



Steven Winter Associates, Inc.
Architects and Engineers

50 Washington Street
Norwalk, CT 06854
www.swinter.com

Telephone
Facsimile
E-mail:

(203) 857-0200
(203) 852-0741
swinter@swinter.com

July 15, 2009

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

For

***East Building/Planetarium
Raritan Valley Community College
North Branch, NJ 08876***

Project Number: LGEA05



TABLE OF CONTENTS

INTRODUCTION..... 3
EXECUTIVE SUMMARY 4
1. HISTORIC ENERGY CONSUMPTION..... 6
1.1. ENERGY USAGE AND COST ANALYSIS 6
1.2. UTILITY RATE 8
1.3. ENERGY BENCHMARKING 8
2. FACILITY AND SYSTEMS DESCRIPTION..... 10
2.1. BUILDING CHARACTERISTICS..... 10
2.2. BUILDING OCCUPANCY PROFILES..... 10
2.3. BUILDING ENVELOPE 10
2.3.1. EXTERIOR WALLS 10
2.3.2. ROOF..... 10
2.3.3. BASE..... 10
2.3.4. WINDOWS 10
2.3.5. EXTERIOR DOORS 10
2.3.6. BUILDING AIR TIGHTNESS 11
2.4. HVAC SYSTEMS..... 11
2.4.1. HEATING..... 11
2.4.2. COOLING 11
2.4.3. VENTILATION..... 11
2.4.4. DOMESTIC HOT WATER..... 11
2.5. ELECTRICAL SYSTEMS 11
2.5.1. LIGHTING 11
2.5.2. APPLIANCES AND PROCESS 12
2.5.3. ELEVATORS 12
2.5.4. OTHERS ELECTRICAL SYSTEMS..... 12
3. EQUIPMENT LIST 13
4. ENERGY CONSERVATION MEASURES 14
5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES 24
5.1. EXISTING SYSTEMS 24
5.2. SOLAR PHOTOVOLTAIC..... 24
5.3. SOLAR THERMAL COLLECTORS..... 24
5.4. COMBINED HEAT AND POWER..... 24
5.5. GEOTHERMAL 24
5.6. WIND..... 24
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES..... 24
6.1. LOAD PROFILES..... 24
6.2. TARIFF ANALYSIS..... 25
6.3. ENERGY PROCUREMENT STRATEGIES 25
7. METHOD OF ANALYSIS 27
7.1. ASSUMPTIONS AND TOOLS..... 27
7.2. DISCLAIMER..... 27
APPENDIX A: LIGHTING STUDY 28
APPENDIX B: eQUEST MODEL 31
APPENDIX C: THIRD PARTY ENERGY SUPPLIERS (ESCOs) 32

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. PDR Associates, SWA's subcontractor for this project, assessed the HVAC, the existing Combined Heat and Power plant and renewable energy systems, and provided recommendations for improvement of these systems. 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 the East Building/Planetarium building only.

The Planetarium building houses lecture halls, small offices and a planetarium. The building is a single story and consists of 10,000 square feet and is fully conditioned. The building is operated on weekdays between the hours of 7am and 6pm and occasionally on Saturdays for special events.

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.

The Planetarium Building 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 Planetarium 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 Planetarium building consumed 10,893 therms of gas during this period at a total cost of \$14,837.67.

SWA benchmarked the Planetarium building 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 larger 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 year 2008 baseline to show changes in energy consumption over time.

SWA recommends a total of 6 Energy Conservation Measures (ECMs) for the Planetarium building. The total investment cost for these ECMs is **\$36,546**. The total investment cost for these ECMs if maximum incentives are achieved is **\$33,316**. SWA estimates a first year savings of **\$11,046** with a simple payback of **3.3 years**. SWA estimates that implementing the recommended ECMs will reduce the carbon footprint of the Planetarium building by **70,223 lbs of CO₂** annually.

There are various incentives that the Planetarium building could apply for that could also help lower the cost of installing the ECMs. SWA recommends that the Planetarium building 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 \$1,440 for lighting, up to \$240 for upgrading lighting controls, \$480 for replacing the domestic hot water boiler and \$1,550 for installing premium efficiency motors with VFD controls on the two existing air handler units. The total amount of available incentives for the recommended scope of work is **\$3,230** and the total investment cost if all the incentives are paid to their maximum amount is **\$33,316**.

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							Lifetime		Annual Carbon Reduction (lbs of CO2)		
		Estimated \$	Source	Electric Savings (kWh)	Unit	Natural Gas Savings (therms)	Unit	Demand	Unit	\$ Savings/year	SPP	LoM		Cost Savings	ROI
1a	Upgrade existing lighting	\$ 8,300	RSMeans	4,236	kWh	-	therms	0.5	kW	\$ 657	12.6	20	\$ 9,590	0.8%	7,585
1b	Upgrade existing lighting controls	\$ 2,640	RSMeans	2,820	kWh	-	therms	0.0	kW	\$ 437	6.0	12	\$ 4,299	5.2%	5,048
2	Weather-strip exterior doors	\$ 106	RSMeans	-	kWh	12	therms	0.0	kW	\$ 19	5.5	10	\$ 164	5.5%	19
3	Replace existing 5HP AHU motors	\$ 2,600	Vendor	20,000	kWh	-	therms	2.3	kW	\$ 3,100	0.8	10	\$ 26,176	90.7%	35,810
4	Replace pneumatic controls	\$ 15,000	Similar project	2,902	kWh	46	therms	0.0	kW	\$ 4,684	3.2	25	\$ 79,781	17.3%	5,703
5	Install CO2 sensor for demand control ventilation	\$ 7,900	Similar project	1,950	kWh	1,140	therms	0.2	kW	\$ 2,149	3.7	10	\$ 18,146	13.0%	16,058
Total	Total Scope of Work	\$ 36,546	-	31,908	-	1,198		3.0	-	\$ 11,046	3.3		\$ 138,155		70,223

ECM Table including Incentives															
ECM#	ECM description	Installed Cost		1st year energy savings							Lifetime		Annual Carbon Reduction (lbs of CO2)		
		Estimated \$	Source	Electric Savings (kWh)	Unit	Natural Gas Savings (therms)	Unit	Demand	Unit	\$ Savings/year	SPP	LoM		Cost Savings	ROI
1a	Upgrade existing lighting	\$ 6,860	RSMeans	4,236	kWh	-	therms	0.5	kW	\$ 657	10.4	20	\$ 9,590	2.0%	7,585
1b	Upgrade existing lighting controls	\$ 2,400	RSMeans	2,820	kWh	-	therms	0.0	kW	\$ 437	5.5	12	\$ 4,299	6.6%	5,048
2	Weather-strip exterior doors	\$ 106	RSMeans	-	kWh	12	therms	0.0	kW	\$ 19	5.5	10	\$ 164	5.5%	19
3	Replace existing 5HP AHU motors	\$ 1,050	Vendor	20,000	kWh	-	therms	2.3	kW	\$ 3,100	0.3	10	\$ 26,176	239.3%	35,810
4	Replace pneumatic controls	\$ 15,000	Similar project	2,902	kWh	46	therms	0.0	kW	\$ 4,684	3.2	25	\$ 79,781	17.3%	5,703
5	Install CO2 sensor for demand control ventilation	\$ 7,900	Similar project	1,950	kWh	1,140	therms	0.2	kW	\$ 2,149	3.7	10	\$ 18,146	13.0%	16,058
Total	Total Scope of Work	\$ 33,316	-	31,908	-	1,198		3.0	-	\$ 11,046	3.0		\$ 138,155		70,223

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

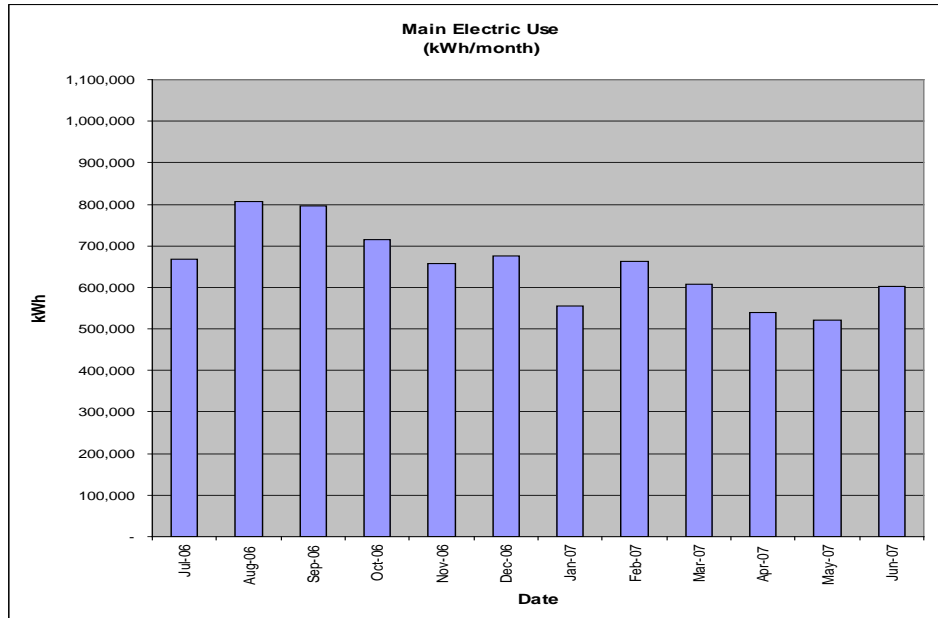
1.1. Energy usage and cost analysis

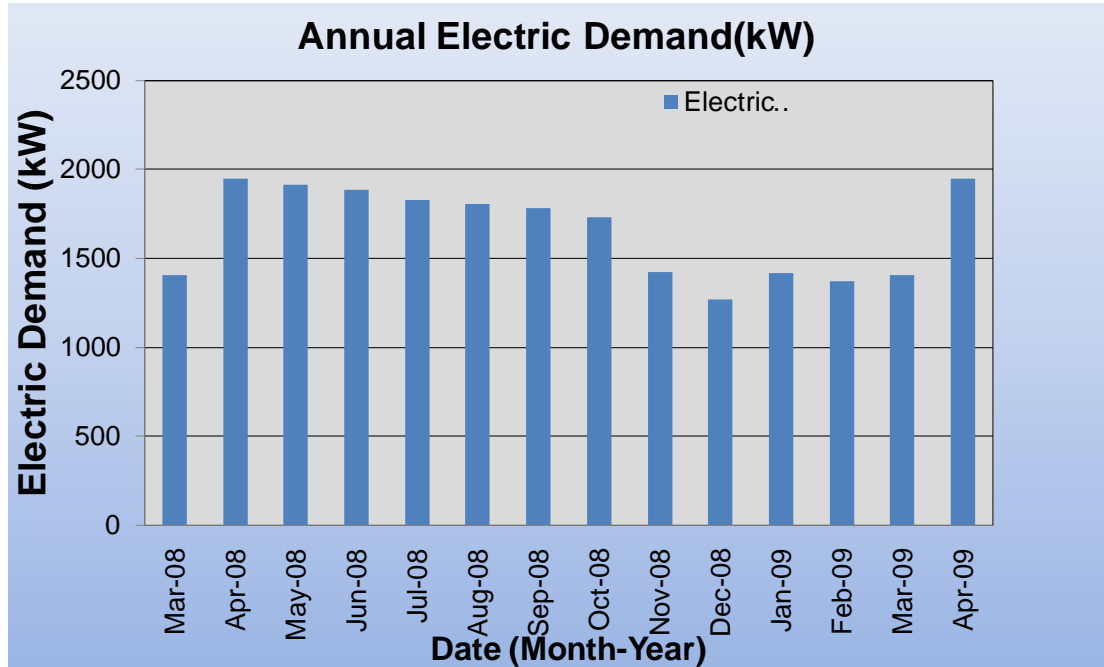
SWA analyzed utility bills from March 2008 through February 2009 that were received from the Raritan Valley Community College.

Electricity - The Planetarium building is included on the campus main electric meter. Since the Planetarium is not metered separately, SWA was not able to determine the amount of electricity that the Planetarium building used specifically. The RVCC campus main electric meter receives electricity from JCP&L at **an average aggregated rate of \$.155/kWh** based electric bills from the previous 12 months. The building 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.

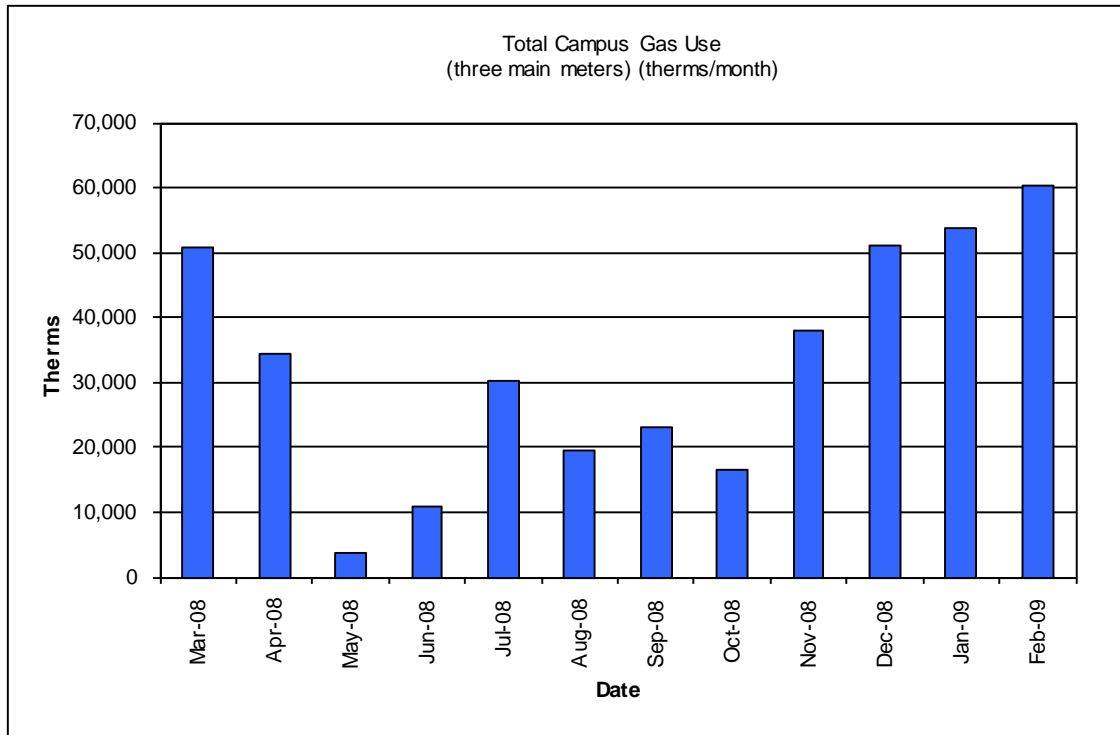
Natural Gas – The Planetarium Building is currently not metered separately for natural gas. The Campus buys natural gas for its three main meters mentioned above from a third-party Energy Service Company (ESCO) via PSE&G at **an average aggregated rate of \$1.36/therm** based on the previous 12 months 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 Planetarium building alone on pro-rata basis of its square footage. This building consumed **10,893 therms of gas** during this period at a total cost of **\$14,837.67**.

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.

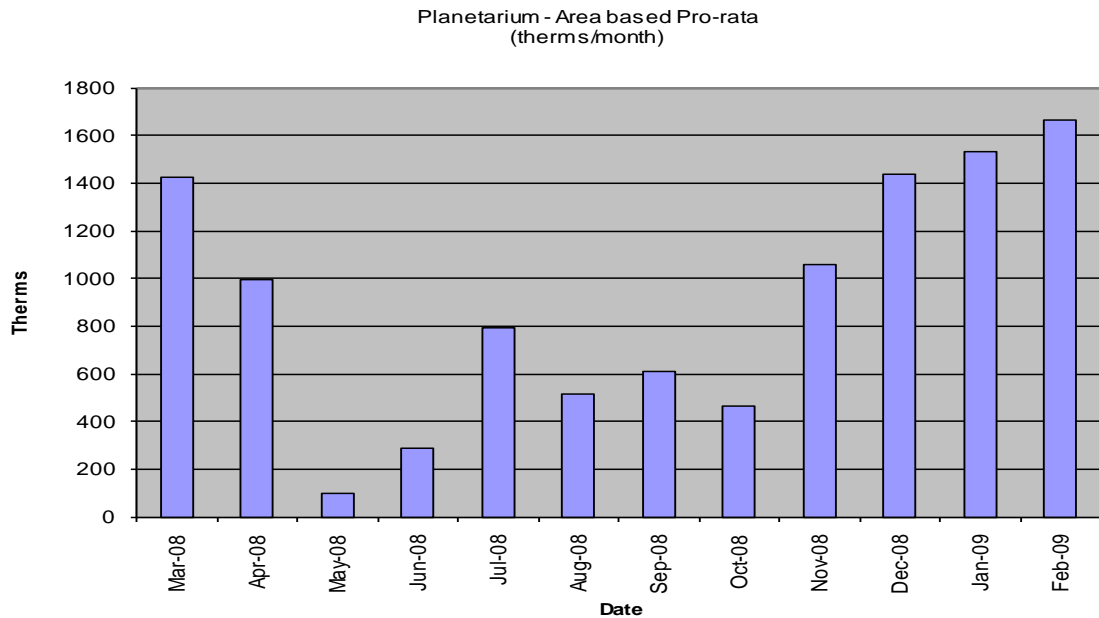




The following chart shows natural gas usage for the Main Campus meter based on utility bills for the 12 month period of March 2008 – February 2009.



Since the Planetarium 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

The Planetarium building 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.



STATEMENT OF ENERGY PERFORMANCE

Raritan VCC

Building ID: 1762814
 For 12-month Period Ending: February 28, 2009¹
 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 Rating² (1-100): N/A

Site Energy Use Summary³

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

Energy Intensity⁵

Site (kBtu/ft ² /yr)	184
Source (kBtu/ft ² /yr)	351

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/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.

Meets Industry Standards⁶ for Indoor Environmental Conditions:

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

Certifying Professional
 N/A

Notes:

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

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, PE facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (20227), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The single-story Planetarium is over 30 years old and houses a planetarium room, lecture halls and small offices within a total floor area of approximately of 10,000 square feet.

2.2. Building occupancy profiles

The peak occupancy for the Planetarium building is approximately 185 persons. It holds demonstrations mostly on weekdays and occasionally on Saturdays.

2.3. Building envelope

2.3.1.Exterior walls

The Planetarium building exterior walls consist of 4” face bricks. 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. Due to an outside temperature of approximately 66°F on the day of the field visit, an accurate infrared scan could not be obtained. Typically, a good infrared scan requires a temperature difference of 20°F between the outside (ambient) temperature and indoor temperature. The heating season when the ambient temperature is much cooler than the indoor temperature is the best time to obtain an accurate infrared scan.

2.3.2.Roof

The Planetarium building consists of a flat roof with 18” parapets around the perimeter. The roof is constructed of EPDM rubber with stone ballast on tapered rigid insulation over a metal deck. The stone ballast is a medium 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 cut in order to cut down on solar heat gain.

2.3.3.Base

The building’s base is a 6” concrete slab-on grade and foundation stem wall. There were no reported problems with water penetration or moisture.

2.3.4.Windows

The double glass paned windows are fixed aluminum-framed units with no insulating properties or films. SWA recommends that whenever windows are to be replaced, to make sure that the most energy efficient windows are always installed and properly air-sealed.

2.3.5.Exterior doors

The doors are aluminum-framed units with no insulating properties or films. The exterior doors of the building were observed to have the original weather-stripping which is no longer performing as intended. SWA recommends that the exterior doors of the building, especially the vestibule located at the main entrance, is 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

The Planetarium building was observed to be a relatively tight building. There were no major observed deficiencies of air tightness within the building besides the exterior doors as discussed in the above-section.

2.4. HVAC systems

2.4.1. Heating

The Planetarium building is connected to the campus-wide hot water and chilled water loop. The building contains two attic-type air handling units that provide both heating and cooling to the building from the hot water and chilled water loops. The air handling units each contain a 5HP fan that can be retrofitted with a VFD motor control. The Planetarium HVAC system is controlled by outdated, inefficient pneumatic controls.

2.4.2. Cooling

The Planetarium building uses the two 5HP attic-type air handling units for heating as well as cooling. There are additional window PTAC units installed in some of the rooms in the building that also are connected to the chilled water loop.

2.4.3. Ventilation

The air handling units that are connected to the main campus chilled water and hot water loops pull in outside air and mix it with building air to provide ventilation.

2.4.4. Domestic Hot Water

Domestic Hot Water is provided by a 4.5 kW electric, 40 gallon capacity heater, installed in 2005. SWA considered the possibility to convert this to a natural gas fired heater, and found it difficult because of exhaust flue issues.

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting – The Planetarium building consists mostly inefficient lighting. The building contains older 4' linear T12 fixtures as well as 2' U-shaped T12 fixtures; both of which contain magnetic ballasts. SWA recommends that all T12 fixtures with magnetic ballasts are replaced with T8 fixtures with electronic ballasts. Based on measurements of lighting levels that were measured for each space, there are no vastly over-lit areas. See attached lighting schedule for a complete inventory of lighting throughout the building and estimated power consumption.

Exit Lights – The building has all 5W LED exit signs installed. There is not a more cost effective option for exit lights available at this time.

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 part of the campus lighting that helps keep the parking lot next door lit properly. There is no need for any immediate upgrade of lighting or timer; however, SWA recommends that the building maintenance adjust any timers 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 the Planetarium building 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 projectors, computers, etc. are purchased.

2.5.3. Elevators

The Planetarium building is a one-story building and therefore has no elevator installed.

2.5.4. Others electrical systems

There are currently no other electrical systems installed at this building.

3. EQUIPMENT LIST

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
HVAC	AH3: 4 pipe heating/cooling air handler, 460/3/60, 5hp fan, elec. Preheat	Mech room East bldg	Trane, Model CCDB107C73K, S/N K90B04431	Elec./Gas	E109, conference room sections	1973	0%
HVAC	RF-3: return fan for AH-3; cabinet fan	Mech room East bldg	Trane, model T-8, S/N K 211222871	Elec.	E109, conference room sections	1973	0%
HVAC	AH4: 4 pipe heating/cooling air handler, 460/3/60, 5hp fan, elec. Preheat	Mech room Planetarium	Trane, Model CCDB107C73K, S/N K90B04432	Elec./Gas	Planetarium	1973	0%
HVAC	RF-4: return fan for AH-4; cabinet fan	Mech room Planetarium	Trane, nameplate N/A	Elec.	Planetarium	1973	0%
Heating	DHW, 40 gallons tank, 4.5kW, 240/1/60	Planetarium lobby	AO Smith, Model ECS 40 200, S/N AE040001651	Elec.	East bldg and Planetarium	2005	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

Summary table

ECM#	Description
1a	Upgrade interior lighting; see appendix A
1b	Upgrade interior lighting controls; see appendix A
2	Weather-strip exterior doors; weather-stripping will decrease the amount of conditioned air that is lost between the exterior door and frame
3	Replace existing 5HP AHU motors; replace two 5HP AHU standard efficiency motors with NEMA premium efficiency motors with VFD controls
4	Replace pneumatic controls
5	Install CO2 sensor for demand control ventilation; installing a CO2 sensor will save energy by reducing ventilation when it is not required

ECM#1a: Upgrade interior lighting

Description:

On the day of the site visit, SWA observed that most of the interior lighting installed at the Planetarium building consisted of either 4' linear T12 magnetic fixtures or 2' U-shaped T12 magnetic fixtures. Lighting consumes a large amount of electrical load and the most efficient lighting should always be purchased. SWA recommends replacing all existing T12 fluorescent bulbs with higher efficiency T8 bulbs as well as replacing all magnetic ballasts with electronic ballast. See Appendix A, Sheet 2 for complete lighting retrofit details.

Installation cost:

Estimated installed cost: \$8,300

Source of cost estimate: RS Means

Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO ₂)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
4,236	-	0.5	\$ 657	12.6	20	\$ 9,590	0.8%	7,585

Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO ₂)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
4,236	-	0.5	\$ 657	10.4	20	\$ 9,590	2.0%	7,585

Assumptions: Savings are based on replacing entire lighting fixture including ballasts and lamps. SWA assumes that a 30% wattage reduction will occur when the ballast and lamps are both replaced. RS Means was used to estimate a price for the entire lighting retrofit. Prices are assuming that lighting retrofits will be performed in-house and an additional 10% cost savings by retrofitting all lighting fixtures for the Planetarium building at the same time.

Rebates/financial incentives:

NJ Clean Energy – Prescriptive Lighting Incentive, Incentive based on installing T5 or T8 lamps with electronic ballasts in existing facilities (\$10-\$30 per fixture, depending on quantity of lamps). Maximum incentive amount is \$1,440.

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#1b: Upgrade interior lighting controls

Description:

Currently, the Planetarium 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 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 occupancy sensors recommendation be found in Appendix A, Sheet 3. Dual Technology occupancy sensors provide 360° of coverage and use both passive infrared and ultrasonic technologies to sense occupancy.

Installation cost:

Estimated installed cost: \$2,640
 Source of cost estimate: *RS Means*

Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO ₂)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
2,820	-	-	\$ 437	6.0	12	\$ 4,299	5.2%	5,048

Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO ₂)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
2,820	-	-	\$ 437	5.5	12	\$ 4,299	6.6%	5,048

Assumptions: SWA calculated the savings for this measure using reduced hours of operation after the installation of occupancy sensors; please see Appendix A, Sheet 3, for the new hours/day assumed.

Rebates/financial incentives:

*NJ Clean Energy - Wall Mounted occupancy sensors (\$20 per control)
 Maximum incentive amount is \$240.*

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: 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 the Planetarium building.

Installation cost:

Estimated installed cost: \$106

Source of cost estimate: *RS Means*

Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO ₂)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
-	12	0.0	\$ 19	5.5	10	\$ 164	5.5%	19

Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO ₂)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
-	12	0.0	\$ 19	5.5	10	\$ 164	5.5%	19

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:

This measure does not qualify for a rebate or other financial incentive 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#3: Replace existing 5HP AHU motors

Description:

Currently, the Planetarium building uses two attic-type air-handling units that provide both heating and cooling to the entire building. These air handling units mix fresh outside air with re-circulated indoor air and run it over either the chilled water or hot water coil, depending on the season, to provide the building with fresh conditioned air. SWA observed that each air-handling unit contained a standard efficiency 5HP fan motor. SWA recommends replacing these two motors with NEMA premium efficiency motors with VFD controls.

Installation cost:

Estimated installed cost: \$2,600
Source of cost estimate: Vendor

Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO ₂)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
20,000	-	2.3	\$ 3,100	0.8	10	\$ 26,176	90.7%	35,810

Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO ₂)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
20,000	-	2.3	\$ 3,100	0.3	10	\$ 26,176	239.3%	35,810

Assumptions: SWA estimated the cost and savings of the system based on current electricity usage as well as previous similar projects.

Rebates/financial incentives:

NJ Clean Energy – NJ SmartStart Building Equipment Incentive, Incentive is for Variable Frequency Drives installed in Variable air volume units (\$65-\$155 per HP). Maximum incentive amount is \$1,550 for the replacement of the standard efficiency motors currently installed in the AHU located in the attic.

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#4: *Replace pneumatic controls*

Description:

Currently, the Planetarium building uses older pneumatic controls to control the HVAC system throughout the building. Pneumatic controls lose accuracy over time and are much less efficient than newer digital DDC control systems. SWA recommends replacing existing pneumatic controls with a programmable digital DDC control system.

Installation cost:

Estimated installed cost: \$15,000
 Source of cost estimate: Similar project

Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO ₂)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
2,902	46	0.0	\$ 4,684	3.2	25	\$ 79,781	17.3%	5,703

Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO ₂)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
2,902	46	0.0	\$ 4,684	3.2	25	\$ 79,781	17.3%	5,703

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 digital DDC controls is the equivalent of changing the thermostatic set points by 2°F. By assuming a set point change of 2°F, installing DDC controls will save approximately 5% of heating and cooling costs, in both electric and gas charges. Additionally, there will be pneumatic compressor savings and operation & maintenance savings, which is 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: Install CO2 sensor for demand control ventilation

Description:

Currently, the Planetarium building has no control on ventilation air for the building in the air-handling units. SWA recommends installing a CO2 sensor in the return duct of the ventilation system for both AHUs. Normally the fans turn on during the day, usually an hour before operation until an hour after operation and remain on full power all day long. The CO2 sensor allows the fans to run at an ASHRAE minimum for classroom/lecture areas during the day. The CO2 sensor will sense elevated levels of carbon dioxide and communicate to the fan that more ventilation is needed.

Installation cost:

Estimated installed cost: \$7,900
 Source of cost estimate: Similar project

Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO2)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
1,950	1,140	0.2	\$ 2,149	3.7	10	\$ 18,146	13.0%	16,058

Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO2)
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
1,950	1,140	0.2	\$ 2,149	3.7	10	\$ 18,416	13.0%	16,058

Assumptions: SWA calculated the savings for this measure by assuming that average fresh air requirement will be reduced by 50% for an entire day, on average. The estimated fresh air saved is about 1300 cfm/day. 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

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

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

5.5. Geothermal

Geothermal is not applicable because of the current HVAC systems supplying the building.

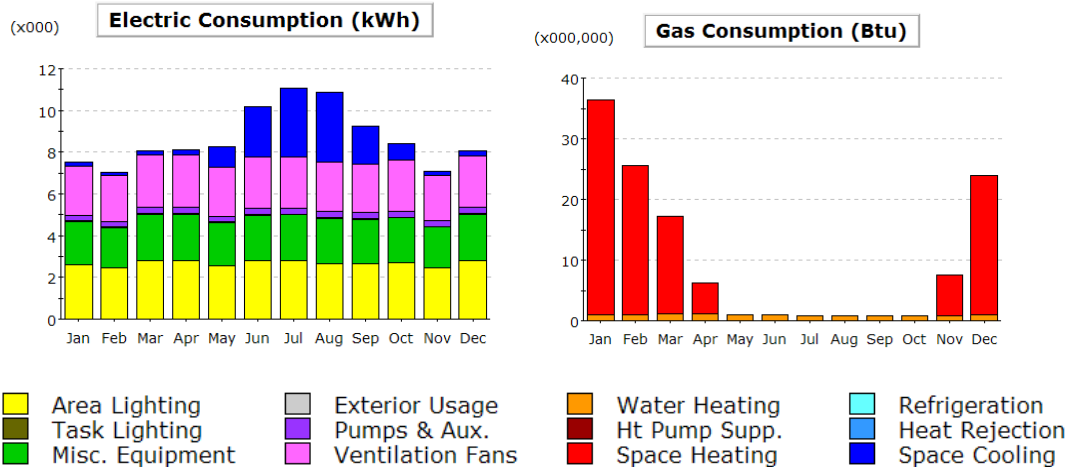
5.6. Wind

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 RVCC by Trace Electrical Services and Testing. The survey was conducted by installing power recording meters for seven days at various buildings on campus. The East Building/Planetarium was not included in this study.



6.2. Tariff analysis

Currently, natural gas and electricity is provided to the Planetarium 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.

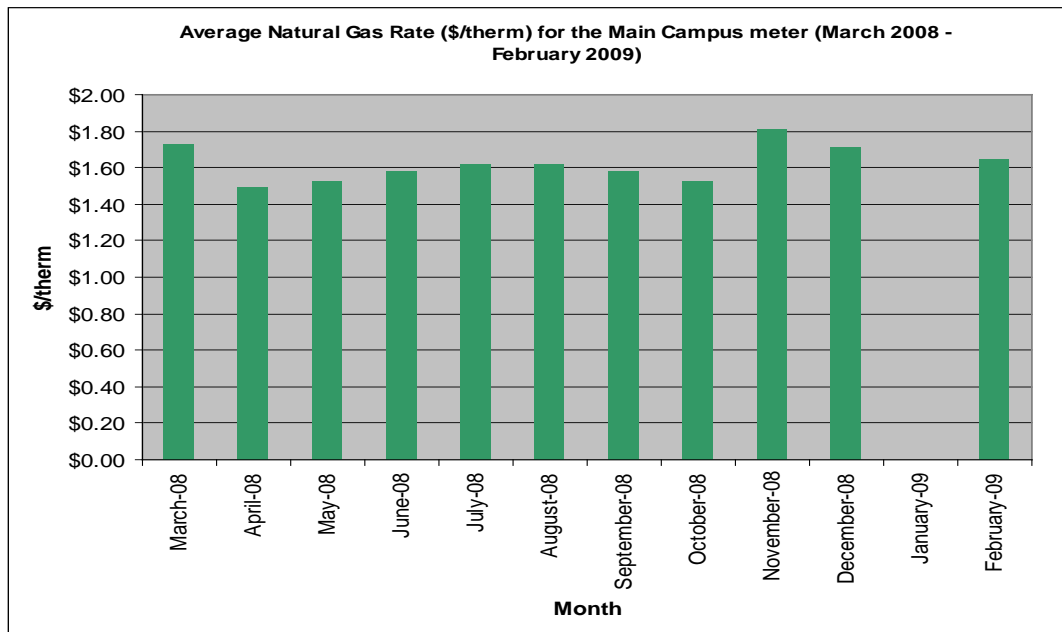
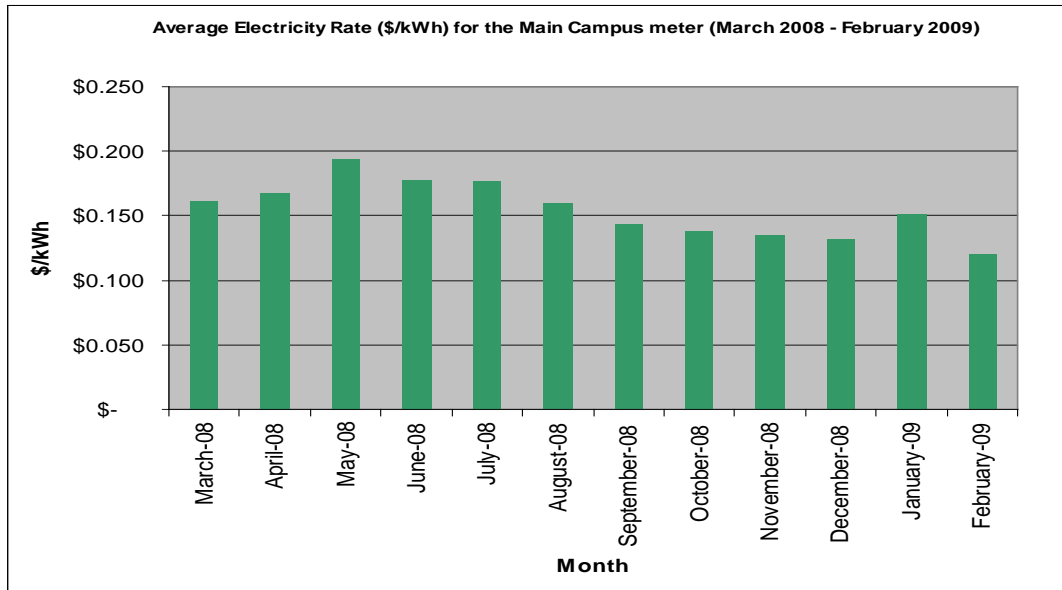
6.3. Energy Procurement strategies

The Planetarium Building 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 Planetarium building annual utility costs are \$1,342.68 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	Total Power (Watts)
1	Planetarium	Main Floor	Lobby	-	LED Exit Sign	-	2	1	LED	5	24	240	None	10
2	Planetarium	Main Floor	Lobby	10	20W MR-16 Halogen	-	5	1	Halogen	20	15	1500	Switch	100
3	Planetarium	Main Floor	Men's Room	24	2' U-shaped T12	magnetic	3	2	fluorescent	40	15	3600	Switch	240
4	Planetarium	Main Floor	Women's Room	24	2' U-shaped T12	magnetic	3	2	fluorescent	40	15	3600	Switch	240
5	Planetarium	Main Floor	Hallway (space tunnel)	8	4' Linear T12	magnetic	14	1	fluorescent	40	15	8400	Switch	560
6	Planetarium	Main Floor	Office	59	4' Linear T12	magnetic	6	2	fluorescent	40	15	7200	Switch	480
7	Planetarium	Main Floor	Office 1 (left semi-circle)	63	4' Linear T12	magnetic	2	3	fluorescent	40	15	3600	Switch	240
8	Planetarium	Main Floor	Office 2 (left semi-circle)	58	4' Linear T12	magnetic	2	3	fluorescent	40	15	3600	Switch	240
9	Planetarium	Main Floor	Lobby Area (Entrance to Planetarium)	-	LED Exit Sign	-	2	1	LED	5	24	240	None	10
10	Planetarium	Main Floor	Lobby Area (Entrance to Planetarium)	10	20W MR-16 Halogen	-	13	1	Halogen	20	15	3900	Switch	260
11	Planetarium	Main Floor	Planetarium	45	25W inc. colors	-	240	1	Incandescent	25	4	24000	Switch	6000
12	Planetarium	Main Floor	Exit area by stairs	67	4' Linear T12	magnetic	4	1	fluorescent	40	15	2400	Switch	160
13	Planetarium	Main Floor	Lecture Hall - E109	24	20W MR-16 Halogen	-	21	1	MR-16	20	15	6300	Switch	420
14	Planetarium	Main Floor	Lecture Hall - E109	-	LED Exit Sign	-	2	1	LED	5	24	240	None	10
15	Planetarium	Main Floor	Storage	62	4' Linear T12	magnetic	6	2	fluorescent	40	15	7200	Switch	480
16	Planetarium	Main Floor	S.C.P.A Office Area	62	4' Linear T12	magnetic	4	2	fluorescent	40	15	4800	Switch	320
17	Planetarium	Main Floor	Back Lobby Area	27	4' Linear T12	magnetic	4	2	fluorescent	40	15	4800	Switch	320
18	Planetarium	Main Floor	Back Lobby Area	27	LED Exit Sign	-	1	1	LED	5	24	120	Switch	5

Appendix A: Lighting study (Sheet 2 – Proposed lights)

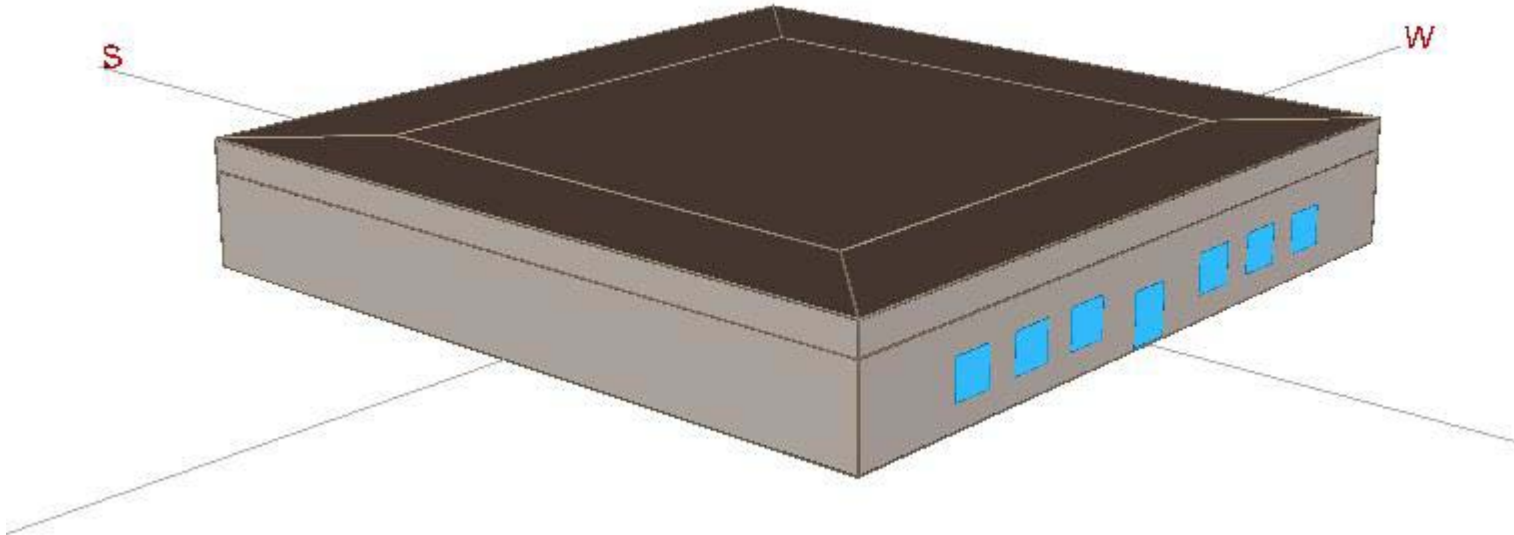
Recommended Lighting											
#	Building	Location in Building	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	Controls	Total Power (Watts)
1	Planetarium	Lobby	LED Exit Sign	-	2	1	5	24	240	None	10
2	Planetarium	Lobby	20W MR-16 Halogen	-	5	1	20	15	1500	Switch	100
3	Planetarium	Mer's Room	2' U-shaped T8	electronic	3	2	32	15	2880	Switch	192
4	Planetarium	Women's Room	2' U-shaped T8	electronic	3	2	32	15	2880	Switch	192
5	Planetarium	Hallway (space tunnel)	4' linear T8	electronic	14	1	32	15	6720	Switch	448
6	Planetarium	Office	4' linear T8	electronic	6	2	32	15	5760	Switch	384
7	Planetarium	Office 1 (left semi-circle)	4' linear T8	electronic	2	3	32	15	2880	Switch	192
8	Planetarium	Office 2 (left semi-circle)	4' linear T8	electronic	2	3	32	15	2880	Switch	192
9	Planetarium	Lobby Area (Entrance to Planetarium)	LED Exit Sign	-	2	1	5	24	240	None	10
10	Planetarium	Lobby Area (Entrance to Planetarium)	20W MR-16 Halogen	-	13	1	20	15	3900	Switch	260
11	Planetarium	Planetarium	25W inc. colors	-	240	1	25	4	24000	Switch	6000
12	Planetarium	Exit area by stairs	4' linear T8	electronic	4	1	32	15	1920	Switch	128
13	Planetarium	Lecture Hall - E109	20W MR-16 Halogen	-	21	1	20	15	6300	Switch	420
14	Planetarium	Lecture Hall - E109	LED Exit Sign	-	2	1	5	24	240	None	10
15	Planetarium	Storage	4' linear T8	electronic	6	2	32	15	5760	Switch	384
16	Planetarium	S.C.P.A Office Area	4' linear T8	electronic	4	2	32	15	3840	Switch	256
17	Planetarium	Back Lobby Area	4' linear T8	electronic	4	2	32	15	3840	Switch	256
18	Planetarium	Back Lobby Area	LED Exit Sign	-	1	1	5	24	120	Switch	5

Totals			Existing			Proposed		
Existing Usage (kWh/year)		31,295	Interior Lighting Total Watts	10095	watts	Interior Lighting Total Watts	9439	watts
Proposed Usage (kWh/year)		27,704	Interior Lighting (W/sqft)	1.01	W/sqft	Interior Lighting (W/sqft)	0.94	W/sqft
Existing Est. Cost (\$/year)	\$	4,850.74						
Proposed Est. Cost (\$/year)		4,294.04						
Total kWh savings		3,592						
Total \$ Savings	\$	556.70						

Appendix A: Lighting study (Sheet 3 – Proposed lighting controls)

Proposed Lighting Controls												
#	Building	Location in Building	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	Controls	number of new occupancy sensors	Total Power (W)
1	Planetarium	Lobby	LED Exit Sign	-	2	1	5	24	240	None		10
2	Planetarium	Lobby	20W MR-16 Halogen	-	5	1	20	15	1500	Sw itch		100
3	Planetarium	Men's Room	2' U-shaped T8	electronic	3	2	32	12	2304	Occ Sensor	1	192
4	Planetarium	Women's Room	2' U-shaped T8	electronic	3	2	32	12	2304	Occ Sensor	1	192
5	Planetarium	Hallway (space tunnel)	4' linear T8	electronic	14	1	32	12	5376	Occ Sensor	1	448
6	Planetarium	Office	4' linear T8	electronic	6	2	32	12	4608	Occ Sensor	1	384
7	Planetarium	Office 1 (left semi-circle)	4' linear T8	electronic	2	3	32	12	2304	Occ Sensor	1	192
8	Planetarium	Office 2 (left semi-circle)	4' linear T8	electronic	2	3	32	12	2304	Occ Sensor	1	192
9	Planetarium	Lobby Area (Entrance to Planetarium)	LED Exit Sign	-	2	1	5	24	240	None		10
10	Planetarium	Lobby Area (Entrance to Planetarium)	20W MR-16 Halogen	-	13	1	20	12	3120	Occ Sensor	1	260
11	Planetarium	Planetarium	25W inc. colors	-	240	1	25	4	24000	Sw itch		6000
12	Planetarium	Exit area by stairs	4' linear T8	electronic	4	1	32	12	1536	Occ Sensor	1	128
13	Planetarium	Lecture Hall - E109	20W MR-16 Halogen	-	21	1	20	15	6300	Sw itch	1	420
14	Planetarium	Lecture Hall - E109	LED Exit Sign	-	2	1	5	24	240	None		10
15	Planetarium	Storage	4' linear T8	electronic	6	2	32	12	4608	Occ Sensor	1	384
16	Planetarium	S.C.P.A Office Area	4' linear T8	electronic	4	2	32	12	3072	Occ Sensor	1	256
17	Planetarium	Back Lobby Area	4' linear T8	electronic	4	2	32	12	3072	Occ Sensor	1	256
18	Planetarium	Back Lobby Area	LED Exit Sign	-	1	1	5	24	120	Sw itch		5
Totals												
Proposed Usage with existing controls (kWh/year)			20,371									
Proposed Usage with new controls (kWh/year)			17,552									
Total kWh savings			2,820									
Total annual \$ Savings			\$ 437.03									

Appendix B: eQUEST model



Appendix C: Third Party Energy Suppliers (ESCOs)

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

JCP&L ELECTRICAL SERVICE TERRITORY		
Last Updated: 06/15/09		
<p>Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095 (800) 437-7872 www.hess.com</p>	<p>BOC Energy Services, Inc. 1135 Mountain Avenue Murray Hill, NJ 011374 (800) 247-2644 www.boc.com</p>	<p>Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728 (800) 556-84113 www.commerceenergy.com</p>
<p>Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446 (888) 635-0827 www.newenergy.com</p>	<p>Direct Energy Services, LLC 120 Wood Avenue Suite 611 Iselin, NJ 08830 (866) 547-2722 www.directenergy.com</p>	<p>FirstEnergy Solutions Corp. 300 Madison Avenue Morristown, NJ 0113113 (800) 977-0500 www.fes.com</p>
<p>Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640 (877) 569-2841 www.glacialenergy.com</p>	<p>Integrays Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830 (877) 763-9977 www.integraysenergy.com</p>	<p>Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 011360 (888) 925-9115, www.sel.com</p>
<p>Liberty Power Holdings, LLC Park 80 West, Plaza II, Suite 200 Saddle Brook, NJ 07663 (866) 769-31139 www.libertypowercorp.com</p>	<p>Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833 (800) ENERGY-9 (363-7499) www.pepco-services.com</p>	<p>PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002 (800) 281-2000 www.pplenergyplus.com</p>
<p>Sempra Energy Solutions The Mac-Cali Building 581 Main Street, 8th Floor Woodbridge, NJ 07095 (877) 273-6772 www.semprasolutions.com</p>	<p>South Jersey Energy Company One South Jersey Plaza Route 54 Folsom, NJ 08037 (800) 800-756-3749 www.southjerseyenergy.com</p>	<p>Suez Energy Resources NA, Inc. 333 Thornall Street 6th Floor Edison, NJ 08837 (888) 644-1014 www.suezenergyresources.com</p>
<p>UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 080113 (856) 273-9995 www.ugienergyservices.com</p>	<p>American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009 (800) 437-7872 www.hess.com</p>	<p>ConEdison Solutions Cherry Tree, Corporate Center 1135 State Highway 38 Cherry Hill, NJ 08002 (888) 625-0955 www.conedsolutions.com</p>
<p>Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450 212-1138-3124 www.creditsuisse.com</p>	<p>Sprague Energy Corp. 12 Ridge Road Chatham Township NJ 011328 (800) 225-1560 www.spragueenergy.com</p>	

PSE&G NATURAL GAS SERVICE TERRITORY

Last Updated: 06/15/09

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