

# Clean Energy News

University of South Florida



## KEY CERC RESEARCH

Photovoltaic Thin Film

Photocatalytic Detoxification and Disinfection

Solar Thermal Power

Hydrogen Production and Storage

Combined Power/ Cooling Thermodynamic Cycle

Rectenna Solar Energy Conversion

Biomass and Biofuels

Carbon Capture and Sequestration

## INSIDE THIS ISSUE

Teach-In	2
Solar Ovens	2
Green Fees	2
Activities	3
Speakers	3
Earth Day	3
Funding	4
Utility	4
"Occupies"	4

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## Green Fees Fund Solar

In October, \$400,000 of Student Green Energy Fee (SGEF) funds were awarded to help the USF cut greenhouse gas emissions and reduce our carbon footprint. The SGEF Council within the Office of Sustainability selected 4 out of 15 proposals submitted by students and employees. Of special interest to the SGEF Council was whether the proposals were focused on the return on investment, and if they would pay themselves off in a

short period of time, explained Christian Wells, director of the Office of Sustainability. Also of interest were what benefits would accrue in terms of energy conservation, reduction of energy used, or production of renewable energy (RE) for our use.

The top-ranked proposal will install 2 photovoltaic (PV) generating systems at the Marshall Center (MSC).

GAANN Fellows (Graduate Assistants in Areas of National Need) Brian Bell, Alden Earle, Trina Halfhide and Jamie Trahan, all Mech'I and Environ,I Eng. graduate students, were awarded \$160,000 for the MSC PV array which will include a moni-

project's faculty advisors are CERC's Lee Stefanakos and Yogi Goswami.

Another award of special interest to the CERC, is the updating & retrofitting of our PV electric vehicle charging station to improve 10 kW of

the existing 20 kW array, and connect it into the USF electricity grid. This will involve designing a more effective array and installing a real-time monitoring and control management system to inventory energy consumption & generation, & to switch off-loads for ener-

gy savings. CERC co-PIs are Zhixin Miao, Lee Stefanakos and Yogi Goswami. SGEF funded this project at \$50,000, with TECO adding \$20,000 as matching funds.

Other awards included retrofitting USF's central utilities plant's main lighting to more efficient induction lighting fixtures; and, solar umbrellas to charge portable electronic devices.



*The original CERC PV array generated 20 kW of electricity. Presently, half of the system is being renovated with new PV modules to provide 10kW of electricity to be tied to the utility grid.*



toring system to be displayed in the MSC so that students, faculty, and staff may view the energy output of both systems. Specifically, the 2 systems include one 15 kW system on the MSC rooftop and one 8.82 kW system on the MSC amphitheater canopy. The 4 Fellows are former students of CERC co-director Yogi Goswami's "Solar Engineering" and "Solar Power Plant Design" courses. The

# It's All About Teaching!

Solar ovens are a low-tech, low-cost option to heating and cooking food.

Similar to a crockpot, solar ovens are essentially well insulated portable boxes that capture and hold the sun's heat.

## Great American Teach-In 2011

CERC graduate student Jamie Trahan participated in the Great American Teach-In for 5th grade gifted students at Oak Grove Elementary and 7th graders at Williams Middle Magnet school, both in Hillsborough County. The Teach-in, held in November, is a day where professionals all over the country go to schools to describe a bit about their jobs, and the importance of education in the work force. Jamie's talk on solar energy emphasized the importance of using renewables and how energy can be produced from the sun. Students were given CERC's RE



CERC's Jamie Trahan demonstrates the power of the sun with a parabolic dish.

coloring books and those who answered questions correctly won prizes provided by CERC including a small solar oven, a solar powered car, and a solar filtration system/water heater. Though the morning started off gloomy and rainy, the sun came out just in time for her demonstration on the power of the sun using a parabolic dish that burned a piece of paper in a matter of seconds. The students eagerly participated and enjoyed the solar demonstration.

coloring books and those who answered questions correctly won

## Designing Solar Ovens

Solar ovens use the energy of sunlight to heat food or to cook it which helps reduce fuel costs and air pollution. To bring this vital message to USF's "Foundation of Engineering" class, instructor Houman Yaghoubi consulted with CERC graduate student Saeb Besarati in defining the class's final project "Design and Fabrication of a Solar-Oven." Besarati's help was instrumental by suggesting that in evaluating the solar-cookers, "temperature profile vs. time" could be a good way to study which design works better in terms of concentrating sunlight. The class's 44 students, mostly undergraduate freshmen and sophomores, teamed up in groups of 4 to 5. Their projects were judged based on design, profile of temperature vs. time, decency of the structure, and estimated cost. The winning team used a hemi-spherical sun-radiation collector made from fiber-glass covered with typical aluminum foil. Compared to typical box shape structures, they showed that a hemispherical collector can concentrate radiations more efficiently.



The winning concentrating solar oven from the team of Alexander Dalzell, Brandon Demers, Zahi Salloum, Dion Motl, and William Harrison.

## Green Fees (cont'd from pg. 1)

In 2008, USF signed the American College and University Presidents' Climate Commitment which obligates USF-Tampa to conduct an annual greenhouse gas emissions inventory and develop a long-term Climate Action Plan to reduce, and eventually eliminate greenhouse gas emissions from the Tampa campus operations and infrastructure. The SGEF is a nominal student fee that is used to assist USF in

conserving energy, reducing energy costs, lowering greenhouse gas emissions, and promoting renewable energy technologies.

Brian Bell and Alden Earle taking measurements for the PV array to be built atop the Marshall Center's roof. The area available for PV panels is roughly estimated as 83' by 76'.



## Faculty and Graduate Student Activities

- In November, CERC co-director Yogi Goswami was named a Fellow of the American Association for the Advancement of Science (AAAS), for his distinguished contributions to research, development and education in renewable energies, particularly innovative work in solar thermal power generation, and for upholding rigorous scientific discourse as Chief Editor of the technical journal "Solar Energy". The AAAS promotes cooperation among scientists, defends scientific freedom, encourages scientific responsibility, and supports scientific education and science outreach for the betterment of all humanity.
- CERC faculty and affiliate faculty received awards at the 2011 USF-Tampa Bay Faculty Honors and awards Reception hosted by President Judy Genshaft in November. The awards are made via the Faculty Senate Honors and Awards

Council. FESC co-PI Babu Joseph received the Outstanding Undergraduate Teaching Award. CERC co-director Yogi



(L-R) USF President Judy Genshaft, Yogi Goswami, and Provost Ralph Wilcox.

Goswami received the Theodore and Venette Askounes-Ashford Distinguished Scholar Award.

- In September CERC Graduate Student Michael Celestin won first place for best poster presentation at the Fourth Annual Nanoscience Technology Symposium held at the Florida International University, in Miami. Celestin's

Paper was entitled "Current Trends in Micro and Nanotechnology-based Energy Harvesting." NanoFlorida is a forum for scientific exchange in the emerging frontier of nanoscience and nanotechnology. More than 100 oral and poster presentations were made at the state-wide conference.

- In July, our recently graduated Ph.D. Student Huijuan Chen, was awarded the 2010-2011 USF Outstanding Thesis/Dissertation (OTD) award. The OTD awards recognize those USF graduates who have demonstrated exceptional performance during their graduate careers at USF-Tampa Bay and whose thesis or dissertation has resulted in significant impact to the discipline at the national level. Dr. Chen's dissertation is entitled: "The Conversion of Low-Grade Heat into Power using Supercritical Rankine Cycles."

## Seminar Speakers

- Dr. Bob Weisberg, of the USF College of Marine Science, presented "Alternative Power Generation for Florida by Mechanical and Solar Means," at the CERC's Clean Energy Symposia Series, in April. Weisberg's talk focused on using the Coastal Ocean Monitoring and Prediction System to assess the potential for electrical power generation by harnessing the natural energy sources of wind and solar, along with ocean currents and waves.
- Dr. Sudhakar Neti of the US DOE's Industrial Assessment Center at Lehigh University in Pennsylvania, presented "Properties of Heat Transfer with Nano-fluids" at the CERC's Clean Energy Symposia Series, in May. Dr. Neti's work is centered on aspects of transport phenomenon.

## Earth Day Tampa Bay 2011

The Tampa Bay Sierra Club, the USF Office of Sustainability and the USF Botanical Gardens co-sponsored Earth Day Tampa Bay 2011, a festival and green business Expo, in April. The 2011 theme "Pride of Place" promoted community pride in the local environment. The CERC displayed research posters and solar powered children's toys. FESC co-PI Sarina Ergas' sustainable algal biofuels group from Civil and Environmental Engineering also displayed highlights from their research.

This year's event, held at the USF Botanical Gardens, included local businesses with home and garden products, green building and RE demonstrations, hybrid and alternative fuel vehicle displays, eco-friendly arts and crafts, community groups, government & non-profit organizations, live music, organic foods & kid's activities.

The 2011 Earth Day marked the 41<sup>st</sup> year the annual event has been fielded. Created in 1970, Earth Day is a global observance of the need to protect the Earth. Responding to widespread environmental degradation, then US Senator Gaylord Nelson called for an environmental teach-in or "Earth Day" to be held every April.





## Clean Energy Research Center

College of Engineering

University of South Florida

4202 E. Fowler Avenue, Mail Stop ENB 118

Tampa, FL 33620

Phone: 813-974-7322 Fax: 813-974-2050

E-mail: [solar@usf.edu](mailto:solar@usf.edu) <http://cerc.eng.usf.edu>

**Director: Prof. Lee Stefanakos**  
[estefana@usf.edu](mailto:estefana@usf.edu)

**Co-Director: Prof. Yogi Goswami**  
[goswami@usf.edu](mailto:goswami@usf.edu)



## Thermal Energy Funding

- CERC received \$2.4M from the Advanced Research Project Agency: Energy (US DOE's ARPA-E) for "Development of a Low Cost Thermal Energy Storage System using Phase Change Materials with Enhanced Radiation Heat Transfer." This project will develop low cost utility scale thermal storage for next-generation concentrating solar power plants with temperatures from 600°C to 1,000°C. This research will result in the development of an innovative high temperature and smaller footprint TES system at a low cost, representing almost a 75% reduction in the cost. This innovative electroless encapsulation technique will be used to enhance heat transfer overcoming the low thermal conductivity of common PCMs. This research will demonstrate a very low cost and high specific energy density storage system for high temperature CSP and nuclear power plants. Sunborne Energy is one of our industrial partners on this project.



## Tutor "Occupies" Hall of Flags

*So, what do you do, when you need someplace to hold a last minute tutoring session before the final exam, but academic room reservations says there are no rooms available?*



*Using ingenuity clearly honed through many semesters of serving as a Teaching Assistant, CERC graduate student Mohamad Khwaja, opted to "occupy" the College of Engineering's newly renovated Hall of Flags (HoF) in December. With an open floor plan, marker boards, and ample seating, the HoF not only provides a comfortable place for students to study, but it also allows for an in-the-moment classroom!*

## Utility Assesses Collaboration

In May, Progress Energy met with USF-Tampa Bay's College of Engineering to talk about possible areas of collaboration in the energy field. Coordinated by the USF-Tampa Bay Office of Innovation Partnerships in the Office of Research and Innovation, the broad discussions included source modeling and design requirements for distributed energy and interfacing into the grid.

The critical need for a trained technical workforce was stressed, particularly in developing 2-4 year degrees for switch field technicians. Also of great interest was the need for analytics to review smart metering data to make the data usable to cut customer cost and consumption. This thrust is aimed at reducing peak demand load on the system.

Attendees included Progress Energy's efficiency and innovative technology group's Will Lowder and George Gurlaskie, and distribution and asset management group's Jay Oliver and Jason Cutlif, along with CoE Dean John Wiencek, Assoc. Dean Tom Weller, CERC co-directors Lee Stefanakos and Yogi Goswami, and former mayor of St. Petersburg Rick Baker. Baker is now the Director of USF Innovation Partnership.