Awards Received by FESC Faculty

The Florida Energy Systems Consortium (FESC) had a productive third year of energy research, technology transfer, education, and outreach activities. We are successfully facilitating interactions amongst Florida's energy industry and researchers in the 11 State Universities, Florida's State and Community Colleges, and the Florida Institute of Technology. FESC facilitates the submission of competitive proposals through providing seed funding to develop proposal concepts, access to major instrumentation, test and process facilities, proposal coordination and development. SUS energy faculty submitted 386 proposals requesting $388,519,936 during the twelve-month period October 1, 2010 thru September 30, 2011. FESC-funded researchers received three US DOE Advanced Research Projects Agency - Energy (ARPA-E) grants recently totaling $11.5M. In addition, the recent collaborative $8M Sunshot award included FESC-funded faculty. Some of the recent FESC faculty awards are given below. In many instances, funding provided by FESC was instrumental in providing preliminary results to enhance the competitiveness of proposals or access to unique facilities.

ARPA-E Grant: $6.3M – Commercial Production of Terpene Biofuels in Pine

Primary Investigator Dr. Gary Peters and Co-PIs Dr. John Davis, University of Florida, IFAS personnel from the University of California – Berkeley, the National Renewable Energy Laboratory, and ArborGen LLC, a leading commercial supplier of genetically improved loblolly seedlings.

Gary Peters

In the US, southern pine trees are widely planted and naturally accumulate significant amounts of turpentine and gums (terpenes) in their wood, making them an excellent crop for direct production of terpene based "drop-in biofuels". Drop-in biofuels are hydrocarbon rich chemicals synthesized in plants that when extracted can be processed into liquid biofuels compatible with current infrastructure and blended with nonrenewable fuels. Current terpene yields, in the form of crude tall oil and turpentine recovered from pulping streams, are limited principally by their relatively low (2-4%) amounts in wood. However, wood terpene level is under environmental and genetic control, and pine trees can accumulate over 20% terpene by weight. To make pine terpenes commercially viable for drop-in liquid fuels, we will aggressively implement four novel and synergistic genetic approaches to increase carbon flow into terpenes, producing trees that accumulate high levels of wood terpene with compositions suitable for blending with existing nonrenewable fuels. At present rates of loblolly pine growth, we estimate that ~25,000 acres of a 10 year old plantation of high terpene wood could produce 100 million gallons of a directly extractable terpene biofuel. This Department of Energy's Advanced Research Projects Agency-Energy PETRO funded project, partners UF's expertise in pine genetics, functional genomics and wood properties with ArborGen, a leading commercial supplier of loblolly pine planting stock, University of

California Berkeley experts in metabolic engineering and terpene synthesis, and the National Renewable Energy Lab's expertise in high throughput characterization of woody biomass and production of biofuels.

For more information please contact Gary Peter gfpeter@ufl.edu and John Davis, Professors School of Forest Resources and Conservation University of Florida

ARPA-E Grant: $2.98M - Thermal Fuel: Solar Thermochemical Fuel Production via a Novel Low Pressure, Magnetically Stabilized, Non-volatile Iron Oxide Looping Process

Primary Investigator Dr. James Klausner and Co-PIs Dr. Joerg Petrasch, Dr. David Hahn, and Dr. Renwei Mei, University of Florida

James Klausner

The project will involve the development of a new dual cavity, high temperature chemical reactor that converts concentrated solar thermal energy to Syngas, which can be used to process gasoline. The overarching project goal is lowering the cost of the solar thermochemical production of Syngas for clean and synthetic hydrocarbon fuels like petroleum. The research team will develop processes that use water and recycled CO_2 as the sole feed-stock and concentrated solar radiation as the sole energy source. Successful large scale deployment of this solar thermochemical fuel production will be the key in accomplishing the mission to enhance the nation's economic and energy security by replacing imported oil with domestically produced solar fuels. The significant advances expected as a result of the proposed research will firmly establish the U.S. as a global technology leader in solar thermochemical fuel technologies.

ARPA-E Grant: $2.5M - Development of a Low Cost Thermal Energy Storage System Using Phase Change Materials with Enhanced Radiation Heat Transfer

Primary Investigator Dr. Yogi Goswami *and Co-PIs Dr. Lee Stefanakos and Dr. Muhammad Rahman., University of South Florida*

Yogi Goswami

This project will develop low cost utility scale thermal energy storage (TES) for next-generation Concentrating Solar Power (CSP) plants with temperatures from 600°C to 1000°C. The uniqueness of the proposed research is the development of low cost industrially scalable capsules of high temperature phase change materials (PCMs) using an innovative electroless encapsulation technique and enhanced utilization of radiant heat transfer to overcome the low thermal conductivity of common PCMs. The proposed development will reduce the capital costs of storage for CSP plants from as much as $\$80/kWh_{th}$ at present to less than $\$10/kWh_{th}$. The development will be useful for both solar power and