown Gas supplies gas to the building. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner. Electricity is also purchased via one incoming meter directly for the facility from JCP&L without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations of 59% over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to over 100% over the most recent 12 month period. The high gas price per therm fluctuations in the summer may be due to low use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months.

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 Hunterdon Polytech is $.160/kWh, which means there is a potential cost savings of $5,140per year. The current natural gas rate for Hunterdon

Polytech is $1.136/therm which is better than the average natural gas cost. A large cost savings potential for electricity exists, however this involves contacting third party suppliers and negotiating utility rates. SWA recommends that Hunterdon Polytech further explore opportunities of purchasing electricity from third party energy suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the facilities. Appendix B contains a complete list of third party energy suppliers for the Hunterdon Polytech service area. Hunterdon Polytech may want to consider partnering with other school districts, municipalities, townships and communities to aggregate a substantial electric and natural gas use for better leveraging in negotiations with ESCOs and of improving the pricing structures. This sort of activity is happening in many parts of the country and in New Jersey.





6.2. Energy Procurement strategies

Also, Hunterdon Polytech would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time to shed a minimum of 150 kW electric demand when requested by the utility during peak demand periods, which is the typical threshold for considering this option.

7. METHOD OF ANALYSIS

7.1. Assumptions and tools

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

7.2. Disclaimer

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

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

Appendix A: Lighting Study of Hunterdon Polytech – Building Trades building

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 (102)	Parabolic	E	4'T8	3	2	32	S	12	261	6	198	658	N/A	Parabolic	4'T8	E	S	3	2	32	12	261	6	198	658	0	0	0
2	GF	Admin. Office	Screw-in	N	CFL	1	1	15	S	12	261	0	15	47	N/A	Screw-in	CFL	N	S	1	1	15	12	261	0	15	47	0	0	0
3	GF	Bathroom	Parabolic	E	4'T8	1	2	32	S	12	261	6	70	219	N/A	Parabolic	4'T8	E	S	1	2	32	12	261	6	70	219	0	0	0
4	GF	Utility Rm	Parabolic	E	4'T8	2	1	32	S	2	193	8	72	31	N/A	Parabolic	4'T8	E	S	2	1	32	2	193	8	72	31	0	0	0
5	GF	Classroom (103)	Parabolic	E	4'T8	9	3	32	S	12	193	8	872	2,168	N/A	Parabolic	4'T8	E	S	9	3	32	12	193	8	872	2,168	0	0	0
6	GF	Locker Area	Parabolic	E	4'T8	4	2	32	S	12	193	8	264	667	N/A	Parabolic	4'T8	E	S	4	2	32	12	193	8	264	667	0	0	0
7	GF	Bathroom Men	Parabolic	E	4'T8	1	3	32	S	12	193	10	106	245	N/A	Parabolic	4'T8	E	S	1	3	32	12	193	10	106	245	0	0	0
8	GF	Bathroom Women	Parabolic	E	4'T8	1	3	32	S	12	193	8	104	241	N/A	Parabolic	4'T8	E	S	1	3	32	12	193	8	104	241	0	0	0
9	GF	Storage Rm (106)	Parabolic	E	4'T8	2	4	32	S	2	193	13	269	109	N/A	Parabolic	4'T8	E	S	2	4	32	2	193	13	269	109	0	0	0
10	GF	Storage Rm (106)	Parabolic	E	4'T8	1	2	32	S	2	193	6	70	27	N/A	Parabolic	4'T8	E	S	1	2	32	2	193	6	70	27	0	0	0
11	**GF**	**Constr. School Workshop**	**HID**	**N**	**MV**	**12**	**1**	**400**	**S**	**12**	**193**	**54**	**4,854**	**12,618**	**T5**	**Parabolic**	**T5**	**E**	**S**	**12**	**4**	**54**	**12**	**193**	**12**	**2,604**	**6,198**	**6,420**	**0**	**6,420**
12	**GF**	**Constr. School Workshop**	**Exit Sign**	**N**	**FI.**	**2**	**1**	**15**	**N**	**24**	**193**	**2**	**32**	**157**	**LEDex**	**Exit Sign**	**LED**	**N**	**N**	**2**	**1**	**5**	**24**	**193**	**1**	**11**	**56**	**102**	**0**	**102**
Totals:						**39**	**25**	**718**					**6926**	**17186.892**						**39**	**28**	**362**				**4655**	**10664.996**	**6,522**	**0**	**6,522**
Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space																														

Appendix B: Third Party Energy Suppliers (ESCOs)

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

Third Party Electric Suppliers for JCPL Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.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
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
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