



**Steven Winter Associates, Inc.**  
Architects and Engineers

50 Washington Street  
Norwalk, CT 06854  
[www.swinter.com](http://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*

***Arts Building  
Raritan Valley Community College  
North Branch, NJ 08876***

***Project Number: LGEA05***



**TABLE OF CONTENTS**

**INTRODUCTION ..... 3**

**1. HISTORIC ENERGY CONSUMPTION ..... 7**

1.1. ENERGY USAGE AND COST ANALYSIS..... 7

1.2. UTILITY RATE ..... 8

1.3. ENERGY BENCHMARKING..... 9

**2. FACILITY AND SYSTEMS DESCRIPTION ..... 11**

2.1. BUILDING CHARACTERISTICS ..... 11

2.2. BUILDING OCCUPANCY PROFILES ..... 11

2.3. BUILDING ENVELOPE ..... 11

2.3.1. EXTERIOR WALLS ..... 11

2.3.2. ROOF ..... 11

2.3.3. BASE ..... 11

2.3.4. WINDOWS ..... 11

2.3.5. EXTERIOR DOORS..... 12

2.3.6. BUILDING AIR TIGHTNESS..... 12

2.4. HVAC SYSTEMS ..... 12

2.4.1. HEATING ..... 12

2.4.2. COOLING..... 13

2.4.3. VENTILATION ..... 13

2.4.4. DOMESTIC HOT WATER ..... 13

2.5. ELECTRICAL SYSTEMS ..... 13

2.5.1. LIGHTING..... 13

2.5.2. APPLIANCES AND PROCESS..... 13

2.5.3. ELEVATORS ..... 14

2.5.4. OTHERS ELECTRICAL SYSTEMS ..... 14

**3. EQUIPMENT LIST ..... 15**

**4. ENERGY CONSERVATION MEASURES..... 16**

**5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES ..... 28**

5.1. EXISTING SYSTEMS ..... 28

5.2. SOLAR PHOTOVOLTAIC ..... 28

5.3. SOLAR THERMAL COLLECTORS ..... 28

5.4. COMBINED HEAT AND POWER ..... 28

5.5. GEOTHERMAL ..... 28

5.6. WIND ..... 28

**6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES ..... 28**

6.1. LOAD PROFILES ..... 28

6.2. TARIFF ANALYSIS ..... 29

6.3. ENERGY PROCUREMENT STRATEGIES..... 29

**7. METHOD OF ANALYSIS ..... 31**

7.1. ASSUMPTIONS AND TOOLS ..... 31

7.2. DISCLAIMER ..... 31

**APPENDIX A: LIGHTING STUDY ..... 32**

**APPENDIX B: eQUEST MODEL ..... 35**

**APPENDIX C: THIRD PARTY ENERGY SUPPLIERS (ESCOs) ..... 36**

## **INTRODUCTION**

On April 21<sup>st</sup>, 22<sup>nd</sup>, 23<sup>rd</sup> & 24<sup>th</sup>, 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 the Arts Building only.

The Arts Building houses mostly classrooms, practice rooms, a print shop and administrative offices. The building is a single story building consisting of 41,000 square feet. The building is operated on weekdays between the hours of 7am and 10pm.

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 21<sup>st</sup>, 22<sup>nd</sup>, 23<sup>rd</sup> and 24<sup>th</sup>, 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 Arts building is currently metered separately for electricity but is provided natural gas from the main campus gas meter. In the most recent year (March 2008-February 2009), the RVCC Arts building consumed approximately 690,480 kWh or \$113,338.55 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 Arts 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 Arts building consumed 3,789 therms of gas during this period at a total cost of \$7,234.60.

SWA benchmarked the Arts building 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 5 Energy Conservation Measures (ECMs) for the Arts building. The total investment cost for these ECMs is **\$29,976**. The total investment cost for these ECMs if maximum incentives are achieved is **\$26,504**. It excludes a total replacement of the building HVAC system, the roof that have reached the end of their life cycle, and solar photovoltaic opportunity. SWA estimates a first year savings of **\$5,071** with a simple payback of **5.9 years**. SWA estimates that implementing the recommended ECMs will reduce the carbon footprint of the Arts building by **50,483 lbs of CO<sub>2</sub>** annually.

There are various incentives that the Arts building could apply for that could also help lower the cost of installing the ECMs. SWA recommends that the Arts 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. Currently, the New Jersey Office of Clean Energy offers a Renewable Energy Incentive program that would pay \$5,000 for the installation of a 5kW PV system. There is also an incentive that issues a Solar Renewable Energy Certificate for every 1000kWh (1MWh) of electricity generated that can be sold or traded for the current market rate of electricity. In order to generate electricity to sell back to the grid, the Arts building would have to become net-metered and would be able to sell electricity at a market rate and also collect an SREC for every 1 MWh generated.

There are also prescriptive measure incentives that would pay RVCC up to \$2,580 for lighting, \$560 for occupancy sensors, and \$312 for installing a new DHW boiler. The total amount of incentives available for the Arts building is **\$3,472** and the total investment cost if all the incentives are paid to their maximum amount is **\$26,504**.

The following table summarizes the proposed Energy Conservation Measures (ECM) according to their economical relevance (excludes Renewable energy measures and capital improvements):

ECM Table without Incentives															
ECM#	ECM description	Installed Cost		1st year energy savings						SPP	LoM	Lifetime		Annual Carbon Reduction (lbs of CO2)	
		Estimated \$	Source	Electric Savings (kWh)	Unit	Natural Gas Savings (therms)	Unit	Demand	Unit			\$ Savings/year	Cost Savings		ROI
1a	Upgrade existing lighting	\$ 14,871	RSMean	6,095	kWh	-	therms	1.0	kW	\$ 1,000	14.9	20	\$ 14,600	-0.1%	10,913
1b	Upgrade existing lighting	\$ 6,160	RSMean	10,366	kWh	-	therms	0.0	kW	\$ 1,700	3.6	12	\$ 16,722	14.3%	18,561
2	Weather-strip exterior doors	\$ 396	RSMean	-	kWh	93	therms	0.0	kW	\$ 151	2.6	10	\$ 1,272	22.1%	1,025
3	Install VendingMiser sensors on all vending machines	\$ 874	Similar project	7,221	kWh	-	therms	0.5	kW	\$ 1,184	0.7	10	\$ 10,000	104.4%	12,929
4	Replace existing DHW boiler	\$ 7,675	Similar project	-	kWh	640	therms	0.0	kW	\$ 1,037	7.4	25	\$ 17,658	5.2%	7,055
<b>Total</b>	<b>Total Scope of Work</b>	<b>\$ 29,976</b>	<b>-</b>	<b>23,682</b>	<b>-</b>	<b>733</b>		<b>1.6</b>	<b>-</b>	<b>\$ 5,071</b>	<b>5.9</b>		<b>\$ 60,252</b>		<b>50,483</b>

ECM Table including Incentives															
ECM#	ECM description	Installed Cost		1st year energy savings						SPP	LoM	Lifetime		Annual Carbon Reduction (lbs of CO2)	
		Estimated \$	Source	Electric Savings (kWh)	Unit	Natural Gas Savings (therms)	Unit	Demand	Unit			\$ Savings/year	Cost Savings		ROI
1	Upgrade existing lighting	\$ 12,271	RSMean	6,095	kWh	-	therms	0.7	kW	\$ 1,000	12.3	20	\$ 14,600	0.9%	10,913
1b	Upgrade existing lighting	\$ 5,600	RSMean	10,366	kWh	-	therms	0.0	kW	\$ 1,700	3.3	12	\$ 16,722	16.6%	18,561
2	Weather-strip exterior doors	\$ 396	RSMean	-	kWh	93	therms	0.0	kW	\$ 151	2.6	10	\$ 1,272	22.1%	1,025
3	Install VendingMiser sensors on all vending machines	\$ 874	Similar project	7,221	kWh	-	therms	0.5	kW	\$ 1,184	0.7	10	\$ 10,000	104.4%	12,929
4	Replace existing DHW boiler	\$ 7,363	Similar project	-	kWh	640	therms	0.0	kW	\$ 1,037	7.1	25	\$ 17,658	5.6%	7,055
<b>Total</b>	<b>Total Scope of Work</b>	<b>\$ 26,504</b>	<b>-</b>	<b>23,682</b>	<b>-</b>	<b>733</b>		<b>1.2</b>	<b>-</b>	<b>\$ 5,071</b>	<b>5.2</b>		<b>\$ 60,252</b>		<b>50,483</b>

**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

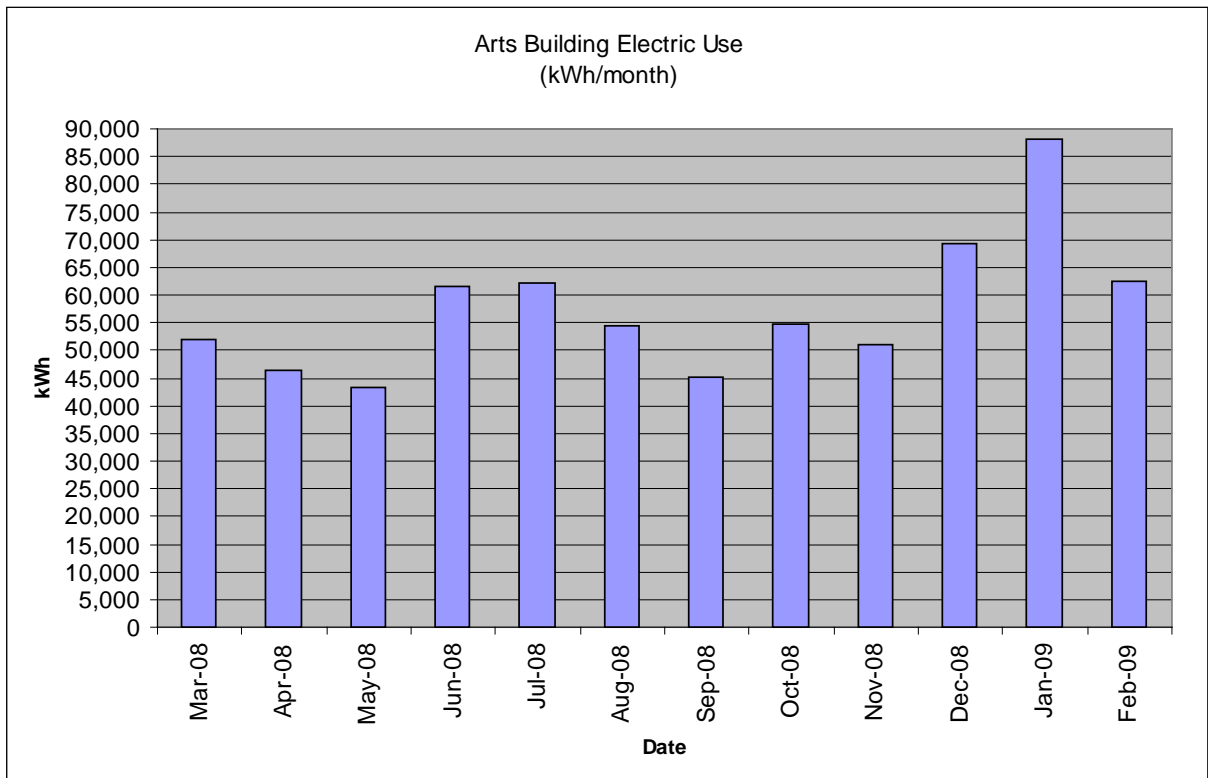
## 1.1. Energy usage and cost analysis

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

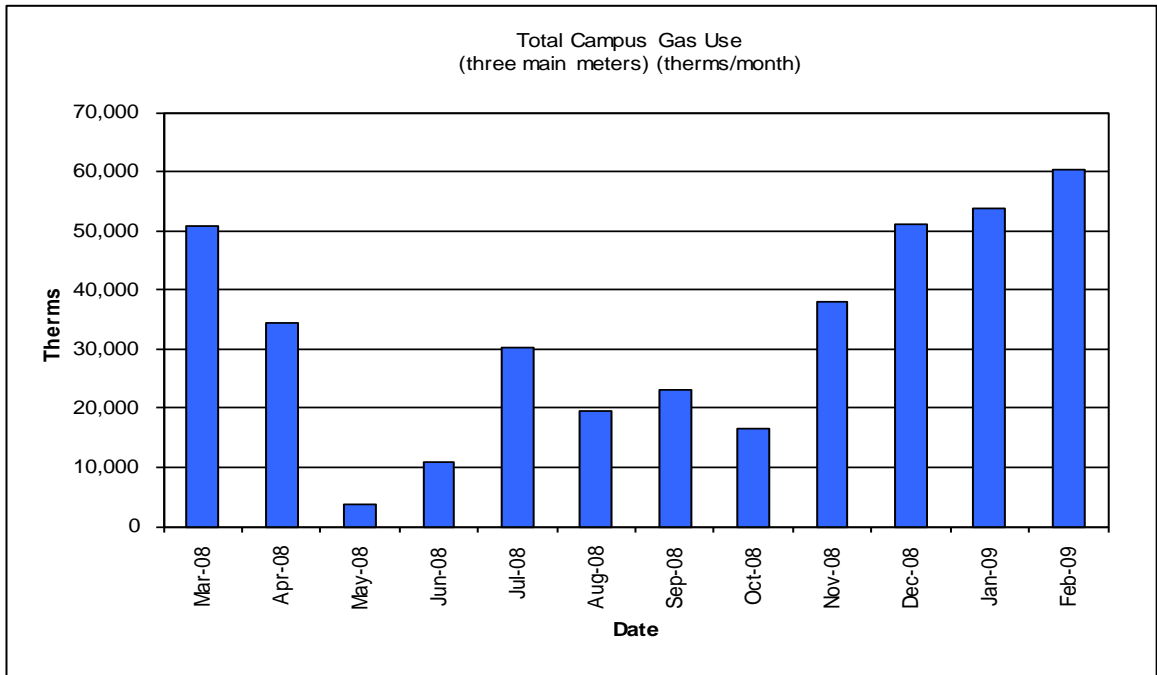
Electricity – The Arts building is currently metered directly for electrical usage. The Arts building electrical meter currently buys electricity from JCP&L at an average rate of **\$.164/kWh** based on the previous 12 months worth of utility bills. The Arts building purchased **approximately 690,480 kWh or \$113,338.55 worth of electricity** in the previous year.

Natural Gas – The Arts 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 Arts building alone on pro-rata basis of its square footage. This building consumed **3,789 therms of gas** during this period at a total cost of **\$7,234.60**.

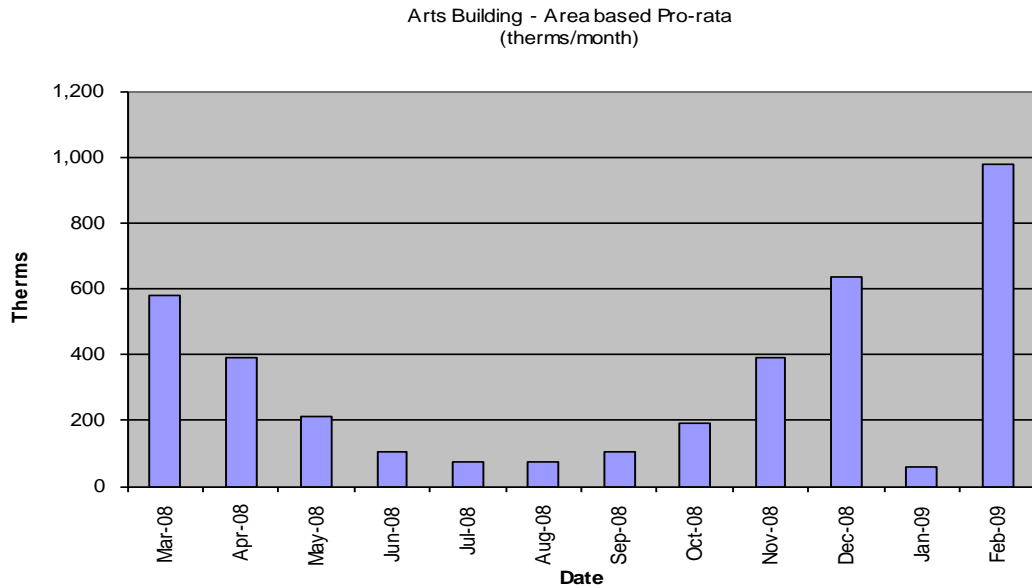
The following chart shows electricity usage for the Arts building meter based on utility bills for the 12 month period of March 2008 – February 2009.



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 Arts 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

The Arts building currently purchases electricity from JCP&L at a general service market rate for electricity usage (kWh) with a separate (kW) demand charge. The Arts building currently pays an average rate of approximately \$0.164/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 Arts 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, 2009<sup>1</sup>  
 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 (ft<sup>2</sup>):** 423,900

**Energy Performance Rating<sup>2</sup> (1-100)** N/A

#### Site Energy Use Summary<sup>3</sup>

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

#### Energy Intensity<sup>5</sup>

Site (kBtu/ft <sup>2</sup> /yr)	184
Source (kBtu/ft <sup>2</sup> /yr)	351

#### Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO <sub>2</sub> 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 Standards<sup>6</sup> 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, on-site facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5800-16

## **2. FACILITY AND SYSTEMS DESCRIPTION**

### **2.1. Building Characteristics**

The Arts Building consists of a single story and an area of 41,000 square feet. The building was built in the 1970s and consists mostly of classrooms, practice rooms, a print shop and administrative offices.

### **2.2. Building occupancy profiles**

The peak occupancy for the Arts Building is approximately 200 persons at any given time during weekdays. The building is typically occupied from 7am to 10pm on weekdays only, throughout the entire year.

### **2.3. Building envelope**

#### **2.3.1. Exterior walls**

The exterior wall finish consists of the original insulated non-structural metal panels. Insulation levels could not be verified. 6" metal studs and fiberglass batt insulation are assumed to fill the exterior wall cavities. During the site visit and data collection period, SWA performed an infrared scan of the exterior walls. Due to an outside temperature of approximately 66°F, 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 roof has an older EPDM rubberized surface set on a gable type roof with a 1/2" slope. No insulation could be verified in the field or is indicated on the plans. At RVCC's request, SWA has evaluated replacing the roof with a better insulated, reflective surface. Replacing the roof also gives an opportunity to replace the air-handling units and other HVAC equipment located on the rooftop so that the building can be connect to the main campus plant. SWA recommends that a well insulated roof is installed with an Energy Star reflective surface to cut down on solar heat gain and to reduce the amount of heat loss throughout the building.

#### **2.3.3. Base**

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

#### **2.3.4. Windows**

The building contains fixed aluminum-framed windows believed to be original to the building. SWA conducted tests on the window panes and was not able to determine if a low-e film coating existed on these windows or not. SWA assumes that the windows have no effective low-e coating. Currently, the building uses horizontal blinds to alter the amount of natural light that is allowed to enter each room. 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 exterior doors of the building were observed to little or no weather-stripping. At the South Entrance, visible gaps were noticed that allow expensive, conditioned air to escape the building. SWA recommends that the exterior doors of the building, especially the doors located at the North and South entrances, 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**

The Arts Building 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 Arts Building is currently not connected to the existing campus-wide chilled water/hot water loop that is supplied from the Cogeneration plant. The building contains 10 rooftop units that provide both electric DX cooling and gas heating for most of the common areas and classrooms. Each of the classrooms, depending on floor area, outdoor exposure and occupancy, has 2 to 4 wall type PTACs. PTACs have DX cooling and electric heating. Units appeared to be in good condition, although during our field investigation during a mild day, units were not operating. The air distribution system consists of ductwork distribution with supply diffusers for the entire building. Each fan coil unit is controlled by a dedicated space thermostat. The space above the suspended ceiling is used as a return air plenum.

The Arts building does not have much flexibility in terms of energy reduction from the current set up of heating and cooling systems. SWA evaluated two options for replacing the existing heating system.

1. One option is to replace all existing rooftop units and window units with newer models that have a much higher EER. It involves sizeable capital cost that shall need longer payback and a smaller return-on-investment.
2. The second option is to connect the building to the campus loop. However, all rooftop units and window units need to be replaced with operationally compatible handling cooling and heating units and a new VAV system. It means replacement of entire existing system. It shall be costlier than the first option.

SWA recommends that RVCC create a capital improvement plan for the Arts Building that addresses several issues at once with building energy use. SWA recommends that the roof is replaced with 4" of polyurethane insulation and a light colored surface. The building can simultaneously be connected to the main campus system. As part of the roof replacement, new air-handling units with heating and cooling coils should be installed along with a new VAV system. As a result, the perimeter electric HVACs can be removed.

### **2.4.2. Cooling**

The Arts building uses the same 10 rooftop units as well as PTAC units to heat *and* cool most of the common areas and classrooms.

### **2.4.3. Ventilation**

The Arts Building uses rooftop units to provide both DX cooling and gas heating throughout the majority of the building. These units also pull fresh air from the outside in order to provide adequate ventilation throughout the entire building.

### **2.4.4. Domestic Hot Water**

Domestic Hot Water is provided by a natural gas-fired, 199 MBH hot water boiler with 100 gallons of storage capacity. SWA recommends replacing this boiler with a newer, condensing hot water boiler that is more efficient.

More efficient hot water appliances will save energy through reduced energy consumption for water heating and money; through reducing water and sewer bills. Energy savings appliances bearing the ENERGY STAR label should be selected to ensure efficiency performance.

## **2.5. Electrical systems**

### **2.5.1. Lighting**

*Interior Lighting* – The Arts building currently consists of mostly T12 fluorescent fixtures with magnetic ballasts but some areas are in the process of being retrofitted with T8 or T5 fixtures. Based on measurements of lighting levels that were measured for each space, there are no vastly over-lit areas. SWA recommends replacing all T12 lighting including magnetic ballasts with T8 lighting and electronic ballasts. SWA also recommends installing occupancy sensors in all of the bathrooms. Since bathrooms are used sporadically throughout the day and are commonly left on for beyond the necessary hours of operation, SWA recommends installing occupancy sensors with a time delay. Typically occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. See attached lighting schedule for a complete inventory of lighting throughout the building and estimated power consumption.

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

*Exterior Lighting* – The exterior lighting was surveyed during the building audit. 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 the Arts 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 computers, dispatch radio equipment, refrigerators, etc. are purchased.

### **2.5.3. Elevators**

The Arts Building is a single story building and therefore contains no elevator equipment.

### **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	RTU8,10: Roof top DX cooling, gas heating, 2000cfm, 208-240/60/3; MCA31.9; 5 tons cooling; heating 120/97.2 in/out MBH	Roof	Trane, Model YCD061C3HBBD, S/N K401032980	Elec./Gas	N/A	1996	15%
HVAC	RTU1-7 (qty 7): Roof top DX cooling, gas heating, est. 2400cfm, 208-240/60/3; est. 6 tons cooling;	Roof	Trane, All nameplates bleached out and not readable	Elec./Gas	N/A	1980's	0%
HVAC	RTU9: Roof top DX cooling, gas heating, est. 2000cfm, 208-240/60/3; est. 5 tons cooling;heating 150/112.5 in/out MBH	Roof	Trane, nameplate bleached out and not readable	Elec./Gas	N/A	1980's	0%
Ventilation	Mushroom exhaust fans, old, 1/2hp (2), 1/3hp (1), 1/4hp (3), 1/8 hp (3) total of 9 nos.; no other details available	Roof	Nameplate, N/A	Elec.	N/A	1980's	0%
Cooling	A total of 45 PTAC units, est. 15000Btu cooling, 0.5kW elec.heating	Perimeter rooms	Nameplate, N/A	Elec.	Perimeter rooms, such as classrooms etc.	1980's	0%
Heating	DHW I/P 199MBH, 193 gal/hr, 100 gallon tank	Mechanical room	AO Smith, Model BTR 197 104; S/N mf990846582	Gas	Whole building	1999	30%

**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

- Connect building to central plant loop including new HVAC system: Please see ECM 5 below for more details
- Replace roof and add 4” of polyurethane insulation: Please see ECM 6 below for more details

##### Summary table

<b>ECM#</b>	<b>Description</b>
<b>1a</b>	<b>Upgrade existing lighting; upgrade all T12 magnetic fixtures to T8 electronic fixtures. Also upgrade any remaining fluorescent exit signs with new 5W LED models</b>
<b>1b</b>	<b>Upgrade interior lighting controls; see appendix A</b>
<b>2</b>	<b>Weather-strip exterior doors; weather-stripping will decrease the amount of conditioned air that is lost between the exterior door and frame</b>
<b>3</b>	<b>Install VendingMiser sensors on all vending machines; the VendingMiser device contains a motion sensor that allows lighting within each vending machine to shutdown when no motion is detected.</b>
<b>4</b>	<b>Replace existing DHW boiler; newer condensing type boilers can provide a much higher efficiency resulting in lowered energy costs.</b>
<b>5</b>	<b>Connect building to central plant loop including new HVAC system</b>
<b>6</b>	<b>Replace roof and add 4” of polyurethane insulation; replacing the roof with a higher insulation value and a reflective coating will make sure that conditioned air inside of the building is thermally separated from outside air.</b>
<b>7</b>	<b>Install 50 kW PV system; Installing PV will reduce annual electric consumption</b>

## ECM#1a: Upgrade existing lighting

### Description:

On the day of the site visit, SWA completed a lighting inventory of the Arts building on the RVCC campus. This building is currently being renovated and existing lighting is currently being retrofitted in portions of the building. Existing lighting consists of T12 fluorescent fixtures with magnetic ballasts and also some fluorescent exit signs. SWA recommends replacing all T12 magnetic fixtures with T8 electronic fixtures as well as fluorescent exit signs with LED exit signs. See Appendix A, Sheet 2 for complete lighting retrofit details. Additionally, there are 54 new fixture recommendations in items 10-14, 40, & 41 & in Appendix A, sheet 2, with daylight sensor controls. SWA recommends installing fixtures with built-in daylight photo sensors.

### Installation cost:

Estimated installed cost: \$14,871

Source of cost estimate: RS Means

### Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
6,095	-	0.0	\$ 1,000	14.9	20	\$ 14,600	-01%	10,913

### Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
6,095	-	0.0	\$ 1,000	12.3	20	\$ 14,600	0.9%	10,913

**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 – 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 \$2,580.*

*NJ Clean Energy – LED Exit signs (\$10/\$20 per fixture)  
Maximum incentive amount is \$20.*

**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#2b: Upgrade interior lighting controls

### Description:

Currently, Arts 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 can 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: \$6,160  
 Source of cost estimate: RS Means

### Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
6,160	-	-	\$ 1,700	3.6	12	\$ 16,722	14.3%	18,561

### Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
6,160	-	-	\$ 1,700	3.3	12	\$ 16,722	16.6%	18,561

**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 \$560.*

### 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 Arts building was intact but worn out in some areas and no longer performing as expected.

### Installation cost:

Estimated installed cost: \$396

Source of cost estimate: RS Means

### Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
-	93	0.0	\$ 151	2.6	10	\$ 1,272	22.1%	1,025

### Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
-	93	0.0	\$ 151	2.6	10	\$ 1,272	22.1	1,025

**Assumptions:** SWA assumes thermal savings based on heating loads calculated using eQUEST modeling and by conducting the billing analysis. In order to estimate a savings for this measure, SWA assumed in the eQUEST model that each wall with exterior doors would have an infiltration reduction of 5%.

### 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: *Install VendingMiser sensors on all vending machines*

**Description:**

On the day of the site visit, SWA observed that there were 4 cold drink vending machines and 2 snack machines located within the Arts building. Vending machines use an excess amount of electricity just to power the display lights that exists inside of the machines. The VendingMiser sensor is a motion detector that allows these display lights to shut off when no motion is detected, saving energy when no one is in the building or directly near a vending machine.

**Installation cost:**

Estimated installed cost: \$874  
 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		
7,221	-	0.5	\$ 1,184	0.7	10	\$ 10,000	104.4%	12,929

**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		
7,221	-	0.5	\$ 1,184	0.7	10	\$ 10,000	104.4%	12,929

**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:**

*There are currently no incentives available for this measure.*

**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 existing DHW boiler

### Description:

Currently, the Arts Building uses the original Domestic Hot Water boiler to meet current hot water demand. This boiler is approximately 30 years old and is no longer performing efficiently. SWA estimates that the efficiency of the current boiler is around 80%. Newer condensing type boilers can reach up to 95% efficiency and will cost much less to operate. SWA recommends replacing the existing DHW water heater with a condensing model. SWA suggests A O Smith Cyclone Xi Condensing 156 MBTUH DHW with 95% efficiency.

### Installation cost:

Estimated installed cost: \$7,675

Source of cost estimate: Similar project

### Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
-	640	0.0	\$ 1,037	7.4	25	\$ 17,658	5.2%	7.055

### Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
-	640	0.0	\$ 1,037	7.1	25	\$ 17,658	5.6%	7.055

**Assumptions:** SWA assumes thermal savings based on heating loads calculated using eQUEST modeling and by conducting the billing analysis. In order to estimate a savings for this measure, SWA assumed the efficiency will be increased from 80% to 95%. Calculations are based on data from DOE, EPA, vendors and calculations developed by PDR Associates over a period of the last 15 years.

### Rebates/financial incentives:

*NJ Clean Energy – NJ SmartStart Building Equipment Incentive, Incentive is for gas-fired water heaters >50 gallons (\$1.00-\$2.00 per MBH). Maximum incentive amount is \$312 for the replacement of the gas-fired hot water boiler.*

### 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#5: Connect building to central plant loop including new HVAC system**

### **Description:**

Currently, the Arts Building uses the original rooftop units to heat and cool the majority of the building. The rooftop units have electric DX cooling with natural gas heating and currently have outlived their life expectancy. At the request of RVCC, SWA has evaluated the costs and savings associated with connecting the building to the main campus plant. The payback calculated is very long, and hence this could be considered a capital investment.

### **Installation cost:**

Estimated installed cost: \$678,581  
 Source of cost estimate: *RS Means*

### **Economics (without incentives):**

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
55,080	49	99.1	\$ 20,829	32.6	25	\$ 354,739	-1.9%	99,163

### **Economics (with incentives):**

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
55,080	49	99.1	\$ 20,829	32.6	25	\$ 354,739	-1.9%	99,163

**Assumptions:** SWA assumes thermal savings based on heating loads calculated using eQUEST modeling and by conducting the billing analysis. SWA has included the cost of replacing the existing HVAC equipment as well as physically connecting the building to the main campus plant. SWA made the following assumptions to calculate kWh savings, therms savings, and dollar savings:

- kWh savings result from shifting cooling from DX to CHW plant. SWA assumed that the efficiency of the cooling system increased from 1.1kW/ton to .6kW/ton, applicable for 3000 hours of yearly cooling needs, and at 60% diversity.
- Heating needs for the building are assumed mostly in winter season.
- kWh reduction will ultimately be shifted to kWh on the central plant. Hence there will be cost savings due to different electricity rates. Calculated savings are \$495.72 per year.
- Finally, by connecting the heating to the HW loop, therms will be shifted from main gas meter to the boiler meter. The rate differential between the two meters will save approximately \$2,900 per year.
- Facility personnel advised an operation and maintenance savings to the tune of \$8,320 per year from compressors, blowers, boilers, etc. assumed as 2 hours/week.

**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](http://www.state.nj.us/dep/opsc/docs/ghg_grant_guidance.pdf)

## **ECM#6: Replace roof and add 4” polyurethane insulation**

### **Description:**

The existing Arts Building roof is old and showing signs of deterioration. As part of a capital improvement plan that includes connecting the building to the main campus unit as well as replacing the rooftop HVAC equipment, RVCC should replace the roof with 4” polyurethane insulation and a light-colored reflective surface. The payback calculated is very long, and hence this could be considered a capital investment.

### **Installation cost:**

Estimated installed cost: \$346,732  
 Source of cost estimate: *RS Means*

### **Economics (without incentives):**

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
14,200	509	0.0	\$ 3,153	110.0	30	\$ 60,240	-2.8%	31,036

### **Economics (with incentives):**

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
14,200	509	0.0	\$ 3,153	110.0	30	\$ 60,240	-2.8%	31,036

**Assumptions:** SWA assumes thermal savings based on heating loads calculated using eQUEST modeling and by conducting the billing analysis.

### **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:*

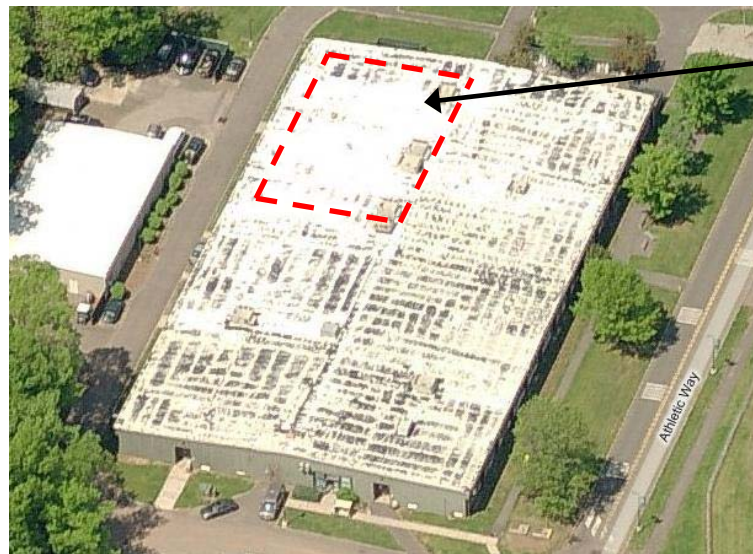
[http://www.state.nj.us/dep/opsc/docs/ghg\\_grant\\_guidance.pdf](http://www.state.nj.us/dep/opsc/docs/ghg_grant_guidance.pdf)

## ECM#7: *Install 50 kW PV system*

### **Description:**

Currently, the Arts Building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels can be mounted on the roof and offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges; usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc. being used within the region, demand charges go up to offset the utilities cost of providing enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity usage by a building but also reduce the buildings electric demand, resulting in a higher cost savings as well. SWA recommends installing a 50kW PV system that will help offset electrical demand for the building and also reduce the annual net electric consumption for the building.

The roof of the Arts building has a large flat surface that would be ideal for installing a PV array.



**Ideal location for solar  
PV panel array**

The location noted above in the picture has an area of greater than 5000 square feet according to building drawings. A typical solar panel used for calculations has an area of approximately 10.7 square feet and can generate a peak kW of up to 123 Watts. Based on a 50 kW system, approximately 220 panels would be necessary and would take up 3850 square feet.

### **Installation cost:**

Estimated installed cost: \$375,500 (estimated labor costs, \$15,000)

Source of cost estimate: Similar projects

Total incentives estimated: \$50,000, and \$34,000 SREC's yearly

**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		
56,721	-	50	\$ 43,165	7.5	25	\$ 751,633	12.0%	77,708

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

**Rebates/financial incentives:**

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

*NJ Clean Energy – Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The building must also become net-metered in order to earn SRECs as well as sell power back to the electric grid.*

**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**

*Please see ECM#7 above.*

### **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 inadequate thermal load year round.*

### **5.5. Geothermal**

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

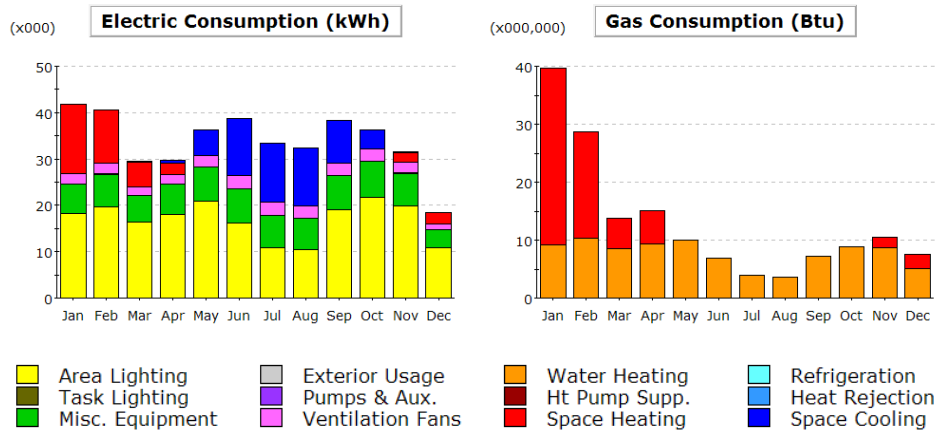
### **5.6. Wind**

*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 the Arts building by Trace Electrical Services and Testing. The survey was conducted by installing power recording meters for seven days at various buildings on campus. The Arts building was surveyed from September 18<sup>th</sup>, 2007 through September 25<sup>th</sup>, 2007. The results of the test revealed that the Arts building had a peak demand of 140.75kW at 2:05pm on September 21<sup>st</sup>, 2007. Over the seven-day period, there was a cumulative power usage of 9.7088 MWh or approximately 1386.971 kWh per day. Below is a chart that shows the annual electric load profile for the Arts building.



## 6.2. Tariff analysis

Currently, natural gas and electricity is provided to the Arts building through the main campus gas meter. 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.

The Arts building is direct-metered and currently purchases electricity 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. Typically, the electricity prices increase during the cooling months when electricity is used by the rooftop air-handling units as well as the PTAC units in the classrooms.

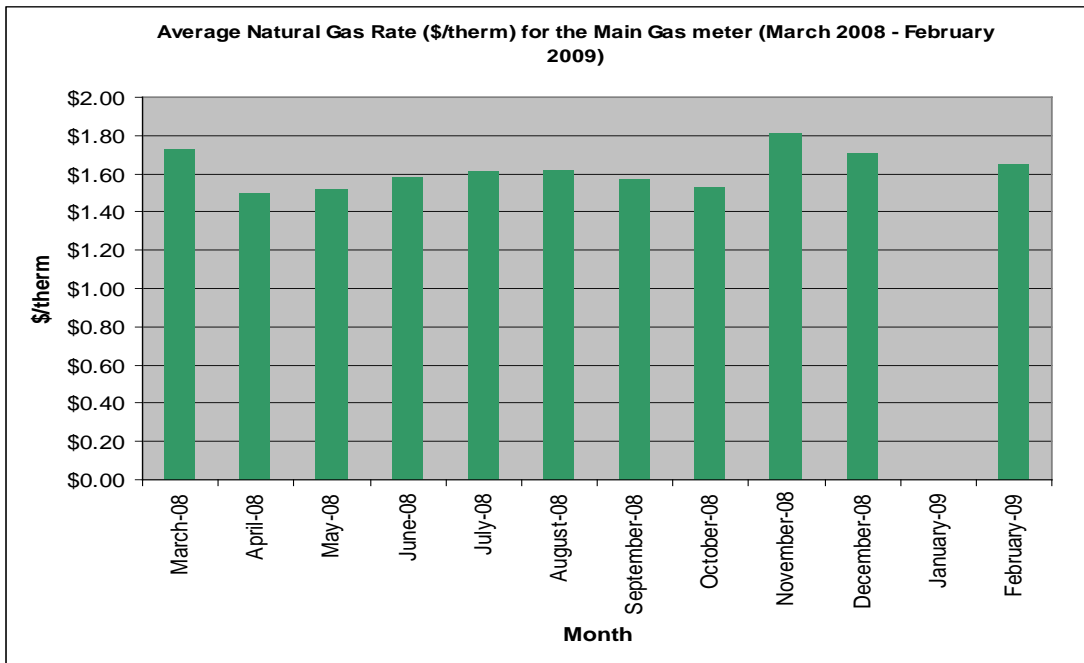
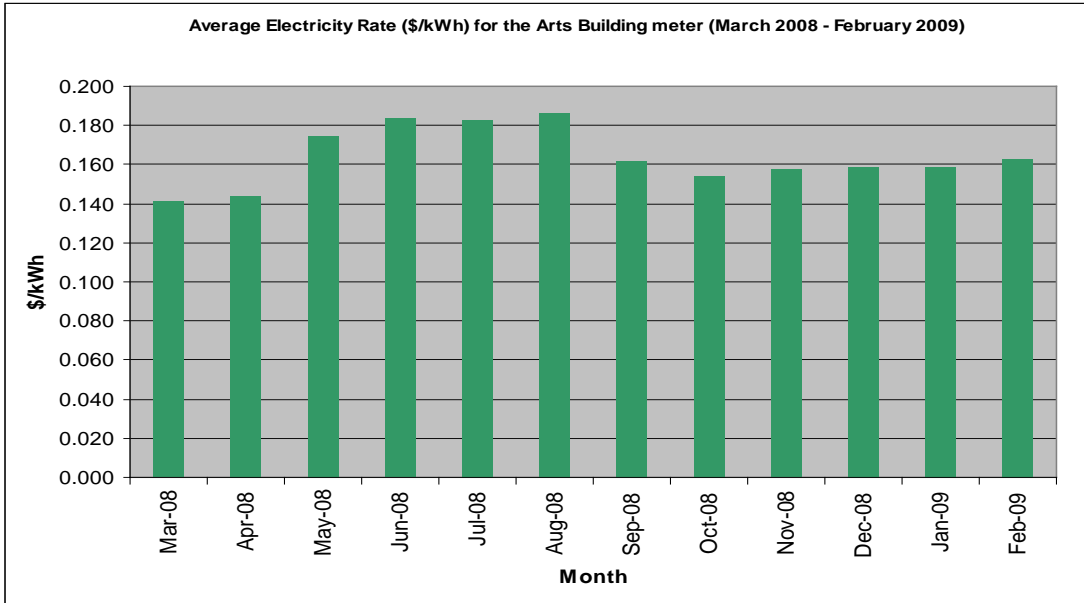
## 6.3. Energy Procurement strategies

The Arts 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. Electricity is purchased directly for the Arts building from JCP&L without an ESCO and therefore SWA analyzed the utility rate for electricity over the previous 12 months. Electric bill analysis shows fluctuations of 24% 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 Arts building annual utility costs are \$9,766.55 higher for electric, and \$1,362.31 higher for gas, for a total of \$11,128.86 higher 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 (Watts)
1	Arts Building	Main	Room A06	55	2' U-shaped T8	electronic	12	2	Fluorescent	32	12	9216	Switch	No	768
2	Arts Building	Main	Room A06	55	75W Inc. Spots	-	35	1	Incandescent	75	3	7875	Switch	No	2625
3	Arts Building	Main	Room A02 - Photography	25	2' linear T8	electronic	20	1	Fluorescent	17	12	4080	Switch	No	340
4	Arts Building	Main	Room A04	<10	2' U-shaped T8	electronic	5	2	Fluorescent	32	2	640	Switch	No	320
5	Arts Building	Main	Room A08 - Dance Studio	25	2' linear T8	electronic	25	1	Fluorescent	17	12	5100	Switch	No	425
6	Arts Building	Main	Room A16	34	2' U-shaped T8	electronic	15	2	Fluorescent	32	12	11520	Switch	No	960
7	Arts Building	Main	Room A23 - Music Studio	48	4' linear T8	electronic	12	4	Fluorescent	32	12	18432	Switch	No	1536
8	Arts Building	Main	Room A23 - Music Studio	48	75W Inc. Spots	-	2	1	Incandescent	75	12	1800	Switch	No	150
9	Arts Building	Main	Room A33 - Music Rehearsal Studio	56	4' linear T8	electronic	15	4	Fluorescent	32	12	23040	Switch	No	1920
10	Arts Building	Main	Room A33 - Storage in Room	23	2' U-shaped T12	magnetic	2	1	Fluorescent	40	2	160	Switch	Yes	80
11	Arts Building	Main	Room A24	25	4' linear T12	magnetic	12	2	Fluorescent	40	12	11520	Switch	Yes	960
12	Arts Building	Main	Room A22	42	4' linear T12	magnetic	12	2	Fluorescent	40	12	11520	Switch	Yes	960
13	Arts Building	Main	Room A20	40	4' linear T12	magnetic	12	2	Fluorescent	40	12	11520	Switch	Yes	960
14	Arts Building	Main	Room A19	48	4' linear T12	magnetic	4	2	Fluorescent	40	12	3840	Switch	No	320
15	Arts Building	Main	Room A19	48	4' linear T8	electronic	2	2	Fluorescent	32	12	1536	Switch	No	128
16	Arts Building	Main	Room A18	36	4' linear T8	electronic	8	2	Fluorescent	32	12	6144	Switch	Yes	512
17	Arts Building	Main	Room A17	38	4' linear T8	electronic	8	2	Fluorescent	32	12	6144	Switch	Yes	512
18	Arts Building	Main	Hallway from A25-A17	18	14" linear T5	electronic	16	1	Fluorescent	14	15	3360	Switch	No	224
19	Arts Building	Main	Hallway from A25-A17	18	LED Exit Sign	-	1	1	LED	5	24	120	None	No	5
20	Arts Building	Main	Print Shop	41	4' linear T8	electronic	20	2	Fluorescent	32	12	15360	Switch	No	1280
21	Arts Building	Main	Print Shop	41	Fluorescent Exit	-	1	1	Fluorescent	20	24	480	None	No	20
22	Arts Building	Main	Men's Room	34	2' U-shaped T12	magnetic	4	2	Fluorescent	40	15	4800	Switch	No	320
23	Arts Building	Main	Women's Room	34	2' U-shaped T12	magnetic	4	2	Fluorescent	40	15	4800	Switch	No	320
24	Arts Building	Main	Room A30	47	4' linear T12	magnetic	4	2	Fluorescent	40	12	3840	Switch	No	320
25	Arts Building	Main	Room 30A	43	4' linear T12	magnetic	1	2	Fluorescent	40	12	960	Switch	No	80
26	Arts Building	Main	Room 26	43	4' linear T12	magnetic	1	2	Fluorescent	40	12	960	Switch	No	80
27	Arts Building	Main	Room 24	43	4' linear T12	magnetic	1	2	Fluorescent	40	12	960	Switch	No	80
28	Arts Building	Main	Area in front of Room 26	47	4' linear T12	magnetic	12	2	Fluorescent	40	12	11520	Switch	No	960
29	Arts Building	Main	Hallway from A30-A34	20	14" linear T5	electronic	12	1	Fluorescent	14	15	2520	Switch	No	168
30	Arts Building	Main	Hallway from A30-A34	20	LED Exit Sign	-	1	1	LED	5	24	120	None	No	5
31	Arts Building	Main	Custodian's Closet	12	4' linear T12	magnetic	1	2	Fluorescent	40	4	320	Switch	No	80
32	Arts Building	Main	Room A32	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
33	Arts Building	Main	Room A35	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
34	Arts Building	Main	Room A37	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
35	Arts Building	Main	Room A39	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
36	Arts Building	Main	Room A38	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
37	Arts Building	Main	Room A36	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
38	Arts Building	Main	Room A34	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
39	Arts Building	Main	Room A34	52	40W Halogens	-	24	1	Halogen	40	2	1920	Switch	No	960
40	Arts Building	Main	Room A09C	72	4' linear T12	magnetic	13	4	Fluorescent	40	12	24960	Switch	Yes	2080
41	Arts Building	Main	Room A09C	72	4' linear T12	magnetic	3	2	Fluorescent	40	12	2880	Switch	Yes	240

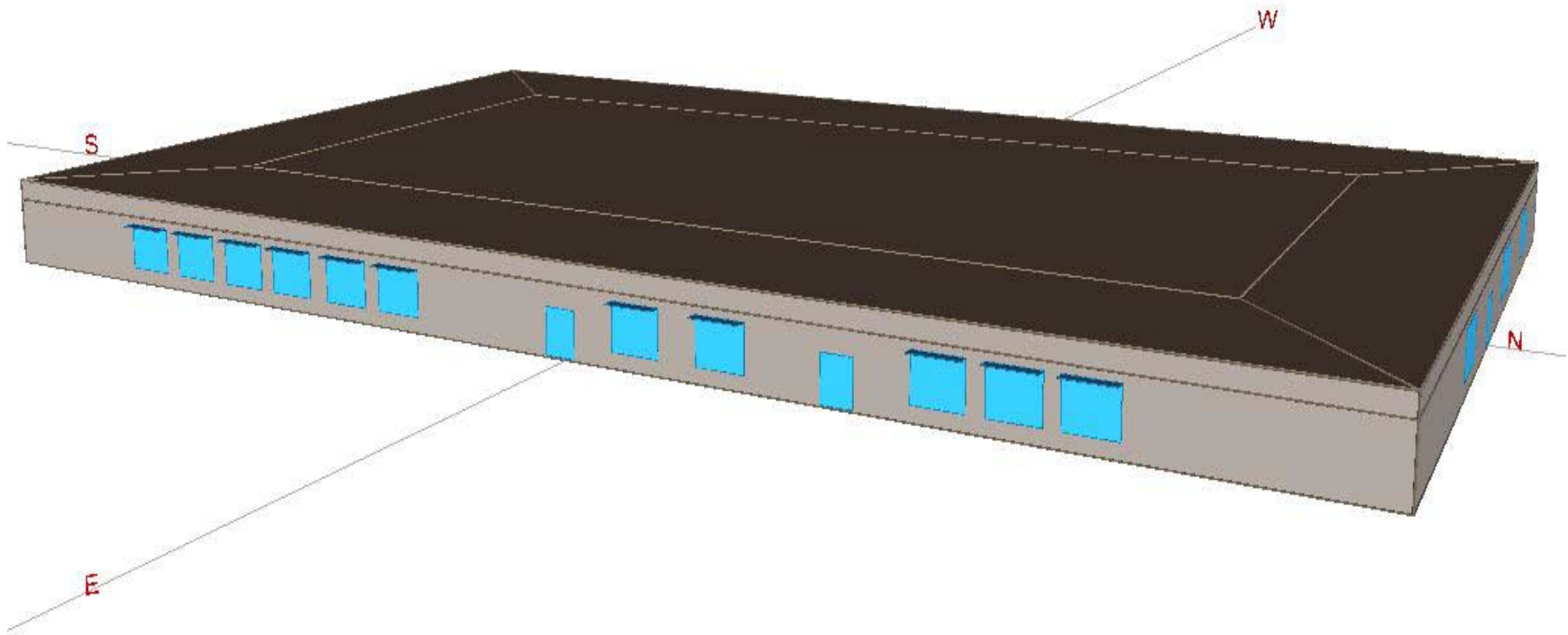
## Appendix A: Lighting study (Sheet 2 – Proposed lights)

Recommended 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 (Watts)
1	Arts Building	Main	Room A06	55	2' U-shaped T8	electronic	12	2	Fluorescent	32	12	9216	Switch	No	768
2	Arts Building	Main	Room A06	55	75W Inc. Spots	-	35	1	Incandescent	75	3	7875	Switch	No	2625
3	Arts Building	Main	Room A02 - Photography	25	2' linear T8	electronic	20	1	Fluorescent	17	12	4080	Switch	No	340
4	Arts Building	Main	Room A04	<10	2' U-shaped T8	electronic	5	2	Fluorescent	32	2	640	Switch	No	320
5	Arts Building	Main	Room A08 - Dance Studio	25	2' linear T8	electronic	25	1	Fluorescent	17	12	5100	Switch	No	425
6	Arts Building	Main	Room A16	34	2' U-shaped T8	electronic	15	2	Fluorescent	32	12	11520	Switch	No	960
7	Arts Building	Main	Room A23 - Music Studio	48	4' linear T8	electronic	12	4	Fluorescent	32	12	18432	Switch	No	1536
8	Arts Building	Main	Room A23 - Music Studio	48	75W Inc. Spots	-	2	1	Incandescent	75	12	1800	Switch	No	150
9	Arts Building	Main	Room A33 - Music Rehearsal Studio	56	4' linear T8	electronic	15	4	Fluorescent	32	12	23040	Switch	No	1920
10	Arts Building	Main	Room A33 - Storage in Room	23	2' U-shaped T8	electronic	2	1	Fluorescent	40	2	112	Switch	Yes	80
11	Arts Building	Main	Room A24	25	4' linear T8	electronic	12	2	Fluorescent	40	12	8064	Switch	Yes	960
12	Arts Building	Main	Room A22	42	4' linear T8	electronic	12	2	Fluorescent	40	12	8064	Switch	Yes	960
13	Arts Building	Main	Room A20	40	4' linear T8	electronic	12	2	Fluorescent	40	12	8064	Switch	Yes	960
14	Arts Building	Main	Room A19	48	4' linear T8	electronic	4	2	Fluorescent	40	12	8064	Switch	No	320
15	Arts Building	Main	Room A19	48	4' linear T8	electronic	2	2	Fluorescent	32	12	1536	Switch	No	128
16	Arts Building	Main	Room A18	36	4' linear T8	electronic	8	2	Fluorescent	32	12	6144	Switch	No	512
17	Arts Building	Main	Room A17	38	4' linear T8	electronic	8	2	Fluorescent	32	12	6144	Switch	No	512
18	Arts Building	Main	Hallway from A25-A17	18	14" linear T5	electronic	16	1	Fluorescent	14	15	3360	Switch	No	224
19	Arts Building	Main	Hallway from A25-A17	18	LED Exit Sign	-	1	1	LED	5	24	120	None	No	5
20	Arts Building	Main	Print Shop	41	4' linear T8	electronic	20	2	Fluorescent	32	12	15360	Switch	No	1280
21	Arts Building	Main	Print Shop	41	LED Exit Sign	-	1	1	Fluorescent	5	24	120	None	No	5
22	Arts Building	Main	Men's Room	34	2' U-shaped T8	electronic	4	2	Fluorescent	40	15	3360	Switch	No	320
23	Arts Building	Main	Women's Room	34	2' U-shaped T8	electronic	4	2	Fluorescent	40	15	3360	Switch	No	320
24	Arts Building	Main	Room A30	47	4' linear T8	electronic	4	2	Fluorescent	40	12	2688	Switch	No	320
25	Arts Building	Main	Room 30A	43	4' linear T8	electronic	1	2	Fluorescent	40	12	672	Switch	No	80
26	Arts Building	Main	Room 26	43	4' linear T8	electronic	1	2	Fluorescent	40	12	672	Switch	No	80
27	Arts Building	Main	Room 24	43	4' linear T8	electronic	1	2	Fluorescent	40	12	672	Switch	No	80
28	Arts Building	Main	Area in front of Room 26	47	4' linear T8	electronic	12	2	Fluorescent	40	12	8064	Switch	No	960
29	Arts Building	Main	Hallway from A30-A34	20	14" linear T5	electronic	12	1	Fluorescent	14	15	2520	Switch	No	168
30	Arts Building	Main	Hallway from A30-A34	20	LED Exit Sign	-	1	1	LED	5	24	120	None	No	5
31	Arts Building	Main	Custodian's Closet	12	4' linear T8	electronic	1	2	Fluorescent	40	4	224	Switch	No	80
32	Arts Building	Main	Room A32	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
33	Arts Building	Main	Room A35	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
34	Arts Building	Main	Room A37	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
35	Arts Building	Main	Room A39	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
36	Arts Building	Main	Room A38	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
37	Arts Building	Main	Room A36	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
38	Arts Building	Main	Room A34	52	4' linear T8	electronic	16	2	Fluorescent	32	12	12288	Switch	No	1024
39	Arts Building	Main	Room A34	52	40W Halogens	-	24	1	Halogen	40	2	1920	Switch	No	960
40	Arts Building	Main	Room A09C	72	4' linear T8	electronic	13	4	Fluorescent	40	12	17472	Switch	Yes	2080
41	Arts Building	Main	Room A09C	72	4' linear T8	electronic	3	2	Fluorescent	40	12	2016	Switch	Yes	240
<b>Totals</b>				Existing Lighting Total Power (Watts)	27866	Watts									
Existing Usage (kWh/year)		78,296	Existing Lighting Power Density (W/sqft)		0.68	W/sqft									
Proposed Usage (kWh/year)		72,201													
Existing Est. Cost (\$/year)		\$12,840.47	Proposed Lighting Total Power (Watts)		27851	Watts									
Proposed Est. Cost (\$/year)		\$11,840.91	Proposed Lighting Power Density (W/sqft)		0.68	W/sqft									
Total kWh Savings		6,095													
Total \$ Savings		\$ 999.56													

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

Recommended Lighting Controls															
#	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 (Watts)
1	Arts Building	Main	Room A06	55	2' U-shaped T8	electronic	12	2	Fluorescent	32	10	7680	Occupancy	No	768
2	Arts Building	Main	Room A06	55	75W Inc. Spots	-	35	1	Incandescent	75	3	7875	Switch	No	2625
3	Arts Building	Main	Room A02 - Photography	25	2' linear T8	electronic	20	1	Fluorescent	17	10	3400	Occupancy	No	340
4	Arts Building	Main	Room A04	<10	2' U-shaped T8	electronic	5	2	Fluorescent	32	2	640	Switch	No	320
5	Arts Building	Main	Room A08 - Dance Studio	25	2' linear T8	electronic	25	1	Fluorescent	17	10	4250	Occupancy	No	425
6	Arts Building	Main	Room A16	34	2' U-shaped T8	electronic	15	2	Fluorescent	32	10	9600	Occupancy	No	960
7	Arts Building	Main	Room A23 - Music Studio	48	4' linear T8	electronic	12	4	Fluorescent	32	10	15360	Occupancy	No	1536
8	Arts Building	Main	Room A23 - Music Studio	48	75W Inc. Spots	-	2	1	Incandescent	75	10	1500	Occupancy	No	150
9	Arts Building	Main	Room A33 - Music Rehearsal Studio	56	4' linear T8	electronic	15	4	Fluorescent	32	10	19200	Occupancy	No	1920
10	Arts Building	Main	Room A33 - Storage in Room	23	2' U-shaped T8	electronic	2	1	Fluorescent	40	2	112	Switch	Yes	80
11	Arts Building	Main	Room A24	25	4' linear T8	electronic	12	2	Fluorescent	40	9	8064	Occupancy	Yes	960
12	Arts Building	Main	Room A22	42	4' linear T8	electronic	12	2	Fluorescent	40	9	8064	Occupancy	Yes	960
13	Arts Building	Main	Room A20	40	4' linear T8	electronic	12	2	Fluorescent	40	9	8064	Occupancy	Yes	960
14	Arts Building	Main	Room A19	48	4' linear T8	electronic	4	2	Fluorescent	40	9	8064	Occupancy	No	320
15	Arts Building	Main	Room A19	48	4' linear T8	electronic	2	2	Fluorescent	32	9	1152	Occupancy	No	128
16	Arts Building	Main	Room A18	36	4' linear T8	electronic	8	2	Fluorescent	32	9	4608	Occupancy	No	512
17	Arts Building	Main	Room A17	38	4' linear T8	electronic	8	2	Fluorescent	32	9	4608	Occupancy	No	512
18	Arts Building	Main	Hallway from A25-A17	18	14" linear T5	electronic	16	1	Fluorescent	14	15	3360	Switch	No	224
19	Arts Building	Main	Hallway from A25-A17	18	LED Exit Sign	-	1	1	LED	5	24	120	None	No	5
20	Arts Building	Main	Print Shop	41	4' linear T8	electronic	20	2	Fluorescent	32	10	12800	Occupancy	No	1280
21	Arts Building	Main	Print Shop	41	LED Exit Sign	-	1	1	Fluorescent	5	24	120	None	No	5
22	Arts Building	Main	Men's Room	34	2' U-shaped T8	electronic	4	2	Fluorescent	40	8	3360	Occupancy	No	320
23	Arts Building	Main	Women's Room	34	2' U-shaped T8	electronic	4	2	Fluorescent	40	8	3360	Occupancy	No	320
24	Arts Building	Main	Room A30	47	4' linear T8	electronic	4	2	Fluorescent	40	9	2688	Occupancy	No	320
25	Arts Building	Main	Room 30A	43	4' linear T8	electronic	1	2	Fluorescent	40	9	672	Switch	No	80
26	Arts Building	Main	Room 26	43	4' linear T8	electronic	1	2	Fluorescent	40	9	672	Switch	No	80
27	Arts Building	Main	Room 24	43	4' linear T8	electronic	1	2	Fluorescent	40	9	672	Switch	No	80
28	Arts Building	Main	Area in front of Room 26	47	4' linear T8	electronic	12	2	Fluorescent	40	10	8064	Occupancy	No	960
29	Arts Building	Main	Hallway from A30-A34	20	14" linear T5	electronic	12	1	Fluorescent	14	15	2520	Switch	No	168
30	Arts Building	Main	Hallway from A30-A34	20	LED Exit Sign	-	1	1	LED	5	24	120	None	No	5
31	Arts Building	Main	Custodian's Closet	12	4' linear T8	electronic	1	2	Fluorescent	40	4	224	Switch	No	80
32	Arts Building	Main	Room A32	52	4' linear T8	electronic	16	2	Fluorescent	32	9	9216	Occupancy	No	1024
33	Arts Building	Main	Room A35	52	4' linear T8	electronic	16	2	Fluorescent	32	9	9216	Occupancy	No	1024
34	Arts Building	Main	Room A37	52	4' linear T8	electronic	16	2	Fluorescent	32	9	9216	Occupancy	No	1024
35	Arts Building	Main	Room A39	52	4' linear T8	electronic	16	2	Fluorescent	32	9	9216	Occupancy	No	1024
36	Arts Building	Main	Room A38	52	4' linear T8	electronic	16	2	Fluorescent	32	9	9216	Occupancy	No	1024
37	Arts Building	Main	Room A36	52	4' linear T8	electronic	16	2	Fluorescent	32	9	9216	Occupancy	No	1024
38	Arts Building	Main	Room A34	52	4' linear T8	electronic	16	2	Fluorescent	32	9	9216	Occupancy	No	1024
39	Arts Building	Main	Room A34	52	40W Halogens	-	24	1	Halogen	40	2	1920	Switch	No	960
40	Arts Building	Main	Room A09C	72	4' linear T8	electronic	13	4	Fluorescent	40	9	17472	Occupancy	Yes	2080
41	Arts Building	Main	Room A09C	72	4' linear T8	electronic	3	2	Fluorescent	40	9	2016	Occupancy	Yes	240
<b>Totals</b>															
Proposed Usage w/ existing controls (kWh/year)				72,201											
Proposed Usage with new controls (kWh/year)				61,834											
Total kWh savings				10,366											
Total annual \$ Savings				\$ 1,606.79											

Appendix B: eQUEST model



**Appendix C: Third Party Energy Suppliers (ESCOs)**

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

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

**PSE&G NATURAL GAS SERVICE TERRITORY**

**Last Updated: 06/15/09**

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