



## UNIVERSITY OF THE VIRGIN ISLANDS

MARCH 2012

### UNIVERSITY WIDE PHOTOVOLTAIC SYSTEM PROJECT



**Project Background:** In an attempt to reduce energy consumption, the University started examining firms to provide alternative renewable energy solutions. In the field of renewable energies there are solar, wind, biomass, water, geothermal, and hydrogen and fuel cells. Previously wind turbines were researched. Due to the maintenance required for these units during hurricane season, it was determined that this project

would not be feasible. Thus, a Request for Qualifications was advertised to explore firms that could provide a Power Purchase Agreement (PPA) for a photovoltaic (PV) system on both campuses.

The PV systems could be ground mounted, roof top mounted, carport integration or a combination of all three. Any option would be rated to the Florida Hurricane standards of 150mph winds and gusts and would not require additional maintenance during hurricane season. The systems would tie into the UVI power grid in order to support as much electrical consumption as possible.

In 2005 the 26<sup>th</sup> Legislature of the Virgin Islands passed Act 6792 of which Section 11 allows UVI to have a power production capacity not to exceed 5 megawatts (MW). Therefore, the University could construct a 2 MW system on the Albert A. Sheen campus and a 3 MW system on the St. Thomas campus. These systems would utilize a decent amount of available land on both campuses. Estimates range from 2 to 5 acres per MW generation.

#### **Power Purchase Agreement:**

In essence a PPA is a contractual agreement where the firms sell a specified amount of energy to UVI at a set rate. The amount of energy sold is based on the system size and how much energy UVI consumes during day light hours. The rate is based on, but is not limited to, the

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type of design, length of the contract, amount of energy purchased, and any possible rebates or tax credits that exist. The type of design refers to whether the system is ground mounted, roof mounted, or integrated in a carport. Ground mounted systems are easier and usually cheaper to install and maintain than the other options.

The PPA also places the responsibility of the maintenance and operation of the system on the firm. At the end of the agreed contract term it would also be the responsibility of the firm to remove all equipment. It is possible to make arrangements to keep some or all of the system.

The PPA is an agreement that is negotiated between the firm and UVI. There are additional requirements and topics that can be added into the agreement. For example, stipulations can be included to protect UVI in the event the system does not generate as much energy as originally specified.

**Photovoltaic Systems in Higher Education:** In 2011 AASHE, Association for the Advancement of Sustainability in Higher Education, started a campus Photovoltaic database, which is voluntary, so it does not contain every system. However, since 2004 there have been 30 installations of systems over 1MW. Twenty-two of these systems were installed after January of 2010. Wall Street research indicates that by the end of 2012 global PV modules will increase to 25 gigawatts (GW) up from 7.3 in 2009. Of this, Goldman Sachs estimates 3GW in the US versus .47GW in 2009. This increase in installations would result in part from current system performances, low industry system costs, proven equipment costs, and the global value of reducing fossil fuel dependency.

**Renewable Energy Future:** In the future, wind, hydrogen and fuel cells may be a technology that could be adopted on the UVI campuses. Newer vertical axis wind turbines are coming out on the market. They are easier to maintain and take up less space. There are also some additional benefits during hurricane season, but more research needs to be done. As for fuel cell technology, the main limitations are cost and quality. Current technology requires a large amount of cells to be effective. Utility size systems are the main consumers of fuel cells. During the proposed time of this PPA should technology improve on these two systems, they can be easily implemented at UVI.

### ***Project Update:***

Six firms responded to the initial Request for Quotations (RFQ).

- **Sustainable Energy Holdings**
- **All Rounder**
- **Caribbean Wind Energy and System 3**
- **AES**
- **Carbon Vision**
- **Standard Solar**

After careful review it was decided that All Rounder and Carbon Vision would not be given the opportunity to bid in the Request for Proposal (RFP) process due to financial concerns and their inability to deliver on a photovoltaic project of the projected scope envisioned.

### ***Request for Proposal:***

An RFP was issued to the four qualified RFQ respondents on August 18, 2011. The Selection Committee reviewed proposals and narrowed the selection down to two qualified firms based on their scores, competitiveness of rates, potential energy savings and estimated project acreage required.

#### ***Two remaining Firms:***

- **Caribbean Wind Energy and System 3** – Caribbean Wind Energy is a local company that specializes in wind and solar technology. System 3 has a history of projects in alternative energy on the west coast of the continental U.S. Their PPA rate ranges from \$0.2505 to \$0.2634 per kilowatt hour (kWh) depending on a carport selection and how much land they are allowed to use.
- **Standard Solar** – This firm is based in the metropolitan area of Washington, DC. They have a wide variety of experience working with higher education and government entities. They currently have over \$80 million in projects that are scheduled to be completed by April of 2012. Their PPA rate is a range of \$0.257 to \$0.297 per kWh.

### ***Selected Firm:***

After review by the Selection Committee it was determined that Caribbean Wind Energy and System 3 would be the best firm. Their design used the least amount of land, and had lower

costs for carports. It is important to note that this partnership has been part of the process of UVI's investigation of Alternative Energy since November of 2010. As Caribbean Wind is a local firm based in St. Croix they are capable of sourcing many local workers for the construction, operation, and maintenance of the system.

System 3 is a California based corporation that was formed in October of 2001. They have done work for California State University as well as various systems for cities in California, Nevada, and Canada. They have approximately 30 sites in a PPA operation for a total of 6MW, and 20 sites under construction for approximately 4MW. They have a total of just over \$73 million of work in progress and under construction.

### ***Array Equipment:***

- Panels: The quoted panels are crystalline silicon cells by Solar World Industries of America. They do not contain any toxic chemicals that could leach if the unit should break. Solar World has been making panels in the USA since 1975.
- Inverters: They are standard electrical components used to convert the energy produced from the array to usable energy for the campus. Satcon is the inverter of choice by System 3. Clinton Hedrington, WAPA's Director of Transmission and Distribution, has reviewed the specifications of the inverter. While he did make some recommendations he did not see anything that would be of concern. The inverters do not generate radiation.
- Racking system: Consists of galvanized steel or aluminum. The units would be mounted on poles and sunk into the ground. Further soil studies would determine how deep the poles would have to be sunk. Concrete ballast blocks are another alternative to the mounting system.

***Array Design:*** Due to space considerations, several design options were considered for cost savings and acreage foot print. Single location ground mount systems are the best option as they are the most economical design to construct and maintain. Carports, while they are an option, are more costly to construct to meet hurricane ratings. Since the initial Request for Proposal went out, Albert A. Sheen's energy audit and equipment repairs resulted in considerable consumption reduction from 2010. This consumption reduction resulted in the need for a smaller system on this campus. Even though this is a smaller system; the fixed costs for this project have not changed by much; however, they resulted in an increase in the proposed rate since the October 2011 presentation. We are presenting three options for evaluation.

- Option 1- This option uses only ground mount systems. It required the most amount of land with 5.9 acres on St. Thomas and 3.21 acres on Albert A. Sheen. Albert A. Sheen campus could use more land than the 3.21 acres, but that would mean utilizing the area at the front of the campus between the main entrance and the AES Field lab.
- Option 2 – This option would involve reducing the amount of land and incorporating carports into the design. In this scenario, the St. Thomas campus would have to add carports on the upper campus by the Nursing Building, the lot by the bookstore, and the lot by South Dorm in order to reduce the ground system by .27 acres.
- Option 3 – This option is presented as WAPA requested that we do not go over the 2MW size on either campus. On Albert A. Sheen campus this is acceptable as it was never our intention or need to go over 2MW. However on St. Thomas this will not cover our daytime demand. This is especially true with the new dorm coming on line in August.

	Option 1 - Land Only		Option 2 Land and Carport		Option 3 - WAPA's Request	
	STT	AAS	STT	AAS	STT	AAS
<b>Acres</b>	5.9	3.21	5.34	3.21	5.26	3.21
<b>Carport Size</b>	N/A	N/A	157	300	N/A	N/A
<b>kWh generation</b>	5,249,000	1,968,000	5,005,000	2,434,000	3,334,000	1,968,000
<b>Estimated Rate</b>	\$0.2715	\$0.2715	\$0.2674	\$0.2674	\$0.2966	\$0.2966
<b>Estimated Savings</b>	\$936,947	\$351,288	\$913,913	\$444,448	\$511,436	\$301,891
<b>Campus Total</b>	\$1,288,235		\$1,358,361		\$813,327	

**Environmental Impact Analysis:** Caribbean Wind Energy and System 3 estimate significant environmental benefits from avoided power plant emission. This system could reduce Green

House Gas Emission by 47,048 tons of CO2. Below is a chart that provided equivalent CO2 reductions.

Equivalent CO2 Reductions	
Small Car	159,484,068 miles
Medium Car	85,541,455 miles
SUV	59,933,503 miles
Air Miles	97,005,773 miles
Trees Planted	1,881,912 trees

**Engagement and Educational Component:** As part of the RFP the firm is required to provide training on maintenance and construction of the system. This will be open to the UVI community. The St. Thomas and Albert A. Sheen campuses will receive a 2KW fixed lab, and a 1kW portable lab. These labs will allow for anyone to learn the basics of constructing and maintaining a system. The portable units can be used for our outreach programs. For our St. John location there will be a 1kW lab.

**Estimated Scheduled Completion:** January, 2013  
**Status:** Seeking Board approval  
**Funding Source:** Selected Firm  
**Project Budget:** No upfront costs by UVI