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July 13, 2009

Local Government Energy Program
Energy audit report
Final; 2/1/2010

For

Hunterdon Hall
Raritan Valley Community College
North Branch, NJ 08876

Project Number: LGEA05

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INTRODUCTION

On April 21st, 22nd, 23rd & 24th, 2009; Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment of the Raritan Valley Community College (RVCC) buildings located in North Branch, NJ. Current conditions and energy-related information was collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

Energy data collected in the field was imported into the eQUEST energy conservation software to generate a baseline model of the building. SWA simulated the installation of energy improvement measures on the baseline model of the building. Energy saving calculations and projected economics are automated and served as the basis for our conclusions.

There are eleven separate buildings that were evaluated for this energy audit; Somerset Hall, Hunterdon Hall, East Building/Planetarium, College Center, Physical Education Building, Library/Theater, Conference Center (ATCC), Science Building, West Building, Arts Building and also the Child Care Center (CCC) buildings. The buildings were built at different times as the college expanded. Each building is unique in area and also building construction.

Only CCC and Arts building have their individual electric meters; other buildings are connected to the main campus electric meter. Science building has its own gas meter; other buildings that use gas are connected to the main campus gas meter. The campus has a district cooling and heating plant that serves chilled water and hot water to various buildings connected to the campus loop; ATCC, Science building, Arts building, and CCC are not connected to this loop. The gas to the boiler providing hot water to the loop is metered separately. The central plant is also equipped with a cogenerator, the gas for which is metered separately. Hence, there are three main gas meters in the campus that are directly or indirectly connected to the eleven buildings: Main campus gas meter, Boiler plant gas meter, and Cogen gas meter.

The present report is for Hunterdon Hall only.

Hunterdon Hall houses mostly classrooms and RVCC administrative offices. The three-story building consists of 42,600 square feet and is fully conditioned. The building is operated from 7am to 10pm on weekdays and occasionally on weekends for classes.

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

The energy audit performed by SWA encompasses eleven buildings of various ages and constructions. A report has been generated for each building in order to fully document the existing conditions and recommended Energy Conservation Measures (ECMs). Based on the field visits performed by Steven Winter Associates (SWA) staff on April 21st, 22nd, 23rd and 24th, 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 and 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.

Hunterdon Hall is currently not metered separately and receives both electricity and gas from main campus meters. In the most recent year (March 2008-February 2009), the RVCC main electric meter recorded approximately 7,807,991 kWh or $1,224,758.25 worth of electricity. The total amount of gas recorded by the three main gas meters in the campus was 392,183 therms or $534,089.63 worth of natural gas. Since the Hunterdon Hall building is not metered separately for gas, SWA estimated the amount of gas consumed by this building alone, directly or indirectly, on a pro-rata basis by its square footage. The Hunterdon Hall building consumed 46,406 therms of gas during this period at a total cost of $63,208.47.

SWA benchmarked Hunterdon Hall as part of the RVCC campus using the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The Portfolio Manager is not currently capable of generating a benchmark score for the building to compare on a national average since the building is part of a campus. The Portfolio Manager is capable of generating a site energy use intensity number using the 12 months prior to February 2009 as a baseline year. The site energy use intensity for the RVCC campus is 184 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 of a different time period can be compared to the current year baseline to show changes in energy consumption over time.

SWA recommends a total of 7 Energy Conservation Measures (ECMs) for Hunterdon Hall. The total investment cost for these ECMs is **$170,768**. The total investment cost for these ECMs if maximum incentives are achieved is **$165,183**. SWA estimates a first year savings of **$33,616** with a simple payback of **5.1 years**. SWA estimates that implementing the recommended ECMs will reduce the carbon footprint of Hunterdon Hall by **319,742 lbs of CO_2** annually**.**

There are various incentives that Hunterdon Hall could apply for that could also help lower the cost of installing the ECMs. SWA recommends that Hunterdon Hall 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. RVCC should consider applying to the New Jersey Clean Energy Pay-for-Performance Program. Additional details are available in the SWA document "Energy Audit Report Summary" for all buildings. There are also prescriptive measure incentives that would pay RVCC up to $960 for upgrading lighting controls, up to $50 for replacing the electric DHW heater and up to $4,575 for the replacement of the 40HP pump motor. The total amount of incentives available for Hunterdon Hall is **$5,585** and the total investment cost if all the incentives are paid to their maximum amount is **$165,183**.

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

ECM Table without Incentives

ECM#	ECM description	Installed Cost		1st year energy savings							SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO2)
		Estimated $	Source	Electric Savings (kWh)	Unit	Natural Gas Savings (therms)	Unit	Demand	Unit	$ Savings/year			Cost Savings		
1	Weather-strip exterior doors	$ 422	RSMeans	-	kWh	81	therms	0.0	kW	$ 131	3.2	10	$ 1,108	16.3%	893
2	Install heat exchanger between duct return and AHU	$ 8,100	RSMeans	960	kWh	321	therms	0.3	kW	$ 669	12.1	25	$ 11,391	1.6%	3,538
3	Replace 1000Kva transformer	$ 46,876	RSMeans	20,345	kWh	-	therms	2.3	kW	$ 3,153	14.9	32	$ 62,580	1.0%	36,428
4	Replace pneumatic controls	$ 85,200	Similar project	13,066	kWh	2,321	therms	0.0	kW	$ 9,945	8.6	25	$ 169,382	4.0%	47,862
5	Replace 40HP pump	$ 12,960	RSMeans	100,000	kWh	-	therms	8.9	kW	$ 15,500	0.8	10	$ 130,879	91.0%	179,050
6	Replace electric DHW heater	$ 6,650	RSMeans	7,100	kWh	-423	therms	0.8	kW	$ 415	16.0	25	$ 7,072	0.3%	8,050
7	Upgrade interior lighting controls	$ 10,560	RSMeans	24,530	kWh	0	therms	0.0	kW	$ 3,802	2.8	12	$ 37,398	21.2%	43,921
Total	**Total Scope of Work**	**$ 170,768**	**-**	**141,471**	**-**	**2,300**		**12.3**	**-**	**$ 33,616**	**5.1**		**$ 419,810**		**319,742**

ECM Table including Incentives

ECM#	ECM description	Installed Cost		1st year energy savings							SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO2)
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4	Replace pneumatic controls	$ 85,200	Similar project	13,066	kWh	2,321	therms	0.0	kW	$ 9,945	8.6	25	$ 169,382	4.0%	47,862
5	Replace 40HP pump	$ 8,385	RSMeans	100,000	kWh	-	therms	8.9	kW	$ 15,500	0.5	10	$ 130,879	146.1%	179,050
6	Replace electric DHW heater	$ 6,600	RSMeans	7,100	kWh	-423	therms	0.8	kW	$ 415	15.9	25	$ 7,072	0.3%	8,050
7	Upgrade interior lighting controls	$ 9,600	RSMeans	24,530	kWh	0	therms	0.0	kW	$ 3,802	2.5	12	$ 37,398	24.1%	43,921
Total	**Total Scope of Work**	**$ 165,183**	**-**	**141,471**	**-**	**2,300**		**12.3**	**-**	**$ 33,616**	**4.9**		**$ 419,810**		**319,742**

Definitions:
SPP: Simple Payback (years)
LoM: Life of Measure (years)
ROI: Return on Investment (%)
Assumptions:
Discount rate: 3.2% per DOE FEMP guidelines
Energy price escalation rate: 0% per DOE FEMP guidelines

1. HISTORIC ENERGY CONSUMPTION

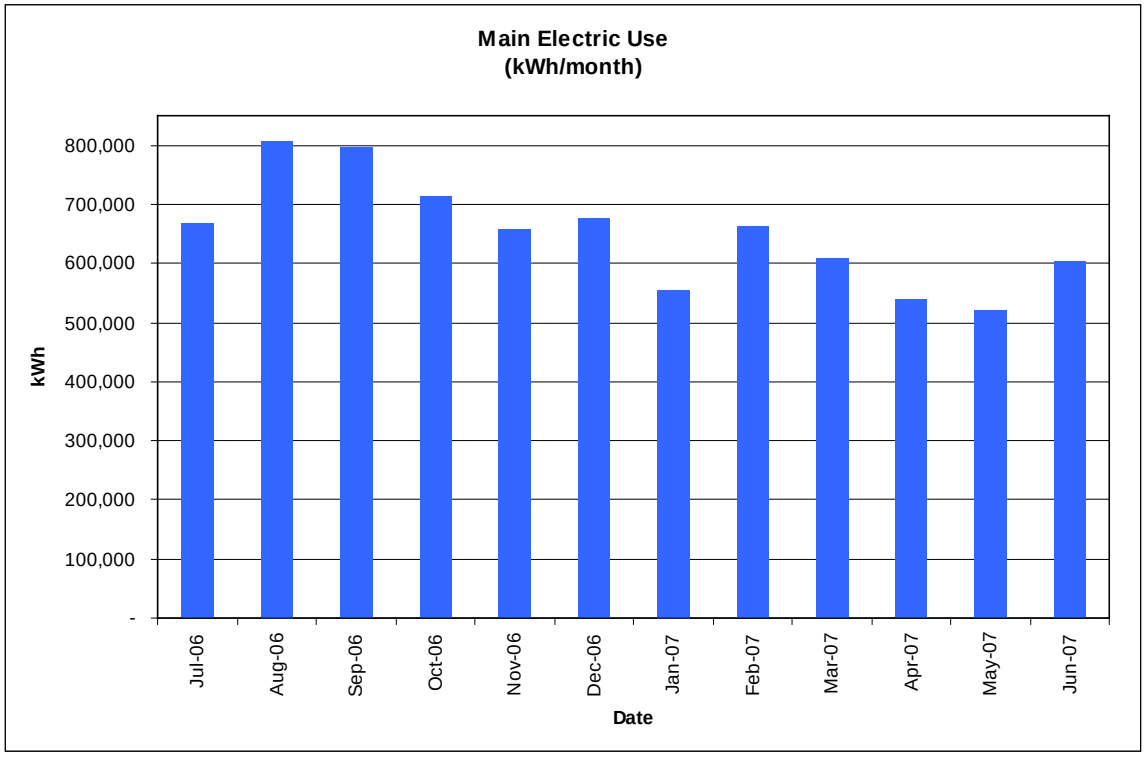
1.1. Energy usage and cost analysis

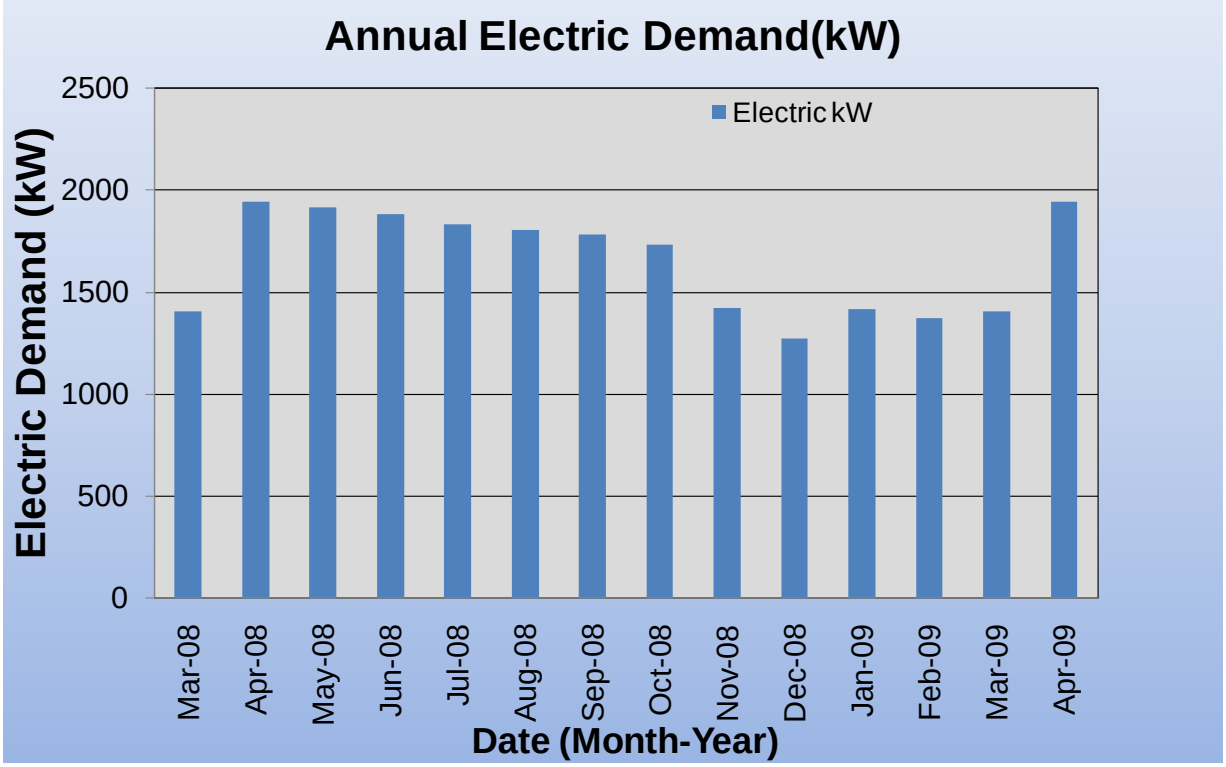
SWA analyzed utility bills from March 2008 through February 2009 that were received from Raritan Valley Community College.

Electricity – Hunterdon Hall is currently not metered separately for electricity. The Main Campus electric meter currently buys electricity from JCP&L at **an average rate of $.155/kWh** based on the previous 12 months worth of utility bills. The Main Campus electric meter purchased **approximately 7,807,991 kWh or $1,224,758.25 worth of electricity** in the previous year. The data also reflected that demand peaked at 1945 kW in April.

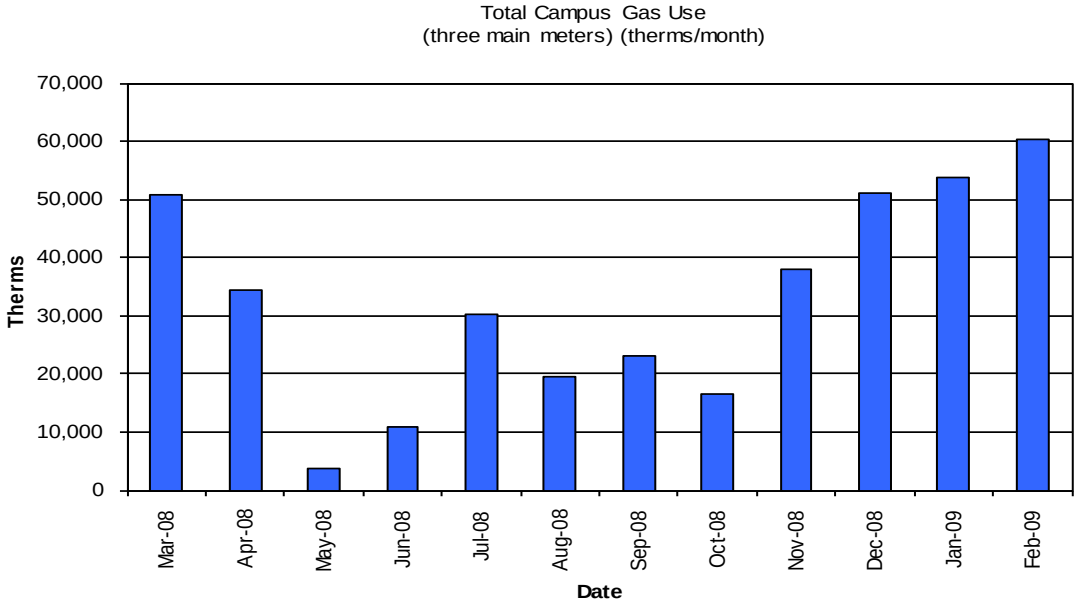
Natural Gas – Hunterdon Hall is currently not metered separately for natural gas. The Campus buys natural gas for its three main meters mentioned above from a third-party Energy Service Company (ESCO) via PSE&G at **an average aggregated rate of $1.36/therm** based on the previous 12 months worth of utility bills. The three gas meters purchased **approximately 392,183 therms or $534,361.90 worth of natural gas** in the previous year. Since the building is not metered separately for gas, SWA estimated the amount of gas consumed by the Hunterdon Hall building alone on pro-rata basis of its square footage. This building consumed **46,406** therms of gas during this period at a total cost of **$63,208.47**.

The following charts show electricity usage (kWh) and electricity demand (kW) for the Main Campus electric meter based on utility bills for the 12 month period of March 2008 – February 2009. Please note that March '08 and April '09 demand in kW was estimated the same as March '09 and April '09 demand in kW.

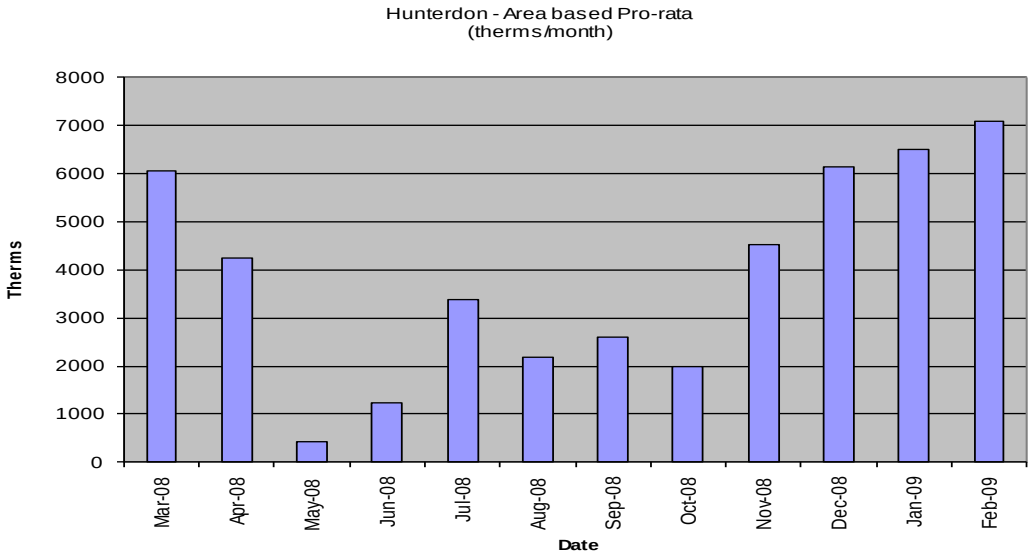




The following chart shows natural gas usage for the Main Campus meter based on utility bills for the 12 month period of March 2008 – February 2009.



Since the Hunterdon Hall building is not metered separately for gas, SWA estimated the amount of gas consumed by the building alone on pro-rata basis by square footage of various spaces for the 12 month period of March 2008 – February 2009, as follows:



1.2. Utility rate

Electricity is received from the Main Campus electric meter which is purchased from JCP&L at a general service market rate for electricity usage (kWh) with a separate (kW) demand charge. The Main Campus electric meter currently pays an average rate of approximately $0.155/kWh based on the previous 12 months of utility bills.

Natural gas is received from the Main Campus gas meter which is purchased at a general service market rate for natural gas (therms). The Campus gas meters that provide natural gas service, directly or indirectly, to the Physical Education building currently pay an average aggregated rate of approximately of **$1.36/therm** based on the previous 12 months of utility bills.

1.3. Energy benchmarking

Hunterdon Hall information and utility data were entered into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The building data could be documented; however, a performance score could not be generated since the building shares a meter as part of the campus. The Energy Star Portfolio Manager currently is not capable of generating a benchmark score for certain building types such as college campuses. SWA has created a Portfolio Manager account for RVCC to access the information. This information can be accessed at: https://www.energystar.gov/istar/pmpam/

```
Username:RaritanValleyCC
Password: RARITANVCC
```

SWA is also sharing the Portfolio Manager information with TRC Energy Services.

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Raritan VCC

Building ID: 1762814
For 12-month Period Ending: February 28, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: June 16, 2009

Facility
Raritan VCC
118 Lamington Road
Branchburg, NJ 08876

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1960
Gross Floor Area (ft²): 423,900

Energy Performance Rating[2] (1-100) N/A

Site Energy Use Summary[3]

Electricity (kBtu)	29,225,895
Natural Gas (kBtu)[4]	48,850,300
Total Energy (kBtu)	78,076,195

Energy Intensity[5]

Site (kBtu/ft²/yr)	184
Source (kBtu/ft²/yr)	351

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	7,129

Electric Distribution Utility
Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	76
National Average Source EUI	170
% Difference from National Average Source EUI	106%
Building Type	College/University (Campus-Level)

Stamp of Certifying Professional

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

Certifying Professional
N/A

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

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

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

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The three-story Hunterdon Hall, originally the Science Building, is over 15 years old, now houses mostly classrooms and administrative offices.

2.2. Building occupancy profiles

The peak occupancy for Hunterdon Hall is approximately 250 persons during weekdays from 7am to 10pm. Occasionally, there are classes held on Saturdays but usually only a part of the building is occupied during those events.

2.3. Building envelope

2.3.1. Exterior walls

Exterior walls consist of 4" face bricks and stone lintels. There are 6" metal studs spaced 16" on center located on the inside of the exterior wall with 6" of R-19 fiberglass batt insulation between each metal stud.

During the site visit and data collection period, SWA performed an infrared scan of the building. The infrared scan was performed early in the morning when the outdoor temperature was round 50ºF. The infrared scan showed that each section was uniform and SWA determined that no problematic areas existed in the building envelope.

SWA evaluated adding additional insulation to the exterior walls of the building in order to reduce thermal losses through the building envelope, but the cost of implementing this measure would be prohibitive. If RVCC decides to do any type of capital improvement to the exterior shell of a building, insulation with a high-effective R-value is always recommended as well as reflective window film on highly glazed areas to reduce the load of the heating and cooling systems.

2.3.2. Roof

Hunterdon Hall consists of a flat roof. The roof is constructed of EPDM rubber with stone ballast on tapered rigid insulation over a metal deck. The stone ballast is a light gray color. On the day of the site visit, SWA inspected the roof and observed no major deficiencies. SWA recommends that if the roof is ever replaced that a well-insulated roof is installed with a light-colored Energy Star reflective surface to cut down on solar heat gain.

2.3.3. Base

The building's base is a 4" concrete slab-on grade and perimeter foundation. No insulation was detected. There were no reported problems with water penetration or moisture.

2.3.4. Windows

The double-paned windows are fixed aluminum-framed units with no insulating properties or films. SWA has determined that there are no cost-effective options for the windows at this point in time.

2.3.5. Exterior doors

The exterior doors of the building are aluminum-framed units with no insulating properties or films. The exterior doors were observed to have the original weather-stripping which is no longer performing as intended. SWA recommends that the exterior doors of the building are 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 door will help ensure that the building is kept tight and insulated over time.

2.3.6. Building air tightness

Hunterdon Hall was observed to be a relatively tight building with the exception of the exterior doors. There were no major observed deficiencies of air tightness within the building besides the exterior doors.

2.4. HVAC systems

2.4.1. Heating

The building is fed from the existing campus CHW and HW loops for summer cooling and winter heating during 5 week days from 7am to 10pm and selectively during after-hour and weekend events when the central CHP engine-generator, chillers and boilers are in operation.

Two very old, large rooftop air-handling units (AHU) with a CHW coil and heating coil serve the building core and all interior rooms. In classrooms and offices, floor mounted unit ventilators with CHW and HW coils fed from campus water loop provide conditioned air.

2.4.2. Cooling

The building is fed from the existing campus CHW loops and uses the same appliances to cool as it does heat.

2.4.3. Ventilation

The building uses the rooftop units to provide fresh air to the building in combination with natural ventilation in classrooms and offices.

2.4.4. Domestic Hot Water

Domestic Hot Water is provided by a 200 MBH gas-fired DHW heater and also a 4.5kW electric water heater in mechanical room.

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting – Hunterdon Hall uses all fluorescent T8 lighting with electronic ballasts. There is no need for any upgrade at this point in time.

Exit Lights – The building contains all 5W LED exit signs.

Exterior Lighting – The exterior lighting was surveyed during the building audit. SWA has deemed it not cost effective to replace exterior lighting at this time. All exterior lighting is controlled by a timer located in the boiler room. There is no need for any immediate upgrade of lighting or timer; however, SWA recommends that the building maintenance adjust the timer at least twice per year in order to make sure that the timer stays current with Daylight Savings Time.

2.5.2. Appliances and process

SWA has surveyed all appliances installed at Hunterdon Hall and have deemed that it would not be cost effective to replace any appliances at this time. SWA recommends that the most energy efficient options are always chosen whenever any appliances including computers, dispatch radio equipment, refrigerators, etc. are purchased.

2.5.3. Elevators

Hunterdon Hall contains a hydraulic elevator. There are currently no energy efficient options that are cost-effective for this type of elevator.

2.5.4. Other electrical systems/transformers

Hunterdon Hall is equipped with a 1000kVA distribution transformer that is original to the building. This medium-voltage, dry-type transformer steps down the 12.47 kV utility feed to 480-V, 3-phase power for step-down to lower voltages downstream in the facility. Old distribution transformers are already efficient at delivering energy with minimal losses, but because they handle large amounts of electricity, small gains in efficiency (as low as a couple of points) from high efficiency models can yield large energy savings.

3. EQUIPMENT LIST

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
HVAC	AH-1: 4 pipe heating/cooling air handler, 460/3/60, 7.6Amps, 5hp fan, 100% OA; Motor replaced in 2009 - high efficiency	Mechanical room, level 1	Trane, Model C0001201, S/N R88A0.701	Elec.	Whole Bldg.	1973	0%
Cooling	Chilled water pump, 1000gpm, 95'head; 40hp, 460V, 48A, 1800 rpm	Mechanical room, level 1	Allis Chambers, model F224, S/N 1-04406-4-2	Elec.	Whole Bldg.	1973	0%
Heating	Hot water pump, 750gpm, 87'head; 25hp weq motor, 460V, 1800 rpm, high eff. Installed in 2008, C/W VFD	Mechanical room, level 1	Allis Chambers, model F224, S/N 1-04406-5-1	Elec.	Whole Bldg.	1973	0%
H/C	Swing pump (hot or chilled water), 1000gpm, 95'head; 40hp, 460V, 48A, 1800 rpm; Size 6X5X11NR	Mechanical room, level 1	Allis Chambers, model F224, S/N 1-04406-4-1	Elec.	Whole Bldg.	1973	25%
Ventilation	Return air fan, c/w 1 hp motor, 230/400V, 3.6/1.6A, eff. 77%	Mechanical room, level 1	Trane, Model T-6, s/n K2H222837	Elec.	Whole Bldg.	1973	25%
Electrical	225kva, 3 phase insulated transformer	Mechanical room, level 1	Sorgel, modeL 225T3H, size 4.7, s/n Y-86114	Elec.	N/A	1994	53%
Electrical	75kva, 3 phase insulated transformer	Mechanical room, level 1	Sorgel, modeL 225T3H, size 4.09, s/n Y-86111	Elec.	N/A	1994	53%
Electrical	30kva, 3 phase insulated transformer	Mechanical room, level 1	Sorgel, modeL 30T3H, size 4.09, s/n X86116	Elec.	N/A	1994	53%
HVAC	Fan coil units, 26 total, of varying hp's, 3 speed	Throughout building	Trane, Nameplate N/A	Elec.	Various individual spaces	1994	25%
Controls	Air compressor, 2x2hp motors, 115/1/60; tank 135psi @450deg F	Mechanical room, level 1	Ingersoll Rand, Model SS3F2-GMW/R, s/n 0706250133	Elec.	HVAC system actuators	2009	0%
Elec.	400kW diesel generator (no nameplate)	Outside, on grade	Cummins	Elec.	Whole Bldg.	2008	95%
Heating	DHW, 40 gallons tank, 3.5kW, 208/1/60	Mechanical room, level 1	AO Smith, Model ecs 40 200, S/n 0831A005835	Elec.	Whole Bldg.	2005	75%

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

SWA considered the following improvements:

Capital Improvement Measures

- AH-1 along with return fans was installed in 1973 and is past its service life. SWA recommends replacing this along with the return air fan. The energy savings will be marginal compared to the cost of replacement, which is estimated at $300,000.

Summary table

ECM#	Description
1	**Weather-strip exterior doors; weather-stripping will decrease the amount of conditioned air that is lost between the exterior door and frame**
2	**Install heat exchanger between duct return and AHU; Return air currently returns to the AHU unit using the mechanical room as a plenum and can precondition the AHU air**
3	**Replace 1000Kva transformer; replacing with a more efficient transformer will reduce building operating costs and increase savings**
4	**Replace pneumatic controls; replace current control system with DDC controls for more accuracy and greater control over building systems**
5	**Replace 40HP pump; electricity can be saved by replacing one of the 40HP pump motors with a 25HP NEMA premium motor with VFD controls**
6	**Replace electric DHW heater; replace 4.5kW electric water heater with an energy efficient condensing boiler**
7	**Upgrade interior lighting controls; see appendix A**

ECM#1: *Weather-strip exterior doors*

Description:

On the day of the site visit, 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 weather-stripping observed at Hunterdon Hall was intact but worn out in some areas and no longer performing as expected.

Installation cost:

Estimated installed cost: $422
Source of cost estimate: RS *Means*

Economics (without incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
-	81	0.0	$ 131	3.2	10	$ 1,108	16.3%	893

Economics (with incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
-	81	0.0	$ 131	3.2	10	$ 1,108	16.3%	893

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. SWA calculated savings using eQUEST and assuming that infiltration would be reduce by 5% on any wall that included an exterior door that needed weather-stripping.

Rebates/financial incentives:

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

Options for funding ECM:

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

ECM#2: *Install heat exchanger between duct return and AHU*

Description:

Currently, Hunterdon Hall uses the mechanical room as a plenum to provide return air back to the AHU unit. As an Operation and Maintenance measure also with some savings, SWA recommends to install 16"x16" duct for return air to an air to air heat exchanger. The other side of the heat exchanger should be connected to the incoming fresh air to AHU. Only sheet metal work is assumed involved; no moving parts.

Installation cost:

Estimated installed cost: $8,100
Source of cost estimate: RS *Means*

Economics (without incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
960	321	0.0	$ 669	12.1	25	$ 11,391	1.6%	3,538

Economics (with incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
960	321	0.0	$ 669	12.1	25	$ 11,391	1.6%	3,538

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. SWA assumes that 16"x16" will need to be installed in order to return air via duct instead of plenum. The estimated return air is about 800 cfm. The therms savings is assumed to result for 4 months in winters, and kWh savings is assumed to result for 4 months in summers. There are no savings assumed for the shoulder season.

Rebates/financial incentives:

There are no incentives available for this measure at this time from New Jersey Clean energy Program (NJCEP).

Options for funding ECM:

This measure could have been applicable for grant from New Jersey Department of Environmental Protection under "Local Government Greenhouse Gas Reduction Grant Program". The deadline for sending the preliminary application was September 4, 2009 – it was mandatory to send a preliminary

application before this date for access to this grant. SWA recommends to visit the following website in future to check for updates on the opening of a second round of grants in 2010:

http://www.state.nj.us/dep/opsc/docs/ghg_grant_guidance.pdf

ECM#3: *Replace 1000kVA 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: $46,876
Source of cost estimate: Vendor

Economics (without incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
20,345	-	2.3	$ 3,153	14.9	32	$ 62,580	1.0%	36,428

Economics (with incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
20,345	-	2.3	$ 3,153	14.9	32	$ 62,580	1.0%	36,428

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. SWA based calculations on the results of an electric survey that was performed last September at the building. Results of this 7-day monitoring period were provided by RVCC. Because the period of measurement is a representative sample of the overall yearly electric usage from the electric bills, we pro-rated the 7-day measured electric usage to estimate the current yearly electric consumption of the building. Savings are calculated based on 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 no incentives available for this measure at this time from New Jersey Clean energy Program (NJCEP).

Options for funding ECM:

This measure could have been applicable for grant from New Jersey Department of Environmental Protection under "Local Government Greenhouse Gas Reduction Grant Program". The deadline for sending the preliminary application was September 4, 2009 – it was mandatory to send a preliminary application before this date for access to this grant. SWA recommends to visit the following website in future to check for updates on the opening of a second round of grants in 2010:

http://www.state.nj.us/dep/opsc/docs/ghg_grant_guidance.pdf

ECM#4: *Replace pneumatic controls*

Description:

The proposed measure consists of replacing the existing pneumatic control system that include controllers and pneumatic temperature sensors with Direct Digital Controls (DDC) to operate the heating and cooling valves. A DDC system will replace the local control loop with an electronic temperature sensor and a microprocessor to replace the controller. The output from the microprocessor will be converted to a pressure signal to position the remaining heating and cooling valves.

The benefits of DDC include simplicity of operation because the building operator would have direct control over the environment of the building as well as the ability to control setpoints with much more accuracy than a pneumatic control system. This would provide considerable energy savings because the controlled variables would be precisely maintained.

Installation cost:

Estimated installed cost: $85,200
Source of cost estimate: Similar project

Economics (without incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
13,066	2,321	4.2	$ 9,945	8.6	25	$ 169,382	4.0%	47,862

Economics (with incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
4,860	2,321	4.2	$ 9,945	8.6	25	$ 169,382	4.0%	47,862

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. SWA assumes that replacing pneumatic controls with DDC controls is equivalent of changing the thermostatic setpoints of the building by 2ºF. Additionally, pneumatic compressor savings and operation & maintenance savings have been included, estimated based on 1 hour per week savings of an O&M personnel.

Rebates/financial incentives:

There are no incentives available for this measure at this time from New Jersey Clean energy Program (NJCEP).

Options for funding ECM:

This measure could have been applicable for grant from New Jersey Department of Environmental Protection under "Local Government Greenhouse Gas Reduction Grant Program". The deadline for sending the preliminary application was September 4, 2009 – it was mandatory to send a preliminary application before this date for access to this grant. SWA recommends to visit the following website in future to check for updates on the opening of a second round of grants in 2010:

http://www.state.nj.us/dep/opsc/docs/ghg_grant_guidance.pdf

ECM#5: *Replace 40HP pump*

Description:

Hunterdon Hall currently houses 3 pumps that work with the campus water loops. Originally, these three pumps were all 40HP pumps with standard efficiency motors. RVCC has replaced one pump motor with a 25HP premium efficiency motor with VFD controls. SWA recommends replacing another 40HP pump with a 25HP NEMA premium efficiency motor with VFD controls.

Installation cost:

Estimated installed cost: $12,960
Source of cost estimate: RSMeans

Economics (without incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
100,000	-	8.9	$ 15,500	0.8	10	$ 130,879	91.0%	179,050

Economics (with incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
100,000	-	8.9	$ 15,500	<1	10	$ 130,879	>100%	179,050

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

Rebates/financial incentives:

NJ Clean Energy – Variable Frequency Drives, Variable air volume ($65-$155 per hp)
Maximum incentive amount is $3,875.

NJ Clean Energy – Premium Motors, Three-phase motors ($45-$700 per motor)
Maximum incentive amount is $700.

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#6: *Replace electric DHW heater*

Description:

Currently, Hunterdon Hall uses an electric DHW heater to meet the domestic hot water (DHW) load of the building. Electric heaters are inefficient and are expensive to operate since they use electricity. SWA recommends replacing this DHW heater with a newer type condensing, gas-fired boiler. Natural gas-fired, condensing types boilers are cheaper to operate and more efficient then electric heaters.

Installation cost:

Estimated installed cost: $6,650
Source of cost estimate: RSMeans

Economics (without incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
7,100	(423)	0.8	$ 415	16.0	25	$ 7,072	0.3%	8,050

Economics (with incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
7,100	(423)	0.8	$ 415	15.9	25	$ 7,072	0.3%	8,050

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. SWA assumes that the proposed condensing boiler will have an efficiency of 95%.

Rebates/financial incentives:

NJ Clean Energy – Natural Gas Water Heating, Gas water heaters <50 gallons ($50 per unit)
Maximum incentive amount is $50

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#7: *Upgrade interior lighting controls*

Description:

Currently, the Hunterdon Hall building lighting is mostly controlled by manual switches. In most areas, lights are on from 7 am through 10 pm; in other areas, lights may be switched off by people owning responsibility for these areas, such as janitor owns responsibility for the janitor rooms. SWA performed an evaluation of installing daylight and occupancy sensors in large spaces, offices and bathrooms that may be left unoccupied a considerable amount of time throughout the day. Further details on the quantity and areas for the sensors recommendation be found in Appendix A, Sheet 2. Dual Technology occupancy sensors provide 360° of coverage and use both passive infrared and ultrasonic technologies to sense occupancy.

Installation cost:

Estimated installed cost: $10,560
Source of cost estimate: RS *Means*

Economics (without incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
24,530	-	-	$ 3,802	2.8	12	$ 37,398	21.2%	43,921

Economics (with incentives):

Annual Savings						Lifetime		
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year	SPP	LoM	Cost Savings	ROI	Annual Carbon Reduction (lbs of CO2)
24,530	-	-	$ 3,802	2.5	12	$ 37,398	24.1%	43,921

Assumptions: SWA calculated the savings for this measure using reduced hours of operation after the installation of sensors; please see Appendix A, Sheet 2, for the new hours/day assumed.

Rebates/financial incentives:

NJ Clean Energy - Wall Mounted occupancy sensors ($20 per control)
Maximum incentive amount is $960.

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 currently no existing renewable energy systems.

5.2. Solar Photovoltaic

Solar Photovoltaic (PV) technology is not applicable for this project because the campus cannot be net metered due to an existing CHP system. Without net metering, the incentives available are considerably reduced and do not justify the investment.

5.3. Solar Thermal Collectors

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

5.4. Combined Heat and Power

Description:

CHP is not applicable for this building because of existing campus-wide CHP unit already in place.

5.5. Geothermal

Description:

Geothermal is not applicable for this building because it would not be cost effective to change to a geothermal system.

5.6. Wind

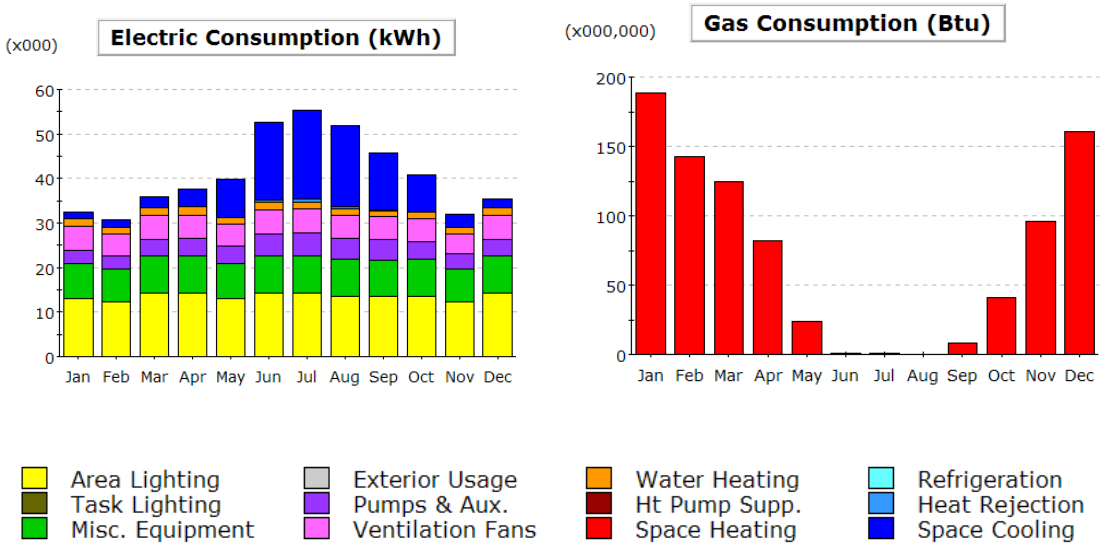
Description:

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

6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load profiles

In 2007, a power survey was conducted at the Hunterdon substation by Trace Electrical Services and Testing. The survey was conducted by installing power recording meters for seven days at various buildings on campus. The Hunterdon substation was surveyed from September 18th, 2007 through September 25th, 2007. The results of the test revealed that the Hunterdon substation had a peak demand of 121.91 kW at 11.51am on September 19th, 2007. Over the seven-day period, there was a cumulative power usage of 15.482 MWh or approximately 2211.714 kWh per day. An accurate load profile could not be determined from utility bills since this building is not metered separately, however a load profile can be estimated from the eQUEST model of the building. Below are the charts from eQUEST that simulate an electric and natural gas profile.



6.2. Tariff analysis

Currently, natural gas and electricity is provided to Hunterdon Hall through the Main Campus gas and electric meters. Natural gas is purchased for the main campus meter from an ESCO and is provided through PSE&G at a general service rate. The general service rate for natural gas charges a market-rate price based on usage and the RVCC billing does not breakdown demand costs. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the natural gas prices increase during the heating months when natural gas is used by the rooftop air-handling units.

Electricity is purchased for the main campus meter from JCP&L at a general service rate. The general service rate for electricity charges a market-rate price based on usage and the RVCC billing does not breakdown demand costs. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

6.3. Energy Procurement strategies

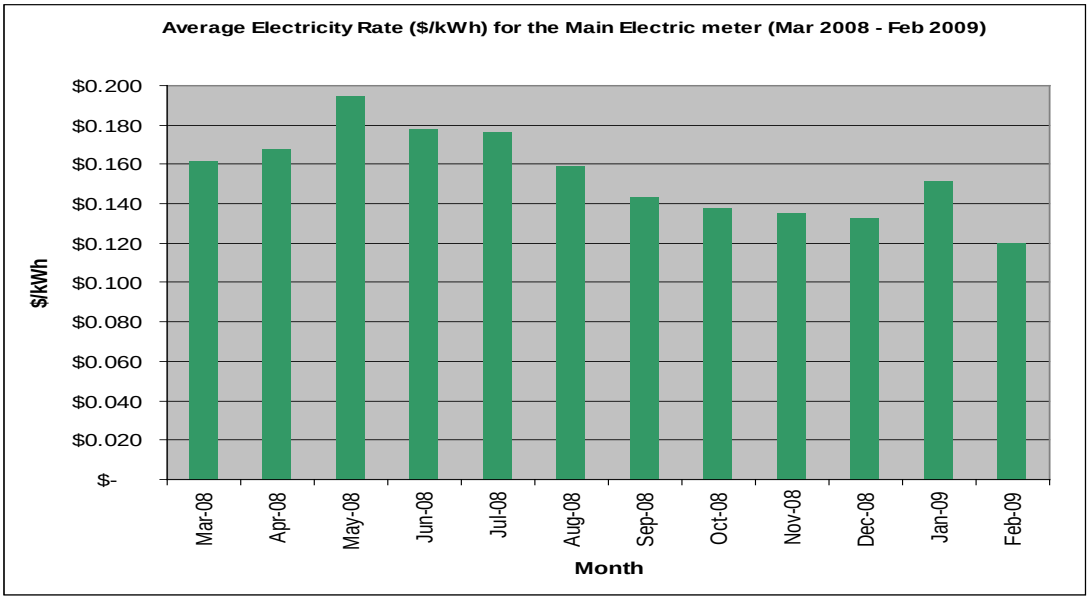
Hunterdon Hall receives natural gas from the main campus meter which already uses an Energy Services Company (ESCO) that acts as a third party energy supplier. Additionally, it receives part of its electricity generated by CHP, and hence consumes some gas indirectly. Further, it is connected to the campus hot water loop, which is heated by gas metered at the central boiler. Electricity is received from the main campus electric meter directly from JCP&L and no ESCO is used. SWA analyzed the utility rate for electricity over the previous 12 months. Electric bill analysis shows fluctuations of 39% over the most recent 12 month period. Some of these fluctuations may have been caused by adjustments between estimated and actual meter readings; others may be due to unusually high and escalating energy costs in 2008. The average estimated NJ commercial utility rates for electric and gas are $0.150/kWh and $1.550/therm respectively. The Hunterdon Hall building annual utility costs are $5,719.83 higher for electric when compared to the average estimated NJ commercial utility rates.

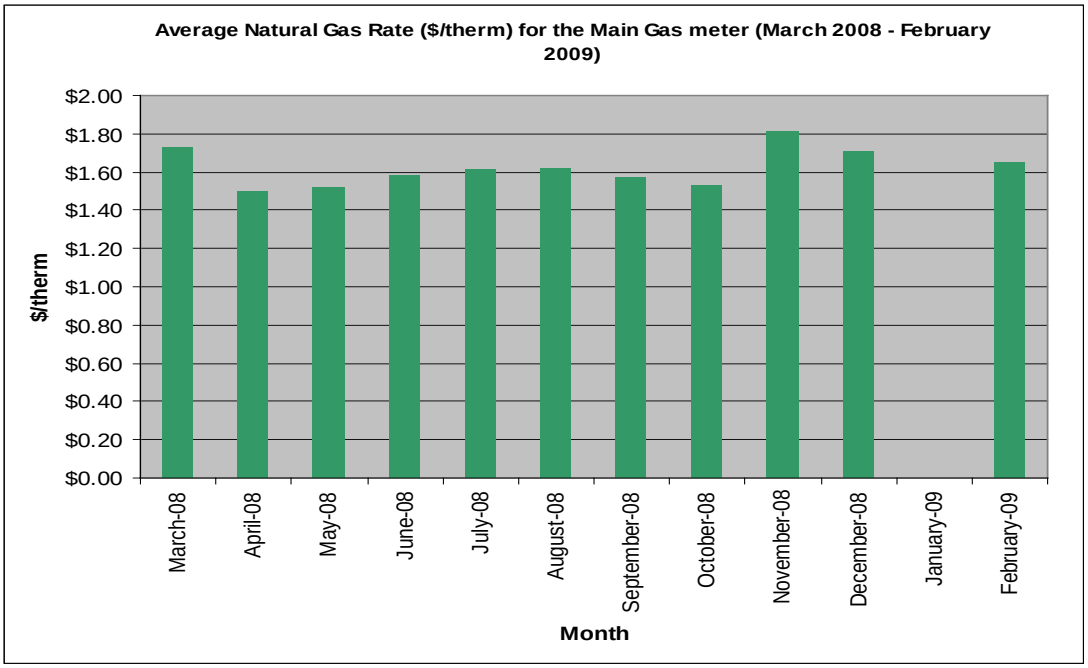
SWA recommends that the RVCC further explore opportunities of purchasing both natural gas and electricity from ESCOs in order to reduce rate fluctuation and ultimately reduce the annual cost of

energy for the campus. Appendix C contains a complete list of third party energy suppliers for the service area.

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

RVCC is already enrolled in a Demand Response Program and Emergency Programs through a contract agreement with Enernoc. Prior to any curtailment or emergency events, temperature setpoints are decreased by a couple of degrees to "boost" the building thermal loads. This system allows RVCC to receive additional revenues from these energy programs without any disruption in occupants comfort.





7. METHOD OF ANALYSIS

7.1. Assumptions and tools

Energy modeling tool:	eQUEST V3.6
Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) 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 (Sheet 1 – Existing lights)

Existing Lighting Conditions															
#	Building	Level/Floor	Location in Building	Measured Lighting Level in Footcandles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	Controls	Daylighting possible?	Total Power (W)
1	Hunterdon	First	Stairwells	19	4' linear T8	Electronic	2	3	Fluorescent	32	15	2880	Manual	No	192
2	Hunterdon	First	Corridors/Entry	17	2' U-shaped T8	Electronic	47	2	Fluorescent	32	15	45120	Manual	No	3008
3	Hunterdon	First	Mechanical Room	24	4' linear T8	Electronic	10	2	Fluorescent	32	15	9600	Manual	No	640
4	Hunterdon	First	H 118	63	4' linear T8	Electronic	9	4	Fluorescent	32	12	13824	Manual	No	1152
5	Hunterdon	First	H 116	61	4' linear T8	Electronic	12	4	Fluorescent	32	12	18432	Manual	Yes	1536
6	Hunterdon	First	H 110	37	4' linear T8	Electronic	12	4	Fluorescent	32	12	18432	Manual	Yes	1536
7	Hunterdon	First	H 114	47	4' linear T8	Electronic	8	4	Fluorescent	32	12	12288	Manual	Yes	1024
8	Hunterdon	First	H 120	34	4' linear T8	Electronic	9	4	Fluorescent	32	12	13824	Manual	No	1152
9	Hunterdon	First	H 111	73	4' linear T8	Electronic	4	4	Fluorescent	32	12	6144	Manual	Yes	512
10	Hunterdon	First	Exit Lights	-	LED	-	14	1	LED	5	24	1680	None	No	70
11	Hunterdon	Second	Stairs	17	2' U-shaped T8	Electronic	2	2	Fluorescent	32	15	1920	Manual	No	128
12	Hunterdon	Second	Stairs	18	4' linear T8	Electronic	2	3	Fluorescent	32	15	2880	Manual	No	192
13	Hunterdon	Second	Corridor	21	2' U-shaped T8	Electronic	24	2	Fluorescent	32	15	23040	Manual	No	1536
14	Hunterdon	Second	Opposite Stairs	16	4' linear T8	Electronic	3	2	Fluorescent	32	15	2880	Manual	No	192
15	Hunterdon	Second	Opposite Stairs	21	4' linear T8	Electronic	3	3	Fluorescent	32	15	4320	Manual	No	288
16	Hunterdon	Second	225	43	4' linear T8	Electronic	6	4	Fluorescent	32	12	9216	Manual	Yes	768
17	Hunterdon	Second	227 - Nursing Lab	70	4' linear T8	Electronic	19	4	Fluorescent	32	12	29184	Manual	Yes	2432
18	Hunterdon	Second	227 - Nursing Lab	33	4' linear T8	Electronic	4	2	Fluorescent	32	12	3072	Manual	Yes	256
19	Hunterdon	Second	228	46	4' linear T8	Electronic	12	4	Fluorescent	32	12	18432	Manual	Yes	1536
20	Hunterdon	Second	211	45	4' linear T8	Electronic	12	4	Fluorescent	32	12	18432	Manual	Yes	1536
21	Hunterdon	Second	229	44	4' linear T8	Electronic	12	4	Fluorescent	32	12	18432	Manual	Yes	1536
22	Hunterdon	Second	210	44	4' linear T8	Electronic	9	4	Fluorescent	32	12	13824	Manual	Yes	1152
23	Hunterdon	Second	210	42	2' U-shaped T8	Electronic	2	2	Fluorescent	32	12	1536	Manual	Yes	128
24	Hunterdon	Second	N 200	61	2F32T8	Electronic	7	2	Fluorescent	32	12	5376	Manual	Yes	448
25	Hunterdon	Second	N 200	52	4F32T8	Electronic	4	4	Fluorescent	32	12	6144	Manual	Yes	512
26	Hunterdon	Second	212	34	2' u-shaped T8	Electronic	3	2	Fluorescent	32	12	2304	Occ. Sensors	Yes	192
27	Hunterdon	Second	213	53	2' u-shaped T8	Electronic	3	2	Fluorescent	32	12	2304	Manual	No	192
28	Hunterdon	Second	214	35	2' u-shaped T8	Electronic	3	2	Fluorescent	32	12	2304	Manual	No	192
29	Hunterdon	Second	215	37	2' u-shaped T8	Electronic	3	2	Fluorescent	32	12	2304	Manual	No	192
30	Hunterdon	Second	216	38	2' u-shaped T8	Electronic	3	2	Fluorescent	32	12	2304	Manual	No	192
31	Hunterdon	Second	217	36	2' u-shaped T8	Electronic	3	2	Fluorescent	32	12	2304	Manual	No	192
32	Hunterdon	Second	218	54	2' u-shaped T8	Electronic	3	2	Fluorescent	32	12	2304	Manual	No	192
33	Hunterdon	Second	219	43	2' u-shaped T8	Electronic	3	2	Fluorescent	32	12	2304	Manual	No	192
34	Hunterdon	Second	220	34	2' u-shaped T8	Electronic	3	2	Fluorescent	32	12	2304	Manual	No	192
35	Hunterdon	Second	Entry to Raised Walk	62	2' u-shaped T8	Electronic	7	2	Fluorescent	32	15	6720	Manual	Yes	448
36	Hunterdon	Third	Stairwells	19	4' linear T8	Electronic	6	3	Fluorescent	32	15	8640	Manual	No	576
37	Hunterdon	Third	Corridors	15	2' u-shaped T8	Electronic	24	2	Fluorescent	32	15	23040	Manual	No	1536
38	Hunterdon	Third	Lounge	52	2' u-shaped T8	Electronic	8	2	Fluorescent	32	12	6144	Manual	Yes	512
39	Hunterdon	Third	Offices Reception	15	4' linear T8	Electronic	3	4	Fluorescent	32	12	4608	Manual	No	384
40	Hunterdon	Third	Copy Room	78	4' linear T8	Electronic	1	2	Fluorescent	32	12	768	SP Switches	No	64
41	Hunterdon	Third	Interior Corridor	32	2' u-shaped T8	Electronic	11	2	Fluorescent	32	15	10560	Manual	No	704
42	Hunterdon	Third	Offices	45	4' linear T8	Electronic	32	4	Fluorescent	32	12	49152	SP Switches	Yes	4096
43	Hunterdon	Third	Offices	34	4' linear T8	Electronic	10	4	Fluorescent	32	12	15360	SP Switches	No	1280
44	Hunterdon	Third	Classroom H 328	54	4' linear T8	Electronic	16	4	Fluorescent	32	12	24576	SP Switches	Yes	2048
45	Hunterdon	Third	Classroom H 329	52	4' linear T8	Electronic	12	4	Fluorescent	32	12	18432	SP Switches	Yes	1536
46	Hunterdon	Third	Classroom 330	57	4' linear T8	Electronic	12	4	Fluorescent	32	12	18432	SP Switches	Yes	1536
47	Hunterdon	Third	Classroom 333	61	4' linear T8	Electronic	16	4	Fluorescent	32	12	24576	SP Switches	Yes	2048
48	Hunterdon	Third	Men's Room	32	2' u-shaped T8	Electronic	2	2	Fluorescent	32	15	1920	Manual	No	128
49	Hunterdon	Third	Women's Room	32	2' u-shaped T8	Electronic	2	2	Fluorescent	32	15	1920	Manual	No	128

Totals		
Existing Usage (kWh/year)		140,025
Proposed Usage (kWh/year)		140,025
Existing Est. Cost ($/year)	$	21,703.95
Proposed Est. Cost ($/year)	$	21,703.95
Total kWh savings		-
Total $ Savings	$	-

Existing		
Interior Lighting Total Watts	42214	Watts
Interior Lighting Power Density (W/sqft)	0.99	W/sqft

Proposed		
Interior Lighting Total Watts	42214	watts
Interior Lighting (W/sqft)	0.99	W/sqft

Appendix A: Lighting study (Sheet 2 – Proposed lighting controls)

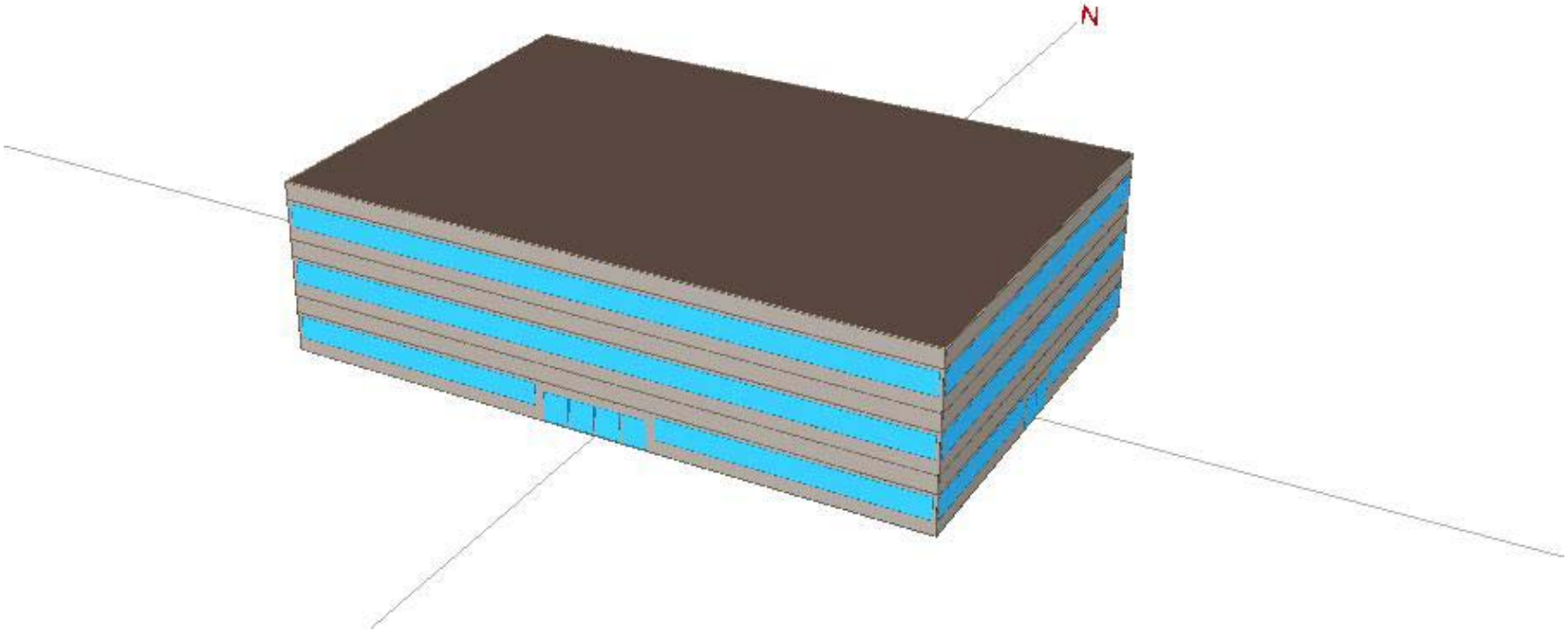
Proposed Lighting Conditions																
#	Building	Level/Floor	Location in Building	Measured Lighting Level in Footcandles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	Controls	Daylighting possible?	New controls	Total Power (Watts)
1	Hunterdon	First	Stairwells	19	4' linear T8	Electronic	2	3	Fluorescent	32	12	2304	Occ. Sensors	No	1	192
2	Hunterdon	First	Corridors/Entry	17	2' U-shaped T8	Electronic	47	2	Fluorescent	32	12	36096	Occ. Sensors	No	1	3008
3	Hunterdon	First	Mechanical Room	24	4' linear T8	Electronic	10	2	Fluorescent	32	12	7680	Occ. Sensors	No	1	640
4	Hunterdon	First	H 118	63	4' linear T8	Electronic	9	4	Fluorescent	32	10	11520	Occ. Sensors	No	1	1152
5	Hunterdon	First	H 116	61	4' linear T8	Electronic	12	4	Fluorescent	32	10	15360	Occ. Sensors	Yes	1	1536
6	Hunterdon	First	H 110	37	4' linear T8	Electronic	12	4	Fluorescent	32	10	15360	Occ. Sensors	Yes	1	1536
7	Hunterdon	First	H 114	47	4' linear T8	Electronic	8	4	Fluorescent	32	10	10240	Occ. Sensors	Yes	1	1024
8	Hunterdon	First	H 120	34	4' linear T8	Electronic	9	4	Fluorescent	32	10	11520	Occ. Sensors	No	1	1152
9	Hunterdon	First	H 111	73	4' linear T8	Electronic	4	4	Fluorescent	32	10	5120	Occ. Sensors	Yes	1	512
10	Hunterdon	First	Exit Lights	-	LED	-	14	1	LED	5	24	1680	None	No		70
11	Hunterdon	Second	Stairs	17	2' U-shaped T8	Electronic	2	2	Fluorescent	32	12	1536	Occ. Sensors	No	1	128
12	Hunterdon	Second	Stairs	18	4' linear T8	Electronic	2	3	Fluorescent	32	12	2304	Occ. Sensors	No	1	192
13	Hunterdon	Second	Corridor	21	2' U-shaped T8	Electronic	24	2	Fluorescent	32	12	18432	Occ. Sensors	No	1	1536
14	Hunterdon	Second	Opposite Stairs	16	4' linear T8	Electronic	3	2	Fluorescent	32	12	2304	Occ. Sensors	No	1	192
15	Hunterdon	Second	Opposite Stairs	21	4' linear T8	Electronic	3	3	Fluorescent	32	12	3456	Occ. Sensors	No	1	288
16	Hunterdon	Second	225	43	4' linear T8	Electronic	6	4	Fluorescent	32	10	7680	Occ. Sensors	Yes	1	768
17	Hunterdon	Second	227 - Nursing Lab	70	4' linear T8	Electronic	19	4	Fluorescent	32	10	24320	Occ. Sensors	Yes	1	2432
18	Hunterdon	Second	227 - Nursing Lab	33	4' linear T8	Electronic	4	2	Fluorescent	32	10	2560	Occ. Sensors	Yes	1	256
19	Hunterdon	Second	228	46	4' linear T8	Electronic	12	4	Fluorescent	32	10	15360	Occ. Sensors	Yes	1	1536
20	Hunterdon	Second	211	45	4' linear T8	Electronic	12	4	Fluorescent	32	10	15360	Occ. Sensors	Yes	1	1536
21	Hunterdon	Second	229	44	4' linear T8	Electronic	12	4	Fluorescent	32	10	15360	Occ. Sensors	Yes	1	1536
22	Hunterdon	Second	210	44	4' linear T8	Electronic	9	4	Fluorescent	32	10	11520	Occ. Sensors	Yes	1	1152
23	Hunterdon	Second	210	42	2' U-shaped T8	Electronic	2	2	Fluorescent	32	10	1280	Occ. Sensors	Yes	1	128
24	Hunterdon	Second	N 200	61	2F32T8	Electronic	7	2	Fluorescent	32	10	4480	Occ. Sensors	Yes	1	448
25	Hunterdon	Second	N 200	52	4F32T8	Electronic	4	4	Fluorescent	32	10	5120	Occ. Sensors	Yes	1	512
26	Hunterdon	Second	212	34	2' u-shaped T8	Electronic	3	2	Fluorescent	32	10	1920	Occ. Sensors	Yes	1	192
27	Hunterdon	Second	213	53	2' u-shaped T8	Electronic	3	2	Fluorescent	32	10	1920	Occ. Sensors	No	1	192
28	Hunterdon	Second	214	35	2' u-shaped T8	Electronic	3	2	Fluorescent	32	10	1920	Occ. Sensors	No	1	192
29	Hunterdon	Second	215	37	2' u-shaped T8	Electronic	3	2	Fluorescent	32	10	1920	Occ. Sensors	No	1	192
30	Hunterdon	Second	216	38	2' u-shaped T8	Electronic	3	2	Fluorescent	32	10	1920	Occ. Sensors	No	1	192
31	Hunterdon	Second	217	36	2' u-shaped T8	Electronic	3	2	Fluorescent	32	10	1920	Occ. Sensors	No	1	192
32	Hunterdon	Second	218	54	2' u-shaped T8	Electronic	3	2	Fluorescent	32	10	1920	Occ. Sensors	No	1	192
33	Hunterdon	Second	219	43	2' u-shaped T8	Electronic	3	2	Fluorescent	32	10	1920	Occ. Sensors	No	1	192
34	Hunterdon	Second	220	34	2' u-shaped T8	Electronic	3	2	Fluorescent	32	10	1920	Occ. Sensors	No	1	192
35	Hunterdon	Second	Entry to Raised Walk	62	2' u-shaped T8	Electronic	7	2	Fluorescent	32	12	5376	Occ. Sensors	Yes	1	448
36	Hunterdon	Third	Stairwells	19	4' linear T8	Electronic	6	3	Fluorescent	32	12	6912	Occ. Sensors	No	1	576
37	Hunterdon	Third	Corridors	15	2' u-shaped T8	Electronic	24	2	Fluorescent	32	12	18432	Occ. Sensors	No	1	1536
38	Hunterdon	Third	Lounge	52	2' u-shaped T8	Electronic	8	2	Fluorescent	32	10	5120	Occ. Sensors	Yes	1	512
39	Hunterdon	Third	Offices Reception	15	4' linear T8	Electronic	3	4	Fluorescent	32	10	3840	Occ. Sensors	No	1	384
40	Hunterdon	Third	Copy Room	78	4' linear T8	Electronic	1	2	Fluorescent	32	10	640	Occ. Sensors	No	1	64
41	Hunterdon	Third	Interior Corridor	32	2' u-shaped T8	Electronic	11	2	Fluorescent	32	12	8448	Occ. Sensors	No	1	704
42	Hunterdon	Third	Offices	45	4' linear T8	Electronic	32	4	Fluorescent	32	10	40960	Occ. Sensors	Yes	1	4096
43	Hunterdon	Third	Offices	34	4' linear T8	Electronic	10	4	Fluorescent	32	10	12800	Occ. Sensors	No	1	1280
44	Hunterdon	Third	Classroom H 328	54	4' linear T8	Electronic	16	4	Fluorescent	32	10	20480	Occ. Sensors	Yes	1	2048
45	Hunterdon	Third	Classroom H 329	52	4' linear T8	Electronic	12	4	Fluorescent	32	10	15360	Occ. Sensors	Yes	1	1536
46	Hunterdon	Third	Classroom 330	57	4' linear T8	Electronic	12	4	Fluorescent	32	10	15360	Occ. Sensors	Yes	1	1536
47	Hunterdon	Third	Classroom 333	61	4' linear T8	Electronic	16	4	Fluorescent	32	10	20480	Occ. Sensors	Yes	1	2048
48	Hunterdon	Third	Men's Room	32	2' u-shaped T8	Electronic	2	2	Fluorescent	32	12	1536	Occ. Sensors	No	1	128
49	Hunterdon	Third	Women's Room	32	2' u-shaped T8	Electronic	2	2	Fluorescent	32	12	1536	Occ. Sensors	No	1	128

Totals		
Existing Usage (kWh/year)		140,025
Proposed Usage (kWh/year)		115,496
Existing Est. Cost ($/year)	$	21,703.95
Proposed Est. Cost ($/year)	$	17,901.82
Total kWh savings		24,530
Total $ Savings	$	3,802.12

Existing		
Interior Lighting Total Watts	42214	Watts
Interior Lighting Pow er Den	0.99	W/sqft

Proposed		
Interior Lighting Total Watts	42214	w atts
Interior Lighting (W/sqft)	0.99	W/sqft

Appendix B: eQUEST model



Appendix C: Third Party Energy Suppliers (ESCOs)

JCP&L ELECTRICAL SERVICE TERRITORY Last Updated: 06/15/09		
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095 (800) 437-7872 www.hess.com	**BOC Energy Services, Inc.** 1135 Mountain Avenue Murray Hill, NJ 011374 (800) 247-2644 www.boc.com	**Commerce Energy, Inc.** 4400 Route 9 South, Suite 100 Freehold, NJ 07728 (800) 556-84113 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 Corp.** 300 Madison Avenue Morristown, NJ 0113113 (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	**Strategic Energy, LLC** 55 Madison Avenue, Suite 400 Morristown, NJ 011360 (888) 925-9115, www.sel.com
Liberty Power Holdings, LLC Park 80 West, Plaza II, Suite 200 Saddle Brook, NJ 07663 (866) 769-31139 www.libertypowercorp.com	**Pepco Energy Services, Inc.** 112 Main St. Lebanon, NJ 08833 (800) ENERGY-9 (363-7499) www.pepco-services.com	**PPL EnergyPlus, LLC** 811 Church Road Cherry Hill, NJ 08002 (800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions The Mac-Cali Building 581 Main Street, 8th Floor Woodbridge, NJ 07095 (877) 273-6772 www.semprasolutions.com	**South Jersey Energy Company** One South Jersey Plaza Route 54 Folsom, NJ 08037 (800) 800-756-3749 www.south jerseyenergy.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 080113 (856) 273-9995 www.ugienergyservices.com	**American Powernet Management, LP** 437 North Grove St. Berlin, NJ 08009 (800) 437-7872 www.hess.com	**ConEdison Solutions** Cherry Tree, Corporate Center 1135 State Highway 38 Cherry Hill, NJ 08002 (888) 625-0955 www.conedsolutions.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450 212-1138-3124 www.creditsuisse.com	**Sprague Energy Corp.** 12 Ridge Road Chatham Township NJ 011328 (800) 225-1560 www.spragueenergy.com	

PSE&G NATURAL GAS SERVICE TERRITORY Last Updated: 06/15/09		
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109 800-6BUYGAS (6-289427) www.cooperativenet.com	**Direct Energy Services, LLP** 120 Wood Avenue, Suite 611 Iselin, NJ 08830 866-547-2722 www.directenergy.com	**Dominion Retail, Inc.** 395 Highway 170 - Suite 125 Lakewood, NJ 08701 866-275-4240 http://retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701 800-805-8586 www.gesc.com	**UGI Energy Services, Inc. d/b/a GASMARK** 704 East Main Street, Suite 1 Moorestown, NJ 080113 856-273-9995 www.ugienergyservices.com	**Great Eastern Energy** 116 Village Riva, Suite 200 Princeton, NJ 08540 888-651-4121 www.greateastern.com
Hess Energy, Inc. One Hess Plaza Woodbridge, NJ 07095 800-437-7872 www.hess.com	**Hudson Energy Services, LLC** 871 Route 17 South Ridgewood, NJ 07450 877- Hudson 9 www.hudsonenergyservices.com	**Intelligent Energy** 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024 800-724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002 1-877-Systrum www.systrumenergy@aol.com	**Metromedia Energy, Inc.** 6 Industrial Way Eatontown, NJ 07724 877-750-7046 www.metromediaenergy.com	**Metro Energy Group, LLC** 14 Washington Place Hackensack, NJ 07601 888-113-Metro www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 088327 800-375-1277 www.mxenergy.com	**NATGASCO (Mitchell Supreme)** 1132 Freeman Street Orange, NJ 07050 800-840-4GAS www.natgasco.com	**Pepco Energy Services, Inc.** 112 Main Street Lebanon, NJ 08833 800-363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road - Office 105 Cherry Hill, NJ 08002 800-281-2000 www.pplenergyplus.com	**Sempra Energy Solutions** The Mac-Cali Building 581 Main Street, 8th fl. Woodbridge, NJ 07095 877-273-6772 800-2 SEMPRA www.semprasolutions.com	**South Jersey Energy Company** One South Jersey Plaza, Route 54 Folsom, NJ 08037 800-756-3749 www.sjindustries.com/sje.htm
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 011328 800-225-1560 www.spragueenergy.com	**Stuyvesant Energy LLC** 10 West Ivy Lane, Suite 4 Englewood, NJ 07631 800-646-64113 www.stuyfuel.com	**Woodruff Energy** 73 Water Street Bridgeton, NJ 08302 800-5113-1121 www.woodruffenergy.com