FESC
Florida Energy Systems Consortium

FLORIDA ENERGY CONNECTIONS

Issue 2 • July 2010

Florida Energy Systems Consortium

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

www.floridaenergy.ufl.edu

352.392.0947

Inside this Issue

Welcome

Since our last newsletter, the FESC team has worked intensively toward the promise of leveraging FESC funds and expertise for Florida's sustainable energy future. Our institutions collaborated on two major multi-million dollar, multi-institutional Energy Innovation Hub proposals, each with substantial industry and national lab participation. The proposal, *Sunlight to Fuels Utilizing Complete Spectrum and Process Intensification*, or "SunFuelsHub," led by the University of South Florida, was submitted in March, while the *Integrated Building Efficiency Consortium* (IBEC), led by the Florida Solar Energy Center/UCF, was submitted in May. Additionally, FESC faculty members responded to a third Modeling and Simulation for Nuclear Reactors Hub announcement. We also completed our semi-annual report and presented it to the FESC Oversight Board on June 3. The full report, including progress reports from all of our FESC-funded projects, is available here.

We are also organizing the 2010 FESC Summit, which is set for September 28-29 at the University of Central Florida's Student Union. The summit will feature internationally renowned speakers, as well as presentations and posters highlighting our innovative research, education and outreach efforts. We have two timely pre-summit workshops in the planning stages; one will focus on technology transfer, entrepreneurship, and commercialization; the other will center on greenhouse gas reduction and energy conservation and will provide Professional Development Hours (PDHs) for Florida professional engineers. These workshops are planned for September 27 at the UCF Student Center. Program and registration information will soon be available on our website, www.floridaenergy.ufl.edu.

Powering Cars and the Grid
The Smart Solar Carport

Mounting solar panels on roofs is nothing new, but researchers at the University of Central Florida (UCF) have taken the idea one step further. And it's a step that will provide increased efficiency along with some much needed shade.

Dr. John Shen is a principal investigator with the smart solar carport project and a professor with the School of Electrical Engineering and Computer Science at UCF. Shen has been working with photovoltaic (PV) for years, and as part of his research with the Florida Energy Systems Consortium (FESC) he's pairing two important pieces of the electric power puzzle.

"On one hand, solar power PV has been a big thing coming to the market place," says Shen. "Another is the plug-in hybrid electric vehicle, or PHEV. We thought, why not combine the two?"

Please see Powering Cars and the Grid page 8

John Shen and graduate students at the solar carport.

Educating an Alternative Energy Workforce

Florida Energy System Consortium (FESC) is using a systems approach to develop a solution to Florida's 21st century energy needs. An important part of that need is the training and education of that energy sector workforce. By the nature of energy related technologies, as well as energy production and delivery, this workforce will be skills-driven and performance-tiered.

Making sure Florida's workforce is prepared for its energy future means those who will enter that workforce need to develop the necessary skills today. With the proper certificates, credentials, and degrees, not only will energy-related career prospects improve, but the industry sector will reap the benefits of a pool of skilled employees. FESC is partnering with FLATE, Florida Advanced Technological Education, to develop this lifelong learning pathway.

FLATE is one of 36 National Science Foundation (NSF) Advanced Technological Education regional Centers of Excellence and serves as a link among Florida's high tech manufacturing sectors, Florida's education system, Florida's Banner Centers, and a workforce ready for training. With an anticipated increase in renewable energy jobs in Florida, FLATE's involvement with technical workforce programs pairs well with the FESC's goal to prepare a qualified energy workforce and the organization's extensive outreach program.

Marilyn Barger, Ph.D., P.E., is the executive director and a principal investigator of FLATE, located at the Hillsborough Community College campus in Brandon, FL. Under her leadership, FLATE has developed a curriculum model that blends nationally recognized credential skills with Florida's two year AS and AAS degree structure, allowing articulation of 15 credit hours with the credential.

As a specific component of FESC's goal, FLATE partnered with Brevard Community College and drafted a curriculum that focuses on the skills needed to work in the alternative energy field. Once the curriculum is approved by Florida's Department of Education (FLDOE), other colleges in the Florida State College system

Please see FLATE page 9

Outreach Update

In-Service Training on Alternatively Fueled Vehicles

The UF Program for Resource Efficient Communities, in conjunction with FESC and the UF Office of Sustainability, conducted an in-service training for UF/IFAS County Extension faculty in Gainesville on March 18th dealing with energy issues and topics primarily centered on alternatively fueled vehicles (AFVs). As part of the training, companies/corporations/individuals with AFVs brought their vehicles to campus for viewing by the attendees and the general public as well as serving on a panel representing plug in hybrid electric vehicles, electric vehicles, solar electric low speed vehicles, as well as a solar bicycle and vehicles run off compressed natural gas, liquefied natural gas, liquefied petroleum gas, and biodiesel.

Glenn Edmonds with AVRC (a R&D group based in Danville VA / www.avrc.com), discusses the technology behind the Hymotion/A123 Plug-In Hybrid Prius and the Coulomb EV charging station that he had on hand for the event with UF.

Transitioning Florida to Clean and Renewable Energy

by Diane Gow McDilda

Moving the state from our current dependency on non-renewable energy to one that's both renewable and clean is a complicated task. A successful transition would move research out of the laboratory and into the hands (and homes) of Florida's citizens.

In an effort to do just that, the Florida Energy and Climate Commission (FECC), Florida's primary organization overseeing state energy programs and climate change policies, asked the Florida Energy Systems Consortium (FESC) to review existing statutory incentives supporting the deployment of energy efficiency and renewable energy in the state of Florida. The review needed to be comprehensive and also include review of current incentives, analysis of renewable portfolio standards, and development of strategies to overcome barriers to commercialization and project finance.

The goal of the report was to provide the Florida legislature and Florida Energy and Climate Commission with a springboard of information that would help move the state toward legislating and implementing energy efficiency and renewable energy programs. Multiple researchers were involved in the report and two of the areas studied included an objective review of the current mix of incentives offered by the state and federal government and financial barriers that deter clean sector technology development and large-scale commercialization.

Principal investigator, Dr. Julie Harrington, Director for the Center for Economic Forecasting and Analysis (CEFA) and Institute for Energy Systems, Economics, and Sustainability (IESES) at Florida State University, investigated the current mix of incentives available to homeowners and business-owners in Florida who installed energy efficient or renewable energy systems. Harrington worked with Dr. Bassam Awad, a former researcher at CEFA, and Zafar Siddiqui and Stephen Muscarella, both current researchers with CEFA.

There are multiple benefits to offering incentives, even on what might be considered a small-scale basis. As the name implies, by incentivizing Floridians to install energy efficient and renewable energy systems; power demands on the grid are reduced, and less greenhouse gases are produced. And businesses tend to locate near their clients, as the demand for renewable energy sources increase in Florida, so will the number of associated industries, bringing with them jobs and energy stability.

"If the demand is there," Harrington says. "There need to be additional funding mechanisms in place."

In considering the energy-related incentives offered by the state and federal government, Harrington and her group tallied up eight different state programs: the corporate tax credit; renewable energy production tax credit; renewable energy technologies investment tax credit; renewable energy property tax exemption; solar energy systems equipment sales tax exemption; renewable energy equipment sales tax exemption; renewable energy technologies grants program; and, the solar energy system incentives program. On a federal level, the group looked at the federal production tax credit along with deductions, depreciations, tax, credits, grants, and loans. The team looked at programs scheduled to sunset, and evaluated programs to determine where funds had been depleted or where a significant amount of money remained.

"The two areas that really rose to the top were renewable tax credits for hydrogen (stationary) fuel cells and rebates under the solar energy system incentive program," says Harrington. "Incentives for hydrogen fuel cells were all used up. Incentives for solar rebates were used up as well, and there was a long waiting list. On the contrary, funds available for hydrogen vehicles were not being used consistently year to year, and our thought was that it might be more advantageous to transfer those funds to solar rebates where they were in demand."

Two of the largest demands for solar projects came in the form of solar hot water heaters and photovoltaic systems. And while incentives for these projects do offer rewards, Harrington notes real movement in this direction could be propelled by clean energy standards or renewable portfolio standards (CES or RPSs) requiring utilities to provide electricity generated via renewable energy means. This along with renewing or extending the types of incentives offered could be the carrot that brings manufacturing firms to Florida.

Please see Transitioning Florida page 10

Renewable and Clean Energy Done Right

by Diane Gow McDilda

Tommy Boroughs, Partner, Holland & Knight, LLP; Member, FESC Advisory Board

As a Charter Member of the Advisory Board of the Florida Engineering Systems Consortium (FESC), Thomas "Tommy" Boroughs is an advocate for bringing clean and renewable technology to Florida and the jobs that come with it. And it's Boroughs' extensive involvement with energy that makes him an asset to FESC.

Boroughs is a partner with Holland & Knight, and has served as Chair of the Florida Energy Commission. He was on the Board of Orlando Utilities Commission and served as president from 2004 through 2006. He's also chaired the American Public Power Association's Policy Makers Council. And in 2007, he was appointed by Governor Crist to the Governor's Energy and Climate Action Team. Boroughs knows that Florida has the assets to be a leader in the clean and renewable energy market.

"Until 2009, Florida's economic growth depended on the sun, beaches, and low-cost land and labor, as well as no state income taxes. Tourism and growth industries like real estate and construction were the only sectors that really benefited from that scenario and that's just not sustainable," says Boroughs. "We need to focus on innovation, research and development, energy efficiency, cleantech, and renewable energy. And if we do this right, we can develop the economy and produce more jobs, all while protecting the environment."

When it comes to transitioning to clean and renewable energy businesses, Boroughs believes that that Florida is well suited, both in terms of location and natural resources, even when compared to other locales.

"Yes, we have different sun here in Florida, we have more clouds than what they have in the American Southwest," Boroughs says. "But we have a lot more potential for using the sun than Germany, and they're leading the world in solar power."

And solar is moving forward in Florida. Because of legislation passed in 2008, Florida Power & Light (FP&L) is currently constructing Next Generation Plants in DeSoto County, Martin County, and at the Kennedy Space Center, moving Florida into second place for the nation's solar energy production. As a result, 1,500 construction jobs were created, supporting a sector hit largely by the recession.

The project at the Kennedy Space Center is a partnering of FP&L and NASA and is expected to create 100 jobs while providing 10 megawatts of electricity. With a technical workforce already in place, it's a prime location to nurture and grow a cleantech hub. But a hub on the east coast doesn't mean the rest of the state is left out, especially when it comes to other renewable forms of energy, like biomass.

"Florida could be the Saudi Arabia of biomass," Boroughs says. "We have the waste, like citrus peels, forestry waste, and sugar cane waste. And we've got the land, the climate, and the rainfall to grow fuels like pine trees and eucalyptus."

With construction falling and taking timber sales with it, rural areas of the state stand to benefit from large-scale biomass projects. Florida has approximately 16 million acres of agricultural land that could be used to support a biomass market. By incorporating Florida-grown fuel, sustainable forests would continue to be maintained and not developed.

There are other sustainable and renewable energy sources that have potential in Florida; however, they have not reached the scalable levels of solar and biomass. Generating electricity from wind power would require installations along Florida's coast and even advocates of wind energy know that few people want to see windmills at the beach.

The same coastline that brings tourists to the state may also provide Florida with the benefits of power drawn from currents in the Atlantic Ocean.

Please see Done Right page 11

Evaluating the Impacts of Carbon Costs

by Diane Gow McDilda

Critical to addressing climate change is controlling greenhouse gas emissions, primarily CO_2. As a state, Florida has taken steps to reduce greenhouse gas emissions from prominent sources such as power plants. And with research performed by members of FESC, the economic impact curbing emissions will have on the state's utilities and residents can be projected.

In July of 2007, Governor Charlie Crist signed three Executive Orders to curtail the production of greenhouse gases. Legislation was passed the following summer putting Florida in position to mandate a reduction of CO_2 emissions within its borders. The specific method of reduction was not spelled out, and both a cap and trade program and a carbon tax were considered realistic options.

While now it looks as though a national program may take precedence over a Florida-specific one, either way Florida's utilities and residents will be impacted. The specific extent of that impact has yet to be determined, but researchers have started to determine the variables involved and potential outcomes.

Ted Kury, Director of Energy Studies with the Public Utility Research Center at the University of Florida teamed with Julie Harrington, Director of the Center for Economic Forecasting Analysis at Florida State University to determine the factors involved in reducing CO_2 emissions and the price of electricity. In cooperation with the Florida Department of Environmental Protection (DEP), Kury and Harrington developed an economic model to simulate the dispatch of electricity to the grid with respect to CO_2 emissions.

The model relies on operating characteristics such as the amounts and types of fuel used to generate electricity, the wholesale cost of the fuel, the amount of electricity used, and the changes in CO_2 emissions with respect to fuel-type.

"We built a model for dispatch to look at different carbon prices," says Kury. "When the price of carbon goes up, either through a tax or cap and trade, emissions go down. But we wanted to know the effects of those increases in carbon prices. And what cost is there a significant reduction?"

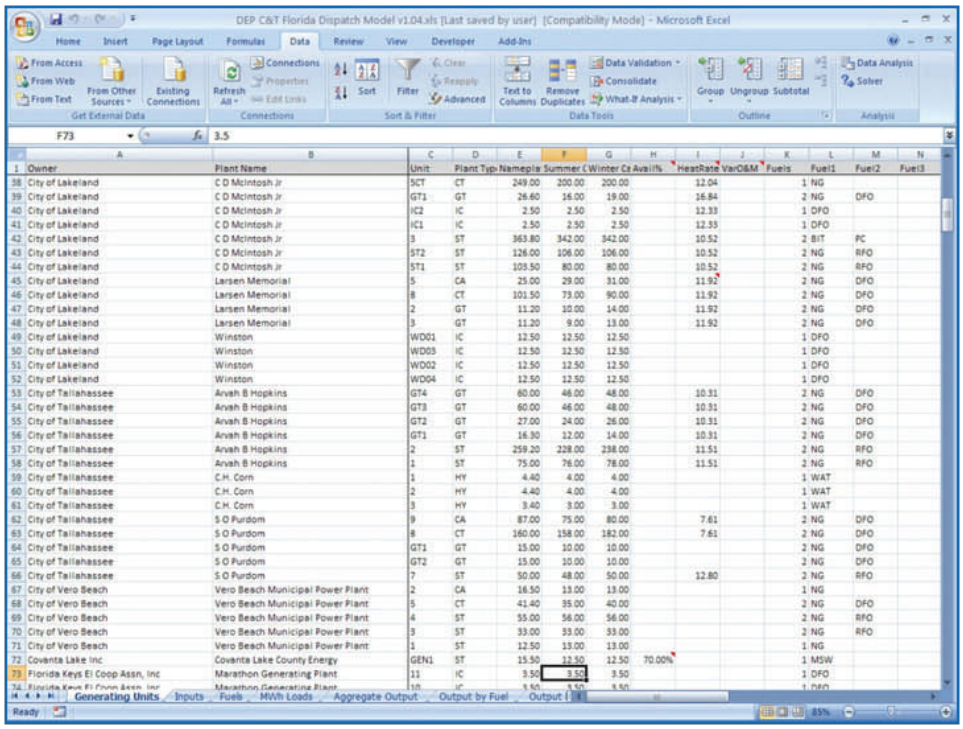
They found that the effects vary year to year.

"We have learned there are flat spots on the emissions curve, for the generation mix here in Florida," says Kury. "In 2011, when you start to increase the cost of CO_2 emissions from zero to $10 per ton, you will see a one to two percent reduction in carbon emissions."

The reduction is based on changing fuel sources, from higher CO_2 emitted fuels to lower. Petroleum coke produces more CO_2 than coal. With a relatively low carbon tax in place ($10 or less), petroleum coke will no longer be used providing a reduction in emissions at a relatively low cost.

"But once petroleum coke is gone, the carbon tax would have to increase to $40 or $50 per ton before the next significant carbon emission reduction would be seen," says Kury. "This is the point when natural gas would replace coal. This scenario could also have significant impact on the rate payers."

Please see Evaluating Impacts page 12



FSU Celebrates the Launch of the Renewable Energy Research Portal

Charles McClure, *Ian Douglas* and *Chris Hinnant* -project investigators.

FSU celebrates the launch of the Renewable Energy Research Portal. The portal identifies, organizes, and makes available, via a web portal, research generated by FSU's IESES as well as other research from participants in the Florida Energy Systems Consortium (FESC). The portal was officially launched on April 5, 2010 and is currently available at the following link. The project investigators are *Charles McClure*, *Ian Douglas* and *Chris Hinnant*.

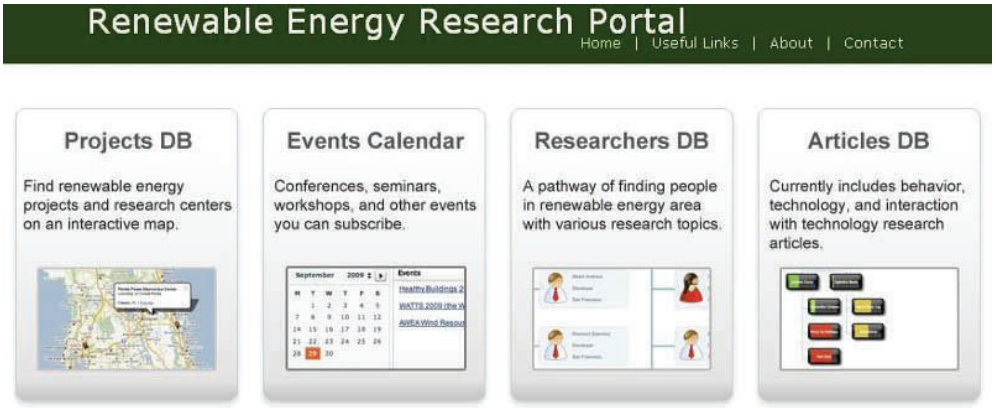


Image of the homepage of the Renewable Energy Research Portal.

The goal of the portal is to provide Florida researchers, businesses, investors, decision makers, and citizens with the research information they need to accomplish statewide energy goals.

The site is an operational web portal that identifies, organizes, and provides access to a range of research related to renewable and alternative energy information. It will use a range of social networking techniques to grow and sustain itself as an active information exchange for renewable energy researchers and stakeholders.

The development of the portal is the result of a collaborative effort between the Information Institute of the College of Communication and Information and the Knowledge Communities Research Group (KCRG) at the Learning Systems Institute at Florida State University. The portal's design is grounded in a needs assessment study of IESES and FESC researchers conducted by Information Institute staff during the spring and summer of 2009 and a software model developed as part of the Global Usability Knowledge Management project previously developed by the KCRG. The Renewable Energy Research Portal has functions that will allow it to grow and expand according to the needs of renewable energy partners in Florida. The project team wishes to invite all interested in renewable energy research and resources to use the portal and provide constructive feedback. The project team can be contacted by email at energy@cci.fsu.edu.

Powering Cars and the Grid

from page 2

The system developed by Shen and his colleague, Dr. Issa Batarseh, professor and director of UCF's School of Electrical Engineering and Computer Science, not only allows fixed transfer of direct current (DC) from the PV units to the vehicle batteries, but also provides the ability to transfer excess power produced by the PV units out to the grid.

The conventional method to charge PHEVs from PV involved a two step process. First, solar power, which is generated as DC, needs to be converted to alternating current (AC) because most homes are configured to operate on AC. And then the AC power is converted to DC again to charge the battery at the PHEV. But power is lost at each conversion, making a one-step transfer much more efficient.

"When you transfer power to the grid and then take it from the grid, you lose efficiency," Shen says. "When you transfer it directly from the solar cells you get considerable improvements in efficiency. The [percent] efficiency of transferring power from solar panels to the grid is in the low 90s. From the grid to charging a PHEV it's about 80 percent, which takes the total efficiency down to the low 70s. That means the efficiency going directly from the solar panel to the PHEV can be in the middle 80s. Considering solar power is only about 15 percent efficient, you want to maximize every bit of juice you can."

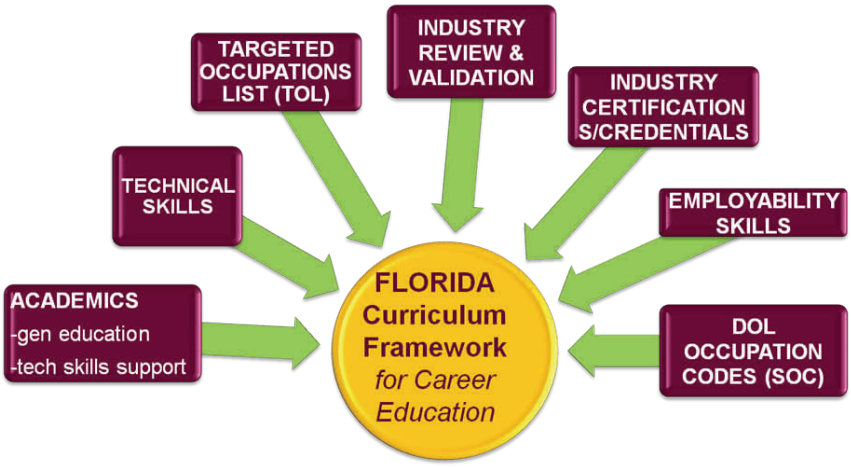
Because PHEVs are not readily available on the market, Shen and his group will initially use batteries as a load test to simulate the PHEVs. And when the batteries are completely charged, excess power collected from the solar panels will go out on the grid. The panels are expected to produce approximately 10 kW of power. Shen's calculations assume six hours on sunlight over 300 days in a year. With this, the system is expected to generate 18,000 kW-hours of electricity every year.

"This really boils down to a research project," says Shen. "It's been a real challenge to build up the energy conversion between all three components. We intend the research to go on for years, maybe the next 10 or 15, to test different concepts. And while the research is going on the carport serves as a practical parking spot."

The project includes four parking spaces in an existing lot near the center of UCF's campus (above). The architecture of the system is modular and can be expanded in pairs of parking spots. The construction of the first carport is complete and the group is in the process of transitioning the bench-scale electronics to the carport within the next six months.

To allow more realistic testing while reducing carbon emissions on campus, Shen is in negotiations with Toyota, Ford Motor Company, and GM and expects to receive PHEVs as they become available.

On March 2, 2010, the UCF Smart Solar Plug-in Facility was officially dedicated in conjunction with the launch of the first Ford PHEV in Florida, an event sponsored by Ford Motor Company and Progress Energy. Representatives from Ford Motor Company and Progress Energy were in attendance along with the Mayor of Orange County, Mr. Richard Crotty, and UCF President, Dr. John Hitt. Beyond acknowledging the work Shen has done with FESC, he hopes that this ceremony will foster an important dialog between the auto industry, power companies, and research institutions.



may choose to add this specialty to the degrees and coursework they currently offer.

The specialization concept is a unique concept developed by FLATE and integrated into the FL DOE approved AA or AAS degree in engineering technology. FLATE developed this original engineering technology 60 credit hour degree which has three components: general education; engineering technology core; along with specialization tracts. The focus on alternative energy will be included as part of the specialization tract. Alternative energy course work can also be used to earn a college credit certificate (CCC). This 15 credit hour certificate consists of technical courses only and provides a strong skills and knowledge background for technical alternative energy workers.

"The curriculum framework is centered on knowledge skills and competency, not specific classes," says Barger. "It is up to the colleges choosing to implement the program to define what classes they think will meet the criteria."

The FLDOE approved the alternative energy framework in March 2010. Education and subject matter experts at FLATE are already assisting community colleges with evaluating existing courses and developing new curriculum to support the new framework. It has already been adopted by Brevard CC for Fall 2010.

FLATE's model builds flexibility into its curriculum framework. Eighty percent of the competencies developed for these frameworks include specific requirements that concentrate on solar energy technologies, basic electronics, introductory information and skills for all alternative energy technologies, along with the knowledge of the regulations and good business practices important in this emerging industry. The remaining 20 percent can be determined by the individual colleges. This degree of freedom allows colleges to comply with approved degree frameworks and still choose to complete their curriculum based on alternative energy prospects of their local industries.

"Because solar is the main focus in Florida, in terms of alternative energy, the framework emphasizes it. The framework includes specific requirements for electronic skills, circuits, and photovoltaics," Barger says. "The remaining coursework can focus on other technologies like wind, geothermal, or biomass production, which might be emphasized in different parts of the state."

Besides preparing students for careers in the alternative energy sector, the program has other benefits. While it's anticipated that jobs in alternative energy will continue to grow, with current economic conditions, nothing is certain. To broaden job prospects, the degree can be applied to both alternative and more traditional forms of energy generation. And the two-year degree is transferrable. Students with an AS degree in engineering technology can transfer to a four year college to pursue a bachelor's degree in engineering technology or a Bachelor of Applied Science (BAS) degree.

Richard Gilbert, Professor of Chemical and Biomedical Engineering at the College of Engineering at the University of South Florida, member of the FESC Education Committee, and a co-principle Investigator for the NSF Grant that supports FLATE activities, summarizes the FESC education initiative as follows: "The way Florida develops, implements, and deploys its energy usage strategy is operationally dependent on the quality and expertise of the workforce Florida prepares to accomplish that task. FLATE represents a FESC resource that enjoys statewide recognition that already works with Florida's industry, education, and advanced technology workforce sectors. The FLATE training and education model is a perfect fit for the skills-focused regulation required energy industry."

From Transitioning Florida page 4

"We need a policy mechanism that brings renewable energies to the state," says Harrington. "A number of companies will take advantage of incentives offered here in Florida and then go to another state. We need to tie these incentives to production, based on units of output, to better ensure oversight and accountability. Additionally, the state should consider expanding certain state-sponsored programs and incentives already in place."

Erik Sander, Director of Industry Programs for the UF College of Engineering and former Associate Director of FESC, was tasked to lead another aspect of the project—to determine the barriers to commercialization and project finance for clean technology projects in Florida. Sander recruited the experience of Jack Sullivan, Jr. and Dr. Aster Adams to partner with him on the project. Sullivan is President of the Florida Research Consortium, a strategic partnership between Florida universities and the state's business community. Dr. Adams is the Director of Analytical Services for the Ohio Consumers' Counsel, the advocate agency for residential utility consumers.

Others involved with the project included dozens of individuals from academia, industry, incubators, government agencies, private equity groups, private donors, venture capitalists, investment bankers, and strategic thought leaders.

"At the end of the day," says Sander. "We want to help create an 'eco-system' that supports energy jobs in Florida and to provide unbiased data and recommendations for the legislature and other stakeholders in Florida's energy future. In order to do that, we have to understand where we as a state stand with relation to the nation in overcoming barriers to bringing renewable energy to the market."

As a team, they determined that the barriers to clean technology can be divided into three major groups: technology, finances, and policies.

"For the clean technology industry to thrive, the technology, capital, and policy must all be aligned—at all stages of development, for the transition to clean and renewable energy sources to be successful. Moving to alignment today, rather than tomorrow, makes success infinitely more likely in this nascent industry," says Sullivan.

Clean technology industries have grown over the last several years, due in large part to concerns over rising oil prices, energy security, and climate change. Government initiatives such as the American Recovery and Reinvestment Act which allotted $83 billion of the $787 billion package to clean technology, helps to spur industry growth.

When it comes to funding clean technology, developers often rely on their personal assets or those of family and friends to transition through the early stages of the process, from research and development, to demonstration and scale-up. However, outside investment is usually required to take the final leap to full-scale commercial deployment. And while local, state, and federal government incentives do exist in Florida, for the most part, they don't match those offered in other states, particularly those of similar economic standing.

"Florida has the fourth largest Gross State Product [GSP]," Dr. Adams says. "We looked at the availability of funds and reported on the funding gaps for all stage of clean technology development in Florida compared to what one would expect of a state with the nation's fourth largest GSP. Here in Florida, we just don't compare favorably in terms of amounts financed, current assets, and system inputs related to new technologies including clean technology."

Important issues to institutional investors include a combination of long-term carbon pricing to jumpstart a market for renewable energy resources, stable subsidies,, and tax breaks.

"In our report, we provided a number of recommendations to reduce the barriers to cleantech commercialization and project finance," says Sander. "From building partnerships between industry and universities, to allowing investors to earn tax credits for high risk investments, and by implementing policies that drive a clean energy demand we can recruit new energy industry to the state and create jobs."

Creating a sustainable demand for clean energy would provide stability to the market. Whether through implementing a renewable portfolio standard or clean energy standard, the state could enhance its role as a purchaser of clean energy and help drive clean technology market demand.

Florida has some distance to cover when it comes to converting to clean and renewable energy sources. If the state chooses to pursue "cleantech," it needs to act now to take advantage of strong federal support and the success of clean technology companies currently on the market. By reducing financial barriers, encouraging partnerships between research and industry, or enacting legislation, Florida can still be a pioneer in the clean energy market.

From Done Right page 5

"The Gulf Stream moves about six miles an hour," says Boroughs. "While that doesn't sound like much, water is much denser than air and can generate a significant amount of energy."

At its closest point, the Gulf Stream is about 15 miles off the coast and it stretches 20 to 30 miles wide. Because 70 percent of Floridians live near the ocean, the proximity of power generation to electrical demands are an added benefit. This technology is relatively new, especially compared to solar and biomass and research is continuing along with the evaluation for full-scale deployment.

Converting a portion of the state's energy portfolio to renewable and clean technologies is a first step in increasing job growth. Construction of renewable energy facilities does bring jobs, but the majority of jobs last only as long as it takes to complete the facility. To better serve the job market, Florida must look to encouraging the manufacturing of cleantech products.

"Manufacturers go where there is a market," says Boroughs. "With a renewable portfolio standard, Florida will build a market."

A renewable portfolio standard (RPS) is legislation that would require a certain percentage of electricity generated in Florida to come from renewable or clean technologies. An RPS would not stand alone when it comes to supporting manufacturing in Florida because the state has many other amenities.

"Florida has 14 deep water sea ports, numerous airports that support global transportation, and logistically we are close to Central and South America," says Boroughs. "Florida is very conducive to international transportation."

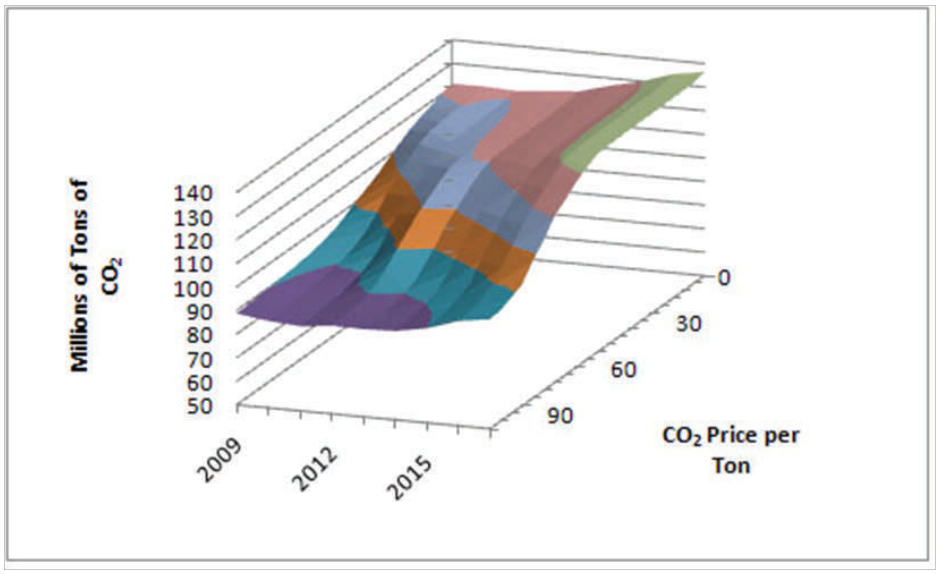
Other benefits include Florida's many hubs and centers, including ones like the Central Florida Research Park in Orlando that spans over 1,000 acres and is located adjacent to the University of Central Florida campus. The facility has an impressive list of high tech tenants and includes business offices as well as government and industry research centers.

"We can build on the hubs and centers we already have, focusing on innovation, research and development, energy efficiency, along with clean and renewable energy. This puts money back into the economy," Boroughs says.

Unfortunately, during the recent legislative session, no energy legislation was passed. There is speculation, however, that a special session could convene, offering another opportunity to address changes in Florida law that would encourage the use of renewable energy here in the state, while improving prospects for high tech employment. By diversifying our energy portfolio Florida can improve employment opportunities, bringing much needed stability to both.

"We can build on the hubs and centers we already have, focusing on innovation, research and development, energy efficiency, along with clean and renewable energy. This puts money back into the economy."

Tommy Boroughs



Without the model to anticipate how costs relate to emission reductions, policy makers could be unaware of the impact of the reductions that they impose. A relatively high increase in utility rates, with only a negligible reduction in emissions, would not only be disruptive to utility operations as well as rate payers, it cast a shadow on the reality of reducing the production of greenhouse gases.

While Kury admits that any cost for CO_2 emissions, whether in tax form or cap and trade, will ultimately be felt by consumers, he suggests that what is done with the revenue generated is an important part of the equation that is often overlooked.

"When people talk about the cost impacts of emissions reduction, they often make the implicit assumption that revenue generated from emissions is thrown away, but that's not a fair assumption. It can always be redistributed," Kury says.

He gives this example.

Suppose the average electrical utility bill is $200 a month. A carbon tax (either directly or as a result of a cap and trade system) could be enacted that increases that bill to $250 per month. This increase in cost would likely encourage homeowners to lower their electrical use, possibly to the extent that their monthly bill is reduced to $225 a month. If the government then refunded the carbon tax and returned an amount equal to $40 a month to the electric customers, the customers would then be paying $185 a month or $15 less than they were paying originally with no carbon tax in place. Those who don't adjust their consumption, of course, would pay more.

This is the case in British Columbia where residents receive a carbon dividend. Bills currently being discussed and debated in congress do not specifically identify how revenue generated from a carbon tax would be managed, but this is integral to the policy. If revenue is distributed as rebates for the purchase of energy efficient appliances, it could discriminate against those who can afford to purchase those appliances. And if used to reimburse those who make energy efficient home improvements, renters would be excluded. Policy decisions need to take all of these into consideration, and these considerations may prove helpful in reducing the negative perception of charging a carbon tax.

While it's not known when (or if) CO_2 emissions will be curtailed on a national or state level, Kury and Harrington's model will assist policy makers on evaluating realistic costs on Florida's economy, utilities, and rate payers.

"When people talk about the cost impacts of emissions reduction, they often make the implicit assumption that revenue generated from emissions is thrown away, but that's not a fair assumption. It can always be redistributed."

Ted Kury

Renewable Ocean Energy & the Marine Environment
Responsible Stewardship for a Sustainable Future

Hosted By:
Center for Ocean Energy Technology at
Florida Atlantic University

November 3-5, 2010
PGA National Resort, Palm Beach Gardens, FL

TOPIC AREAS

Oceanography
Resource assessment; effects of energy extraction on the resource

Benthic Environments
Sedimentation concerns, deep coral reefs

Pelagic Environments
Flora and fauna, protected species (mammals, turtles) and coupling between the pelagic and benthic environments

Coastal Environments, Reefs, Fish
Aggregating devices (FADS), fish migrations, spawning

Social and Economic Implications
Socioeconomic opportunities, navigation concerns, aesthetics

Data Management
Data collection, information management, role of marine spatial planning

To explore cutting-edge science and technology and to identify gaps in the current state of the knowledge regarding the environmental impacts of ocean energy

For more information, or to sign up to receive additional updates, please visit us at:
http://www.ces.fau.edu/conferences/coet