



# FLORIDA ENERGY CONNECTIONS

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Florida Energy Systems Consortium

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## 2011 FESC Summit—Sept. 27-28 at UF



Robert C. Armstrong

This year's FESC Summit, held September 27-28 at the University of Florida's Reitz Union, opened with welcoming remarks from Dr. Win Phillips, University of Florida's Senior Vice President and Chief Operating Officer, and Commissioner Adam H. Putnam, Florida Department of Agriculture and Consumer Services.

The program featured internationally renowned speakers, as well as presentations and posters highlighting FESC's innovative work leading to alternative energy strategies, improved energy efficiencies and expanded economic development for Florida. Robert C. Armstrong, Department of Chemical Engineering and MIT Energy Initiative at the Massachusetts Institute of Technology presented "Linking Science, Innovation, and Policy to Transform the World's Energy Systems: The MIT Initiative," as the keynote address for the third annual FESC Summit, to over 200 conference attendees. The Summit is organized to allow energy experts in the State University System (SUS) of Florida to share their energy-related research findings and to promote future collaboration.

The complete program can be accessed at the FESC Website:  
[http://www.floridaenergy.ufl.edu/?page\\_id=6622](http://www.floridaenergy.ufl.edu/?page_id=6622)

### Inside this Issue

<a href="#">Community College Energy Workshop</a>	2
<a href="#">2011 Department of Energy Pre-Summit Workshop</a>	3
<a href="#">I6 Green Challenge Grant from Economic Development Administration</a>	4
<a href="#">Awards Received by FESC Faculty</a>	5
<a href="#">FESC Technology Commercialization Project</a>	6
<a href="#">New Member Spotlight</a>	7
<a href="#">Innovation HUB at the University of Florida</a>	7

### Upcoming Events:

**Carbon Management Technology Conference**—February 7-9, 2012

**2012 SE FLC Conference** —February 8-10, 2012

**Space Coast Energy Symposium** —February 15-16, 2012

[2011 FESC Summit continued on page 9](#)

## Community College Energy Workshop, Sept. 26, 2011 at Santa Fe College



FLATE Pre-Summit

The Florida Energy Systems Consortium's (FESC) Pre-Summit Energy Workshop, hosted by The Florida Advanced Technological Education Center (FLATE) and the Banner Centers for Construction, Clean Energy and Energy, took place at Santa Fe College Center for Economic and Innovative Development in Gainesville, September 26. The workshop gathered individuals from academia, industry and government to continue the work of forging strong, lasting partnerships essential for Florida's decisive move toward a sustainable future.

Following the welcome and introduction by Dr. Tim Anderson, Director of FESC, participants learned about the results of a statewide Green Jobs Survey (funded in 2009 by the U.S. Department of Labor). Attendees also learned about green job training skill gaps from Ms. Vesselka McAlarney of the Florida Agency for Workforce Innovation. Ms. Kathryn Frederick of the Florida Department of Education gave an Energy Cluster update followed by updates from the Banner Center and FLATE provided by Ms. Colleen Kettles (Florida Solar Energy Center) and Dr. Marilyn Barger (FLATE), respectively. Additionally, Tom Lane, President of Energy Conservation Services, was also on hand during registration and lunch time to share his new book, "Solar Hot Water Systems – Lessons Learned 1977 to

Today" and new Teacher Resource guide. Free books were provided to the educators upon request.

During lunch workshop participants were treated to an informative and exciting presentation – "POWER UP! Preparing Florida's Students for Tomorrow's Economy through Partnerships" by Ms. Carol Higley of the Jacksonville Electric Authority and 2011 Co-Chair of the Florida Energy Workforce Consortium. College energy program updates followed, after which Mr. Kurt Morauer of the Banner Center for Construction talked about Residential Energy Efficiency and Weatherization. Dr. Tim Middlekoop of the University of Florida's Industrial Assessment Center provided information on Industrial Energy Efficiency, followed by a FLUKE demonstration and hands-on activity conducted by Mr. Ed Pucetas, Fluke Calibration.



Ed Pucetas

Feedback received about the event was overwhelmingly positive. A similar event is planned for next year as energy-related workforce and training needs continue to grow in Florida. Separate feedback for the hands-on workshop in the afternoon was also very positive. Faculty and teachers all enjoyed using the remote sensing equipment to visualize heat patterns and visualize temperature profiles in the meeting room.

## 2011 Department of Energy Pre-Summit Workshop—Sept. 26 at UF

September closed with a workshop on Florida’s clean energy supply chain, co-hosted by the Florida Energy System Consortium and the U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy (EERE). The workshop brought together a variety of stakeholders from around Florida, including Tim Tangredi, CEO of Dais Analytic, and Scott Faris, CEO of Planar Energy, as well as some of the FESC’s Industry Advisory Board members. Opening remarks were given by Dr. Tim Anderson of FESC, Dr. Henry Kelly of EERE. Keynote speaker, Agriculture Commissioner Adam Putnam, gave a presentation during lunch. The workshop participants represented a cross-section of Florida’s clean energy industry, from academic research to large-scale manufacturing and local start-ups to multinational companies with a global footprint.



Commissioner Adam Putnam

Despite the variety of attendees, some common themes emerged around Florida’s strengths and potential in the clean energy industry. As noted first by Dr. Anderson, biomass and solar resources in Florida are abundant and ocean, wind, and other renewable sources also have the potential to diversify Florida’s energy supply. Additionally, Florida has a talented workforce that is well-positioned to gain a competitive advantage in the efficiency and renewables markets; especially by transitioning from the space and construction industries. Furthermore, Florida is an energy intensive state with a large projected population growth, so electricity demand will encourage investments in efficiency and support investments in renewable electricity.

Beyond Florida’s strengths in the industry, another common theme was the difference in timeframes for the useful life of energy infrastructure, political cycles, and financial returns for investors. This difference in timing has a significant impact on the support for new energy technology. Related to this, another common theme

was the acknowledgement that legal and regulatory certainty is fundamental to permit and promote the adoption of new energy technology. Finally, many participants recognized the importance of local government leadership supporting business and human capital development in their communities.

The participants also noted some common challenges as potential action items for the industry. Many participants noted the need for workforce training, both to counter the “graying” of the utility industry and to match the “greening” of the energy industry as a whole, as well as to facilitate the transition of talent from construction

and other industries. Working together to produce “a hit” in energy technology that catalyzes investment in Florida and overcome the time-scale problem between finance and energy infrastructure was also noted.

A few legal and policy suggestions emerged from the workshop as well. One suggestion was to adjust the avoided cost calculation used under §366.051 F.S. to more fully account for the value to ratepayers created by different fuel types, consistent with FERC’s October 21, 2010, Order, “Order Granting Clarification and Dismissing Rehearing,” 133 FERC 61,059, Dockets EL10-64-001 and EL10-66-001. Another suggestion was to update the definition of utility under §366.02 F.S. to account for new technology that makes distributed generation possible by adding similar exceptions for renewables as those for natural gas. Additionally, establishing a “renewables reinvestment” target for Florida’s investor-owned utilities that requires or allows them to reinvest a modest percentage of their profits into renewable energy in Florida and developing statewide building efficiency benchmarking standards to complement building code compliance efforts were also mentioned as possible solutions to challenges in Florida’s clean energy industry.

## 16 Green Challenge from Economic Development Administration



*Primary Investigator Tom O'Neil, University Central Florida, Co-PI: Dr. Tim Anderson, FESC, and Technological Research and Development Authority (TRDA)*

*Other Partners: Space Florida, and the Florida High Tech Corridor Council*

The Florida Energy Systems Consortium in partnership with Technological Research and Development Authority (TRDA) and the University of Central Florida (Lead University) received \$1.3 million award from the Economic Development Administration. Space Florida and the Florida High Tech Corridor Council supported the application and provided matching funds.

The team will create the Florida Cleantech Acceleration Network (FL CAN). The “FL CAN” will be a unique distributed, virtual proof of concept model that consists of a network of Florida-based universities, business incubators, investors and industry resources to accelerate the commercialization of innovative clean technology into new business ventures or to license the technology into existing firms.

The Florida partners will work together to speed up the development and commercialization of research in clean technology and energy, such as solar power, building science, energy efficiency, and energy from biomass. The “FL CAN” will be a hub for connecting Florida’s most promising clean technology research with experienced entrepreneurs, entrepreneurial students, industry partners, venture capitalists, and other resources that can expedite the formation of new ventures. The center will provide focused entrepreneurship education programs, industry contacts in energy, mentorship by “been there, done that” technology executives, and access to investors.

“We proposed this network to utilize the existing resources we have in the state and bring them together to help jumpstart the development of clean technologies statewide,” said Tom O’Neal, associate vice president for UCF’s Office of Research and Commercialization and the lead investigator on the project. “Not only do we have outstanding energy research expertise, we have a skilled technical workforce located in Florida’s Space Coast to develop a strong energy innovation cluster in Central Florida,” O’Neal added.

As part of the grant, FESC will catalog all clean technology-related intellectual property developed at Florida universities. In addition, FESC will facilitate the accessibility of a network of laboratory facilities that are dedicated to clean technology development. Entrepreneurs, students, scientists and established companies interested in developing commercial products based on Florida-based research will have access to these user facilities.

UCF and TRDA will jointly manage the market research activities. The combined UCF and TRDA teams will provide extensive market research expertise to assess technologies and to develop strong marketing plans for the most promising projects within the center.

Link to web site: [www.flcleantech.com](http://www.flcleantech.com)

## 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 environmen-

tal 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](mailto:gfpeter@ufl.edu) and John Davis, Professors School of Forest Resources and Conservation Univer-

sity 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 Syn-gas, which can be used to process gasoline. The overarching project goal is lowering the cost of the solar thermochemical production of Syn-gas for clean and synthetic hydrocarbon fuels like petroleum. The research team will develop processes that use water and recycled CO<sub>2</sub> as the sole feed-stock and concentrated solar radiation as the sole energy source. Successful large scale

[Continued on page 9](#)

# FESC Technology Commercialization Project

FESC technology commercialization funding program is modeled on the very successful Florida High Tech Corridor Council (FHTCC) Matching Grants Research Program which has been ongoing at USF and UCF since 1996 and at UF since 2005. In this program, FESC core universities proposed energy related projects for FESC funding that is matched on a 2:1 basis by industry funds. FESC provided up to \$50K per project attracting around \$400K of industry support to these FESC funded projects. Four industry contracts are already in place. One of the projects is given below:

## Development of a Low Cost Concentrating Solar Energy System Using Solar Sausages

**PI:** Dr. David Van Winkle, and Sean Barton, Department of Physics, Florida State University

**Industry Partner:** Hunter and Harp Holdings (HHH)

Traditional systems of solar concentration involve heavy parabolic mirrors that focus sunlight on fragile vacuum-sealed tubes. The mirrors and vacuum sealed tubes are very expensive and require constant maintenance and detailed cleanings in order to remain productive. Recognizing the need for a 21st century approach to solar collection, a research team at Florida State University has developed a collection system based on the same principles as its past counterparts, yet is 1/20th of the cost to fabricate and is 1/50th the weight. This technology can produce temperatures of over 400°C after a few moments of exposure to sunlight. The results have drawn attention from Department of Energy as well as major utility companies who are in the business of harnessing energy.

The Inflatable Solar Energy Collector is a transparent cylindrically shaped pressurized polyester membrane that supports a light reflective film lengthwise inside. This creates two opposing chambers that can be differentially pressurized to change the shape of the reflective film. This differential pressure is adjusted to optimize the shape of the reflective film to maximize the amount of light focused on the energy receiver, which is typically filled with flowing water or oil.

Beginning in late 2010, weekly meetings have been held at HHH offices in Tallahassee that include representatives of the several entities involved in deploying the "Solar Sausage" concentrating system at the Yulee St. site in Tallahassee. The entities include Pro Solar Inc.,

Barkley Consulting Engineers Inc., Winton Engineering PA, and Applied Research and Design Inc. A series of 50-foot long prototype sausages were made and inflated on site. Many issues were identified that needed to be resolved before manufacturing and deploying several hundred solar sausages on site including methods of constructing, mounting, and operating the balloons, distribution of air and electricity, and removal of heat.



As can be seen in the photo, the project is well along in terms of deployment of the technology on the Yulee St. site. The project has involved full and part-time employment of approximately 100 individuals over the last 8 months doing construction, site development, and manufacturing.

## New Member Spotlight



**B**rian Yablonski, new member of the [FESC Industry Advisory Board](#), is currently the External Affairs Director for the Gulf Power Company, an investor owned utility serving Northwest Florida. He is responsible for the management and oversight of regulatory affairs and governmental affairs activities.

Prior to working with Gulf Power, Mr. Yablonski was Vice President of Public Affairs for the St. Joe Company, one of Florida's largest private landowners. In this role, he helped strategically plan nearly 600,000 acres of land in Northwest Florida, including having overseen state and federal governmental relations, environmental strategy and economic policy development. He also served as Director of Policy and Deputy Chief of

Staff for Florida Governor Jeb Bush, where he helped craft the administration's major policy initiatives.

Mr. Yablonski is in his seventh year as a commissioner on Florida's Fish and Wildlife Conservation Commission, the state agency charged with protecting endangered species and wildlife, and overseeing hunting and fishing activities in the state of Florida. In addition, he was appointed in 2007 by then-Florida Speaker of the House Marco Rubio to serve on the Florida Taxation and Budget Reform Commission, which meets once every 20 years to examine the state's tax and budget structure. In that capacity, he served as the primary sponsor of Constitutional Amendment 4, an initiative to provide tax exemptions for natural lands placed into permanent conservation easements. As a result of this work, he was named Florida's 2009 Wildlife Conservationist of the Year by the Florida Wildlife Federation.

Mr. Yablonski is also an Adjunct Fellow with the Property and Environment Research Center (PERC) in Bozeman, Montana. This national institute works to improve environmental quality through the use of market principles and property rights. Mr. Yablonski is a contributor to PERC's policy journal. As well, Mr. Yablonski sits on the Board of Directors of the Foundation for Excellence in Education and the Foundation for Florida's Future, both reform-oriented education organizations chaired by former Governor Bush.

Mr. Yablonski graduated with honors from Wake Forest University and the University of Miami School of Law.

## Innovation HUB at the University of Florida

**T**he University of Florida announced the opening of the Florida Innovation Hub (the first building located in Innovation Square). The Hub was built with an \$8.2M grant from the Economic Development Administration and a \$5M matching funds from UF. The 48,000 ft<sup>2</sup>- facility located in downtown Gainesville serves as an incubator for technology-based start-up companies. The Hub provides office space, modern laboratories, conference rooms, and other resources to the tenants. Programs and activities at the hub will bring together entrepreneurs, investors, students and service providers to incubate new ideas.



The Hub houses the UF's Office of Technology Licensing and UF Tech Connect. Nanophotonics, one of the tenants of the Hub, was funded by FESC Phase I program. Link to the Florida Innovation Hub website: <http://innovationsquare.ufl.edu/>

Each day included a plenary session, technical sessions, round table discussion, and poster session. The first day's plenary session featured Dr. Roy Periana, Director, Scripps Energy Laboratories, Dr. George Philippidis, Director, Alternative Energy Research Center and Associate Professor of Biofuel Engineering, University of South Florida Polytechnic, Commissioner Eduardo Balbis, Florida Public Service Commission, and Chris Fountas, General Partner, Milcom Venture Partners. The second day featured Dr. Pramod Khargonekar, Professor and Eckis Chair, University of Florida Department of Electrical and Computer Engineering, Dr. Winston Schoenfeld, Director of PVMC-FL and Associate Professor of FSEC & CREOL, University of Central Florida, and Dr. Chris Ferekides, Professor, Electrical Engineering, University of South Florida.

The technical sessions were each divided into three categories. Topic categories included: Biomass, Algal Biofuels, Solar Energy, Energy Efficiency, Energy Systems, Marine Energy, Carbon Capture, Nuclear Energy, Energy Storage and Delivery, and Energy Policy.

A Round Table discussion was designed to garner ideas around the questions: *If the SUS was to develop a major proposal, what would be the technical problem statement/vision and title? What would be the benefit to the State?* The following strategic area groups were available for participants to choose from: Bio-Energy, Carbon Capture, Energy Efficiency and Conservation & Geothermal, Energy Storage, Grid Technologies & Electricity Distribution, Secure Energy Systems, Solar PV, Solar Thermal, and Policy, Nuclear, Ocean Energy & Offshore Wind.



Energy Efficiency Group- Round Table Discussion

The first day of the Summit ended with a poster session highlighting 57 posters (18 students, 39 faculty), followed by a reception sponsored by Florida Power and Light. There was also a student poster contest resulting in 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> place winners as well as two honorable mention awards. This year's Summit included tours of the FCRC Biofuels Pilot Plant for interested attendees, as well as displays/units throughout the two days.

In addition to the Summit itself, two Pre-Summit Workshops were held on September 26. The first, *The Florida Clean Energy Workshop* was organized by DOE/EERE and focused on innovation in R&D and manufacturing in Florida's Clean Energy industry. This one day workshop drew 163 participants. The Community College Energy Workshop was organized by the Florida Advanced Technological Education Center (FLATE). Forty three people participated in this workshop. During the Summit both the FESC Advisory Board and FESC Oversight Board held their meetings.

Most participants, who completed the FESC Summit evaluation, rated the agenda items as Very Useful or Extremely Useful. Logistical elements of the conference were primarily rated as Very Adequate or Extremely Adequate. Plans are underway for combining the FESC and Florida Energy Summits in 2012.

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<sub>th</sub> at present to less than \$10/kWh<sub>th</sub>. The development will be useful for both solar power and nuclear power.