FESC
Florida Energy Systems Consortium

FLORIDA ENERGY CONNECTIONS

Issue 4 • July 2011

Florida Energy Systems Consortium

University of Florida, Weil Hall, Room 311
Gainesville, FL 32611

www.floridaconserves.org

352.392.0947

Inside this Issue

Upcoming Events

Sunshine State Renewable Energy Expo—July 27-29, 2011

3rd Annual FESC Summit—September 27-28, 2011

Carbon Management Technology Conference—February 7-9, 2012

2011 FESC Summit—Sept. 28-29 at UF

The annual FESC Summit features internationally renowned speakers, and highlights FESC's innovative work toward alternative energy strategies, improved energy efficiencies, and expanded economic development for Florida. Abstract submission and registration for the 2011 event should be active on the FESC Website, http://www.floridaenergy.ufl.edu in June.

More than 260 people attended last year's FESC Summit at the University of Central Florida's Student Union. Participants represented a broad cross-section of energy interests, ranging from government and industry to research, development, and education. The complete program is available here: http://www.floridaenergy.ufl.edu/wp-content/uploads/V12_2010-Summit-Program1.pdf

This year's event features the **Florida Clean Energy Workshop**, which will be organized by the Department of Energy's Division of Energy Efficiency and Renewable Energy (EERE). This workshop is targeted toward enhancing Florida's clean energy industry. This workshop is free to the public and is scheduled for September 26, 2011 at the Reitz Union. Other pre-summit workshops are in the planning stages, including:

Facilitating Collaboration Among Local Governments for Energy Efficiency: Presented by Florida State University's Network of Energy Sustainable Communities.

For up-to-the-minute information on the 2011 FESC Summit, please check the FESC Website!

Closing the Gap on Clean Fuels: Bringing Research to Market

By Diane Gow McDilda

John Wolan and his students are working to produce fuel from yard waste.

John Wolan, Associate Professor of Chemical and Biomedical Engineering at the University of South Florida and UF alumni, is working closely with a team of USF professors, graduate students and a statewide solid waste research center created by the Florida Legislature to produce alternative and sustainable fuels. The feedstock doesn't include vegetation grown for the sole purpose of fuel production, but it does include "yard waste"— something that most homeowners produce and put out on their curb for pickup. John is using something that would otherwise go to, well, waste.

"We've made both diesel and jet fuel from pine chips. It's almost like alchemy, like doing magic and turning straw into gold. We start out by converting the pine chips into a synthetic gas thru a gasification process. The syn-gas contains a mixture of Carbon Monoxide and Hydrogen Gas. We then use a catalytic process that we have developed here at USF to turn the syn-gas into diesel or JP-8 aviation fuel. It is almost like magic. We think we can turn yard waste into fuels that can be used by everything from a fighter jet to a long haul trucker. We are very excited," says Wolan.

Conventional crude oil refining produces a spectrum of fuels and other petroleum products including gasoline, kerosene, diesel fuel, and naptha, which is used to make a variety of chemicals. Refining the fuel is done through fractional distillation, a process that is heavily water and energy intensive and produces a significant amount of waste, including sulfur emissions. In contrast, Wolan's process was designed specifically to produce ultra-low sulfur diesel and aviation fuel, eliminating the need for refining. The process is clean, sustainable, low impact and tunable toward

Please see Closing the Gap on page 6

Florida Climate Institute offers Seed Grants for UF/FSU Collaborations

Florida Climate Institute

The Florida Climate Institute will be offering a limited number of seed grants to FSU faculty (research or tenure-track) to develop collaborative UF-FSU research proposals to national agencies. The Request for Proposal is available at the FCI website. The application deadline is July 31, 2011.

The Florida Climate Institute (FCI) is a joint venture between the University of Florida and the Florida State University. Their goals are to develop and disseminate scientifically sound information on climate variability and climate change, to enhance understanding of the interrelationships among climate, natural resources, ecosystems and society, to develop decision support systems for addressing risks and opportunities, and to promote effective partnerships among universities and broader community stakeholders.

Outreach Update: Sustainable Floridians Program Launches

Program for Resource Efficient Communities, University of Florida

The University of Florida Cooperative Extension Service, in conjunction with UF's Program for Resource Efficient Communities (PREC), a FESC partner, has launched a new non-formal sustainable living education program called Sustainable Floridians Volunteer Program or Sustainable Floridians Master Volunteer Program.

The program combines the knowledge base of university experts with a discussion and action format designed to help individuals take steps toward sustainability. The program guides and motivates participants in creating Florida-appropriate sustainability action plans. Participants discover what their ecological footprint is and how they can shrink it to reduce resource consumption, save money, and become part of a transition to a more environmentally, socially, and economically sustainable future. The program emphasizes the role that individuals and households play in using water resources and fossil fuels and how reductions at home benefit both households and communities, especially in Florida.

Pilot classes took place in the fall of 2010 in Marion and Leon counties, with 40 participants completing the 6-week course (14 in Marion, 26 in Leon). Course topics included an introduction to the general principles of sustainability and the ecological footprint; water; energy; and transportation and land use. Course components included readings, lecture, and guided discussions. Participants were given data logs with which to begin recording their consumption of energy, water, as well as to record monthly vehicle miles traveled. People taking the course brought in utility bills, which opened the way for lively discussion about steps to reduce usage and bills. Follow-up contacts will be made to determine whether usage drops subsequent to the class.

Class members were given a master checklist with detailed recommendations for reducing resource use at the household level for energy, water, and transportation. The "low hanging fruit" actions were identified, as well as steps that involve more investment of time, money, and effort. Individual outcomes are still being assessed; however, early results include some participants' commitment to cutting back on amounts of water used for lawn watering.

In addition to providing plenty of information about ecological footprints, the course encouraged participants to create "ecological handprints" that improve their community. Class members were asked to take on a community project. The initial Marion County class formed a homeowner "green team." The initial Leon County class was recruited with the understanding that graduates would in turn facilitate sustainability discussion groups in the community.

One Leon County Sustainable Floridian already has coordinated and facilitated two study circles to discuss topics of sustainability and community health -- one in his neighborhood and one at his workplace. Two participants in the neighborhood course have in turn followed suit with a similar study circle in yet another neighborhood.

A community-wide Eco-Teams program in Tallahassee using Sustainable Floridians as facilitators is set to launch June 21st with the first orientation session for teams of study circle hosts and Sustainable Floridian facilitators. The Eco-Teams program is a partnership between UF/IFAS-

Please see Sustainable Floridians on page 7

Example of Content in Sustainable Floridians Program

FAU's Southeast National Marine Renewable Energy Center Achieves Major Milestone

The Southeast National Marine Renewable Energy Center (SNMREC) at Florida Atlantic University recently accomplished a major milestone in the establishment of its testing capabilities. The Center successfully completed offshore testing of a key component of its small-scale ocean-current turbine test berth – a Mooring and Telemetry Buoy (MTB). The MTB test was the first step of a multi-phase strategy to create a real-time offshore energy test facility and scientific observatory.

The MTB was towed by the M/V Thunderforce with a drop weight to simulate its moored behavior.

The MTB was tow-tested offshore of Fort Pierce, where Harbor Branch Oceanographic Institute engineers and SNMREC engineers joined the crew of the M/V Thunderforce to verify buoy performance as designed.

"The test was a success because the predicted behavior of the buoy matched closely with the measured behavior during testing," said Bill Baxley, chief engineer at SNMREC. "The test showed that the buoy performs at it was designed for its eventual offshore deployment."

The steel-hulled buoy is approximately 21 feet long and 10 feet wide, and its unique hull design is shaped to survive strong currents. Onboard the buoy, there are a variety of renewable power sources such as solar panels, small wind turbines, and sailboat water turbines that provide power for onboard oceanographic instruments, safety and navigation systems, and wireless communication. The safety and navigation systems include active radar target enhancers and a Class "A" Automatic Identification System transmitter. Wireless communication systems also are included to relay collected data to shore and to provide the ability to monitor buoy health remotely.

A three dimensional rendering of fully instrumented Mooring and Telemetry Buoy (MTB).

The M/V Thunderforce, with support from a Boat U.S. vessel, towed and tested the buoy offshore. Upon reaching the predetermined location in the Gulf Stream about 18 miles east of Fort Pierce, the buoy attachment was reconfigured. The test configuration, which emulates how the buoy would be anchored offshore, was used to determine how the buoy would behave under various current speed and sea heading conditions. The objectives of the MTB system tow tests were to verify buoy stability, tracking and wave response, as well as to verify onboard scientific instrument functionality and planned maintenance procedures.

"This success is an important step toward realizing the testing facility that we have been envisioning and to provide the nation with its first offshore ocean current

Please see SNMREC on Page 8

Industry Focus: Pratt & Whitney Rocketdyne

Pratt & Whitney Rocketdyne's upcoming/ ongoing projects in Florida.

For nearly 50 years, Pratt & Whitney Rocketdyne (PWR) engines have launched humans to the moon, boosted astronauts into space, and powered satellites into orbit vital to worldwide communication, navigation, research, weather prediction, as well as our nation's security. Realizing our engineering expertise has broad applications in the commercial sector, we have focused our attention on its use in sustainable energy worldwide, including energy-related opportunities in Florida, which has a highly-skilled workforce. PWR is presently exploring energy-related projects ideal for the Sunshine State.

Strategies for sustainable/renewable energy in Florida

One obvious commodity is Florida's abundance of just that – sunshine, which can be harvested directly by converting it to electricity, or indirectly through the growth of sustainable biomass. Considering today's technology, I believe the best near-term renewable energy strategy for Florida is solar-to-electricity, most likely distributed in 10 to 20 megawatt electric installations. This municipal-scale approach is much more cost effective than smaller rooftop solar installations, and could be implemented without expensive upgrades to the electrical grid. Augmenting these installations in the future with affordable electric storage technology is also important. As the cost of solar technology continues to decline, and with responsible incentives, I believe we could see solar as the foundation of Florida's sustainable future.

PWR is a strong supporter of Concentrated Solar Power (CSP) Tower technology, which stores the sun's energy in high temperature molten-salt and provides electricity well into the evening or through the night when the sun is no longer shining. The storage feature also improves grid integration, enabling larger plants to be constructed and deployed. Electricity costs are reduced due to the high efficiency and economies-of-scale for the larger plants. However, CSP Tower plants work best with full, direct sunlight, uninterrupted by clouds or diffused by humidity. The CSP Power plants large field of movable mirrors is also vulnerable to hurricane-wind conditions. Due to Florida's propensity for passing clouds and humidity-diffused sunlight, photovoltaic (PV) solar technology is generally preferred in the state. Also, since PVs are installed lower to the ground, they are more tolerant and easier to design for high-wind conditions.

Randy C. Parsley is Director, Global Program Development, Pratt & Whitney Rocketdyne. He is also a member of the FESC Industry Advisory Board.

From the beginning, the PWR compact gasifier has been designed to operate on coal or coal/biomass mixtures. With this coal/biomass combination, and including CO_2 sequestration, the ability to achieve a carbon-neutral or carbon-negative system is possible. We are currently testing this technology in pilot-scale with great success. Based on this approach, we are also investigating a derivative design that would operate on 100 percent biomass. The carbon-neutral output from the biomass gasifier could be used directly to produce electricity or to be further refined for liquid fuel, plastics and other products currently produced from petroleum.

Due to our expertise and current activities in gasification, I believe this is the most reasonable path for the company to pursue in Florida. Distributed 5 to 10 megawatt electric installations would seem to be a reasonable scenario. This would allow biomass plants to be situated within an affordable supply radius of about 75 miles.

In addition, a broad range of technologies being researched within the Florida University system are intriguing, including affordable methods to break down cellulose-based biomass or rapid-growth, oil-producing algae – both of which would be game changers for industry. Also intriguing are approaches being re-

Please see PWR on page 9

customer fuel needs as gasoline or other liquid hydrocarbon fuels can be produced.

"The diesel produced has a cetane number about 30 points higher than conventional diesel. The cetane number is a measurement of the combustion quality of diesel fuel during compression ignition —it's a very high quality and high performance diesel."

In March 2010, Wolan and his student team were invited to the Global Venture Challenge, sponsored by the US Department of Energy. Other guests included international research organizations, agencies, and venture capitalists. Competing research groups were judged not just by their research, but how processes could be scaled-up and mass marketed. The team, comprised of engineering student Syed Ali Gardezi and MBA student Jaideep Rajput were finalists in the event, placing fourth overall and second in the US.

"It was a great experience," says Wolan. "We got to meet other research groups as well as many venture capitalists." Beyond networking, the challenge was extremely educational.

"I'm a professor of chemical engineering, being at the challenge was like earning an additional finance & investment Ph.D. in three days," says Wolan.

Conversations between Wolan and capital investors he met at the challenge continue. It's a tenuous time for investors, particularly in the area of sustainable fuel. Some investors have been duped by researchers deceptively claiming they are capable of producing a high quality fuel, when their samples were actually purchased at a gas station. Because of this, investors are cautious and asking for more verification. Wolan has gone as far as carbon dating his fuel, showing that it was made recently, using biomass products and not fossils-based.

Even though Wolan is excited about the team's progress and accolades, he knows it will take some time for the business-side to pan out. Mean while, he's continuing to reach out to the business community. He's been in conversations with an equine center in Ocala that produces close to 300 tons of barn waste per day which is currently landfilled. Waste to most, the manure and straw is also a potential fuel source. By developing a process that allows for diversity in feedstock material, adaptations to various environments, including less than hospitable locations becomes attractive.

With a goal of 50 percent alternative fuel production by 2015, the military is investigating more in sustainable sources for their aviation and diesel fuel. Currently, fuel produced via Fischer-Tropsch synthesis such as Wolan's is the only current military-approved alternative for use in jet engines. In addition, the process equipment can be skid-mounted and operated turnkey. Because of this, the systems could potentially be air lifted and dropped to isolated locations such as military bases or to impoverish nations such as Haiti to generate fuel and manage waste material.

"We really think we're doing what is right in the right place at the right time," says Wolan. "When the military imports fuel to locations such as Middle East bases, there's a high cost for security due to the value of the fuel. We really can't see a downside to our process." The turning point will come, Wolan believes, when they can accurately estimate the cost of fuel produced by their biorefinery process.

"Investors want to know, will it cost $2 a gallon or $20 a gallon and what is my rate of return?" Wolan says.

...Continued on page 7

Sustainable Floridians from Page 3

Leon Extension, City of Tallahassee Department of Environmental Policy & Energy Resources, Leon County Office of Sustainability, and the local NGO "Sustainable Tallahassee." Coordination is being shepherded by Dr Tom Taylor, a Leon County Sustainable Floridians graduate and professional facilitator, who served for years as a principle instructor for the UF/IFAS Natural Resources Leadership Institute (NRLI) while he was FSU faculty with the Center for Conflict Resolution (CRC).

Pinellas County launched its pilot in April 2011 and began with 28 registered participants for the course. At the end of the seven week program, they graduated 26 Sustainable Floridian Master Trainees. Each of these trainees will donate 30 hours of volunteer time to Pinellas County Extension in the Sustainable Living Program Area.

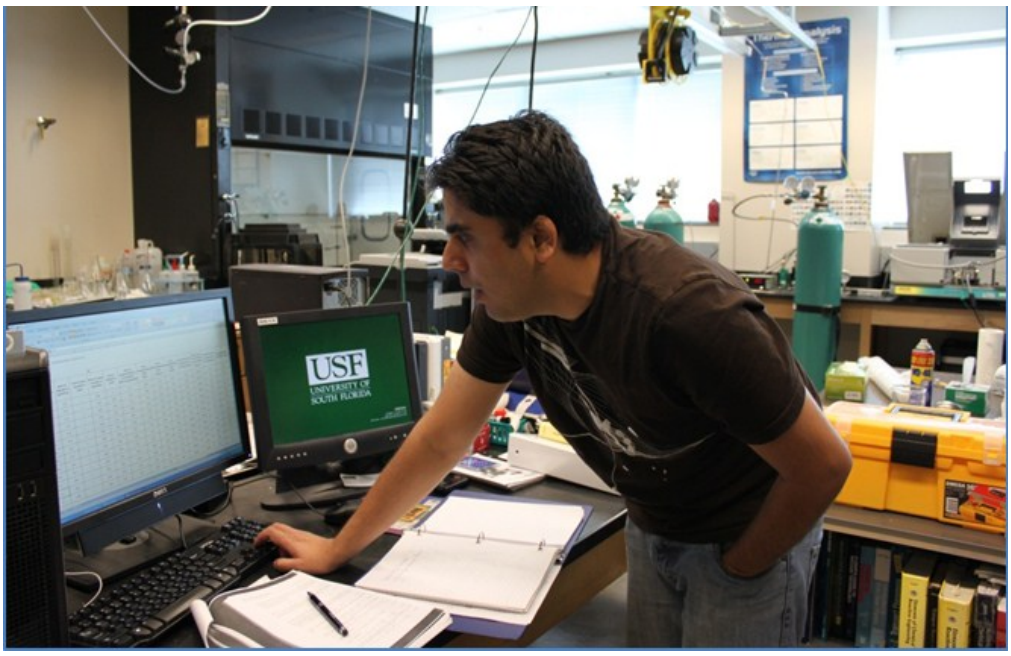
Pinellas County Extension will provide training and support through monthly meetings and updates, hands on training to ensure proficiency with sustainability topics, and ongoing volunteer opportunities.
In addition, Pinellas County Extension developed a website (http://pinellas.ifas.ufl.edu/sustainability/sustainFloridians.shtml) and created additional marketing pieces (newspaper ad, Open House invite) to support the program.

Marion County plans another class beginning June 21st and Pinellas and Leon counties will offer the program again in September 2011. Additional pilot classes are currently planned in Osceola and Sarasota counties. The ultimate goal is formation of a master program with flexible elements to provide a forum for education, action, and community development for Florida communities.

Closing the Gap on Clean Fuels from page 7

"These are not easy questions to accurately answer yet, but once that's known, the market will open up." Wolan and his crew are working on determining production costs, so it's likely that business support will soon follow.

Funding has been provided by several sources including the Florida Energy Systems Consortium (FESC). The FESC Principal Investigator at USF is the very distinguished Dr. Yogi Goswami. Funding is also being provided by The Bill Hinkley Center for Solid and Hazardous Waste Management. The Bill Hinkley Center is a state-wide research center created by the Florida Legislature in 1988. (Bill Hinkley is a remarkable man who worked for the Florida Department of Environmental Protection for almost 30 years who was the architect of the way we recycle and manage waste here in Florida. Mr. Hinkley was deceased in 2005.) The Hinkley Center provides funding for waste management research to professors at 7 public and 2 private universities here in Florida. A tiny bit of the cost of buying a tire or a car battery here in Florida goes to fund this very important research of turning waste into a valuable resource. The Hinkley Center is hosted by the University of Florida College of Engineering and is the only center of its kind in the United States.

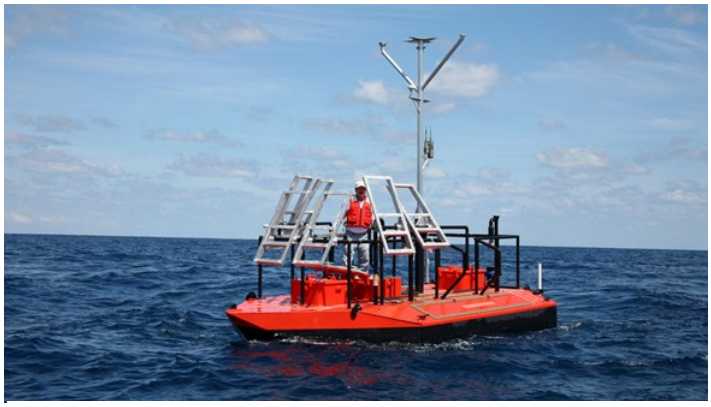


Engineering graduate student Syed Ali Gardezi works in the Wolan lab.

From SNMREC on page 4

generator test berth," said Susan Skemp, Executive director of the SNMREC at FAU.

Engineers now plan to make minor modifications based upon test results to improve performance and will complete final integration of the measurement, communication and power systems. After this phase, the Center will be ready to anchor the buoy offshore this summer.Video footage from the test is available online at the FAU website. For more information, call Susan Skemp at 561-297-2339, or sskemp@fau.edu.



Senior Engineer Geoff Beiser boards the MTB during testing to inspect a hatch compartment.

BOEMRE to Prepare an Environmental Assessment for Marine Hydrokinetic Technology Testing Offshore Florida

The Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) recently announced that it is taking the first step toward issuing a lease that would authorize the testing of equipment designed to use ocean currents offshore Florida to generate electricity on the Outer Continental Shelf (OCS).

"This is the first lease application BOEMRE has received to test ocean current equipment on the U.S. Outer Continental Shelf," said BOEMRE Director Michael R. Bromwich. "Before a leasing decision is made, we are preparing an environmental assessment under the National Environmental Policy Act and are providing an opportunity for public input concerning these activities."

Florida Atlantic University has applied for a lease to deploy an experimental demonstration device, which is the action that has prompted the need for BOEMRE to conduct an Environmental Assessment (EA). The proposed lease area covers three OCS blocks located approximately nine to 15 nautical miles offshore Fort Lauderdale.

BOEMRE is preparing an EA to consider the environmental consequences associated with issuing a lease, which will include environmental impacts that may result from installing a buoy, deploying small-scale ocean current devices, and operating a deployment vessel in the area that would be covered by the lease. The EA will consider environmental issues, including impacts to benthic habitats, marine mammals, sea turtles, pelagic fishes, and existing human uses.

A Request for Information published in November 2007 announced that BOEMRE had established an interim policy under which it would issue limited leases authorizing renewable energy resource assessment, data collection, and technology testing activities on the OCS and that it was accepting nominations for limited leases to conduct these activities. Limited leases have a term of five years and do not authorize the commercial production or transmission of energy.

BOEMRE identified 16 proposed lease areas for priority consideration based on the technological complexity of the project proposed, timing needs, competing OCS space-use issues, and relevant state-supported renewable energy activities and initiatives. Of the 16 areas, BOEMRE identified four proposed areas offshore Florida as priority areas for testing ocean current technology and collecting resource data. In April 2008, BOEMRE solicited expressions of competitive interest in leasing any of these nominated areas and received no indications of competitive interest in acquiring leases within these four areas offshore Florida, which include the three blocks of interest to Florida Atlantic University.

BOEMRE requests public comment from interested parties to identify environmental issues and any alternatives that should be considered . To comment, please see the press release in its entirety at the FESC Website.

From PWR on Page 5

searched to harvest ocean energy in an environmentally-friendly way. For Florida, either capture of kinetic energy from currents, or thermal energy from ocean temperature gradients seem the best bets. Anyone who has been SCUBA driving off Florida's cost and experienced these effects first-hand could testify to their predictable strength and consistency.

How can Florida Energy Systems Consortium best address these issues?

Florida has a fantastic university system that develops great skills and technology to address our sustainable energy needs. When these students graduate, they will need jobs along with the state's existing highly-skilled workforce. The Florida Energy Systems Consortium (FESC) can address this issue by helping to develop a state-supported sustainable energy strategy. If properly structured, I believe this strategy could lead to job growth within the state and enable commercial deployment of technologies that compete cost-wise with fossil fuels. Producing sustainable energy produces sustainable jobs if done right.

Viability of new technologies and commercializing them

One of the responsibilities for FESC Advisory Board members is to help recognize technologies that are viable for commercialization. Upon identifying these technologies, board members provide the State of Florida with recommendations on how it should distribute university research funding. Ultimately, however, the marketplace decides the success or failure of a new technology. FESC Advisory Board can play an important role in screening the viability of new technologies for the state of Florida. I'm a strong believer in environmental responsibility, but also a believer in a strong marketplace.

University of South Florida receives prestigious grant awards

Two prestigious grants were awarded for thermal energy storage (TES) research to Prof. Yogi Goswami, director of the USF arm of FESC, and co-director of the USF Clean Energy Research Center (CERC). USF Co-PIs include CERC Director Prof. Lee Stefanakos and Mechanical Engineering's Prof. Muhammad Rahman.

Both awards address the groundbreaking science of concentrated solar power (CSP), which can be used to focus the sun's rays to generate heat, and subsequently electricity. CSP plants combined with heat stores can produce climate-friendly electricity as needed, even when the sun is not shining.

E-On International granted $814,108 for "Innovative Latent Thermal Energy Storage System for Concentrating Solar Power Plants." This project will produce encapsulated phase change material capsules of different sizes and melting ranges of use in several energy storage applications such as space heating and cooling, solar cooking, solar water heating, industrial process heat, greenhouse and waste heat recovery systems. Joining the Goswami-led USF research team, this project includes a research team from IMDEA Energía in Madrid headed by Prof. Manuel Romero.

US DOE granted $3.9M for "Development and Demonstration of an Innovative Thermal Energy Storage System for Baseload Solar Power Generation." This research aims to develop a thermal energy storage system based on encapsulated phase change materials to meet the utility-scale base-load CSP plant requirements at much lower system costs than the existing TES concepts, making it competitive with fossil fuels.

Prof. Yogi Goswami (top) and Prof. Lee Stefanakos (bottom).

UF-led research team wins a four-year, $5.4 million federal grant

Several FESC-funded researchers are part of a University of Florida-led research team that has won a four-year, $5.4 million federal grant to develop methods of producing energy from a familiar southern crop, sweet sorghum.

Known as a source of table syrup and cattle feed, sweet sorghum is also one of the region's most promising feedstocks for making fuel ethanol.

Agronomist and bioenergy expert Wilfred Vermerris, seen here in a North Florida sorghum field, is the principal investigator in a University of Florida-based project that garnered a four-year, $5.4 million federal grant to explore the bioenergy potential of sweet sorghum. The grant, funded by the U.S. Department of Agriculture and U.S. Department of Energy, will fund research to develop and assess sweet sorghum varieties for production of fuel ethanol and chemicals

The grant is part of a $47 million package announced earlier this month to support eight bioenergy projects nationwide. Funded by the U.S. Department of Agriculture and Department of Energy, the package is part of a federal effort to reduce dependence on imported oil and cut greenhouse gas emissions associated with petroleum fuels.

The team will focus on research aimed at enhancing production of sweet sorghum as an energy crop.The team will also explore sweet sorghum as a source of raw materials for chemicals used to make bioplastics and other products.

The project will investigate sweet sorghum's economic potential, sustainability and environmental impact, said Wilfred Vermerris, principal investigator and an associate professor with UF's agronomy department and the UF Genetics Institute.

"Sustainability and environmental impact have been of concern to many people looking at bioenergy production," Vermerris said. "We don't want to create more greenhouse gases than we would using petroleum production."

The team will develop and evaluate multiple varieties to assess factors such as water needs, ability to grow in Florida soils, heat tolerance, and susceptibility to diseases and insect pests.

Researchers will look for varieties that yield large amounts of fermentable sugars, which can be fermented to produce fuel ethanol, he said.

They also plan to produce what's called cellulosic ethanol, made from fiber in the plant's crushed stalks using genetically engineered bacteria developed at UF by Lonnie Ingram, a distinguished professor in the microbiology and cell science department, and colleagues. Ingram was an invited speaker at last year's FESC Summit.

Also among the seven co-principal investigators are FESC-funded researchers Jim Preston, K.T. Shanmugam and John Erickson. Preston and Shanmugam will work closely with Ingram on juice and biomass processing experiments at the UF Ethanol Pilot Plant in Gainesville and the Stan Mayfield Biorefinery in Perry.

The team plans to test promising sorghum varieties on a commercial scale. To accomplish this, the Tampa-based firm U.S. EnviroFuels LLC , will collaborate on the project as a co-principal investigator. Some of the experiments will take place at the Highlands EnviroFuels commercial-scale biorefinery in Lake Placid, Fla.

Source: UF/IFAS News