



# FLORIDA ENERGY CONNECTIONS

Issue 3 • June 2012

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**UF-led Research Team Selected  
for \$125 Million Joint U.S.-India  
Energy Project**

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A University of Florida-led research team has been selected to participate in a five-year, \$125 million energy project involving the United States and India, U.S. Department of Energy officials have announced.

Known as the Joint Clean Energy Research and Development Center, or JCERDC, the project is aimed at reducing energy consumption, cutting dependence on petroleum products and increasing use of renewable fuels.

The UF-led team will develop biofuels derived from inedible plant material. Two other research teams, led by the National Renewable Energy Laboratory and Lawrence Berkeley National Laboratory, will focus on solar energy and energy efficiency of buildings, respectively.

Total funding for the biofuels project is about \$21 million, including about \$2.7 million in federal funding destined for UF.

“This award highlights many of the attributes that make the University of Florida a world-class research institution,” said David Norton, UF vice president for research. “It illustrates our commitment to building interdisciplinary partnerships, both domestically and internationally, to achieve important scientific goals such as developing renewable clean-energy solutions.”

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### Upcoming Events:

**9th INTECOL International Wetlands Conference: Wetlands in a Complex World**—June 3-8, 2012, Orlando, FL USA

**Florida Energy Summit**—Rosen Shingle Creek, Orlando, FL—August 15 – 17, 2012

**Cleantech to Spacetech: MegaWatt Ventures, I2 CAP & FL-CAN Showcase**—Florida Hotel, Orlando, FL—September 20-21, 2012

## ET Degree: New Energy Efficiency Specialization Under Development

*By: Brandon Campus, FESC Project Manager*

The Florida Advanced Technological Education Center (FLATE) and Florida Energy Systems Consortium (FESC) have been collaborating with the National Science Foundation-funded Energy Systems Technology Technicians (EST<sup>2</sup>) project team to design a new specialization for the Engineering Technology (ET) Degree and associated College Credit Certificate. The EST<sup>2</sup> project team comprises individuals from Brevard Community College, Florida State College at Jacksonville, Tallahassee Community College and Hillsborough Community College.



The new IEE specialization was one of the topics at the Engineering Technology Forum at Indian River State College in March

Together with FLATE, FESC and experts from industry, government and academia, the team has been working on defining the new specialization from an industry perspective. Keith Zipper, President of Energy Reduction Solution, a company focused on increasing electrical energy efficiency on the plant floor, has been working closely with the EST<sup>2</sup> team. By opening up his plant to the team, he will provide them with an up-close, real-life opportunity to experience what kinds of skills are needed for future energy efficiency technicians in the industrial/commercial setting. Representatives from the Universities of Florida, Miami, Alabama and Rutgers have been invaluable in providing support from the academic realm. John Segal, a Technical Assistance Centers Deployment Specialist from the US Department of Energy, has also provided the EST<sup>2</sup> team with expertise and guidance. Jon Jensen, who heads up the Energy Conservation Group at SMC Corporation of America, has given the team a great deal of insight about what he has found in the field and what the industry is looking for as far as skills and knowledge.

The Industrial Energy Efficiency specialization tract comes at a time when interest in reducing operating costs through energy efficiency maximization is growing significantly both in Florida and throughout the nation. The new specialization will be designed to provide the training necessary to teach manufacturing, industrial, and other appropriate technicians, such as HVAC technicians or electricians, to save energy costs on the plant floor. Hands-on courses will focus on how to identify and correct some of the energy inefficiency in industrial and/or commercial facilities. Courses will target major energy consumption areas including motors, hydraulics, pneumatics, compressor, heat or cooling loss, and automated systems. Students will be required to demonstrate the ability to evaluate energy efficiency technologies and energy assessment methodologies. Analysis of energy consumption data for energy efficiency opportunities and the use of instrumentation for energy efficiency will also be covered. As a part of the curriculum, students will also receive content focused on training them how to address behavioral issues in industrial settings. The final course will be either a capstone course focused on integrating systems or work experience. Upon completion of the program students will be armed with the knowledge and skills necessary to implement energy efficiency strategies in industrial processes/systems, and as a result impact the bottom line.

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## UCF engineering team wins \$100,000 for clean energy plan

A University of Central Florida engineering team that developed a business plan for a start-up that promotes renewable and green energy solutions won a \$100,000 prize from the [U.S. Department of Energy](#).

Mesdi Systems Inc., the company founded by UCF engineering students Brandon Lojewski, Jian Liu, Cheng Li, Michael Tullbane, Thomas Yang, and Johan Rodriguez, will represent the southeast region at the DOE National Clean Energy Business Plan finals at the White House in Washington, D.C. June 12-13.

UCF's team beat out plans submitted by [Georgia Tech](#), [Duke University](#), [University of Maryland](#), and [Virginia Tech](#).

The award is part of the DOE's inaugural [ACC Clean Energy Challenge](#), a business plan competition that encourages university students throughout the southeastern United States to develop business plans for new clean energy companies focused on renewable energy, energy efficiency improvements, and advanced fuels and vehicles.

The challenge coincides with five additional regional competitions in the U.S. as part of its network of student-focused clean energy business plan competitions that will take place over the next three years.



*[left] UCF undergraduate mechanical engineering student Johan Rodriguez (left) and mechanical engineering graduate student Brandon Lojewski accept the \$100,000 prize from the U.S. Department of Energy. (U.S. Department of Energy / May 3, 2012)*

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## Deep Freeze Discovery

*USF physicists discover a “new recipe” for solid state refrigeration, bringing efficiency to the process.*

**TAMPA, Fla. (April 23, 2012)** – Physicists from the University of South Florida have discovered a potential new way to advance solid state refrigeration technology, making the evolving field of environmentally-friendly and energy-efficient alternative to conventional refrigeration more efficient.

Solid state refrigeration eschews conventional refrigerants and mechanics to produce cooler temperatures through thermoelectric technology, without the moving parts and chemical refrigerants now commonly used. But despite its anticipated advantages, such technology is not competitive nowadays because of the low efficiency of the solid state refrigerants. Their findings were published in [Physical Review Letters](#).

Assistant Professors Inna Ponomareva and Sergey Lisenkov in USF's Department of Physics developed state-of-the-art computational experiments to simulate performance of ferroelectric materials as solid-state refrigerants. Such materials can convert electrical energy into thermal energy and vice versa – known as the electrocaloric effect.

The process works when an electric field is applied to material under certain conditions, causing the temperature to rise. The removal of the electric field will cause the temperature to

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## New UCF Tech May Lead to Inexpensive Biofuel



A University of Central Florida chemistry professor's low-tech process for breaking down raw materials into sugar may be the linchpin for making low cost biofuels.

Thor Renewable Energy Inc. has secured an exclusive license to the technology and plans to expand its commercial-scale biofuel production facilities to Florida's Space Coast later this year.

Richard Blair, assistant professor of chemistry and forensic science at UCF, and a biofuels specialist, uses a milling process to convert raw materials to simple sugars and other useful compounds. He was initially exposed to the general technique while working at NASA's Jet Propulsion Laboratory (JPL). Blair's process uses a rotating drum to grind raw materials and, in a twist, uses a natural and inexpensive catalyst to convert cellulose into simple sugars. Most

techniques used today rely on sulfuric acid to spark the conversion process, resulting in hazardous byproducts that must be reprocessed prior to disposal.

"The ball mill converts biomass immediately to a sellable product. It is inherently green and easily scalable: this is unique because many lab processes are not green or easily scalable," Blair said.

Many biofuel production systems use sugars as the raw materials. The availability of sugar is often limited by crop performance: if crop yields are low, or if crops fail, then biofuels facilities – such as ethanol plants – do not have the sugar feedstock needed to create biofuel.

Blair thought that the ball mill had potential for biofuel production because it will convert any type of biomass – from yard waste to scrub brush – into sugar and it doesn't leave behind problematic by-products. For Thor this could eliminate the problem of having to compete with food supplies such as corn and soybeans, for raw materials or feedstock.

"UCF's breakthrough cellulose-to-sugar technology provides a rational, practical, and efficient path that broadens feedstock possibilities for biofuels production. This gives us more flexibility in site selection," said Thor's CEO Bill Cox. "This also lessens our dependence upon specific crop cycles, and to inherent price swings that occur within all crop commodities."

Cox learned of the UCF technology at the Space Coast Energy Symposium sponsored by the Florida Cleantech Acceleration Network in February.

Thor plans to scale-up and incorporate UCF's technology as part of its future commercial-scale biofuels production facilities, including a likely expansion in Brevard County later this year. The company will use the technology to produce clean fuels that offer higher horsepower and lower emissions. Thor's commercial plants could create over 50 jobs, and is currently working with Brevard County's Economic Development Commission, the State's TRDA, and other State agencies as it considers possible expansion opportunities in Florida. Headquartered in Singapore, Thor also has activities in Latin America and the Philippines.

*Dr. Blair's project titled as "Milling Technology Leads the Way to Cost Effective Ethanol Production" was one of the FESC Phase I Projects. It was funded to perform an analysis of commercialization and economic prospective.*

[UF Led Research team Continued from page 1](#)

Also on the UF-led team are the University of Missouri, Virginia Tech, Montclair State University, Texas A&M University, Show Me Energy Cooperative, and Green Technologies. They will work with a counterpart team based in India and led by the Indian Institute of Chemical Technology-Hyderabad.

The researchers' primary goal will be to develop and optimize several crops as biofuel feedstocks, said Pratap Pullammanappallil, an associate professor with UF's Institute of Food and Agricultural Sciences. The crops include high-yield biomass sorghum, sweet sorghum, pearl millet, bamboo and switch grass.

Sorghum and switch grass will likely be the group's initial focus, he said. The UF researchers will concentrate on improving technology for converting biomass to fuel. Much of the work will take place in the Biofuels Pilot Plant on the UF campus and the Stan Mayfield Biorefinery Pilot Plant in Perry, a joint venture between UF and Buckeye Technologies Inc.

"Another goal is to expand our capacity to utilize waste streams in the cellulosic ethanol conversion process," he said. The researchers will investigate ways of using spent feedstocks, wastewater and other materials to produce additional bioenergy and products such as fertilizers and bioplastics.

Pullammanappallil, based at the agricultural and biological department, is the team's principal investigator. Other UF faculty members on the team are: Zhaohui Tong of agricultural and biological engineering; Lonnie Ingram and Keelnatham Shanmugam of microbiology and cell science; Ramesh Reddy, George O'Connor and Ann Wilkie of soil and water science; and Wilfred Vermerris of agronomy.

Work on the project is expected to begin this fall, Pullammanappallil said.

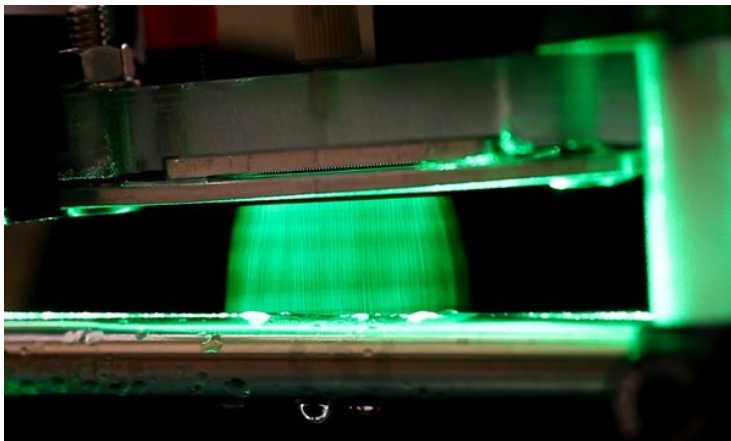
[UCF Engineering Team wins \\$100,000 for Clean Energy Plan. Continued from page 3](#)

UCF officials said Mesdi Systems' winning plan uses "electrospray technology to vastly improve the manufacturing process for making lithium ion batteries and other products to ultimately reduce production costs and increase product life. For example, an electric car battery made with the UCF process would be able to travel for hundreds of miles on a single charge."

Many products and parts, such as solar cells and batteries, are made with coatings or particles that require materials to be uniformly sprayed during the manufacturing process. The technology that produces the spray can greatly impact the final product.

Current technology uses pressurized gas to spray the liquid resulting in large non-uniform droplets and significant manufacturing waste.

But Mesdi Systems proposes using electrospray technology that employs electrical charges to create uniform, ultrafine droplets with precision control. That technology can be developing batteries, photovoltaic solar cells, medical devices, pharmaceuticals and other products.



A demonstration of the electrospray technology that helped UCF's engineering team win the ACC Clean Energy Challenge. (UCF / May 3, 2012)

Specific Technical Skills Standards for IEE
Evaluate energy efficient technologies
Evaluate energy assessment methodologies
Analyze energy consumption data for energy efficiency
Demonstrate ability to use instrumentation for energy efficiency
Implement energy efficiency
Apply lean and green manufacturing principles/concepts
Troubleshoot integrated industrial utility equipment systems

A short survey was conducted in March to gather data to ensure the new framework is comprehensive and covers all areas necessary to produce the skilled workforce needed in this area. In addition, it provided an opportunity to identify individuals interested in collaborating to work on the new curriculum framework. More than a third of survey respondents indicated that they were currently working on curriculum including energy efficiency in industrial/commercial settings components. These included consumption analysis and reduction factors, energy auditor tasks and energy management system protocols (e.g. ISO 50001), energy efficient HVAC and building construction. Air flow, pump/compressor/motor efficiency were also listed. Occupations respondents intend to train students for, included Energy Technicians, Environmental Technicians, Sustainability Planners, Smart Grid Technicians, Energy Auditors and any generally all individuals involved in developing and implementing Energy Management Programs for their company. The vast majority of respondents were very interested in collaborating to craft the new curriculum framework. The EST<sup>2</sup> team plans to submit the framework to the Florida Department of Education in the fall of this year so colleges can implement it in the 2012-2013 academic year.

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drop. Thanks to the reversibility of such temperature changes they can be utilized in a refrigeration cycle, the faculty members said.

While the ability of ferroelectric materials to exhibit the electrocaloric effect was known for many decades their practical applications for solid state refrigeration was impossible due to minuscule value of the temperature change. In recent years the interest to the electrocaloric properties of the ferroelectrics has increased enormously, thanks to the predictions of giant electrocaloric effect in ferroelectric nanostructures.

Using the novel computational tool and USF supercomputing resource, the researchers demonstrated a new way to enhance the electrocaloric efficiency. Their method is based on the discovery of coexistence of positive (temperature raise) and negative (temperature drop) electrocaloric effect in the same ferroelectric material. By designing a "special recipe" for a refrigeration cycle that can be created when the positive and negative effects alternate, the efficiency of refrigeration can be greatly enhanced, they reported.

## Recent Funding Opportunities

FESC office tracks the energy related funding opportunities, shares them with faculty and industry partners, facilitates the submission of multi-faculty, multi-SUS university competitive proposals in response to solicitations for major research programs. The most recent funding opportunities are listed below. For a complete list please visit the [funding opportunities](#) page on the FESC website.

DE-FOA-0000719 - Innovative Biosynthetic Pathways to Advanced Biofuels

[More information](#)

DE-FOA-0000729 - Advanced Computational and Modeling Research for the Electric Power System

[More information](#)

DE-FOA-0000625 - Light-Duty Fuel Cell Electric Vehicle Validation Data -- DEADLINE EXTENTION

[More information](#)

SN-12-15-PKM - Defense Production Act Title III. Advanced Drop-In Biofuels Production Project

[More information](#)