



Florida Energy
Systems Consortium

April 2014 Issue

**Florida Energy System Consortium Workshop
May 12-13 Gainesville, FL**

FESC Highlights

The **2014 FESC** Workshop is scheduled for **May 12-13, 2014**, at the **Hilton University of Florida Conference Center in Gainesville, Florida**. *FESC will financially support the hotel expenses for up to 84 oral presenters from academia. In addition, on a first-come, first-serve basis, FESC will financially support the hotel expenses for up to 66 poster presenters and attendees from academia including students.*

Florida Energy News

U.S. Energy News

Funding Opportunities

WORLD NEWS

Upcoming Events

Power Up Energy Expo
Apr 28-30 Pensacola
Beach, FL.

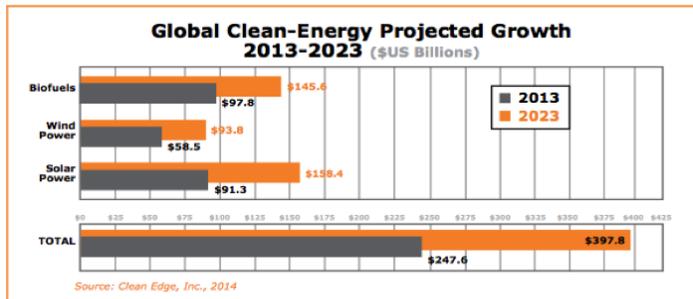
Florida Energy Systems
Consortium Workshop
May 12-13 Gainesville,
FL

World Congress on
Industrial Biotechnology
May 12-15
Philadelphia, PA.

Second Annual Go
SOLAR Renewable
Energy Fest June 6-7
Fort Lauderdale, FL

Clean Edge Finds Global Solar Deployment Exceeds Wind For First Time

The global clean-energy picture for 2013 was a classic good news-bad news story, according to the Clean Energy Trends 2014 report issued by clean-tech research and advisory firm Clean Edge, Inc. The industry saw dazzling growth, success, and rising stock prices in some sectors - most notably solar photovoltaic (PV) deployment - but downward trends and policy and finance hurdles in others.



Last year also marked a significant transition in the history of clean

energy: for the first time since Clean Edge began tracking global markets in 2000, the world installed more new solar PV generating capacity, 36.5 gigawatts, than wind power (35.5 GW). Record levels of new solar deployment in China, Japan, and the U.S. combined with a down year in the wind industry to create this unprecedented crossover.

The global solar market’s continued double-digit growth of 15 percent, plus a modest uptick in biofuels’ market size, was not enough to overcome the wind industry’s lackluster performance. As a result, combined global revenue for solar PV, wind power, and biofuels held nearly steady at \$247.6 billion, down just slightly from \$248.7 billion in 2012.

“The adoption of clean energy is set against a bigger-picture context that finds many of the world’s largest energy-using nations struggling with critical choices for their energy future,” said Ron Pernick, Clean Edge co-founder and managing director. “Climate disruptions, smog alerts, planned and unplanned nuclear power shutdowns, and resource scarcity are all driving significant change, accelerating the double-digit adoption growth of solar PV, hybrid and electric vehicles, green buildings, and other clean-tech solutions.”

The Clean Energy Trends 2014 report’s key findings include:

- Solar photovoltaics (including modules, system components, and installation) grew to \$91.3 billion from \$79.7 billion in 2012, with a record 36.5 GW installed globally. In contrast to 2011 and 2012, when PV panel costs plummeted more than 20 percent in both years, prices held nearly steady last year, dropping slightly to \$2.50 per watt installed.
- Wind power (new installation capital costs) fell to \$58.5 billion from \$73.8 billion in 2012. The industry added 35.5 GW of new capacity in 2013, well below the previous year's record 44.7 GW and its weakest performance since 2008.
- Biofuels (global production and wholesale pricing of ethanol and biodiesel) rose slightly, from \$95.2 billion in 2012 to \$97.8 billion last year. Global biofuels production remained constant at 31.4 billion gallons, with average prices increasing slightly.
- Together, Clean Edge projects that these three sectors will expand from \$247.6 billion in 2013 to \$397.8 billion within a decade.
- Venture capital investments in U.S.-based clean-tech companies totaled \$4.4 billion in 2013, falling 25 percent from \$5.8 billion in 2012, according to data provided by Cleantech Group. Picking up some of the VC financing slack is the continued rise of large corporate and project finance deals. Google's \$3.2 billion acquisition of smart thermostat maker Nest in early 2014 is the most prominent example, but other recent large deals include Goldman Sachs' \$500 million fund to finance SolarCity PV installations and Wells Fargo's pledge to invest \$100 million in tax equity financing in SunEdison projects.
- For the first time, Clean Edge expanded the scope of its global market size research to include green buildings and electric and hybrid vehicles. Since 2000, these sectors have experienced compound annual growth rates of 68.9 percent and 38 percent respectively.

For more than a decade, Clean Edge has covered the industry's most important trends. During this time, it has covered the rise of solar leasing over ownership, the phaseout of incandescent lighting, renewable energy adoption by the U.S. military, Tesla as a startup, and many more. This year's report spotlights five key trends that will affect clean-energy markets in the coming years:

1. Enlightened Utilities Begin To Embrace Distributed Energy Assets
2. Cities Lead Climate Charge by Focusing on Regional Carbon Reduction
3. Net Zero Energy Buildings Gain Ground
4. Internet-Enabled Clean-Tech Startups Define a New Sector
5. Vertical Farming Sprouts in Cities Around the World

Source: Clean Edge News

Panel: Climate Change Felt 'On All Continents'

Climate change is impacting human and natural systems on all continents and oceans, according to a summary report released on March 31 by the Intergovernmental Panel on Climate Change (IPCC). The report, titled *Climate Change 2014: Impacts, Adaptation, and Vulnerability*, notes there are increasing risks from the changing climate, but the report also concludes that there are opportunities to respond to such risks, though the risks will become difficult to manage with high levels of warming.

The findings for policymakers released by the IPCC's Working Group II mark the culmination of four years' work by hundreds of experts who have volunteered their time and expertise to produce a comprehensive assessment of impacts, adaptation, and vulnerability. The report considers every region and many sectors, ranging from oceans to human security, and focuses on effective responses. It notes that adaptation to reduce the risks from a changing climate is now starting to occur, but with a stronger focus on reacting to past events than on preparing for a changing future.

The report builds on the four previous assessment reports produced by the IPCC since it was established in 1988. In another report released in September 2013, the IPCC determined that human influence on the climate system is clear, and concludes that it is "extremely likely" that human influence has been the dominant cause of the observed warming since the mid-20th century.

Source: EERE Network News

Spain To Spend \$15M On First Grid Energy Storage Facilities

The Spanish government is ready to shell out \$15 Million to finance its first ever grid energy storage facilities.

Just recently, Endesa, the leading utility firm in Spain has launched government-backed "Project Store". It aims to test the feasibility of putting up grid-connected energy storage systems on a commercial scale.

In particular, the project calls for setting up of storage facilities in Spain's three islands in the Canaries namely La Palma, La Gomera , and Gran Canaria.



These remote areas that form part of the Canary islands will benefit from the project as the storage facilities target to provide efficient yet inexpensive back up electricity for power generating systems.

For the millions of inhabitants in EU's over 280 islands, power failure has been a perennial problem. Existing networks simply can't adapt easily to surges in power demand thus countries within the EU have been investing in grid energy storage projects to help address the situation.

Meanwhile, Endesa shared that the storage facility in La Palma will make use of ultra-condenser storage technology. The other facility in La Gomera will be supported by a flywheel system. As for Gran Canaria facility, Li-ion battery technology will be employed.

Three other project participants namely Ingeteam, Isotrol, and Schneider Electric will join Endesa to see the project through to completion.

China Can Transition to an 80% Renewable Electric Power System by 2050 Without Sacrificing Economic Growth

The China's Future Generation report shows how by embracing conservation measures and renewable energy, China can transition to an 80% renewable electric power system by 2050 at far less cost than continuing to rely on coal. As a result, China's carbon emissions from power generation could be 90% less than currently projected levels in 2050 without compromising the reliability of the electric grid or slowing economic growth.

The report was prepared by the Energy Transition Research Institute (Entri) for WWF and uses robust computer modeling to simulate four scenarios based on today's proven technology: a Baseline, High Efficiency, High Renewables, and Low-Carbon Mix scenario. To develop its findings, Entri examines China's electricity supply and demand on an hour-by-hour basis through 2050 using its advanced China Grid Model.

The analysis also describes recent Chinese regulatory efforts and challenges to increasing the

percentage of renewable electricity in the country, while providing a set of targeted recommendations for Chinese leaders and policy makers on energy efficiency, prioritizing low-carbon electricity supply investments, allowing price changes to reflect the true cost of service, and prioritizing collection and analysis of key power usage data.

FESC HIGHLIGHTS

Burying Power Lines Not Always the Answer

By: Theodore Kury, Ph.D.- Kury is the director of energy studies at the University of Florida's Public Utility Research Center, where he studies the economic impacts of energy policy.



As winter storms continue to pound the United States, causing billions in damage and millions to be without electricity service, customers inevitably ask why doesn't somebody -- my utility, my regulator, my government -- do something about this? Why aren't power lines, for example, buried safely underground?

It's not that simple. The short answer? It is expensive, requires the buy-in of multiple entities that serve the community and doesn't always solve the problem.

Because it costs so much to bury power lines, it's crucial that the expense yields value for electricity consumers, who will ultimately bear all the costs associated with providing electricity service.

It's easy to see why a community under siege by intense weather would want to put the lines underground: Underground lines are protected from wind-related damage as well as ice and snow. But they also may be more vulnerable to damage from water intrusion.

They're popular, too, in densely populated areas and new subdivisions where utility poles and a plethora of overhead lines would cause a kind of overhead congestion. As of 2012, about 39% of the customers in the United States reported having underground electricity service.

But going underground can be difficult: In the electric utility business in the United States, it is nearly impossible for the utility, regulator or government to address the question of changing how power is delivered without the sign-on and cooperation of the others.

Frum: Why we should bury the power lines

Let's start with the utility company: It is closest to the challenge, managing the electricity system, but cannot spend the money to change the power line configuration without the assurance from its regulator, whether it is the state public service commission or a city commission, that it will recover its investment through the rates it charges to its customers.

For its part, the regulator cannot directly fix the power lines but still must ensure that any money the utility spends provides value for consumers.

Finally, the government, or the other voice for the consumers, must determine whether consumers are willing to pay for such a change. (The state of Florida's reaction in the wake of the 2004-2005 hurricane seasons provides a model for this type of cooperative effort, as utilities, regulators and government officials meet every year to address the efficacy of Florida's storm hardening efforts, including the potential undergrounding of power lines.)

Then there are two major challenges associated with relocating power lines underground:

First, it is very expensive.

Burying power lines costs roughly \$1 million per mile, but the geography or population density of the service area can halve this cost or triple it. In the wake of a statewide ice storm in December 2002, the North Carolina Utilities Commission and the electric utilities explored the feasibility of burying the state's distribution lines underground and concluded that the project would take 25 years and increase electricity rates by 125%. The project was never begun; the price increase was not seen as reasonable for the consumers.

A 2010 study on undergrounding a portion of the electricity system in the District of Columbia for the Public Service Commission found that costs would increase rapidly as utilities tried to underground more of their service territory.

The study concluded that a \$1.1 billion (in 2006 dollars) investment could improve the reliability for 65% of the customers in the utility's service territory, but an additional \$4.7 billion would be required to affect the remaining 35% of customers in outlying areas. That is, over 80% of the costs for the project would be required to benefit roughly one third of the customers.

Burying the lines raises another potential problem: reduced accessibility of the lines, making it more difficult to repair the system. So while customers may see fewer outages as a result of undergrounding, the duration of those outages may increase.

Electric users ask: Why not put power lines underground?

Other benefits of undergrounding, such as aesthetic ones, may be more difficult to quantify, but studies have shown that consumers are sometimes willing to pay more for underground service.

Second, burying power lines does not always protect them from storm damage. It may mitigate damage from wind events such as flying debris, falling trees and collected ice and snow, but so can trimming trees, replacing wood poles with steel, concrete or composite ones, or reinforcing poles with guy wires. These strategies may be nearly as effective in reducing storm damage and may cost less.

Finally, undergrounding power lines only shifts the risk of damage from wind events to the risk of damage from corrosive storm surge and flooding that may result from rainfall or melting ice and snow. Areas with greater vulnerability to storm surge and flooding will confront systems that are less reliable -- and at greater cost - as a result of undergrounding.

In short, whether a community should go underground with its power lines is a question to be evaluated on a case-by-case basis by the utility, its regulator and the government.

Otherwise, consumers will end up spending more for their electricity service and getting less.

The opinions expressed in this commentary are solely those of Ted Kury.

USF Awarded Prestigious EPA National Research Water Center in Nutrient Management

By Colleen Naughton

TAMPA, Fla. (Feb. 5, 2014) – Researchers in the University of South Florida’s Department of Civil & Environmental Engineering have been awarded a \$2.22 million grant from the U.S. Environmental Protection Agency to establish a national research center to tackle a dire issue plaguing waterways in Florida and across the country: nutrient pollution from wastewater and stormwater runoff.



1 Nitrogen and phosphorous support the growth of algae.
Photo | Erica Vance, U.S. EPA

The USF Center for Reinventing Aging Urban Infrastructure for Nutrient Management (RAINmgt) will develop integrated research and demonstration projects focused on nutrient pollution management technologies while also developing regional models that determine appropriate solutions from the household to city levels. Their work will also emphasize pollution reduction and water reuse options over treatment and disposal.

The center will be led by USF engineering Professor James Mihelcic, who is joined in the project by USF environmental engineering faculty members Jeffrey Cunningham, Sarina Ergas, Maya Trotz, Daniel Yeh, and Qiong Zhang.

The USF proposal was selected as one of four EPA Centers for Water Research on National Priorities Related to a Systems View of Nutrient Management. The centers were announced by EPA Administrator Gina McCarthy at the National Council of Environmental Science National Conference in Washington last week.

“This research is much needed in urban coastal areas and will also assist efforts to restore and improve the water quality in Tampa Bay and other impaired estuaries in Florida and the United States,” Mihelcic said. “Recent news stories about poor water quality associated with Florida springs and Lake Okeechobee outflow highlight the need for more innovative and sustainable approaches to manage nutrients found in wastewater and stormwater.”

For example, Mihelcic said, it is estimated there are more than 600 springs in Florida with very high flow rates which may be the greatest amount of freshwater concentration on the planet. However, where once most springs had white, sandy bottoms; countless are now murky because their bottoms are covered in green algae and plant growth.

He said this is due to a steady rise in nutrient levels from fertilizer runoff, municipal wastewater treatment plant discharge, and thousands of poorly designed and maintained household treatment systems such as septic tanks.

According to the 2010 Springs Initiative Monitoring Report by the Florida Department of Environmental Protection, 36 of the 49 springs monitored were above the set nitrogen threshold of 0.35 mg/L. This is not only a problem for visibility for tourists and the glass-bottomed boats but also for the wildlife and humans that depend on water quality. Algae that thrive in nutrient rich waters compete for limited dissolved oxygen from other fish and

organisms and can cause rashes and nausea for swimmers, kayakers and tubers.

More than just environmental impact, a 2003 Florida State Study found that the springs generate significant employment and \$70 million dollars annually. Mihelcic also stated that “The research will benefit the public because poor water quality lowers the economic, social, and environmental value of our Nation’s waters for current (and future) generations. In Florida, our springs, rivers, estuaries, coastal waters, and the Everglades all suffer because of nutrient pollution. Nutrient management is also a national and global issue because of food security.

Another example of the devastation wreaked by nutrients in Florida is recent releases of nutrient rich waters from Lake Okeechobee which happens to be the largest lake in the southeastern United States. This summer’s heavy rainfall flooded the lake with billions of gallons of freshwater polluted by run-off from farms, golf courses, homes, and septic tanks. Algae blooms have subsequently distressed this fragile ecosystem that is part of the St. River Estuary that supports over 4,000 plant and animal species, 36 of which are listed as endangered or threatened.

Researchers are now focused on developing new strategies and technologies that could manage and control these nutrients in a more sustainable manner. For example, nutrients found in domestic wastewater could be recovered and reused as fertilizer and storm water could be better managed to reduce nitrogen loadings into local waterways.

The National Nutrient Management Center will work towards this goal by first developing and understanding the science behind nutrient management technologies and then develop and test sustainable innovations that improve community well-being.

One example is the construction of a rain garden that was recently managed by a USF doctoral student at Young Middle Magnet School as a demonstration of how to better manage storm water runoff. This rain garden averts 277,380 gallons of water and has already provided a green and aesthetically pleasing space in place of standing water that would flood and damage the school gymnasium during intense storm events.

Research and demonstration projects will also take into account political, social, economic, and environmental factors. A tool will be produced that will compare economic costs and environmental impacts per pound of nitrogen and phosphorus recovered or removed for nutrient removal and recovery technologies. This will be scaled up to a larger nested water quality model that will quantify the impact of nutrient management and loading on Tampa Bay in Florida.

USF will be working in partnership with the University of Texas-Austin, Yale University, the University of Maryland and the University of Florida, as well as with researchers from Resources for the Future in Washington, DC;, engineering practitioners from Hazen & Sawyer and Greeley & Hansen; and the Corporation to Develop Communities of Tampa.

The center additionally will train community members and future engineers and water managers, to achieve progress along a path forward for sustainable nutrient management.

The National Center for Reinventing Aging Infrastructure for Nutrient Management can be followed at: <http://usf-reclaim.org> and on Twitter @USF_Reclaim. Reclaim is a global network of researchers, students, and practitioners lead by USF students and faculty dedicated to developing geographically-appropriate and culturally relevant engineered systems to recover

nutrient, energy, and water resources from waste.

Colleen Naughton is a PhD student in USF's College of Engineering.

UF/IFAS Researchers Help to Sequence Genome for Loblolly Pine - Major Source of Lumber, Paper

GAINESVILLE, Fla. — To look at the humble loblolly pine – grown in neat rows on large farms throughout the southeastern U.S. and milled for things like building lumber and paper – you would never think that its genetic code is seven times larger than a human's.

That is just one of the things researchers, including two from the University of Florida's Institute of Food and Agricultural Sciences and the UF Genetics Institute, learned as they sequenced the loblolly pine genome for the first time. They also discovered genes resistant to a devastating pine forest disease.

It's the largest genome sequenced to date and the most complete conifer genome sequence ever published. It is described in the March issues of *GENETICS* and the journal *Genome Biology*.

The tree is the primary source of pulpwood and saw timber for the U.S. forest products industry.

The size and complexity of conifer genomes has, until now, prevented full genome sequencing. To sequence a genome, it must first be broken down into smaller, more manageable data pieces in order for computer programs to handle them. The pieces are then assembled and annotated – or described – as scientists look at each stretch of base pairs to see which genes are present, where they are on the genome and what they do. Different genes control different traits or characteristics in the living organism. The loblolly pine genome has 22 billion base pairs, while the human genome has 3 billion.

"It's a huge genome. But the challenge isn't just collecting all the sequence data. The problem is assembling that sequence into order," said David Neale, a professor of plant sciences at the University of California, Davis, who led the project.

John M. Davis, professor and associate director of the UF School of Forest Resources and Conservation, and Katherine Smith, a biological science technician with the USDA Forest Service's Southern Institute of Forest Genetics, took the lead in annotating the genes in a portion of the genome. They were looking for genes controlling resistance to fusiform rust, a disease that infects southern pines and renders them unfit for wood products. What they found was a whole family of resistance genes.

"Commercially, it is the most economically devastating disease of the southern pines," Davis said. "If growers didn't have genetic resistance, we would have no pine plantations – it's that important."

Florida's nearly 16 million acres of timberland supported economic activities that generated \$14.7 billion in economic impact in recent years and provided nearly 90,000 full- and part-time jobs. A molecular understanding of genetic resistance is a valuable tool for forest managers as they select trees that will develop into healthy groves. More than 500 million loblolly pine seedlings with these resistance genes are planted every year throughout the U.S.

The loblolly genome research was conducted in an open-access manner, benefitting all 31 researchers at 13 universities and institutes, even before the genome sequencing effort was completed. Data have been freely available throughout the project, with three public releases starting in June 2012.

The work was supported in part by the U.S. Department of Agriculture's National Institute of Food and Agriculture.

Davis said his work is not finished – and might never be – because annotating a genome is a process that goes on forever.

“It never stops because we are always adding meaning to the genome sequence as we learn about other genomes,” he said.

UFIT, IFAS Create Website to Gauge Value of Florida's Energy Projects

GAINESVILLE, Fla. — Floridians can learn extensive details about energy projects in the state with the help of a website created by University of Florida Information Technology and the Program for Resource Efficient Communities, known as PREC.

UFIT and PREC partnered last summer to create My Florida Energy Projects, which allows users to examine data from Florida's energy-saving projects. The website application, complete with maps, graphs, and other data, went live Sept. 30, 2013.

PREC, part of UF/IFAS Extension, promotes resources that allow communities to reduce energy consumption. The site provides data collected from projects funded by the American Recovery and Reinvestment Act. The application was created for the Florida Department of Agriculture and Consumer Services to help the public and policy makers determine which projects should be pursued in the future.

“The purpose of the My Florida Energy Projects website is to help Floridians understand the impacts of federal and state grant dollars for energy efficiency projects in the state,” said Nicholas Taylor, energy extension project coordinator for the PREC. “The website is intended to track cumulative energy savings and display the data in ways that help users understand the costs and benefits of each project over time.”

The site offers a map with regional project data, including grant dollars, energy saved, and dollars saved. The reported projects have saved 234,756 megawatt-hours in electricity so far, which is equivalent to the amount of energy it would take to power 21,662 homes for an entire year.

The website also includes graphs and charts with filtering abilities, an advanced search function and a glossary of terms. The graphs include the total amount of electricity saved compared with dollars spent and the total number of workshops, training, and education sessions offered throughout the state of Florida.

One energy-reduction project in Venice, Fla., has already received a 100 percent return on investment. The project combined a variety of methods, such as retrofitting buildings, installing energy-efficient light bulbs and educating the public about available energy audit and rebate programs. Besides providing data to understand which initiatives are yielding the greatest

results, My Florida Energy Projects allows municipalities and counties to share best practices related to energy efficiency and conservation matters.

“We hope that this website will allow the Florida Office of Energy to continue sharing information about projects across the state for years to come,” Taylor said.

UF’s Information Technology division hosts the application and will continue to support the project. The project team recently completed an enhancement to the site’s administrative features, such as the ability for authenticated users to update project data and add new grant programs. The design and development work was done by staff in UFIT’s Enterprise Systems department.

Dave Gruber, senior director of ES, noted the importance of not only making the information available, but of developing the online tools to use with the site.

“The My Florida Energy Projects website not only provides the public with valuable project data — it also provides the online evaluation tools necessary to examine and analyze the information,” Gruber said. “The coding work was as important to the project as the website development, because the tools help the public determine which energy methods are the most cost-effective and efficient. Our staff was extremely pleased to work on a project with statewide reach.”

For more information about the project, visit the My Florida Energy Projects website, or email IFAS energy extension project coordinator Nicholas Taylor.

FSU MagLab Researchers Make Superconducting Breakthrough



2 David Larbalestier,
director of the Applied
Superconductivity
Center.

Researchers at Florida State University's National High Magnetic Field Laboratory (MagLab) have invented a groundbreaking new way to process superconducting material — one that makes it far more useful for building high-powered magnets for facilities like the Large Hadron Collider at CERN, which was instrumental in proving the existence of the God particle.

The superconductor discovery was made by MagLab scientists and a researcher at CERN, the particle accelerator laboratory in Switzerland, and will be published in the April issue of Nature Materials. The article is also currently available online.

An image of the superconductor that’s causing all the excitement — a newly processed form of Bi-2212, or “bisco” — will also be featured on the journal’s cover.

Bisco is a complex high temperature superconducting material made of bismuth, strontium, calcium, copper and oxygen that is well known to superconduct (or transmit electricity without loss) at super-cold temperatures up to 90 degrees Kelvin or negative 183 degrees Celsius.

“This is the first time that any high-temperature superconductor has been made in the form that is the most useful for creating high-field magnets — a form that is round, multifilament, twisted and capable of being made in multiple architectures and sizes — without giving up the high-current density that is needed for making powerful magnets,” said David Larbalestier, the

director of the Applied Superconductivity Center and the lead investigator of the journal article. “For the very long lengths that are needed for magnet coils — hundreds of meters to kilometers in length — we have figured out a way to increase the critical current density by almost a factor of 10.”

Because most superconductors are used to make magnets, what matters even more than the temperature at which they become superconducting is the density of supercurrent (supercurrent flows without resistance and thus generates no heat or electrical loss) that can flow through wires made of the material.

Magnet engineers were previously using a form of bisco constructed in a superconducting ribbon processed in a complex way that minimized its capabilities. Now, by employing the MagLab’s new, pioneering process, they can make Bi-2212 into round wires.

Put another way, engineers were previously limited to wide “fettuccini” ribbons to build magnets, but now can choose skinny “spaghetti” wires. Magnet builders much prefer “spaghetti” to “fettuccine” because high current cables and complex winding shapes are much more feasible with round than with flat wires.

That means the newly processed MagLab bisco “spaghetti” can also carry far more electricity than its “fettuccini” predecessor.

“We’re talking current density of well over 500 amps per square millimeter,” said Larbalestier of the increase. By contrast, copper wiring in a house operates at 1 amp per square millimeter.

What makes the breakthrough even more valuable is that this technology already has industry-wide appeal. Oxford Superconducting Technology, for example, has a number of interested customers, and the researchers involved are providing processing details or process support so that the results can be replicated.

The discovery came through very careful study of the complex microstructure of the wires and correlation to the supercurrent density. The multiple investigators on the article, “Isotropic round-wire multifilament cuprate superconductor for generation of magnetic fields above 30 T,” include processing experts, microstructural experts and superconducting property measurement experts. They are Jianyi Jiang, Ulf Peter Trociewitz, Fumitake Kametani, Matthieu Dalban-Canassy, Maxime Matras, Peng Chen, Natanette C. Craig, Peter J. Lee, Eric Hellstrom at the MagLab and CERN scientist Christian Scheuerlein.

“We want to see this process used,” Larbalestier said. “We want to build lots of magnets out of Bi-2212, get the wire cost down, useable lengths way up and make Bi-2212 the precursor of new generations of round, twisted, multifilament high temperature superconductor wires that will revolutionize superconducting applications.”

The conductor research underpinning the breakthrough was supported by a grant from the U.S. Department of Energy’s Office of High Energy Physics in the framework of a multilab collaboration (Very High Field Superconducting Magnet Collaboration), in which groups at Fermilab, Brookhaven and Lawrence Berkeley Labs played major roles. The high field magnet work at the MagLab was financed by the National Science Foundation and the state of Florida.

UM: Magnetism and An Electric Field

University of Miami physicist and his collaborators describe a novel approach to switch on and off magnetism, which can lead to a new generation of better-performing electronic devices.
By Marie Guma-Diaz and Annette Gallagher

CORAL GABLES, Fla. (February 18, 2014) — There is a big effort in industry to produce electrical devices with more and faster memory and logic. Magnetic memory elements, such as in a hard drive, and in the future in what is called MRAM (magnetic random access memory), use electrical currents to encode information. However, the heat which is generated is a significant problem, since it limits the density of devices and hence the performance of computer chips.

Scientists are now proposing a novel approach to achieve greater memory density while producing less heat: by using an electric field instead of a current to turn magnetism on and off, thereby encoding the electrical devices.

The University of Miami researcher and collaborators did not discover electrical control of magnetism, but a new understanding of the phenomenon. The study shows how the electric field, and not the change in the electron density in the film (called doping), leads to control of magnetism in current experiments. The findings are published in the journal *Scientific Reports*.

“Our work shows a new path to using a magnetic capacitor which uses electric field to control magnetism,” says Stewart Barnes, physicist at the UM College of Arts and Sciences, and corresponding author of the study. “The energy dissipation involved is much lower than produced with an electric current, drastically reducing the heat.”

Electricity and magnetism are two aspects of the electromagnetic force. Ampère’s law says that when charged particles flow in a conductor, they produce a magnetic field. The intensity of an electric current flowing in a wire determines the intensity of this field near the wire. On the other hand, an electric field in the space around a given charge is given by Coulomb’s law. It determines the force on a second nearby charged particle. There is no charge flow.

Traditionally, magnetism is activated in an electromagnet by passing a current through a coil around a magnetic material. This coil generates a magnetic field. The new method uses a capacitor, a device used to generate an electric field, to control the magnetism of a magnetic material.

“With the electrical control of magnetism, you use a capacitor in which one element is magnetic and, simply by charging the capacitor, you change the direction of the magnetism, say from being in the plane of the film to being perpendicular,” says Barnes.

This property of magnetic materials, where the magnetization is oriented in a preferred direction, is called anisotropy. The new approach developed by the researchers is founded on a relativistic effect called Rashba spin-orbit coupling. The effect arises from the interaction between the spin of an electron and an electric field.

“We use this Rashba effect to produce a magnetic anisotropy, which leads to our control of magnetism,” says Barnes. “We produce the electric field, in part, by a proper choice of the magnetic and non-magnetic elements in our bi-layer and by generating an electric field with a capacitor.”

The new mechanism has been studied, theoretically, in sandwiches of magnetic materials and non-magnetic metals or semi-conductors. The analysis of a number of such sandwiches helps

answer technical questions associated with the control of magnetism of thin ferromagnetic films, as might be used in memory and logic devices.

Thin magnetic films with a controllable perpendicular magnetic anisotropy (PMA) have important applications, not only for MRAM and logic, but also for electromechanical devices, such as actuators, which are devices that transform an electrical signal into motion. For that reason, an internal electric field that can be used to engineer such a PMA is of great interests.

The researchers are planning experiments which verify the basic principles of the current study and to simulate the materials involved using a computer. The study is called “Rashba Spin-Orbit Anisotropy and the Electric Field Control of Magnetism” Co-authors are Jun’ichi Ieda and Sadamichi Maekawa, from the Advanced Science Research Center of the Japan Atomic Energy Agency, in Tokai, and CREST, Japan Science and Technology Agency, Sanbancho in Tokyo.

FAMU Awarded More Than 1.3 Million in USDA Grants

Florida A&M University (FAMU) has been awarded three grants worth more than \$1.3 million from the United States Department of Agriculture’s (USDA) National Institute of Food and Agriculture (NIFA).

FAMU was among a select group of land-grant institutions whose proposals were accepted under the grant program.

“For nearly 125 years, [FAMU] has played a vital role in ensuring access to higher education and opportunities for underserved communities,” said Agriculture Secretary Tom Vilsack. “These competitively-awarded grants support high-quality research, teaching and extension activities, and support the continued leadership of 1890 institutions in the fields of agriculture, the environment and public health.”

Two of the grants, which together exceed \$450,000, were awarded through the 1890 Institution Research, Extension and Teaching Capacity Building Grants Program. The grants will support the university's agricultural science programs while strengthening the linkage between other 1890 land-grant institutions, the USDA and private industry.

The third grant was awarded through the 1890 Facilities Grants Program. More than \$900,000 will be provided to FAMU to assist in acquiring and improving food science facilities, equipment and research libraries.

The grant dollars will contribute to the FAMU College of Agriculture and Food Sciences, and its Cooperative Extension Program's, continued efforts to play a critical role in teaching students to meet the high-quality, innovative research needs that are vital to the well-being of our nation's food, fuel and fiber.

FAMU Professors Neil James, Ph.D., Mehboob Sheikh, Ph.D., and Muhammad Haseeb, Ph.D., were the principal investigators for the grant proposals.

“The purpose of the grants are to continue capacity training, enhance faculty skills and develop new teaching techniques,” said Sheikh. “We want to be current with developing trends and technologies and with providing training for our students and hands-on learning experience in the laboratory.”

UF Selected: Energy Department Announces Student Teams, Location for Solar Decathlon 2015

IRVINE, Calif. – At an event today in Irvine, Calif., U.S. Deputy Secretary of Energy Daniel Poneman will announce the 20 collegiate teams selected to compete in the U.S. Department of Energy Solar Decathlon 2015 and unveil the competition’s location – the Orange County Great Park. The 20 teams from colleges and universities across the country and around the world will now begin the nearly two-year process of building solar-powered houses that are affordable, innovative and highly energy-efficient. Watch the event at University of California, Irvine at www.energy.gov/live.

“As President Obama made clear in the State of the Union address, we need an all-of-the-above energy strategy that creates a safer and more sustainable planet, while ensuring American students and workers have the skills they need for the challenging jobs of today and tomorrow,” said Deputy Secretary Poneman. “The Solar Decathlon provides the next generation of America’s architects, engineers, and entrepreneurs with the real world experience and training they need to strengthen U.S. innovation and support new, clean sources of energy.”

Over the coming months, the 20 Solar Decathlon teams will design, construct and test their houses before reassembling them at the Solar Decathlon 2015 competition site in Irvine. As part of the Solar Decathlon, teams compete in 10 different contests – ranging from architecture and engineering to home appliance performance – while gaining valuable hands-on experience.

In fall 2015, the student teams will showcase their solar-powered houses at the competition site, providing free public tours of renewable energy systems and energy-efficient technologies, products, and appliances that today are helping homeowners nationwide save money by saving energy. The solar-powered houses will represent a diverse range of design approaches; building technologies; target markets; and geographic locations, climates, and regions, including urban, suburban, and rural settings.

Since 2002, the National Mall in Washington, D.C., was the venue for five Solar Decathlons. In 2013, Solar Decathlon organizers extended the competition’s reach beyond Washington to showcase energy efficiency and renewable energy technologies to a new group of visitors and sponsors. The Orange County Great Park, located between Los Angeles and San Diego, hosted Solar Decathlon 2013 and welcomed more than 60,000 guests. For Solar Decathlon 2015, the Orange County Great Park was selected once again – providing the West Coast with another opportunity to experience the Solar Decathlon up close.

Broadly, the Solar Decathlon helps demonstrate how energy-efficient and renewable energy technologies and design save money and energy while protecting local communities and boosting economic growth. The Solar Decathlon also gives students a one-of-a-kind learning and training experience – giving them the tools they need to pursue careers in the growing clean energy industry.

Find more information on the Orange County Great Park at www.ocgp.org.

The following teams have been selected to compete in Solar Decathlon 2015:

California Polytechnic State University

California State University, Sacramento
Clemson University
Crowder College and Drury University
Lansing Community College and Kendall College of Art and Design of Ferris State University
Missouri University of Science and Technology
New York City College of Technology
Oregon Institute of Technology and Portland State University
Stanford University
State University of New York at Alfred College of Technology and Alfred University
Stevens Institute of Technology
University of Florida, National University of Singapore, and Santa Fe College
The University of Texas at Austin and Technische Universitaet Muenchen
University at Buffalo, The State University of New York
University of California, Davis
University of California, Irvine; Saddleback College; Chapman University; and Irvine Valley College
Vanderbilt University and Middle Tennessee State University
West Virginia University and University of Roma Tor Vergata
Western New England University, Universidad Tecnológica de Panamá, and Universidad Tecnológica Centroamericana
Yale University

The 20 student teams selected to participate in the U.S. Department of Energy Solar Decathlon 2015 include eight returning teams and 12 new teams.

The FLATE-FESC Annual Summer Camp Enters Its 4th Year This Summer

The Florida Advanced Technological Education Center (FLATE), a National Science Foundation Center of Excellence in high-technology manufacturing, is the go-to organization for manufacturing and advanced technical education, best practices and resources supporting the high performance skilled workforce for Florida's manufacturing sectors.



The FLATE-FESC Annual Summer Camp enters its 4th year this summer. The camps have been a huge success, with last year's camp boasting the highest attendance ever. with overwhelmingly positive feedback from both teachers and students. Thirty 7th and 8th grade students from Beth Shields and Pierce Middle Schools were treated to four days of exciting,

hands-on activities centered on capturing and keeping their interest in STEM (Science, Technology, Engineering and Math) subjects - specifically renewable energy.

By participating in the camp, students also learned about the many diverse and exciting careers available in the field of clean energy. Camp participants were all part of Hillsborough County School District's AVID (Advancement Via Individual Determination) Excel Program, consisting of first generation college-bound, English language learners. Students' feedback from the final camp survey illustrated strongly how much they learned about energy while at the same time having fun. Student comments included, "The experiments we did were a magnificent

experience for an 8th grader," "We got to be creative and at the same time learn something," "The thing I like about energy is we do these awesome projects of energy". One hundred percent of the students said that they learned new things about energy and 95% stated that they felt the camp would help them making future career choices with over half saying that they would consider a career in clean energy. We are looking into the possibility of adding a high school camp in 2015 following requests from teachers.

FLORIDA ENERGY NEWS

Natural-gas Breakthrough Could Lead to Cheaper Fuel

By Marcia Heroux Pounds, Sun Sentinel

A discovery in South Florida could lead to wider use of clean-burning fuels. Scientist Roy Periana, who heads the Scripps Energy Materials Center in Jupiter, has devised a more efficient method of converting the major components of natural gas into useable fuels. The discovery, announced Thursday, could open the door to cheaper, more abundant fuel with lower emissions, Scripps said.

"This is considered one of the Holy Grails of chemistry," said Periana, who said he has worked on the problem since the early 1990s. "If we can learn how to control the chemistry, we can have huge impact. The United States could move away completely from oil and build an economy on natural gas."

The research will be published Friday by the journal Science. Jim Robo, chairman and chief executive of NextEra Energy, parent company of Florida Power & Light Co., said the discovery is exciting.

"We share the strong belief that technology will continue to drive down the cost of energy in this country, improving efficiency, benefiting our environment and ultimately our customers," Robo said. "We are fortunate to have such a renowned research facility in our back yard."

FPL, the state's largest electric utility, is partnering with Scripps on a separate project focusing on clean energy. About 68 percent of the utility's electric generation runs on clean-burning natural gas, a spokesman said. FPL's plant at Port Everglades in Fort Lauderdale is being converted from oil-burning to natural gas.

While Scripps is known best for its research to defeat cancer and other diseases, the institute "is a teaching organization," Periana said. "We're also interested in creating technology that would benefit mankind."

The U.S. Department of Energy has said natural gas will replace coal as the largest source of U.S. electricity by 2035. Natural gas production is forecast to grow steadily, increasing 56 percent from 2012 to 2040, the U.S. Energy Information Administration said in December.

The U.S. and Canada are the only major producers of commercially viable natural gas. Currently, natural gas has to be heated to high temperatures to convert it to useable fuel. Producers have had to build expensive plants to convert it.

The plant can represent 70 percent of the cost of the product, Periana said.

Periana said he has figured out a way to use chemistry to get the molecules to react without using high temperatures.

But he said more research is needed before the process can be commercialized. Scripps could spin out a company or partner with an energy or chemical company. Either method would benefit Scripps, bringing revenue to hire scientists and potentially breakthroughs, he said.

"If we could locate that here in Jupiter, that would be fantastic," he said. A lab to continue the studies would cost \$2 million to \$3 million over three years, Periana estimates.

The county and state invested more than \$600 million in taxpayer-backed incentives to lure the Scripps Research Institute from La Jolla, Calif., to Palm Beach County. Scripps opened its permanent campus in 2009 and has had only limited success at commercializing its discoveries.

Gainesville Renewable Energy Center

By: Bradley Osburn

The Gainesville Renewable Energy Center biomass power plant has been at the center of a lot of controversy in the last few years, but what's not often talked about how the facility actually operates. Check out our tour of the facility.

LOCATION: 11201 NW 13th St.

WEBSITE: www.gainesvillebiomass.com

NUMBER OF EMPLOYEES: 46

HOW LONG IN CURRENT LOCATION: The facility was completed in October 2013 and began commercial operations in Dec. 17, 2013

WHAT THEY DO: GREC burns renewable wood materials to produce up to 102.5 megawatts of electrical power for Gainesville. It is a 24-hour operation, seven days a week.

FUN FACT: The plant does not use an incinerator, but a bubbling fluidized bed boiler that burns the wood and produces steam to power the steam turbine generator that produces electricity. It is designed to burn wood with a moisture absorption level of 40 to 50 percent.

Wood is offloaded from semi-trucks into enormous bins by chaining the trucks to a platform and using powerful hydraulics to lift the front of the truck over 75 degrees so that the cargo spills out into the open bins.

GREC is a "baseload power" facility, meaning that it meets the minimum power production necessary for GRU to meet the demand of its customers at any given time. With GREC, Gru's energy supply is more than 20 percent renewable.

The plant does not produce any wastewater and recycles its water in-system. GREC receives reclaimed water from the City of Alachua.

GREC runs at an electrical output of 70 to 102.5 megawatts. 100 megawatts is enough energy to power 70,000 homes.

GREC's Contained Emission Monitoring System ensures that no particulate matter spews out of the plant's stack. The visible emission from the tower is water vapor. Ash and particulate matter from the boiler is collected in vacuum bags and tested for chemical content.

New Electron Beam Manufacturing Facility Will Spur Economy, Experts Say

ROCKLEDGE – Mainstream Engineering has always been involved in cutting-edge research, particularly when it comes to thermal technologies.

Now, the Rockledge-based company is working on a new technology project that could bring worldwide recognition here, as well as millions of dollars in research funding and world-class scientists.

The project is called the Electron Beam Enabled Advanced Manufacturing Facility and it's scheduled to open in June. What will make the facility unique is that its electron beam technology was

previously inaccessible to those outside of classified government programs. Now the technology will be available for non-government use, presenting new opportunities for scientific research and technological innovation, said Robert Scaringe, Mainstream Engineering's founder.

"We basically have a golden egg," Scaringe said. "Hopefully, it will spawn a tremendous amount of manufacturing and research."

Scaringe goes so far as to say the facility could help transform Brevard's popular "Space Coast" moniker to the "Tech Coast."

How it works

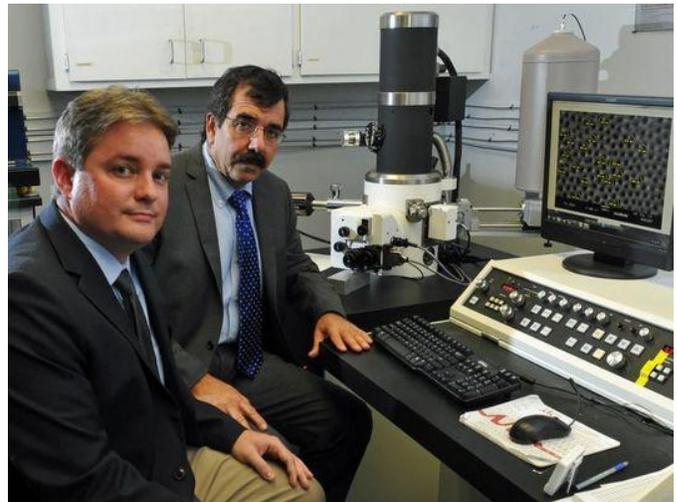
The main part of the electronic beam apparatus is a 22-foot long tubular-like machine.

"It will look like a giant ray gun and shoot into a giant vacuum chamber," propelling electron beams at whatever materials are being processed, Scaringe said.

When an electron beam collides with a material, it will cause a chemical reaction and create a luminous, multi-colored glow.

In engineering speak, electron beams — commonly known as e-beams — are streams of negatively charged, subatomic particles, and e-beam technology allows for the conversion of a natural material into "a state that normally does not occur in nature," according to Justin Hill, Mainstream's technology leader and manager.

What this means in practice is that e-beams can change the atomic structure of chemicals, giving them unique properties that are useful for engineering purposes. For instance, e-beams can be used to create solid substances which are both durable and flexible, a quality which is rare in natural elements but which is desirable for components of aerospace vehicles.



3 Robert Scaringe, right, is president and founder of Mainstream Engineering. Justin Hill is Technology Leader & Manager with Materials Science & Engineering. (Photo: TIM SHORTT/FLORIDA TODAY)

E-beam technology has a variety of potential applications, some of which have nothing to do with manufacturing. Hypothetically, people could harness the technology to test bomb detectors, create X-ray shields and develop alternative energy sources.

Local entrepreneurs will be able to access the facility for \$100 per hour, and Scaringe said the availability of this facility could make the Central Florida region a magnet for federal science grants and technology companies.

Financial backing

Mainstream's e-beam facility, which will be at the company's research complex off Yellow Place in Rockledge, has already attracted approximately \$2 million in grants, including:

- More than \$1.1 million from the U.S. Office of Naval Research;
- \$200,000 from the U.S. Department of Energy; and
- \$184,000 from NASA.

Local sponsors include Florida Institute of Technology, which contributed \$100,000; Space Florida, which kicked in \$65,000; and CareerSource Brevard, which forwarded \$64,800 to Mainstream for the e-beam project.

Several government agencies have expressed interest in giving additional grant money to the project if it goes well.

Those who partnered with Mainstream say that the company's technology is a significant advancement for the U.S. manufacturing industry.

"It's a small step in terms of job generation in the short run, but it's exactly what needs to be done to build the foundations for a more robust and sophisticated manufacturing environment," said Dale Ketcham, chief of strategic alliances at Space Florida.

David Steitz, a spokesman for NASA, said using e-beams could be revolutionary.

"The proposed processing technology can address and produce materials which are more flexible, lighter and safer," he said.

Sarwat Chappell, the free electron program manager of the Office of Naval Research, said that she saw promise in Mainstream's e-beam project because "it gives U.S. industry another avenue for maintaining its technology lead."

Chappell added that Mainstream's facility would be useful, because it would make the theft of American scientist's intellectual property less likely.

Ties to Florida Tech

Scaringe has always been a big supporter and research collaborator with Florida Institute of Technology. The e-beam facility should further those ties.

Frank Kinney, vice president for research at Florida Tech, said Mainstream's e-beam technology could facilitate academic research in a variety of subjects but most especially in physics and

chemistry.

Kinney said the facility could be used to calibrate atomic particle sensors and other precise scientific instruments and that these calibrations could have important academic repercussions.

Joe Dwyer, head of Florida Tech's physics department, agrees.

E-beams, for example, could help Dwyer solve the mystery of how lightning works and give him a glimmer of an idea about how to harness its electric power and protect people from its deadly force, he said.

"If you want to protect the public from lightning strikes, it helps to understand how lightning works," Dwyer said.

Kinney and Dwyer agreed that Mainstream's facility would attract researchers and top-notch grad students to Brevard, and they said that it was their hope that this would result in more federal grants.

"The reason we entered into a partnership with Mainstream is because it allows us greater access to federal funding," Kinney said.

U.S. ENERGY NEWS

Stanford Scientist Unveils 50-State Plan to Transform U.S. Energy Use to Renewable Resources

By Mark Shwartz, Precourt Institute for Energy

Feb. 15, 2014

Stanford University scientist Mark Jacobson has developed a 50-state roadmap for transforming the United States from dependence on fossil fuels to 100 percent renewable energy by 2050. He unveiled the plan on Feb. 15 at the annual meeting of the American Association for the Advancement of Science (AAAS) in Chicago.

"Drastic problems require drastic and immediate solutions," said Jacobson, a professor of civil and environmental engineering at Stanford. "Our new roadmap is designed to provide each state a first step toward a renewable future."

The motivation for the 50-state plan, he said, is to address the negative impacts on climate and human health from widespread use of coal, oil and natural gas. Replacing these fossil fuels with clean technologies would significantly reduce carbon dioxide emissions that contribute to global warming and spare the lives of an estimated 59,000 Americans who die from exposure to air pollution annually, he said.

In recent years, Jacobson and his colleagues have developed detailed proposals for converting the energy infrastructures of New York, California and Washington states to 100 percent wind, water and solar power by 2050.

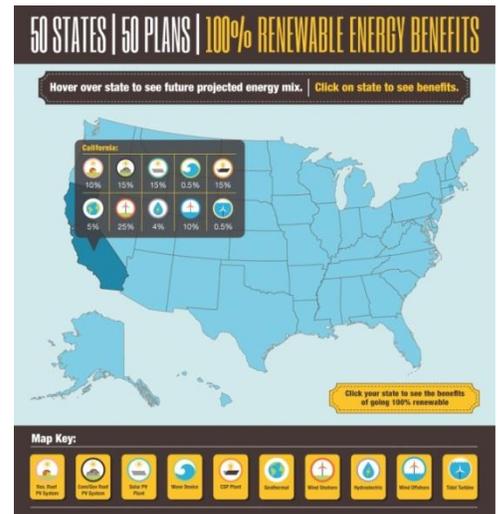
The new plan includes an online interactive map tailored to maximize the renewable resource potential of each of the 50 states. Hovering a cursor over California, for example, reveals that the Golden State can meet virtually all of its power demands (transportation, electricity,

heating, etc.) in 2050 by switching to a clean technology portfolio that is 55 percent solar, 35 percent wind (on- and offshore), 5 percent geothermal and 4 percent hydroelectric. Nuclear power, ethanol and other biofuels are not included in the proposed energy mix for any of the states.

“The new map provides all of the basic information, such as how many wind turbines and solar panels would be needed to power each state, how much land area would be required, what would be the cost and cost savings, how many jobs would be created, and how much pollution-related mortality and global-warming emissions would be avoided,” Jacobson said.

The 50-state plan has been posted on the website of The Solutions Project, a national outreach effort led by Jacobson, actor Mark Ruffalo (co-star of *The Avengers*), film director Josh Fox and entrepreneur Marco Krapels to raise public awareness about switching to clean energy produced by wind, water and sunlight. To publicize the plan, Ruffalo joined Solutions Project member Leilani Munter, a professional race car driver, at a Feb. 15 Daytona National Speedway racing event that Munter participated in.

“Global warming, air pollution and energy insecurity are three of the most significant problems facing the world today, said Jacobson, a senior fellow at the Stanford Woods Institute for the Environment and Precourt Institute for Energy. “Unfortunately, scientific results are often glossed over. The Solutions Project was born with the vision of combining science with business, policy, and public outreach through social media and cultural leaders – often artists and entertainers who can get the information out – to study and simultaneously address these global challenges.”



Commissioning Underway on Crescent Dunes CSP Plant

Commissioning has begun on Crescent Dunes, a concentrated solar power (CSP) project in the US claimed to be the largest of its kind in the world with molten salt storage capability.

Developer SolarReserve said the commissioning of its 110MW Crescent Dunes project near Tonopah, Nevada, marked the first step towards bringing the project into full commercial operation, which is scheduled for later this year.

SolarReserve said the project has five times the capacity output of pilot projects that have tested this technology.

It said the storage technology means the plant can operate without the need for any back-up generation from fossil fuel-powered facilities and provide power



4 Crescent Dunes, Nevada. Commissioning is under way. Image: SolarReserve.

on demand. Unlike other tower systems, it uses a dry cooling system that saves on scarce water resources.

The commissioning phase will include system-by-system verification and start-up, as well as equipment calibration and testing.

SolarReserve said commissioning activities underway at Crescent Dunes include energisation of the utility interconnection system and other electrical systems, as well as the first stages of testing and calibration of the heliostat field – the array of mirrors that track and concentrate the sun’s energy on to the molten salt tower, which produces super-heated steam.

"Start of commissioning of the Crescent Dunes solar power plant marks a critical milestone for the project as well as the solar industry. We are now able to build utility-scale power plants, fuelled only by the sun, which operate on-demand, day and night, just like traditional fossil fuel or nuclear power plants," said SolarReserve's CEO Kevin Smith.

"SolarReserve's industry-leading solar thermal energy storage technology solves the intermittency issue that limits the use of other renewable energy projects and thus enables firm, reliable delivery of electricity whether or not the sun is shining or the wind is blowing."

When complete, SolarReserve expects Crescent Dunes to generate 500,000MWh of electricity annually.

FESC Partner SECWC to Operate DOE's Southeast Regional Resource Center for Wind Energy

Raleigh, N.C. – The Southeastern Coastal Wind Coalition (SECWC) will lead the efforts for a U.S. Department of Energy Wind Energy Regional Resource Center (RRC) focusing on the Southeastern states. As one of six new Wind Energy Regional Resource Centers recently announced by the National Renewable Energy Laboratory, the Southeastern RRC will work to advance the wind industry in the Southeast by providing fact-based information to stakeholders, engaging electric utilities, engaging on wind energy permitting processes and preserving access to quality wind resources - both onshore and offshore.

The Southeastern RRC will be a joint effort of SECWC and several partners including the North Carolina Solar Center at N.C. State University, Clemson University, Coastal Carolina University, Georgia Institute of Technology, the Florida Energy Systems Consortium, James Madison University, Navigant Consulting and a network of over 80 affiliate organizations. These partners have long been reliable sources of unbiased information on wind energy and have a long history of stakeholder engagement in the region.

"Engaging a broad range of stakeholders who may have different views on wind energy is critical to growing the industry in a responsible way," said Mary Hallisey Hunt, Director of Operations - Strategic Energy Institute at the Georgia Institute of Technology. "The Southeastern RRC team represents a highly credible source of fact-based

information on wind energy that can help inform policy and permitting processes in the region.”

The Southeast is different from many other parts of the country with regard to both the opportunities and challenges of deploying wind energy. “The Southeastern RRC team has a keen understanding of market dynamics in the Southeast and has demonstrated the ability to constructively engage with a broad range of stakeholders around wind energy, including utilities, industry, supply chain companies, government, decision-makers, local leaders, and non-profits,” said Elizabeth Colbert-Busch, Director of Business Development at the Clemson University Wind Turbine Testing Facility.

By constructively engaging with stakeholders and building strong relationships with a broad range of partners throughout the region, SECWC has quickly become a trusted resource for information on wind energy in the Southeast. “The Southeastern RRC team has developed a strategic focus to specifically address the unique characteristics of the Southeast market,” said Brian O’Hara, President of the Southeastern Coastal Wind Coalition. “We are proud to join a great group of partners in creating this Southeastern RRC and we look forward to engaging with many more groups as we work to build up the wind industry in our region,”.

World's Largest Concentrating Solar Power Plant Opens in California

“The Ivanpah project is a shining example of how America is becoming a world leader in solar energy,” said Secretary Moniz. “As the President made clear in the State of the Union, we must continue to move toward a cleaner energy economy, and this project shows that building a clean energy economy creates jobs, curbs greenhouse gas emissions, and fosters American innovation.”

Ivanpah has the capacity to generate 392 megawatts (MW) of clean electricity -- enough to power 94,400 average American homes -- most of which will be sold under long-term power purchase agreements to Pacific Gas & Electric and Southern California Edison Company. The project is a joint effort by NRG, Google, and BrightSource Energy, and Bechtel served as the engineering, procurement, and construction contractor.

“This project was made possible by the successful public-private partnership between the Department of Energy and the project sponsors,” said Peter Davidson, LPO Executive Director. “Through partnerships like this, we can continue to build an innovative clean energy economy in the U.S.”

Ivanpah is one of five CSP projects that received loan guarantees from the Department, and when these projects are completed, they will provide a combined 1.26 gigawatts (GW) of electric capacity. These loan guarantees, are also helping to finance the first solar thermal storage project and the first power tower with solar thermal storage in the U.S., as well as some of the world’s largest parabolic trough CSP plants. In addition to construction, operations and maintenance jobs, these projects are creating jobs in a national supply chain that reaches 39 states.



5 Ivanpah, the world's largest concentrating solar plant, opened in California on February 13. Credit: BrightSource Energy

Currently, the LPO supports a large, diverse portfolio of more than \$30 billion supporting more than 30 closed and committed projects. The LPO portfolio includes one of the world's largest wind farms; several of the world's largest solar generation and thermal energy storage systems; the first new commercial nuclear power plant to be licensed and built in the United States in three decades; and more than a dozen new or retooled auto manufacturing plants across the country.

A "Remarkable" Project: Southern Co.'s Kemper Power

By Russell Ray

Later this year, Southern Co.'s controversial Kemper power plant will be placed online and the world will see how technology will turn coal-fired generation into an effective tool to combat climate change.

The 550-MW integrated gasification combined cycle (IGCC) facility in eastern Mississippi will be the first large-scale coal plant in the U.S. to use carbon capture and storage (CCS) technology. Kemper will convert lignite or brown coal, the dirtiest and cheapest form of coal, into a cleaner-burning syngas. Carbon dioxide (CO₂), the greenhouse gas scientists have linked to global warming, and other impurities are then stripped from the gaseous fuel before it is burned. The resulting emissions will be as low as those produced by a power plant fueled with natural gas. What's more, the captured CO₂ will be piped 62 miles south, where it will be used for enhanced oil recovery.

"Quite remarkable," U.S. Energy Secretary Ernest Moniz said after visiting the project back in November. "We're going to need not 10, maybe 100 more of these plants across the country."

The Kemper project represents a technological tool for suppressing climate change and preserving one of this nation's most abundant and reliable resources for power generation. The problem, though, is cost. At more than \$4 billion, the project's cost is more than a billion dollars over budget, according to Southern Co. subsidiary Mississippi Power. But the cost is sure to come down as more CCS projects, including SaskPower's Boundary Dam project in Canada and Summit Power's Texas Clean Energy Project, are deployed. To foster this mission, the U.S. Department of Energy has funded several demonstration projects and is providing up to \$8 billion in loan guarantees for CCS projects. The first deadline to apply is Feb. 28.

"Carbon capture is obviously an important part of what we're trying to do at the Department of Energy," Peter Davidson, executive director of DOE's Loan Program Office, said while speaking at POWER-GEN International 2013. "We really want to get the word out that the government is open for business with this \$8 billion solicitation."

Despite the progress made at Kemper, CCS remains a questionable technology and is not commercially viable on a national scale. A number of CCS projects have failed, primarily due to economics and disputes over government policy. But over time, the cost of CCS technology will come down and the technical challenges will be overcome with the help of DOE funding of further research and development.

While Kemper is an exemplary project that illustrates the promise of CCS as a technological solution to climate change, the U.S. Environmental Protection Agency's decision to establish the nation's first-ever limit on CO₂ emissions based on CCS technology is grossly premature. The limit - 1,100 pounds per megawatt-hour for coal plants - would be impossible to meet without building a costly CCS system. The agency pointed to Kemper, claiming the project is proof that CCS is ready for commercial deployment on a national scale.

But the technology used at Kemper was developed under a unique set of circumstances and cannot be replicated in other parts of the country. The CCS system at Kemper was developed by Southern Co. along with its partners and should not be used to establish a national standard for CO2 emissions.

Right now, CCS technology is not being used at a commercial-scale power plant anywhere in the U.S. Yet, the EPA is using the technology to establish environmental law. Under the Clean Air Act, any CO2 standard for new plants must be based on "the best system of emission reduction" that has been "adequately demonstrated."

At POWER-GEN International 2013, Amy Ericson, president of Alstom U.S., said the technology has not met that legal threshold just yet, because CCS providers are still unable to guarantee compliance. However, Ericson is confident the technology will be ready for large-scale commercial operation once more testing and demonstration is performed.

"There are projects moving forward throughout the globe," Ericson said. "It will reach commercial viability. It's just a matter of when."

The power sector and the U.S. government have not given up on research and implementation. They can't afford to ignore what many describe as the most important technological solution to climate change.

More Solar Power To Come for Georgia Power

Georgia Power is soliciting proposals through a combined Requests for Proposals (RFP) process to fulfill nearly 500 megawatts of utility-scale solar generation.

The RFP includes 70 MW to complete the Georgia Power Advanced Solar Initiative (GPASI) portfolio and 425 MW approved as part of the company's 2013 Integrated Resource Plan (IRP).

The RFP will be conducted with oversight by the Accion Group, Inc., which is serving as the Independent Evaluator for the process.

In the fall of 2012, Georgia Power proposed, and the Georgia Public Service Commission (PSC) approved, the company's GPASI program. The GPASI was launched with no regulatory requirement and with a market-based design that does not put upward pressure on customer rates. In 2013, as part of the company's IRP, the PSC approved an additional 525 MW of solar energy to be procured with similar requirements to prevent any upward rate pressures.

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.

DEPARTMENT OF ENERGY

[DE-FOA-0000979](#) - ADMINISTRATION OF THE WAVE ENERGY CONVERTER PRIZE

Issue Date: 03/10/2014

Concept Paper Deadline: 04/07/2014, 5:00PM, EST

Full Applications: 05/14/2014, 5:00PM, EST

- The Water Power Program is seeking a Prize Administrator with expertise in prize competitions to collaborate with DOE, technical experts, and a wave tank testing facility in developing and implementing the Wave Energy Converter (WEC) Prize.
- The WEC Prize competition aims to attract innovative ideas from developers new to the industry and next generation ideas from existing developers by offering a monetary prize purse and providing an opportunity for tank testing and evaluation of scaled WEC prototypes.

DE-FOA-0001023 - FOSSIL ENERGY RESEARCH AND DEVELOPMENTS

Issue Date: 03/13/2014

Application Due Date: 05/22/2014, 11:59PM, EST

- The intent of this Department of Energy (DOE), National Energy Technology Laboratory (NETL) funding opportunity announcement (FOA) is to solicit applications for selection and award in FY 2014 that focus on the following technical topic areas: (1) gas hydrate reservoir-response field experiments in Alaska and (2) field programs for marine gas hydrate characterization.
- These projects will support program goals and represent a critical component of advancing several of the specific mandates previously established for the Methane Hydrate Program under the Methane Hydrate Act of 2000 (as amended by Section 968 of the Energy Policy Act of 2005).

DE-FOA-0000971 - ENVIRONMENTAL STEWARDSHIP FOR RENEWABLE ENERGIES TECHNOLOGIES

Issue Date: 3/10/2014

Concept Papers Deadline: 4/7/2014, 5:00PM, EST

Full Application Deadline: 5/22/2014, 5:00PM, EST

- This FOA will support the development of instrumentation, associated signal processing algorithms or software, and integration of instrumentation packages for monitoring the environmental impacts of marine and hydrokinetic technologies. It will also support the development and testing of sensors, instrumentation, or processing techniques to collect physical data on ocean waves (e.g., height, period, directionality, steepness).
- The mission of the DOE Water Power Technologies Office (the Office) is to support research, testing, and development of innovative technologies capable of generating renewable, environmentally responsible and cost-effective electricity from U.S. water resources.

DE-FOA-0000966 - NOTICE OF INTENT: FUEL CELL TECHNOLOGIES INCUBATOR: INNOVATIONS IN FUEL CELL AND HYDROGEN FUELS TECHNOLOGIES

- The mission of the Fuel Cell Technologies Office (FCTO) is to enable the widespread commercialization of a portfolio of hydrogen and fuel cell technologies through applied research, technology development and demonstration, and diverse efforts to overcome institutional and market challenges. Fuel cell systems research and development (R&D) is working to reduce cost and improve durability for fuel cells used in transportation, stationary, and portable applications.
- To accomplish this mission, FCTO has developed a strategic plan, or multi year program

plan to identify the technical challenges and barriers that need to be overcome. These technical challenges and barriers form the basis for FCTO to issue funding opportunities announcements (FOAs) for financial assistance awards in these specific areas.

DE-FOA-0000997 - MICROGRID RESEARCH, DEVELOPMENT AND SYSTEM DESIGN

Issue Date: 01/31/2014

Application Due Date: 04/28/2014, 3:00pm EST

- The purpose of this FOA, issued by NETL, on behalf of the Office of Electricity Delivery and Energy Reliability, is to solicit R&D and testing of advanced microgrid controllers that will allow communities in the United States to develop/design commercial-scale microgrid systems. It is hoped that, ultimately, these (and other efforts) will facilitate communities deployment of microgrid systems that enhance reliability, sustainability, and economic value by allowing achievement of their specific objectives for energy resilience; and help meet the DOE targets.
- Projects proposed in response to this FOA are to be conducted within the States, District, Territories, and tribal lands of the United States. Moreover, proposed designs should significantly advance microgrid deployments in keeping with the DOE targets, rather than merely presenting marginal improvement of existing commercial or previously demonstrated technology.

DE-FOA-0001016 - LOW TEMPERATURE GEOTHERMAL MINERAL RECOVERY PROGRAM

Issue Date: 02/04/2014

Submission Deadline for Full Application: 05/02/2014, 5:00pm EST

- While geothermal power is an attractive potential source for sustainable energy production, the high heat temperature requirements (typically >150°C) of most geothermal capture systems constrain geographic distribution and economic viability of geothermal energy production. Advancement of strategic material or mineral recovery aims to address this limitation.

DE-FOA-0001051 - ADVANCED GASIFICATION AND NOVEL TRANSFORMATIONAL COAL CONVERSION TECHNOLOGIES

Issue Date: 02/21/2014

Application Due Date: 04/18/2014, 11:59:59pm EST

- The objective of this activity is to competitively solicit projects in novel technologies under the Gasification Program Area to support Department of Energy (DOE) strategic goals. This work will target technological advancements that will reduce the cost of coal conversion to hydrogen or chemical-grade syngas. These objectives will be explored through: (1) reducing plant capital/operation costs; (2) increasing overall plant efficiency; and (3) reducing the cost of lower greenhouse gas (GHG) emissions.

DE-FOA-0001089 - SCIENTIFIC DISCOVERY THROUGH ULTRAFast MATERIALS AND CHEMICAL SCIENCES

Issue Date: 02/21/2014

Application Due Date: 04/21/2014, 5:00pm EST

- The Office of Basic Energy Sciences (BES), U.S. Department of Energy (DOE), announces its interest in receiving applications from small collaborative groups of investigators for support of combined experimental and theoretical efforts to advance ultrafast chemical

and materials science.

- The purpose of this FOA is to stimulate application of the new ultrafast science capabilities utilizing x-rays, VUV, and other lower frequency sources. Proposals should describe hypothesis-driven research that uses the unique capabilities of ultrafast science. Collaboration teams performing both experiment and theory research are mandatory. Also mandatory are clear descriptions of management plans and performance metrics for assessing progress.
- Applications should propose research that will extend ultrafast techniques to uniquely attack a significant research problem. For ultrafast experiments, including pump/probe experiments, required sources must be readily available within the period of the proposed project. Applications focused on new source development, demonstration efforts, and/or systematic, exploratory surveys of broad scientific areas will be considered non-responsive.

DE-FOA-0001096 - SCIENTIFIC DISCOVERY THROUGH ADVANCED COMPUTING (SciDAC): MULTISCALE INTEGRATED MODELING FOR FUSION ENERGY SCIENCE

Issue Date: 03/06/2014

Application Due Date: 05/02/2014, 4:59 pm EST

- The Office of Fusion Energy Sciences (FES) and the Office of Advanced Scientific Computing Research (ASCR), Office of Science, U.S. Department of Energy (DOE), announce their interest in receiving applications from collaborative groups of investigators for developing an integrated simulation capability for fusion energy science. More specifically, applications are solicited for the development of advanced multiphysics and multiscale integrated simulation capabilities for magnetically confined plasmas addressing problems of direct relevance to burning plasma science and ITER.

DE-FOA-0000974 - BIOENERGIES TECHNOLOGIES INCUBATOR

Issue Date: 02/25/2014

Application Due Date: 05/23/2014, 5:00pm ET

- The mission of the Bioenergy Technologies Office (BETO) is to engage in research and development (R&D) and demonstration and deployment (D&D) activities to transform renewable biomass resources into commercially viable, high-performance biofuels, and bioproducts, and biopower that enable biofuels production. To accomplish this mission, BETO develops a strategic plan, or multi-year program plan to identify the technical challenges and barriers that need to be overcome.

DE-FOA-0000977 - CLEAN ENERGY MANUFACTURING INNOVATION INSTITUTE FOR COMPOSITE MATERIALS AND STRUCTURE

Issue Date: 02/25/2014

Application Due Date: 06/19/2014, 5:00pm ET

- The focus of the Institute resulting from this Funding Opportunity Announcement (FOA) will be low cost, energy efficient manufacturing and recycling of fiber reinforced polymer composites. The Institute will target continuous or discontinuous, primarily carbon and glass fiber composite, with thermoset or thermoplastic resin materials due to their superior strength and stiffness to weight ratios relative to other materials, and subsequent applicability to clean energy and industrial applications with potential impact to national energy goals. These types

of composites are foundational technologies that are broadly applicable and pervasive in multiple industries and markets with potential transformational technical and economic impact.

DE-FOA-0001018 - Solar Manufacturing Technology 2 (SolarMat 2)

Issue Date: 02/10/2014

Application Due Date: 04/30/2014, 5:00pm ET

- This FOA is intended to assist the development and demonstration of innovative manufacturing technologies that will increase the U.S. share of the global solar market and create competitive advantage for domestic manufacturers. Multiple innovations are required to reach the advanced technology scenario discussed in the previous section. The innovation could come, for example, from a company introducing an advanced manufacturing technology that lowers domestic PV module manufacturing costs or that lowers that of a product manufactured domestically for the global PV supply chain. The advantage could come from contributing to a dramatic increase in module performance; thereby lowering a product's cost per output power. Manufacturing technologies that decrease the cost or improve the performance of BOS components (not including power electronics) are also within the scope of this funding opportunity. Technologies that improve the installation process are also relevant.

UPCOMING EVENTS

Power Up Energy Expo | April 28-30 | Pensacola Beach, FL

The 2014 Power Up Energy Expo is coming to Pensacola Beach, Florida (April 28-30). Come be a part of the largest energy conference along the Gulf Coast! See attached for event details. For more details please visit www.PowerUpEnergyExpo.com



Current Federal employees and Active-Duty Military personnel receive free registration with special Promo Code.

Great sponsorship opportunities are still available. Showcase your company at Power Up.

Florida Energy System Consortium Workshop | May 12-13| Gainesville, FL

The 2014 Florida Energy Systems Consortium (FESC) Workshop is scheduled for May 12-13, 2014, at the Hilton University of Florida Conference Center in Gainesville, Florida.



FESC will financially support the hotel expenses for up to 84 oral presenters from academia. In addition, on a first-come, first-serve basis, FESC will financially support the hotel expenses for up to 66 poster presenters and attendees from academia including students. Students will share hotel rooms with other student attendees.

World Congress on Industrial Biotechnology | May 12-15 | Philadelphia, PA



The 11th Annual BIO World Congress on Industrial Biotechnology will take place May 12-15, 2014 in Philadelphia at the Pennsylvania Convention Center. BIO is proud to partner with PHLLife to bring this event to the Philadelphia area!

December 12, 2013- Deadline to submit an abstract

December 2013- Registration, housing & exhibit sales open

Early February 2014- Program Announced

March 31, 2014- Early Bird Registration Deadline

April 2014- BIO One-on-One business partnering open for attendees to schedule on-site meetings

May 12-15, 2014- BIO World Congress in Philadelphia!

Second Annual Go SOLAR Renewable Energy Fest | June 6-7 | Fort Lauderdale, FL

The Fest will be held on June 6 and 7, 2014 at the Greater Fort Lauderdale/Broward County Convention Center in Fort Lauderdale. This is the premier event in South Florida to promote and expand rooftop solar in Florida. For our second Fest, in addition to photovoltaics, we added topics such as thermal, biomass, energy efficiency, and wind energy and job creation to our agenda.



Note from the Editor

Thank you for reading Florida Energy Systems Consortium Newsletter and sharing this newsletter with your colleagues. We try to highlight developments in renewable energy technology and research all across Florida and the world. If you have any news you would like to see featured in the Newsletter, or events you would like to announce, feel free to e-mail floridaenergysystems@gmail.com for posting in the next newsletter and on the **FESC website**: www.floridaenergy.ufl.edu