SGEF Application Review Portal: Greetings, Zaida Darley!

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10kW Solar PV System at ENB/CUT ($50,000.00)

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Submitted On	2011-10-03 16:55:11
Status	Open/Funded
Administrator Options	Mark As Open/Under Review I Mark As Open/Not Funded I Mark As Closed/Funded I Mark As Closed/Not Funded
Proposal Cycle	Fall 2011
Principal Investigator	Zhixin Miao (zmiao@eng.usf.edu, Phone: 8139748269)
Co-Investigator	Stefanakos Lee (stefanak@eng.usf.edu, Phone: 8139744413)
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Organization	Clean Energy Research Center and Physical Plant Division

Project Details

Description **606 words**	Objective: The objective of this project is to reduce green-gas emission of the USF Tampa campus by efficiently using renewable energy technologies. Three tasks will be carried out and completed in this project: (i) integrate the 10 kW Photovoltaic (PV) generation system into the USF electricity grid; (ii) design and implement a PV charging station to charge USF golf carts instead of being charged from the electricity grid; and (iii) design and implement a real-time monitoring and control Energy Management System (EMS) to inventory energy consumption, renewable energy generation and to switch off loads for energy saving. Description: The PV charging was established in 1995 and represents the first 20kW solar charging station in the U.S.A. Currently the charging station is not connected to the grid. To maximally use the solar energy, it is necessary to connect the solar charging station to the grid. The integration can certainly lower the net energy consumption at the USF Tampa campus. Another advantage is the USF golf carts could be charged via charging station powered by PV panels. One of the major tasks of the project is to purchase and install inverters to convert the dc electricity from the charging station to ac electricity at 120 volts and 60 Hz. The existing inverters were purchased in 1990s. In the past twenty years, power electronic technology has made significant improvement in terms of rating and control capability. There are three reasons to replace the existing inverters: low efficiency, lack of reactive power control capability, and incompatibility of the current communication standards. Low efficiency and lack of reactive power control reduce the economic benefits of using solar energy. The incompatibility of communication makes real-time monitoring and control difficulty to realize. The second major task of the project is to design and implement a charging station for USF golf carts. Not only the power generated by PV panels could be injected into utility grid, but also it could be used to charge USF golf carts. Normally, a USF golf cart needs 7 kWh energy to be fully charged, and the power rating of current PV panels is 10 kW. However, a battery charger and proper controller need to be designed in order to meet the charging requirements of the batteries in golf carts. If 80% of the energy generated by the PV panels could be used to charge golf carts, which could

	support the usage of 18 golf carts everyday. The third major task of the project is to design and build an EMS to inventory energy production and consumption in the USF Tampa campus. Moreover, the EMS will have the capability to switch off loads for energy saving. Measurements from the PV charging station will be integrated into the EMS. With a PC, we can access the EMS and check if the PV charging station is at work. Such monitoring system reduces the maintenance cost. Moreover, the EMS could optimize the use of energy generated by the PV station. Not only to support golf cart charging, but it also could supply electricity to the auxiliary services of USF buildings. Electric vehicle is a critical energy source in future smart grid. The golf carts at USF are great asset from smart grid point of view. The auxiliary and emergency electricity supply is very critical to USF community at night. The golf carts could be parked and connected to the charging station at night, which could be used as a backup energy source in case an outage occurs at utility grid. The EMS could seamlessly switch the power supply from utility to charging station, which could greatly improve the reliability of power supply and enhance the safety on campus.
Amount Requested	$50,000.00
Amount Received	$0.00
Budget Justification 30 words	The estimated cost of solar PV systems for this size is $7,000 per kW. The project will re utilize existing structure to mount new panels, which will help reduce the cost.
Resource Matching 64 words	The project has been submitted for TECO rebate. If approved by TECO, USF will receive $20,000 for this 10kW solar panel system. The project cost will be shared by other funding sources. The fund requested is for student stipend and equipment to integrate measurements into the Energy Management System. The measuring equipments are required to have communication capability to send out signals through communication systems.
Timeline 55 words	The project will be required to comply with USF design guidelines and construction standards, and code review process. It will also comply with USF purchasing requirements. To comply with TECO requirements for receiving rebate funds of $20,000 for the project, it will be necessary to expeditiously complete the project within 90 days of TECO pre-audit walk through.
Evaluation Metrics 41 words	USF has joined the pilot program of OSIsoft and acquires the real-time monitoring, archiving and control system – PI system. The metering will measure the amount of electricity generated by the Solar PV. The monitoring will be integrated with other PI systems.
Sustainability Plan 129 words	Estimation is carried out here to calculate the return on investment. The PV station could generate more than approximately 80 kWh per day, which equals to 43.6175 kg CO2 reduction per day. And the total CO2 reduction could reach 15.95 ton per year. The proposed project aligns with the USF Strategic Plan on student success. The project provides a great opportunity for students to build and enhance their skills for smart grid workforce. The project will enhance energy awareness of students and inspire students in studying renewable energy, smart grid, communication and IT. The project will be sustained after the budget period is ended. A demo of an Energy Management System will certainly attract local utility companies to support our initiative in effective use of renewable energy sources and storage through EMS.

Return On Investment Details

Energy	29200 kWh
CO_2 Emissions	51592.312 pounds CO_2 per kWh
Cost Savings	$3212
Return On Investment	6.00%

Reviewer Comments (Add Yours)

On 2011-10-26 08:34:51, **Thomas Snelling** said:

The budget justification is a little weak and lacking detail. Not sure how the education component would reach the student

population unless some kind of “education campaign” accompanies the project. Students would not be engaged, only staff.

On 2011-10-26 07:59:50, **Daniel Yeh** said:

On 2011-10-26 07:59:36, **Daniel Yeh** said:

On 2011-10-18 10:18:27, **Margaret Rush** said:

I do like the idea of powering golf carts off solar. I have seen some projects where the solar panels are attached directly to the golf cart, but you are choosing to use a station that apparantly already has some solar panels, but never connected to the grid. I am not clear on how you are spending the $50,000 plus the $20,000 rebate from TECO. There are a couple of other solar projects wanting a real-time information system. It could be cost effective to coordinate with other projects and obtain similar systems.

On 2011-10-12 15:52:48, **Stanley Kroh** said:

In the interest of full disclousre, I am a Tampa Electric Company employee. If the $20K rebate is approved, where will the money go? The costs as described in the proposal are unclear and itemized details need to be provided.

On 2011-10-12 00:16:40, **Rick Martinez** said:

I very much like this idea. Rather than reduce the electric bill for an over-airconditioned building, this goes directly to powering a fleet of vehicles necessay to USF functions. Great idea that will involve direct participation of staff and students on an ongoing basis as they help reduce energy needs.

On 2011-10-11 14:54:17, **Christian Wells** said:

Project appears sound in concept. There is inadequate justification for the $50,000 expenditure. What will it buy?

Add Comments