Florida Energy Systems Consortium

October 2013

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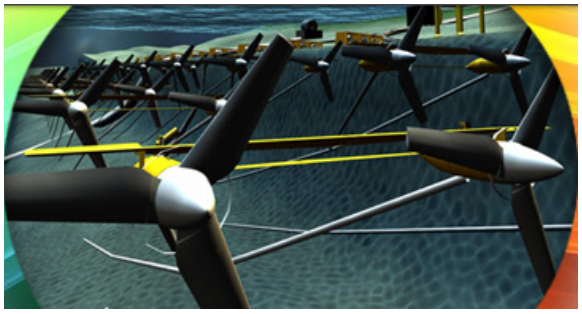
FESC BRINGING ENERGY SOLUTIONS TO FLORIDA THE NATION AND THE WORLD

www.floridaenergy.ufl.edu

The Florida Energy Systems Consortium promotes collaboration among the energy experts at its 11 supported state universities to share energy-related expertise. The consortium assists the state in the development and implementation of an environmentally compatible, sustainable, and efficient energy strategic plan. The Consortium ***performs research and development on innovative energy systems that lead to alternative energy strategies, improved energy efficiencies, and expanded economic development for the state***. The legislature appropriated funding for research at five of the universities as well as support for education, outreach, and technology commercialization. The Consortium reports to and provides guidance on an as needed basis to the Florida Legislature, Executive Office of the Governor, and the Florida's Office of Energy housed in the Florida Department of Agriculture and Consumer Services.



Overarching to the Consortium's research strategy is an energy systems approach which identifies innovation opportunities, prepares an energy workforce, and guides economic development. Through collaborative research and development across the State University System and the industry, the goal of the consortium is to become a world leader in energy research, education, technology, and energy systems analysis.

SUMMARY OF FESC ACTIVITIES

FESC brings Florida statewide faculty together for energy research and also connects Florida industry with university research expertise and facilities, resulting in improved technology transfer and commercialization. Continued financial support for FESC and the development of advanced energy technologies are critical for the state to achieve its economic growth targets and become a national leader in energy research and technology commercialization.

Key activities include:

Research

- Manage state-funded energy and technology commercialization research projects at Florida state universities
- Link Florida energy industry, faculty members, incubation networks, and investors for collaborative proposal development and collaborative research via the FESC network
- Provide federal, state and other grant support to the FESC network partners

Industry Program

- Connect Florida's energy industry to statewide faculty members in order to meet the energy industry's technical needs
- Facilitate the commercialization of university energy-related technology
- Maintain the Florida energy industry database: http://www.floridaenergy.ufl.edu
- Introduce new Florida-based energy companies to funding sources and mentor networks
- Disseminate the Florida University User Facilities and Patents Catalogs (posted at FESC and FL-CAN web sites) to the Florida industry.

Education and Outreach

- Provide leadership for and the facilitation of the development/delivery of energy education and outreach efforts across the state
- Disseminate information to the Florida public through Fact Sheets, the FESC web site, and training.
- Meet education needs within Florida's energy industry through education of students (future employees), workforce training, short courses and workshops.

Florida Statute requirements

- Assist Florida Office of Energy in meeting 2012 Florida Statute 570.0741, 2011 Florida Statute 377.703, and 2008 Florida Statute 1004.648 requirements.

Database

- Maintain database of FESC network (industry, academia, etc.) contacts and energy research reports/presentations

Workshop and Summit

- Hold an annual technical workshop to increase awareness of energy research. Assist the Florida Office of Energy with the Florida Energy Summit planning.

SUMMARY OF FESC SUCCESSES

FESC is unique in the US; no other state has a statewide energy consortium involving all of its universities. The state of Florida has wisely pioneered the concept of combining its university resources into one statewide center to advance energy research, technology transfer/commercialization, energy education, and outreach in this rapidly changing and critically important field.

Since its inception in 2008, FESC has successfully promoted and forged collaborations among energy experts across Florida's universities, Florida industry, and other Florida state entities. These collaborations have led to a large, diverse, and comprehensive FESC network, resulting in alternative energy strategies, improved energy efficiencies, and expanded economic development opportunities within the state.

Key outcomes include:

- Leveraging of the initial $38 million state appropriation in 2008 to obtain an additional $373 million in energy research funding from third parties to entities in the state of Florida
- Translation of this energy research funding into 376 invention disclosures and 89 energy technologies licensed to industry
- Creation of 26 start-up companies in the energy sector
- Involvement in energy research and technology development by over 270 companies, over 300 university faculty, and over 130 research parks, investors, entrepreneurs and government laboratories from within the FESC network
- Conducted 69 energy workshops for Florida industry education and training
- Delivery of 30 continuing education classes for Florida licensed building contractors and architects to help them better understand energy use in various building environments
- Dissemination of more than 50 Fact Sheets and two books informing the Florida public of both how to modify their energy use and avenues for funding energy efficiency improvements
- Educating, through their direct involvement in energy-related research and technology projects, over 300 undergraduate and post-graduate students at Florida universities
- National dissemination of FESC research results (over 1000 publications and over 1000 presentations) that have promoted Florida's energy capabilities and technical leadership throughout the US – thus helping to attract energy industry and energy funding to the State

FESC LEADERSHIP TEAM

Dr. Jennifer Sinclair Curtis, Interim Director

Dr. Curtis is Distinguished Professor of Chemical Engineering and Associate Dean for Research in the College of Engineering at the University of Florida (UF). Professor Curtis received a B.S. in Chemical Engineering from Purdue University (1983) and a PhD in Chemical Engineering from Princeton University (1989). She has an internationally-recognized research program in the development and validation of numerical models for the prediction of particle flow phenomena. She is the co-author of over 100 publications and has given over 160 invited lectures at universities, companies, government laboratories and technical conferences. Professor Curtis is a recipient of a Fulbright Senior Research Scholar Award, a NSF Presidential Young Investigator Award, the American Society of Engineering Education's (ASEE) Chemical Engineering Lectureship Award, the Eminent Overseas Lectureship Award by the Institution of Engineers in Australia, the ASEE's Sharon Keillor Award for Women in Engineering, and the AIChE Fluidization Lectureship Award. She currently serves as Associate Editor of the *AIChE Journal* and on the Editorial Advisory Board of *Industrial & Engineering Chemistry Research*, *Powder Technology* and *Chemical Engineering Education*. She has served on the National Academy of Engineering's (NAE) Committee on Engineering Education and has participated in two NAE Frontiers of Research Symposiums (2003 and 2008). Currently, she is Co-Chair of the National Academies' Chemical Science Roundtable and serves on the Governing Board of the Council for Chemical Research. She is a Fellow of AAAS, AIChE and ASEE.

Ms. Canan "Janan" Balaban, Associate Director

Ms. Balaban holds BSc. and MSc. in Chemical Engineering and has served for over 20 years in industry as an engineer, research scientist, and manager. Her industrial experience includes rechargeable batteries, sol-gel technology, phenolic resins, bio-mass, coal desulfurization, gasification, and sintering. She has transferred a number of technologies from research to manufacturing and has three patents and one trademark. Ms. Balaban joined the University of Florida in 2003 and managed the $10M NASA funded Hydrogen Research Program until March 2008. During this period she has facilitated the establishment of the Florida Institute for Sustainable Energy and its Energy Technology Incubator (State Center of Excellence). She served as the Associate Director of Florida Institute for Sustainable Energy at the University of Florida until she joined the Florida Energy Systems Consortium in Jan 2009.

FESC STEERING COMMITTEE MEMBERS

(UNIVERSITY LEADS)

FESC's Steering Committee members consist of representatives of the 12 State University System institutions and a member from the Florida Office of Energy.

Charles Weatherford, Professor and Chair, Department of Physics, FAMU

Dr. Weatherford's group performs theoretical and computational research in atomic, molecular, condensed matter, and plasma physics. They are interested in bound-state and continuum processes describing electron collisions with atoms and molecules, atomic ion collisions with atoms and molecules, and single photon and laser interactions with atoms and molecules. In particular, they are interested in laser quantum control of atoms and molecules for remote sensing of nuclides, explosives, and drugs.

Camille E. Coley, JD, Assistant Vice President for Research and the Associate Director for the Southeast National Marine Renewable Energy Center, FAU

Camille E. Coley, J.D., serves as Assistant Vice President for Research and the Associate Director for the Southeast National Marine Renewable Energy Center at Florida Atlantic University (FAU). At FAU, Ms. Coley directs the Division of Research's Program Development by overseeing the internal awards programs for researchers, holding workshops and seminars to support research activities, and engaging external sponsors. She is actively involved in the University Committee by serving as a liaison to the University Research Committee, the University Safety Committee, University Facilitates Committee and the Diving and Boating Safety Committee. She manages the regulatory activities of the Southeast National Marine Renewable Energy Center with federal, state and local governmental organizations as well as the Center's outreach and education programs. Further, Ms. Coley was a member of the Governor's 21-member Action Team on Energy and the Environment, and currently serves on the Federal Advisor Committee to the U.S. Global Climate Program.

Joseph Simmons, Backe Chair in Renewable Energy FGCU

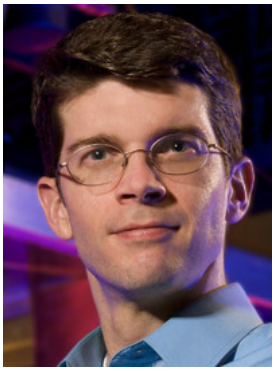
Dr. Joseph H. Simmons is the FGCU's Backe Chair in Renewable Energy. He holds a Ph.D. in Physics from the Catholic University of America, a Master of Science in Physics from John Carroll University, and a Bachelor of Science from the University of Maryland. A fellow of the American Ceramic Society, his research experience includes serving as Research Physicist for NASA at the Lewis Research Center in Cleveland, Ohio and Senior Physicist for the National Bureau of Standards in Washington, DC. Simmons is a recipient of the George

W. Morey Award for Research Excellence (American Ceramic Society), the Excellence in Engineering Teaching Award from the Florida Chapter of Alpha Sigma Mu, the Ford Motor Company Outstanding Research Award, and was named to the Greaves Walker Honor Roll. Dr. Simmons was leading the Arizona Research Institute for Solar Energy (AzRISE) at the University of Arizona prior to this position.

Osama A. Mohammed, Director, Energy Systems Research Laboratory and Professor, FIU

Professor Mohammed received his Master and Doctoral degrees in Electrical Engineering from Virginia Tech in 1981 and 1983, respectively. He has performed research on various topics in power and energy systems in addition to computational electromagnetics and design optimization in electric machines, electric drive systems and other low frequency environments. He performed multiple research projects for several Federal agencies since 1990's dealing with; power system analysis, physics based modeling, electromagnetic signature, sensorless control, electric machinery, high frequency switching, electromagnetic Interference and ship power systems modeling and analysis. Professor Mohammed has currently active research programs in a number of these areas funded by DoD, the US Department of Energy and several industries.Professor Mohammed is a world renowned leader in electrical energy systems and computational electromagnetics. He has published more than 350 articles in refereed journals and other IEEE refereed International conference records. He is an elected Fellow of IEEE, an elected Fellow of the Applied Computational Electromagnetic Society, the recipient of the prestigious IEEE Power and Energy Society Cyril Veinott electromechanical energy conversion award, the 2012 outstanding FIU research award, and author of book chapters.

William S. Oates, Associate Professor, Department of Mechanical Engineering, FSU



Dr. Oates received his Ph.D. in Mechanical Engineering from Georgia Institute of Technology in 2004. He spent two years as a post doctorate researcher in the Department of Mathematics at North Carolina State University from 2004-2006. He joined the Department of Mechanical Engineering at Florida State University (FSU) in 2006. He is also an associated faculty with the graduate program in Materials Science at FSU. His research interests include experimental and theoretical solid mechanics, simulation of functional materials across quantum to continuum scales, and nonlinear control of smart materials and adaptive structures. He has received the ASME Gary Anderson Early Achievement Award, the NSF CAREER Award, and the DARPA Young Faculty Award.

Jeanne Viviani, MPA, Director, Research Programs and Services, NCF

Jeanne Viviani is the Director of the Office of Research Programs and Services at New College of Florida. Coming on board in September 2003, she established the first ever sponsored research office. Her office handles pre-award and post-award (except for grant accounting which is handled through their Business Office). As the Human Protections Administrator for the NCF Institutional Review Board, she processes and reviews student protocol applications for using human subjects. Ms. Viviani is also the primary point of contact for nationally competitive scholarships and fellowships such as Fulbright, Rhodes, and others. Prior to New College, she has worked in many different government offices such as the Department of Navy with the U.S. Marine Corps,

the U.S. District Court in the Middle District of Florida, Psychosocial Oncology at H. Lee Moffitt Cancer Center and the Hillsborough County Public Defender's Office.

David Block, Director Emeritus and Professor of Engineering, Florida Solar Energy Center, UCF

Dr. David Block is Director Emeritus of the Florida Solar Energy Center (FSEC) having served as Center Director for over 25 years. As FSEC's Director, he was responsible for leading all of the Center's activities and research efforts. At the present time, he is leading the U.S. Department of Energy's (DOE) Southeast Solar Training program. He has also lead the DOE funded Florida Hydrogen Initiative, the DOE Engineering Technology Hydrogen and Fuel Cell Education program, the UCF portion of the Florida Energy System Consortium and was the coordinator and manager of the five-year, 28 million dollar NASA grant for Florida universities. His present research interests are in the areas of electric vehicles and the smart electrical grid. He has 100s of publications and presentations on solar, hydrogen and education technologies.

Issa Batarseh, Professor, UCF

Dr. Issa Batarseh is a Professor of the Department of Electrical Engineering and Computer Science at the University of Central Florida (UCF). He received the Ph.D., and M.S. in Electrical Engineering and the B.S. in Computer Engineering and Science from the University of Illinois at Chicago in 1983, '85 and '90, respectively. Dr. Batarseh was a visiting Assistant Professor at Purdue University, Calumet, from 1989 to 1990 before joining UCF in 1991. Dr. Batarseh's power electronics research focuses on the development of advanced systems for solar energy conversion to improve cost, power density, efficiency and performance. The research includes the analysis and design of high frequency dc-ac inverters, resonant converter topologies; low-voltage dc-dc converters, small signal modeling and control of PWM and resonant converters; power factor correction techniques; power electronic circuits for distributed power systems applications. He has published several patents, and many journal and conference papers and a textbook entitled Power Electronic Circuits in 2003 with John Wiley.

Sean Meyn Professor and Robert C. Pittman Eminent Scholar Chair, UF

Meyn received the B.A. degree in mathematics from the University of California, Los Angeles (UCLA), in 1982 and the Ph.D. degree in electrical engineering from McGill University, Canada, in 1987 (with Prof. P. Caines, McGill University). He is now Professor and Robert C. Pittman Eminent Scholar Chair in the Department of Electrical and Computer Engineering at the University of Florida, the director of the *Laboratory for Cognition & Control*, and director of the *Florida Institute for Sustainable Energy*. His academic research interests include theory and applications of decision and control, stochastic processes, and optimization. He has received many awards for his research on these topics, and is a fellow of the IEEE. He has held visiting positions at universities all over the world, including the Indian Institute of Science, Bangalore during 1997-1998 where he was a Fulbright Research Scholar. During his latest sabbatical during the 2006-2007 academic year he was a visiting professor at MIT and United Technologies Research Center (UTRC). His award-winning 1993 monograph with Richard Tweedie, Markov Chains and Stochastic Stability, has been cited thousands of times in journals from a range of fields. The latest version is published in the Cambridge Mathematical Library. For the past ten years his applied research has focused on engineering, markets,

and policy in energy systems. He regularly engages in industry, government, and academic panels on these topics, and hosts an annual workshop at the University of Florida.

John Kantner, Assistant Vice President for Research, UNF

John Kantner, Ph.D., joined the University of North Florida in August 2013 as the Assistant VP for Research. Prior to that, he was VP for Academic & Institutional Advancement at the School for Advanced Research in Santa Fe, NM, an independent center for research in the social sciences and humanities. From 1999 to 2006, Dr. Kantner was a faculty member in the Department of Anthropology & Geography at Georgia State University in Atlanta, where he achieved the rank of associate professor with tenure prior to his departure. Dr. Kantner received his doctorate from the University of California–Santa Barbara, where he studied archaeology, anthropology, geography, geochemistry, and evolutionary theory. His research focuses on the archaeology of ancient societies, with a particular interest in the processes by which complex social and political regional institutions emerged from communities of comparatively simple horticulturists. His research is explicitly comparative, and he has collaborated on projects throughout the US, as well as in Costa Rica and Peru. In addition to several books, Dr. Kantner's research appears in journals such as Human Nature, Journal of Anthropological Archaeology, Journal of Anthropological Research, Journal of Archaeological Research, Journal of Archaeological Science, and Historical Archaeology.

Yogi Goswami, John and Naida Ramil Professor, USF

Dr. Goswami received his MS and PhD in Mechanical Engineering from Auburn University. He is Editor-in-Chief of the Solar Energy journal, and Advances in Solar Energy: Annual Review of Research and Development. Within the field of Renewable Energy he has published as an author or editor of 16 books, 12 book chapters, 4 conference proceedings and over 200 refereed technical papers. He also holds 14 US patents and 1 world-wide patent. Dr Goswami has chaired a number of task forces to advise the U.S. Congress and the federal administration on energy policy. He has given invited testimonies on energy policy matters to the US Congress and the United Nations. Dr. Goswami has also served as an advisor on Energy matters to the Government of India and the World Bank. Dr. Goswami is a recognized leader in professional scientific and technical societies. He has served most recently as the President of the International Solar Energy Society (ISES), and a Governor of ASME-International (2003-2006). In the past he has served as a Senior Vice President of ASME, Vice President of ISES and President of the International Association for Solar Energy Education. He is a recipient of the Frank Kreith Energy medal and John Yellott Award for Solar Energy from ASME, the Farrington Daniels award from the International Solar Energy Society (ISES), the Charles Greely Abbott award, and Hoyt Clark Hottel award of the American Solar Energy Society (ASES), and more than 50 awards and certificates from major engineering and scientific societies.

George Philippidis, Director of the Alternative Energy Research Center and Associate Professor, USFP

Dr. Philippidis is the Director of the Alternative Energy Research Center and Associate Professor of Biofuel Engineering at the University of South Florida Polytechnic (USFP). He is also the President of the Advanced Biofuels Corporation (consulting firm) and has over 20 years of experience in leading strategic business units in advanced biofuels and renewable energy. In 1989, Dr. Philippidis joined the National Renewable Energy Laboratory (NREL) of the Department of Energy, where he directed a joint venture with Amoco Corporation in biofuels development. In 1996 he became Business Director at

a subsidiary of Thermo Fisher Corporation, a Fortune 500 company, where he commercialized composite products. In 2002 he joined the Applied Research Center at Florida International University, where he created and directed the Center's energy business. Dr. Philippidis leads the development and commercialization of cellulosic and algal biofuels, drop-in fuels, and value-added chemicals, as well as the integration and deployment of renewable energy systems. He works closely with the private sector, venture capital firms, and equity investors to bring clean technologies to the market place. He advises US and international companies and governments on biofuels and renewable power technologies, energy policy and trade, public-private partnerships, market development, intellectual property management, and project financing. Dr. Philippidis holds a Ph.D. in Chemical Engineering and an MBA. He has authored numerous articles and book chapters, has given several presentations and media interviews, and holds 11 US and world patents in cleantech.

Muhammad H Rashid, Ph.D., Professor, Department of Electrical and Computer Engineering, UWF

Dr. Rashid was previously employed by the University of Florida as Professor and Director of University of Florida/University of West Florida Joint Program. He is now with the University of West Florida. Rashid received B.Sc. degree in Electrical Engineering from the Bangladesh University of Engineering and Technology, and M.Sc. and Ph.D. degrees from the University of Birmingham in UK. He is a *Life Fellow* of the Institute of Electrical and Electronics Engineers (IEEE, USA) and a *Fellow* of the Institution of Engineering & Technology (IET, UK). He received the 1991 IEEE *Outstanding Engineer Award, the* 2002 IEEE Educational Activity Award (EAB) Meritorious Achievement Awaed in Continuing Education, the 2008 IEEE Undergraduate Teaching Award, and 2013 IEEE IAS – Outstanding Achievement Award. Dr. Rashid is an ABET program evaluator for the electrical and computer engineering programs. He is the Series Editor of *Power Electronics and Applications with the* CRC Press. Dr. Rashid is actively involved in teaching, researching, and lecturing in electronics, power electronics, and professional ethics. He has published 18 books listed in the US Library of Congress and more than 160 technical papers. His books are adopted as textbooks all over the world. His book, *Power electronics* has translations in Spanish, Portuguese, Indonesian, Korean, Italian, Chinese, Persian, and Indian edition. His book, *Microelectronics,* has translations in Spanish in Mexico and in Spain, Italian, and Chinese. He lectures and conducts workshops on Outcome-Based Education (OBE) and its implementations including assessments. He also authored a book on "The Process of outcome-Based Education -Implementation, Assessment and Evaluations". UiTM Press 2012, Malaysia. he is a Distinguished Lecturer for the IEEE Education Society and a Regional Speaker (Previously Distinguished Lecture) for the IEEE Industrial Applications Society.

FESC OVERSIGHT BOARD

The FESC Oversight Board guides FESC policy and activities, and ensures that FESC activities meet legislative requirements. The Oversight Board is comprised of all of the Vice Presidents for Research or equivalent administrators at each of the State University System institutions.

David P. Norton, Oversight Board Chair and Vice President for Research, University of Florida

Dr. David P. Norton became Vice President for Research at the University of Florida in January 2012. He had served as Associate Dean for research in the UF College of Engineering since 2009. He is also a professor in the Department of Materials Science and Engineering. Dr. Norton came to UF in 2000 after 11 years at Oak Ridge National Laboratory. His research interests primarily focus on electronic, photonic and magnetic thin film materials. He has published more than 300 articles in refereed journals and books, presented numerous invited papers and lectures at national and international conferences, and organized conferences and workshops in the areas of electronic oxides and laser processing. He is a Fellow of the American Vacuum Society, the American Physical Society and the American Association for the Advancement of Science, and a member of the Materials Research Society and the Electrochemical Society. Dr. Norton conducted his undergraduate and graduate studies within the Department of Electrical and Computer Engineering at Louisiana State University, receiving his doctorate in 1989.

John Kantner, Assistant Vice President for Research, University of North Florida

Dr. John Kantner joined the University of North Florida in August 2013 as the Assistant Vice President for Research. Prior to that, he was Vice President for Academic & Institutional Advancement at the School for Advanced Research in Santa Fe, NM, an independent center for research in the social sciences and humanities. From 1999 to 2006, Dr. Kantner was a faculty member in the Department of Anthropology & Geography at Georgia State University in Atlanta, where he achieved the rank of associate professor with tenure prior to his departure.

Dr. Kantner received his doctorate from the University of California–Santa Barbara, where he studied archaeology, anthropology, geography, geochemistry, and evolutionary theory. His research focuses on the archaeology of ancient societies, with a particular interest in the processes by which complex social and political regional institutions emerged from communities of comparatively simple horticulturists. His research is explicitly comparative, and he has collaborated on projects throughout the United States, as well as in Costa Rica and Peru. In addition to several books, Dr. Kantner's research appears in journals such as Human Nature, Journal of Anthropological Archaeology, Journal of Anthropological Research, Journal of Archaeological Research, Journal of Archaeological Science, and Historical Archaeology.

Andres Gil, Vice President for Research, Florida International University

Dr. Andrés Gil works directly with faculty and principal investigators to assure the University's compliance with Federal and state regulatory research requirements. He also works with other senior University administrators and researchers in areas of research development, and with deans to facilitate communication between the Division of Research and the schools/colleges on matters related to research. In addition, he supports the University's mission to provide faculty and staff with a quality grants, contracts, and research administration support program. Dr. Gil has a B.A. in Sociology/Anthropology from FIU, and a Masters degree in Social Work from Barry University. After earning a Ph.D. in Medical Sociology from the University of Miami, Dr. Gil became the Director of the South Florida Youth Development Project at the University of Miami. In 1992, Dr. Gil joined the Western Consortium for Public Health at the University of California, Berkeley where he was a research scientist. Later, he became an Assistant Professor of Human Development and Family Relations at the University of Connecticut. In 1996, he joined FIU as Assistant Professor and Associate Director for Research in the School of Social Work, later becoming Director of Research Development in the College of Health and Urban Affairs. He serves as an advisor to the Mental Health Services Administration and the National Institute of Mental Health on issues pertaining to at-risk youth. Dr. Gil has co-authored numerous articles that examine the role of culture, race, and ethnicity in current social problems. His most recent articles, "Disaster-related stress, depressive signs and symptoms, and suicidal ideation among a multi-racial/ethnic sample of adolescents: A longitudinal analysis" and "Culture Conflicts and Problem Behaviors of Latino Adolescents in Home and School Environments" appeared in Child Psychology and Psychiatry and the Journal of Community Psychology respectively. Dr. Gil also holds the rank of Professor in the School of Social Work.

Gary K. Ostrander, Vice President for Research, Florida State University

Dr. Gary K. Ostrander was appointed Florida State University's Vice President for Research in May of 2012. He previously served as the vice chancellor for Research and Graduate Education at the University of Hawaii's flagchip campus in Honolulu. Dr. ostrander has held faculty positions at Oklahoma State University and Johns Hopkins University. Ostrander received a bachelor's degree in biology from Seattle University, a master's degree in biology from Illinois State University, and a doctorate from the University of Washington. Initially, his research focused on exploiting novel aspects of the biology of aquatic species to address fundamental questions of cancer biology. In recent years, his research program has focused on laboratory and field studies aimed at understanding the worldwide deterioration of coral reef ecosystems.

Paul R. Sanberg, Vice President for Research & Innovation, University of South Florida

Dr. Paul R. Sanberg (Ph.D., D.Sc.) is Vice President for Research & Innovation, President of USF Research Foundation, Distinguished University Professor. Dr. Sanberg trained at York University, the University of British Columbia, the Australian National University and Johns Hopkins University School of Medicine, among others. Before coming to USF, Dr. Sanberg held academic positions at Ohio University, the University of Cincinnati, and Brown University. Prior to his current position, Dr. Sanberg served as Associate Dean in Morsani College of Medicine, Associate Vice President in USF Health, Senior Associate Vice President for the Office of Research & Innovation and Special Assistant to the President all at USF. Dr. Sanberg is a member of the Board of Scientific Counselors for the National Institute of Drug Abuse at the National Institutes of Health, and has served on numerous scientific advisory boards for health-related foundations and companies. He has significant industry experience with biotech companies involved in cell therapy for degenerative disorders and biopharmaceutical development. He is the Editor-in-chief of Technology and Innovation, and serves on editorial boards for more than 30 scientific journals. Dr. Sanberg is the President of the National Academy of Inventors and has also served as president of a number of professional societies including the American Society for Neural Transplantation and Repair, the Cell Transplant Society, and the International Behavioral Neuroscience Society. He is the author of more than 550 scientific articles, including thirteen books, with over 16,000 scientific citations (Google scholar). As an inventor on approximately 100 health-related U.S. and foreign patents, his early work was pioneering in understanding why brain cells die in neurological disorders and in drug abuse research. His recent research has focused on discovering innovative ways to repair the damaged brain, and has helped lead the team that demonstrated that bone marrow and umbilical cord blood derived stem cells can be transformed to neural cells that may be useful in stroke, spinal cord injury and ALS. Dr. Sanberg's work has been instrumental in translating new pharmaceutical and cellular therapeutics to clinical trials for Tourette syndrome, depression, stroke, Huntington's disease and Parkinson's disease.

Richard Podemski, Associate Vice President for Research, University of West Florida

Dr. Richard S. Podemski is Associate Vice President for Research and Dean of Graduate Studies at the University of West Florida. Prior to assuming this position in July 2005 he was Dean of Graduate Studies and Research at Buffalo State College in the State University of New York System, Dean of the School of Education at the University of St. Thomas in St. Paul, MN, and Associate Dean of the College of Education at the University of Alabama. He has presented at international and national conferences and published extensively on a variety of issues in higher education and public school leadership. He has been listed Who's Who in American Education and Who's Who in the South and Southeast. In 2001 he was awarded the Distinguished Alumni Award from the Graduate School of Education at the University at Buffalo where he completed his Ph.D. in Educational Administration.

Kinfe Redda, Professor and Vice President for Research, Florida A&M University

Dr. Redda was appointed interim Vice President, Division of Research, in May of 2010. Redda began employment at FAMU on January 1, 1985 as an associate professor of medicinal chemistry in the COPPS. During his tenure at FAMU, Redda has generated more than $30.1 million from research and training grant awards. A prolific grantsman, Redda graduated from the faculty of pharmacy, University of Albert (Canada), with a Ph.D. degree in Medicinal Chemistry in 1978. He completed a two-year postdoctoral research fellowship in synthetic medicinal chemistry a Dalhousie University, Canada. He served as an assistant professor of medicinal chemistry at the College of Pharmacy, University of Puerto Rico in San Juan from 1980 to 1984. In 1998, former FAMU President Frederick S. Humphries appointed Redda to serve as the director of the NIH funded Minority Biomedical Research Support (MBRS) Program at FAMU. He was promoted to a full professor level in 1989. Redda excelled in expanding and strengthening biomedical research on campus and generated millions of dollars for FAMU from NIH during his tenure as the MBRS director for 17 years. He was also the principal investigator and program director of the highly successful NASA funded and FAMU administered Space Life Sciences Training Program (SLSTP), a summer program for about 40 college students that were recruited nationally from1987-1995. The training of these high achieving students, who had passion for space life sciences, was held at the Kennedy Space Center.

Thomas J. Roberts, Associate Vice President for Research, Florida Gulf Coast University

Dr. Thomas J. Roberts is the Associate Vice President for Research at Florida Gulf Coast University in Fort Myers, Florida serving as the Chief Research Officer and authorized institutional representative. He established the Office of Research and Sponsored Programs beginning with his hiring in 1998 and has since led the advancement of research at FGCU in a variety of areas. He has been a professional research administrator for nearly twenty-five years and has worked at various types of institutions including comprehensive, doctoral granting, medical school, and major research university environments. He authored the first doctoral dissertation focusing specifically on the field of research administration. Dr. Roberts is the 2007 recipient of the coveted Rod Rose Award for Outstanding Scholarship from the Society of Research Administrators International. He earned his doctorate in Educational Leadership from the University of Central Florida.

Barry T. Rosson, Interim Vice President for Research, Florida Atlantic University

In fall 2010, Dr. Rosson was appointed Interim Vice President for Research, overseeing the offices of the Vice President, Sponsored Programs, Research Accounting, Research Integrity, Technology Transfer, Veterinary Services and the FAU Research Corporation. He also serves as the Dean of the Graduate College, and Professor of Civil Engineering at Florida Atlantic University. Dr. Rosson began his academic career in 1991 at the University of Nebraska as an Assistant Professor in the Department of Civil Engineering. He was promoted to Associate Professor with tenure in 1997 and to Professor in 2003. While at the university he served as Associate Chair of the Department of Civil Engineering, Director of Graduate Studies in the College of Engineering, and Associate Dean in the Office of Research and Graduate Studies. In addition to his extensive administrative background, Dr. Rosson received in excess of $3 million for his research in structural engineering from federal, state, and private organizations including the NSF, USDA Forest Products Laboratory, and 3M Corporation. Dr. Rosson received his Doctor of Philosophy degree in structural engineering from Auburn University in

Auburn, Alabama and his MSc and BSc degrees in civil engineering from Texas A&M University in College Station, Texas. He is a Fellow of the American Society of Civil Engineers, Fellow and Past-President of the Architectural Engineering Institute, and Member of the American Society for Engineering Education. He has served as Associate Editor of the ASCE Journal of Structural Engineering and Chair of the Committee on Professional Practice (ASCE Presidential Appointment).

MJ Soileau, Vice President for Research and Commercialization, University of Central Florida

Dr. M.J. Soileau received his PhD in Quantum Electronics from the University of Southern California, is currently Professor of Optics, Electrical and Computer Engineering and Physics and is the Vice President for Research. His research interests include the nonlinear optical properties of materials and laser-induced damage. He is a Fellow of IEEE, the SPIE–The International Optical Engineering Society, and the Optical Society of America.

Jeanne Viviani, MPA, Director, Research Programs and Services, New College of Florida

Jeanne Viviani is the Director of the Office of Research Programs and Services at New College of Florida. Coming on board in September 2003, she established the first ever sponsored research office. Her office handles pre-award and post-award (except for grant accounting which is handled through their Business Office). As the Human Protections Administrator for the NCF Institutional Review Board, she processes and reviews student protocol applications for using human subjects. Ms. Viviani is also the primary point of contact for nationally competitive scholarships and fellowships such as Fulbright, Rhodes, and others.

Prior to New College, she has worked in many different government offices such as the Department of Navy with the U.S. Marine Corps, the U.S. District Court in the Middle District of Florida, Psychosocial Oncology at H. Lee Moffitt Cancer Center and the Hillsborough County Public Defender's Office.

FESC INDUSTRIAL ADVISORY BOARD

Frank Bevc, Director, Technology Policy and Research Programs, Siemens Energy

Mr. Bevc is currently Director, Technology Policy and Research Programs at Siemens Energy, based in Orlando. He's responsible for the identifying opportunities for innovation and cooperative research, as well as working with government and industry partners to promote commercialization of clean energy technologies that serve the global energy market. Current product initiatives cover a diverse field, including carbon capture technologies, renewable energy systems, Smart Grid distribution systems, advanced electric power transmission components, advanced turbomachinery systems, and supporting technologies. Prior assignments have included engineering management responsibility for steam turbine systems and gas turbine advanced research, product line management responsibility for marine turbine generator sets and superconducting magnet systems and commercial responsibility for advanced research programs.

Mr. Bevc received both engineering and business administration degrees from the University of Pittsburgh and is a senior member of both ASME and IEEE. He has held a number of association and advisory board positions, including past chair of the US Gas Turbine Association and the US Advanced Ceramics Association. He currently serves on industry advisory boards at the University of Central Florida, the University of Florida, the Florida Center for Advanced Aero Propulsion, Carnegie Mellon University's Electric Industry Initiative, MIT's Carbon Sequestration Initiative and Penn State's Clean Energy Forum.

Tommy Boroughs, Partner, Holland & Knight, LLP

Thomas "Tommy" Boroughs is a Partner in the Orlando office of Holland & Knight, focusing his practice in the areas of zoning and land use regulatory matters together with real estate development, acquisition and sales. He currently serves as the Co-Chair of the firm's Florida Land Use Team.

In addition to his considerable experience in zoning and land use, he also has extensive experience in various areas of real estate development, as well as transactional aspects of real estate, including purchase and sale negotiations, structuring and financing of complex commercial real estate transactions. Recently, he has focused on energy law with an emphasis upon renewable and alternative energy. Mr. Boroughs has experience in solar pv, solar concentrating power and biomass gassification projects.

Robert F. Caldwell, Vice President – Efficiency and Innovative Technology, Duke Energy

Robert Caldwell has the overall responsibility for: 1) Overseeing the development and implementation of the company's portfolio of energy-efficiency and demand-side management programs; 2) Evaluating and investing in emerging renewable generation and alternative energy options, as well as innovative energy technologies; and 3) Managing wholesale power business.

Mr. Caldwell joined Progress Energy in 1998 as Vice President, Strategic Planning, and has held a number of other positions leading to his current one. Prior to joining Progress Energy, he served in various management positions with a Michigan utility. He graduated from Central Michigan University with a Bachelor of Science degree in Business Administration. He earned a Master of Business Administration degree from Michigan State University.

Gustavo R. Cepero, Vice President, Florida Crystals Corporation

Gustavo Cepero has over 35 years of experience in the energy industry, including a 20 year career with Florida Power & Light (FP&L) and 15 years with Florida Crystals. He started his career with FPL as entry level engineer and progressed to head of several major departments. During this time, Mr. Cepero accumulated experience in all major functional areas of the electrical power industry, including engineering, economic and markets analysis, financial, legal and regulatory, fuel procurement, and environmental and in all conventional forms of power generation and fuels (oil, gas, coal, and nuclear). Mr. Cepero was directly involved in most of the major power supply and delivery decisions and projects undertaken by FPL from the late 1970's through 1990. He s currently an officer with Florida Crystals responsible for planning and business development, with a special focus on the energy business. Mr. Cepero has been directly involved in the development, construction, financing, and management of energy projects for Florida Crystals as well as the evaluation and, if applicable, the development of new technologies, with particular emphasis on renewable electricity and fuels. Florida Crystals is a pioneer and leader in sustainable agriculture and the conversion of renewable agricultural resources (sugars, carbohydrates, and biomass) to energy, such as electricity and ethanol, and Mr. Cepero has been instrumental in all such efforts. Mr. Cepero has a Bachelor's degree in Electrical Engineering from the University of Detroit, a Master of Business Administration from Florida International University, a Juris Doctor from the University of Miami, and an Executive MBA from the Harvard Business School. He has been a member of the Florida Bar since 1982, and a member of the Institute of Electrical and Electronics Engineers since the 1970s.

Christopher Fountas, Partner, Arsenal Venture Partners

Christopher Fountas is a General Partner of MVP. He has spent much of his career founding, building and funding early-stage technology companies, many at the intersection of the commercial and government markets. Mr. Fountas co-manages both MILCOM and OnPoint. He serves as a Trustee of OnPoint and manages several of MVP's investments, including those in The NanoSteel Company, Atraverda, Akermin, Cocona and Petra Solar. Mr. Fountas has over 20 years experience founding, advising and capitalizing emerging growth companies. Mr. Fountas has co-founded several successful start-up companies, and continues to serve as a board member and advisor to many of these companies, including Alpine Fresh.

Christopher Fountas graduated from The Ohio State University with a B.S. Degree in Finance and earned a JD (cum laude) from the University of Miami.

Nick Gladding, Attorney at Law, Dunlap & Moran, PA

Mr. Gladding is an experienced environmental and energy lawyer. He focuses on environmental counseling, permitting, enforcement defense and litigation. With more than 20 years of experience in 30-plus states and most EPA regions, he has been involved in major civil cases, high-profile criminal investigations, and complex regulatory and dispute resolution proceedings. Mr. Gladding also has been significantly involved in state legislative lobbying in ten states. He has represented numerous Fortune 500 companies, as well as smaller businesses and business owners in diverse environmental proceedings. For the past several years, he has focused on assisting businesses with renewable energy and energy efficiency issues. He also has served on the FESC Steering Committee and for three years as a Commissioner on the Florida Energy and Climate Commission.

Byron A. Knibbs, Vice President – Sustainable Services Department, Orlando Utilities Commission

Byron A. Knibbs joined Orlando Utilities Commission (OUC) in May 1997, as Director of Business Development. As he progressed through the organization, Mr. Knibbs was promoted to Director of Business Development and Lighting in January 2000; his responsibilities included aggressively marketing OUC services and managing the daily operations of the Lighting Division. In March 2005, he was promoted to Vice President of the Energy Delivery Business Unit and was responsible for the day-to-day operation of OUC's Transmission, Substation and Distribution systems. In October 2009, Mr. Knibbs was appointed Vice President of Sustainable Services and is responsible for renewable and conservation programs, process improvements, new technology, education and sustainability awareness, shared services for OUC and OUC Cooling. Mr. Knibbs previously worked with the City of St. Cloud Electric Utility for 12 years in different capacities, four of those years as the Electric Utility Director. During his tenure with the City, his work experience in different departments spanned from engineering, substation, system operations, power production, transmission and distribution, and metering, to contract administration. Mr. Knibbs holds an Associate/Bachelor Degree in Aeronautics Electronic Engineering Technology, a Bachelor Degree in Computer Information Science and a Masters Degree in Business Administration.

J.L. Martinez, Sr. Senior Director of Clean Energy, Florida Power and Light

J.L. "Buck" Martinez is the Senior Director of Clean Energy for FPL, where his responsibilities include overseeing the development of renewable energy projects in the State of Florida. FPL is one of the nation's leading electricity-related services companies. Its subsidiaries include Florida Power & Light Company, Florida's largest electric utility with nearly 4.5 million customer accounts, and FPL Energy, LLC, a fast-growing independent power producer with a presence in 26 states. Mr. Martinez joined Florida Power & Light in 1981. Prior to being named to his present position, he served as director human resource services overseeing the corporate safety department, labor relations and the corporate quality program. Before that he served the company in various management positions and special projects. Mr. Martinez holds a Bachelor of Arts degree from St. Thomas University and a Master of Business Administration degree from Nova Southeast. In addition, he is a graduate of the Boston University Leadership Program. He and his wife Silvia, and their three children, live in Palm Beach Gardens, Florida.

Sheila McDevitt, Attorney at Law

Sheila McDevitt served as the chair of the Board of Governors, State University System of Florida. Ms. McDevitt was an attorney with the law firm of Ackerman Senterfitt and a business strategist with extensive experience in the public utilities sector. Ms. McDevitt is a recognized authority on ethics and compliance with a proven track record of creating long-term, sustainable solutions in response to complex business issues from mergers and acquisitions and other commercial transactions to litigation, governance, and political matters. Prior to joining Ackerman Senterfitt, Ms. McDevitt retired, after 26 years, as the Senior Vice President, General Counsel, and Chief Legal Officer at TECO Energy, Inc. in Tampa, Florida where she is credited for having built the first Legal Department within a 108 year old, large, traditional utility company. At TECO, Ms. McDevitt was a key member of the CEO's senior leadership team formulating and implementing strategic initiatives and providing solutions to many significant issues affecting the corporation and its operating companies. She led the corporation's legal affairs, all corporate compliance and governance, environmental strategy; internal and external communications; diversity and the corporate secretary duties. Ms. McDevitt has a deep commitment to public service and higher

education. She chaired the Governor's Blue Ribbon Commission on Higher Education Minority Access and Diversity. She is also a Trustee of St. Leo University and served from 2005 to 2007 as the Chair of the Board. For the College of Law at Florida State University she chaired the Board of Visitors from 2004 to 2005 and has remained a member since 1996.

Sean O'Neill, Co-Founder and President, Ocean Renewable Energy Coalition

His thirty year career includes twelve years directing communications and public affairs for a $17 billion national energy company and providing media, communications, and crisis communications consultation to Fortune 500 corporations, non-profits, and trade associations. As Director of Public Affairs and Crisis Communications for the largest independent public relations firm in New England, he directed crisis communications programs which mitigated damages from natural disasters and controversial business situations including: plant closings, product liability, corporate governance, labor negotiations, and ownership transitions. Prior positions include Director of Public Affairs for the San Diego Economic and Environmental Coalition, Director of Research for the Center for Technical Services, and Chairman of the Merrimack River Watershed Council. Mr. O'Neill received his bachelor's degree in English from Columbia College in New York City and a master's degree in Public Communications at American University where he has taught undergraduate and graduate level communications courses as an adjunct faculty member.

Randy C. Parsley, Director Global Program Development, Pratt & Whitney

Since graduating from the University of Kentucky in 1977, Randy Parsley worked for Pratt & Whitney Rocketdyne in West Palm Beach, Florida. His career began as a propulsion engineer gaining experience in a wide range of systems including gas turbine, liquid rocket, nuclear and hypersonic propulsion. During this time, he acquired two graduate degrees from University of Miami and gradually moved toward the business and program development side of the business. For the past five years he has led the effort to leverage our strong aerospace heritage to expand into the commercial energy business sector. His primary focus for this growth is in the areas of coal and biomass gasification, concentrated solar-thermal, concentrated solar photovoltaic and biomass torrefaction. This broad experience has provided him with a deep understanding of the difficult technical, business and marketing balance needed to bring an idea from concept to reality. It has also allowed him to establish a diverse network of domestic and international contacts in both the propulsion and energy industries. Within this network, he has earned a reputation for honesty, integrity and sound judgment. He has a flexible consensus building management style, but can be focused and determined when the need arises.

Roy Periana, Director, Scripps Energy Laboratories, The Scripps Research Institute

Prof. Periana immigrated to the US when he was 17 years old to pursue a career as a Chemist. He graduated with honors from the University of Michigan with a BSc in Chemistry. He then joined Dow Chemical where he worked for two years. During this time his work resulted in 10 patent applications. He then left Dow Chemical to pursue a PhD in chemistry at U.C. Berkeley. Dr. Periana joined an early startup company in the Silicon Valley, Catalytica, Inc. At Catalytica he rose through the ranks from Research Chemist to Vice President of research over the course of 10 years. In that time he was directly responsible for raising approximately $35 million. His work helped to take the company public with a $250M capitalization. During this time he became one of the

world's leading experts in the now established field of low-temperature chemistry for the conversion of hydrocarbons raw materials to fuels, chemicals, and power. Dr. Periana is now with Scripps Florida. His long-term plans at Scripps Florida is to build a $100M department focused on the development of the next generation of cleaner, cheaper fuels, chemicals, and energy for the 21st century.

Greg Ramon, Director, Regulatory Policy and Compliance, TECO

Greg Ramon has over 30 years experience with TECO Energy, with 20 years of management in engineering, and planning and operations of distribution and bulk power systems. For the last 10 years, Mr. Ramon has led Regulatory Affairs, leading changes in the Florida region in the areas of wholesale market improvements and regional transmission planning services. At Tampa Electric, Mr. Ramon directs the coordinated development of regulatory policy and compliance plans for transmission, telecommunications, and new technology as it relates to evolving State, FERC, FCC, and other Federal agency initiatives to increase competition, efficiency, and reliability of electric utility systems. Mr. Ramon also coordinates research and development with public institutions. In addition to his role on the FESC Industry Advisory Board, he also serves on the Industry Advisory Board of the USF Power Center for Utility Explorations (PCUE), and participates in a multi-university and industry solar proposal to the US Department of Energy, entitled "The Sunshine State Solar Grid Initiative (SUN-GRIN)", led by Florida State University's Center for Advanced Power Systems (CAPS). Mr. Ramon has a history of involvement in industry activities. He serves on the EEI Reliability Policy Working Group, chaired the IEEE Real Time Thermal Line Ratings in the '80's, and chaired an independent effort sponsored by EPRI and NERC in the late '90's that defined the framework for Interconnected Operations Services under open access conditions.

Brian Yablonski, External Affairs Director, Gulf Power Company

Brian Yablonski is currently External Affairs Director for the Gulf Power Company, an investor owned utility serving Northwest Florida. He is responsible for the management and oversight of regulatory and governmental affairs activities. Prior to working with Gulf Power, Mr. Yablonski was Vice President of Public Affairs for the St. Joe Company, one of Florida's largest private landowners. In this role, he helped strategically plan nearly 600,000 acres of land in Northwest Florida, including having overseen state and federal governmental relations, environmental strategy and economic policy development. He also served as Director of Policy and Deputy Chief of Staff for Florida Governor Jeb Bush, where he helped craft the administration's major policy initiatives. Mr. Yoblonski is in his seventh year as a commissioner on Florida's Fish and Wildlife Conservation Commission, the state agency charged with protecting endangered species and wildlife, and overseeing hunting and fishing activities in the state of Florida. In addition, he was appointed in 2007 to serve on the Florida Taxation and Budget Reform Commission, which meets once every 20 years to examine the state's tax and budget structure. In that capacity, he served as the primary sponsor of Constitutional Amendment 4, an initiative to provide tax exemptions for natural lands placed into permanent conservation easements. As a result of this work, he was named Florida's 2009 Wildlife Conservationist of the Year by the Florida Wildlife Federation. Mr. Yablonski graduated with honors from Wake Forest University and the University of Miami School of Law.

RESEARCH PROGRAM

Six Focus Areas Towards Florida's Energy Leadership

The State of Florida is uniquely positioned to be technology leaders in the following five focus areas. In fact, aside from the sectors of utility companies and marine energy, four of the focus areas of proposed emphases by Florida Energy Systems Consortium (FESC) align with the current critical mass of industrial companies already located in the State of Florida. Complementary research is needed as outlined below.

Developing Florida's Biomass Advantage for Renewable Fuels

FESC member universities are internationally recognized leaders in biomass energy research. Florida ranks first in the country in annual generation of cellulosic biomass with almost 10% of the US total. In Florida several biomass species are produced in large volumes, primarily sugar cane bagasse in South Florida, citrus peel in Central Florida, and woody biomass in North Florida. Moreover, the State has all the key assets for algae technologies: year-round warm weather and sunlight, long shore line, under-utilized land (decommissioned phosphate mines and aquaculture operations), CO_2 from Florida industries (utility, cement, mining, landfills), and wastewater from industrial and municipal treatment facilities. Harnessing cellulosic biomass and algae for conversion to liquid transportation fuels (and other value-added products) is a huge economic opportunity, as over 135 billion gallons of gasoline (worth over $400 billion) and 60 billion gallons of aviation, military, and diesel fuels (worth over $200 billion) are consumed annually just in the United States. Florida's location and resources position it to be a leader in the development and commercialization of biomass-to-fuel technologies in partnership with the private sector. Such a leadership will bring investment, jobs, and tax revenue to the State and will diversify Florida's economy, while making it more sustainable. We propose four (4) key focus areas:

1. **Feedstock Development and Deployment:** With our expertise in genetics and management, we will develop energy-rich crops to supplement agricultural residues as sources of cellulosic biomass. Using breeding and molecular genetics we will develop high energy-yielding cultivars with improved biosafety and by employing management science we will devise growing systems for Florida annual and perennial grasses, oil- and sugar-rich plants, and woody and aquatic energy crops. In parallel, we will develop economic models to estimate costs and identify opportunities for farmers and investors.

2. **Cellulosic Biomass Technologies:** Using our expertise in applied biomass research we will develop scalable and cost-effective processes to produce fuels, chemicals, and power from cellulosic biomass. In the biochemical approach we will study pretreatment and enzymatic hydrolysis to convert biomass to sugars for microbial fermentation to biofuels and hydrocarbons. In the thermochemical approach gasification and catalytic conversion or pyrolysis will convert biomass to drop-in liquid hydrocarbons, power, and co-products such as fertilizers. The technical data will be fed to economic models to calculate capital and operating costs and required key resources (energy, water, raw materials, land).

3. **Algae Technologies:** Based on our expertise in algae research we will develop modular and cost-effective algae cultivation systems. Algal biomass production will be based on the use of industrial flue-gas CO_2 and wastewater, followed by cell harvesting and lipid or polysaccharide extraction for conversion to biocrude oil or alcohols, respectively. These will be upgraded to jet and military fuels at existing US oil refineries. At the same time we will optimize co-product generation, such as fish food, animal feed, and methane from algal biomass to improve process economics.

4. **Anaerobic Digestion Technologies:** Based on our expertise in anaerobic digestion research, we will develop cost-effective integrated anaerobic digestion systems to produce bioenergy (methane) and biofertilizer from organic Florida feedstocks, including purpose-grown energy crops, algal press cake, crop residues, food waste, and other organic materials. In partnership with Florida farmers, food processors, and grocers we will optimize the anaerobic digestion of these materials for production of methane-rich biogas that is readily converted to electricity or used in natural gas systems.

State of Florida Opportunities for High Impact Solar Energy Research

Solar energy is a ubiquitous clean energy resource, and great progress has been made in recent years to develop advanced technologies to harness its potential to enable power production for the grid, domestic power production and heating, thermal desalination, clean fuel production, industrial process heat, and solar cooling, among others. The State of Florida has substantial solar energy resources and a strong incentive to take on the national grand challenge economical solar energy conversion through sustained research and development of the next generation solar energy technologies so that a robust solar energy industry is grown from within. Because solar energy is an intermittent energy source it is essential that solar energy collection be coupled with energy storage technologies to be economically impactful. Numerous storage solutions are being pursued, including thermal, thermochemical, and electrochemical. FESC is prepared to lead a rigorous and transformational research effort to develop the next generation solar energy technologies that will reach levelized cost parity with fossil energy power production. The following are some of the areas to focus:

1. **Photovoltaics: A.** Florida researchers have been the global leaders in the development of thin film photovoltaic cells including CdTe and CIGS. However, some of the materials are rare. Replacement of these materials with earth abundant materials and development of large area cells would help establish new PV manufacturing industry in the State and increase job growth. **B.** Developing highly integrated and smart power electronics to convert solar energy and connect to the grid is very important to developing highly reliable grid-tie PV system. **C.** In addition smart electronic approaches and new materials and processing can be used to improve the performance of the PV panels by controlling their temperature and keeping the surface dust free. **D**. Transformative concepts in the development of efficient and cost effective supercapacitors for smart grid operation of PV.

2. **Automatic Permiting, Automatic Utility Interconnection and Autonomous Operation of PV Systems:** Residential rooftops offer the largest real estate for installing PVs. Widespread adoption of residential PV must address various potential costs, including permitting and auditing of PV systems, the cost of connection/disconnection to the grid, and the cost of volatility of solar radiation. Applied research of system integration and operation is needed in the areas of permitting automation, interconnectivity, communications, voltage control and stability, energy and data management, and advanced control of demand response.

3. **Concentrated Solar Power (CSP):** In order for CSP to reach grid parity the thermal power conversion efficiencies must increase and the costs must decrease and high temperature thermal storage technologies should be employed to increase the power plant utilization factor, especially to enable the sale of power to the grid during peak hours. The research needed includes: a) Development of novel thermodynamic cycles for power production which might include but are not limited to supercritical steam, supercritical CO2, Ericsson, or Brayton combined cycles; b) High temperature thermal energy storage; high efficiency mechanical storage, and combined thermal/photovoltaic power production.

4. **Solar Fuels:** Gaseous and liquid fuels can be produced using solar energy by converting water and CO_2 to syngas which can be used directly or converted to liquid fuels such as jet fuel using Fischer Tropsch synthesis. Various approaches to liquid fuel production are available, including PV-Electrolysis, Thermochemical, and Photosynthesis. There is great interest to develop some of these technologies with the potential to start a new type of industry in Florida and lead to job growth.

5. **Heating, Cooling and Clean Water:** a) Another transformative application for solar energy within the State of Florida includes thermally driven refrigeration and cooling. Highly absorbing and desiccant materials such as zeolites and metal hydrides may pave the way for innovative new thermal refrigeration and cooling systems that can operate using solar energy. Other desiccant materials such as Lithium Chloride give us an opportunity to design Desiccant/vapor compression hybrid cooling systems with high potential COP. B) Solar Desalination can play a very important role in providing abundant clean drinking water for Florida. Technologies may include but are not limited to humidification/dehumidification, thermodynamic cogeneration of power and water, and reverse osmosis operated by solar power. C) Solar photocatalytic technologies for clean water have improved a lot and can become commercial. However, additional research to extend the wavelength range to utilize the visible light would increase the effective use of sunlight and reduce costs. D) Solar heating, cooling and desalination technologies should include thermal energy storage to allow their utilization when sunlight is not available.

Enhancing Energy Efficiency and Conservation

Energy efficiency and conservation offer the greatest potential to reduce Florida's energy consumption. Buildings use more energy than any other sector of the economy, including transportation and industry. Therefore, the focus of this thrust area is on improving resource efficiency in the built environment: including existing and newly constructed residential and commercial buildings both at the scale of individual structures and communities. Because of Florida's hot/humid climate, much of the building sciences research conducted nationally doesn't apply well in our state. Building performance research is needed to evaluate and support implementation of specific efficiency practices in Florida. Key research opportunities include development of novel energy efficiency retrofit technologies and analysis of end-use energy consumption data in collaboration with utilities. The following are some of the areas to focus:

1. **Energy Efficient Building Technologies for Residential and Commercial Buildings:** Buildings account for ~84% of total electric power use in the state. A 35% reduction in building energy use can be achieved by improved efficiency, saving Florida millions of kWhr/yr. Further reduction can be achieved by creating "zero energy homes" using only on-site PV power, a stated goal of the U.S. DOE. This offers the opportunity to develop marketable products that meet Florida's energy and environmental goals. New and emerging building energy efficiency systems require study with respect to Florida's unique hot/humid climate. Cost/benefit analysis of efficient buildings, building energy efficiency expertise in our education system and our marketplace along with creative financial instruments and business models are needed. Conservation can also benefit from the use of more renewable energy sources. New technologies are needed to handle the intermittent nature of renewables. Buildings are expected to play a key role since they form the largest electric demand. To address this need, FESC will develop new technologies for high efficiency HVAC retrofits in both commercial and residential buildings using advanced sensing and control, conduct field evaluations to document the cost/benefits of "beyond code" building energy efficiency programs; conduct testing of building efficiency options; create building energy course work; construct and monitor zero energy buildings; develop solutions to help absorb intermittency of renewable energy sources by using fast-responding management of building loads such as HVAC, including benefit/cost analysis and their

effect on the electric grid; and recruit advanced Florida builders and early adopter homeowners to collaborate on zero energy building design and retrofit projects. As part of the Consortium, well-instrumented testing structures and buildings will be established to evaluate the effectiveness of integrated emerging technologies.

2. **Analysis of Metered Energy Consumption Data to Increase Effectiveness of Florida Utilities' Demand Side Management (DSM) Programs:** Florida utilities have made substantial investments in energy conservation and efficiency programs. Expectations of savings, or deemed savings, are typically used to estimate program cost effectiveness and make decisions about DSM portfolios, types of programs, and specific energy conservation measures. Although metered consumption data are readily available, utilities seldom conduct follow-up evaluations of savings. Systematic measurement and verification (M&V) is needed to accurately determine whether utility DSM programs are actually achieving their energy and demand savings goals. FESC proposes to evaluate end-use energy consumption data from Florida municipal utilities merged with property appraiser and DSM program data for the following research and analysis tasks: measure energy savings of high-efficiency HVAC DSM participants; establish marginal energy savings values across equipment efficiency levels (SEER-14 to SEER-18 vs. SEER-13); compare measured to modeled/deemed savings estimates; calculate the individual and average cost effectiveness of high-efficiency HVAC retrofits; identify poor performers among installed HVAC systems from data, and flag for maintenance and/or re-commissioning; and provide results to partnering municipal utilities for targeting of future DSM programs to the customers likely to achieve the greatest savings.

Smart Grid and Energy Storage

According to a reliable 2008 study by the Political Economy Research Institute, an investment of $8 Billion in Florida's electric infrastructure would result in 123,756 persistent Florida jobs. In 2011, Florida consumed over 230 terawatt-hours of electricity, or the equivalent of about $25 billion in retail sales. It was second in the nation in electric energy consumption behind Texas. These recommended investments and this staggering level of load are a unique Florida opportunity, an opportunity that is often referred to as smart grid investments or grid modernization. The investments will provide better jobs, reliability, flexibility, information and automation – all of which are essential to growing Florida's economy.

Florida Power and Light's (FPL's) smart grid expansion is costing over $800 million. FPL has achieved real economic, safety, and reliability benefits from a fully wired and operational smart grid. FPL has shown that when done correctly, a smart grid is able to automatically sense and gather important data about both consumer and supplier habits, allowing operators and computers to better tweak systems before any major problems arise. FPL installed 4.5 million smart meters alongside more than 10,000 sensors all over the grid. To date, over four hundred malfunctioning transformers have been sensed before they caused a power outage, probably saving Florida small and large business tens of millions, if not over a hundred million dollars in lost revenue. Duke Energy, Gulf Power, TECO, JEA and a host of municipal and cooperative utilities are just as engaged.

FESC universities actively collaborate with Florida utilities in high profile projects. The Gateway to Power Consortium (G2P), led by FPL and Smart Energy Grid Associates, seeks to deliver workforce training for electrical power sector personnel in areas most relevant to the next-generation electric power workforce. The $3.6M US DOE funded SUNGRIN initiative is looking at the implications of a high penetration of solar energy on the Florida Grid. The FESC initiated Network of Energy Sustainable Communities (NESC) provides information and venues to train the local government units on energy opportunities, increasing their efficiency in capturing federal energy block grants. Florida's $126 Million US DOE funded SunSmart

program has worked to increase the deployment of solar energy and energy storage systems in schools, business and electric vehicles. The following are some of the areas to focus:

1. **Floridian Economics, Policy Uncertainty and Consumer Behavior:** We must know, in order of magnitude, the energy economy investments that yield the greatest benefit to utilities, consumers, energy security and energy independence.

2. **Science and Technology to Support Florida's Generation Capacity Growth, Transmission Grid Expansion, Efficiency and Modernization:** FESC must determine the right priority of investments that need to be made in electric generation (in particular the mix of new nuclear, clean coal technologies that pass new US EPA standards, natural gas, and alternative sources), as well as identify the transmission upgrades that will lead to higher distribution availability (new and self-healing lines) and efficiency.

3. **Science and Technology to Support Florida's Distribution Grids, Distributed Generation Resources, Demand Side Management, and Premise Appliance integration in Efficiency Programs:** We must first educate a changed and enlightened consumer (conservation). Additionally, automating efficiency and load management functions will allow Florida to do more with less electricity, provide grid stabilizing ancillary service and lessen the need for expensive and dirty fast ramping electric generation.

4. **Resilient Grids by Using Science and Technologies of Cyber-Physical Systems**: Advanced metering implementation has meant unprecedented access to data through distributed sensors. To obtain access to all of this data requires communication infrastructure, and to make use of this data requires a combination of automated centralized and decentralized decision making (e.g. fault detection and response). Advanced monitoring, detection, protection and controls must be developed and implemented that reliably meet the needs of the grid. These technologies must be robust to hardware failures and resilient to malicious attacks.

5. **Electric Vehicles as a Solution to Florida's Significant Energy Storage Problem:** Much of the promise of Smart Grid is based on a perception that it will lead to an increased penetration of renewable energy. Unfortunately, this may never come to pass in Florida if man-made energy storage options do not become available. Florida has almost no opportunities for natural energy storage at grid-scale. Because EV are a significant leveraging factor, Florida may be the best state in the country to first achieve a true economic electric vehicle based transportation economy.

Marine Energy – Power Generation by Using Marine Hydrokinetic (MHK) Resources

Covering more than 70% of Earth's surface, the oceans collect and store the sun's vast energy quite effectively, which is available 24/7 in various forms (tides, waves, ocean currents, gradients, etc.). Surrounded by the ocean on three sides, and with the second longest coastline of all U.S. states, Florida is uniquely positioned to harness marine renewable energy resources. Several forms of marine renewable energy that could soon be cost-competitive with fossil fuel sources for utility-scale power generation have emerged in Florida – ocean current energy, ocean thermal energy, and offshore wind. Each still requires investment in technology development, environmental research, and policy issues, but realization of commercial power generation from these sources will yield energy security, sustainability, and a more diverse renewables portfolio for the state.

1. **Ocean Current Energy:** Ocean currents flow in complex patterns governed by the wind, by the water's salinity and temperature, by the shapes and highly variable depths of the ocean basins, and by Earth's rotation. Most ocean currents are driven by wind and by solar heating of surface waters near the equator, while some currents result from density and salinity variations within the water column. Converting these currents into usable electrical power requires equipment to transform flowing water into mechanical energy and then to electricity (i.e., rotating turbines or linear "kites"). In particular, an ocean current resource is primarily found offshore Southeast Florida, in the channel between Florida and the Bahamas—the Florida Current portion of the Gulf Stream. The Southeast National Marine Renewable Energy Center (SNMREC), designated by the U.S. Department of Energy, has been assisting a growing ocean current energy sector to identify and reduce various barriers to commercial implementation. Although still an emerging market, the ocean current energy sector promises not only to be a unique opportunity for Florida to establish an international expertise and capability, but a significant base-load power source for its residents and businesses in the coming decades.

2. **Ocean Wave Energy:** Electric generation from ocean wave energy could provide plentiful clean and sustainable energy to Florida. Through collaboration with Harris Corporation, innovative concepts including a wave buoy (for an array deployment in the sea) and an oscillating wave column (with a uni-directional impulse turbine for coastal deployment) have been developed, and laboratory prototypes have been tested. The development of large-scale generation systems that can be robust to extreme weather conditions is critical in the state of Florida.

3. **Ocean Thermal Energy:** The SNMREC is also investigating ocean thermal energy conversion (OTEC) potential, the process by which the temperature difference between the ocean's warm surface and cold deep water is used to generate power. Long pipes pump abundant cold water to the sea surface which, in conjunction with warm water, turn turbines that generate electricity, albeit with low efficiency. Although typically only found in areas of the tropical oceans with greater than 1000 meter depth (like the southern portions of the Gulf of Mexico), portions of the Southeast Florida coast exhibit unique characteristics where required temperature differences are found in less than 300 meters depth. This technology was demonstrated in Hawaii and other places around the world late in the 20th century, but further developments are needed to achieve cost-competitive generation, especially further offshore from coastlines. While large OEMs such as Lockheed Martin Corp. are proceeding with floating OTEC technology development in other parts of the world, utility-scale power generated from this marine renewable resource is most viable for the continental U.S. in Florida, but unique challenges (like high current conditions) must be tackled before full implementation.

4. **Offshore Wind:** Wind power is the fastest growing source of renewable energy, with worldwide production doubling every three years. Wind is converted to electricity using 50 to 100 tower-mounted wind turbines, arranged as a wind farm. Offshore wind, considered to be a marine renewable energy resource, is not affected by the roughness of the land surface (topography, vegetation, buildings) and so presents an attractive potential. Large-scale offshore wind resource maps reveal potential for wind power in Florida's coastal waters. Offshore wind farms are usually built in relatively shallow water, and Florida's wide continental shelves present ample opportunities for their placement outside of coastal viewsheds. FESC scientists have found that the northwestern Gulf of Mexico has the potential to generate several thousand megawatts of power for Floridians. The study will ultimately help determine whether wind is a viable renewable energy resource for Florida and whether it is capable of supporting a new industry and the jobs and revenue that could come with it.

Nuclear Energy

Nuclear Energy is an essential contributor to Florida's energy mix. The nuclear industry employs approximately 25,000 Floridians. The construction of two new plants is projected in the next decade, with addition of 2,000 megawatts of electricity generation and thousands of new jobs benefitting the state's economy.

Florida is a leader in nuclear research, education and training, as evidenced by University of Florida's nationally ranked nuclear engineering program, the state of the art University of Florida Training Reactor and, a National Science Foundation funded a $3.2M regional center of excellence at Indian River State College, and a $4M/yr Department of Energy funded Nuclear Environmental Research Center at Florida International University Applied Research Center.

Development of new training methods, technologies and processes are needed to meet the challenges in nuclear energy unique to Florida, such as:

1. **Nuclear Workforce Development:** To ensure growth and sustainability of Florida's nuclear energy industry, there is a need to enhance Florida's nuclear careers. Training the next generation nuclear workforce will provide the skillset needed to expand industry in the state of Florida and engagement at all levels of education (including the graduation of new engineers, technicians and outreach to K-12). Collaboration of Florida academic institutions and industrial partners is paramount to success.

2. **Plant Modernization Technologies:** As nuclear power plants age, analog safety technologies become harder to maintain. Adoption of digital technologies in the nuclear sector has significantly lagged that of other technological industries. Utilities have been slow to implement these systems due to regulatory licensing uncertainty and a lack of internal expertise with new systems. As the previous generation of the nuclear workforce retires, the pool of available expertise in analog technology declines. Development in digital control technologies and plant modernization technologies are needed to ensure the continued viability of existing installations.

3. **Back-end Technologies:** With plans for a spent fuel repository at Yucca Mountain set aside and no national policy for addressing this issue, reactors store their fuel on-site and will continue to do so over the next decades. To enable Florida's leadership in back-end nuclear technologies, support is called for applied research in new processes and technologies for the storage, characterization and disposition of radioactive waste streams including methods to minimize waste, increase safety, and identify improved, alternative methodologies to nuclear waste disposition and its long-term monitoring. Specific challenges are present in the development of better technologies for assessing and assaying fuel stored on site in pools and dry casks.

Technology transfer offices, incubators, and small business development centers at the Florida colleges and universities will be leveraged to maximize the economic impact of these investments. A tie to entrepreneurship and economic development entities will help mature small businesses into successful companies. Making these investments will maintain and grow Florida's nuclear energy footprint. Investment in nuclear energy research and education will secure the workforce that sustains this growth, fulfilling the requirements of large employers. The nuclear industry will become an economic driver that will increase the number of small businesses, internal and external spinoffs, and entrepreneurship in Florida

FESC TECHNOLOGY TRANSFER PROGRAM

- ***TECHNOLOGIES LICENSED:*** **Sixty Three (63) technologies were licensed to industry** during Oct 1, 2009 to Sep 30, 2012.
- ***INVENTION DISCLOSURES SUBMITTED:*** The research translated into **169 invention disclosures** by FESC faculty who collaborated with over **200 companies** during Oct 1, 2009 to Sep 30, 2012.

Phase I: Early Stage Market Research / Business Plans

FESC funded the development of 15 business plans and market research studies ($7,500 each) for FESC supported later stage technologies. The 15 projects selected are:

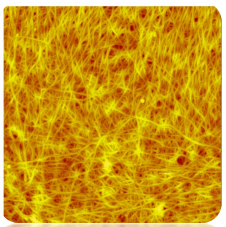
University	Project	Energy Field
FIU	Novel Fabrication Method of Nanoscale Fibers and Tubes	Energy Storage and Distribution
FIU	Synthesis of Hydrides and the Vehicular Use of Hydrogen Producing Reactions	Renewable Fuels
FSU	High Efficiency Multijunction PVs for Solar Energy Harvesting	Solar Energy
FSU	Multi-Piece Wind Energy Blades	Wind Energy
FSU	Microgrid Controllers & Solar Wind Distributed System Controls	Energy Storage and Distribution
UCF	High Efficiency Air Conditioning Condenser Fan Blades	Energy Efficiency
UCF	Milling Technology Leads the Way to Cost Effective Ethanol Production	Bio-energy
UCF	Hybrid PV and Thermoelectric Cell Elements Improve Solar Cell Efficiency	Solar Energy
UCF	Wind and Solar Battery Chargers	Energy Storage and Distribution
UF	Advanced Membrane Reactors for H_2 Production	Renewable Fuels
UF	ChromaDynamics	Energy Efficiency
UF	Highly Efficient, Long-Life, Weather Compatible Nanomaterials-Based Display	High Performance Display Technologies
UF	High Power, Fuel Flexible, Cost-Effective Solid Oxide Fuel Cell	Energy Storage and Distribution
USF	Enhanced Lead Sulfide Quantum Dots for Solar Cells	Solar Energy
USF	A Practical Method of CO_2 Sequestration	Carbon Capture and Sequestration

Phase II: Matching Funds R&D Program

The second tier of the FESC technology commercialization funding program is modeled on the very successful Florida High Tech Corridor Council (FHTCC) Matching Grants Research Program that has been ongoing at USF and UCF since 1996 and at UF since 2005. This model serves a number of purposes: 1) industry partners are by definition highly engaged in the development process in the university as they are co-funding the R&D package, 2) this provides at least a 2X leveraging of FESC funds on each project, 3) a natural pipeline of the technology deployment to the private sector partner is established as they are typically working on development aspects in parallel with university research on the project, and 4) the FHTCC program has proven that this model spawns new and long lasting R&D collaborative relationships between companies and SUS university researchers. Phase II projects were funded up to $50K in matching funds for each project. The total industry match is in excess of $400K. The funded projects are:

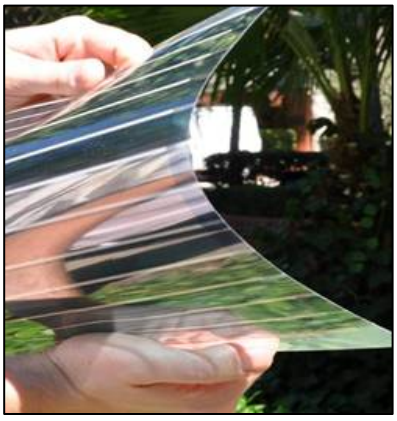
University	Title	PI	Company
FSU	Deployment of a Low Cost Concentrating Solar Energy Systems Using Solar Sausages	David Van Winkle	Hunter Harp Holdings, LLC
UCF	UCF and Harris Corp Joint Wave Energy Projects	Zhihua Qu	Harris Corp.
UF	SWNT Based Air Cathodes for FC and Metal Air Batteries	Andrew Rinzler	nRadiance LLC, portfolio company of Nanoholdings LLC
UF	Stress Evolution in Solid-State Li-ion Battery Materials	Kevin Jones	Planar Energy Devices Corp.
UF	Development of High Efficiency Polymer Solar Cells	Franky So/John Reynolds	Sestar Technologies, LLC.

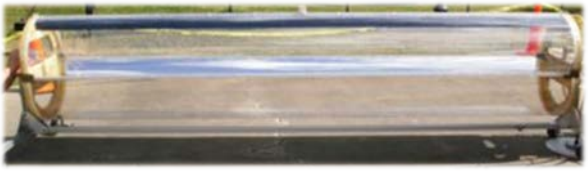
Wave Energy – Prototype Turbine



Fuel Cell - Carbon Nano Fibers

Organic Solar Cells





Solar Sausage

FLORIDA UNIVERSITY SPIN-OFF COMPANIES

#	University	Name of Business	Location	Start-Up Date	Specialty	# of Employees
1	FSU	Bing Energy International	Tallahassee, FL	2010	Fuel Cells	10 in US and 30 in China
2	FSU	General Capacitor	Tallahassee, FL	2012	Super Capacitors	1
3	FSU	High Performance Magnetics	Tallahassee, FL	2008	Cable-in-Conduit (CIC) magnet components	10-20
4	FSU	SunnyLand Solar, LLC	Tallahassee, FL	2011	Solar Collectors	2
5	UCF	Almos Battery Corp.	Orlando, FL	2011	Grid Scale Battery (Low Temp Molten Salt)	2
6	UCF	Garmor, Inc.	Orlando, FL	2012	Edge-Functionalized Graphene Oxide	8
7	UCF	Mesdi Systems, Inc.	Orlando, FL	2011	Electrospray (for Batteries, FC, etc.)	9
8	UCF	HybridaSol	Orlando, FL	2012	PV-TE Hybrid	1
9	UCF	HySense Technology, LLC	Rockledge, FL	2012	H_2 Sensing Tape	1
10	UCF	TALAWAH Technologies	Orlando, FL	2012	H_2 Sensors	3
11	UCF	*CeramiPower**	Orlando, FL	2011	CHP	0
12	UCF	*PV Integrated**	Cocoa Beach, FL	2011	Thin Film PV	0
13	UF	Energy Efficiency Company**	Greenville, SC	2009	Energy Efficiency – Turbines	5 to 10
14	UF	Florida FGT, LLC	Gainesville, FL	2010	Energy Crops	1
15	UF	Florida Sustainables	Gainesville, FL	2010	Chemicals from Biomass	2
16	UF	NanoPhotonica, Inc.	Longwood, FL	2010	Next Generation Optoelectronic Devices	5
17	UF	Compressor Company**	Houston, TX	2010	Air and NG Compressors	5 to 10
18	UF	Fuel Cell Company**	Fulton, MD	2010	Solid Oxide Fuel Cells	5 to 10
19	UF	Solar Fuel Company**	Gainesville, FL	2012	Chemicals to H_2	1
20	UF	Solar Powder	Gainesville, FL	2011	Nanoparticle Thin Film Photovoltaics	1

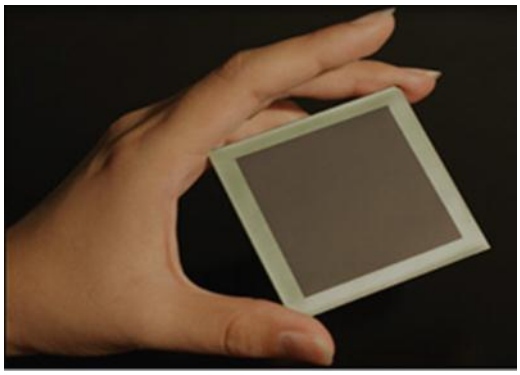
21	UF	*UB-WiSystems, Inc.**	Gainesville, FL	2012	Low Power Wireless Transmission	0
22	UNF	Omnii Sense, LLC	Jacksonville, FL	2011	Intelligent Sensor Network for Street Light Efficiency	4
23	USF	MudPower	St. Petersburg, FL	2011	Microbial FC	3
24	USF	Trash 2 Cash-Energy, LLC	Tampa, FL	2011	Landfill Gas to Liquid Fuel	7
25	USF	*Energy Management Professionals**	Lutz, FL	2008	HVACR	0
	USF	New Energy Technologies Inc.***	Columbia MD	2009	SolarWindow™ Technology	**

** These companies did not survive*

*** Company name kept confidential due to university licensing*

** New Energy Technologies Inc. is not a university spin-off. They licensed USF technology

FL FGT: Energy Crops



RedOx Power Systems , LLC

Florida Sustainables™

From Biomass to Biodegradable Plastics

SunnyLand Solar, LLC, Solar Concentrator

DESCRIPTION OF FLORIDA UNIVERSITY SPIN-OFF COMPANIES

Bing Energy International (Tallahassee, FL – FSU Technology)
http://bingenergyinc.com/
By utilizing a revolutionary carbon nanotube based solution, Bing Energy International (BEI) has developed a product and process that maximizes the effectiveness of the platinum catalyst required for PEM fuel cells. PEM fuel cells are relatively low temperature devices that can be used in a wide variety of applications ranging from backup power, to automotive power, to stationary power generation. The result is equal or better electrical output, from only 30% of the platinum and with increased durability. This technology has been independently verified to meet nearly all of the Department of Energy's hydrogen fuel cell goals for the year of 2015.

General Capacitor (Tallahassee, FL – FSU Technology)
http://www.news.fsu.edu/More-FSU-News/Florida-State-inks-deal-to-license-new-supercapacitor-invention
General Capacitor LLC is a privately held company and was founded in 2012 to manufacture advanced Li-Ion capacitors.

High Performance Magnetics (Tallahassee, FL – FSU Technology)
http://ciceft.com/
High Performance Magnetics designs, fabricates and tests advanced cable-in-conduit (CIC) magnet components. CICs are typically used in large-bore, fast-ramping superconducting magnets for high-tech applications such as Magnetically Confined Fusion Energy, High-Field Magnet Laboratories, Spallation Neutron Sources, and Superconducting Magnetic Energy Storage devices.

SunnyLand Solar, LLC (Tallahassee, FL – FSU Technology)
http://www.research.fsu.edu/techtransfer/solarsausage.html
SunnyLand Solar is developing a new solar technology licensed from Florida State University called the "Solar Sausage". This technology has the potential of dramatically reducing the cost of concentrated-solar applications. Material cost, ease of manufacturability, optical quality, and speed of deployment are just some of its benefits. It is an inflatable made of durable Mylar and has been shown to tolerate UV radiation and routine high winds. SunnyLand, as sole licensee, has already deployed over 2,300 these units in North Florida and with determination continues to work on improvements to this burgeoning technology.

Almos Battery Corporation (Orlando, FL – UCF Technology)
The company is engaged in developing a new battery technology which is safe & low cost for electric power grid applications. The proposed product is a prototype battery which is scalable to megawatts power and megawatts-hr energy. The prototype battery is being built. The battery allows the operation to be on an unattended basis for extended period of time. Integration of battery system into utility transmission and distribution is a mature and well defined process.

Garmor Inc., (Orlando FL – UCF Technology)
http://garmortech.com/
Garmor has developed a simple yet effective method of producing edge-functionalized graphene oxide. Whereas traditional methods have relied upon powerful oxidizing agents and acids to produce graphene,

Garmor relies upon new advances in milling technology to produce graphene oxide yielding only water as a by-product. These proprietary achievements eliminate hazardous waste disposal costs and deliver a product suitable for large scale production at commodity-type prices.
Graphene/graphene oxide has already been shown to have wide applications as an adsorbent, lubricant, corrosion inhibition, electrodes, transistors, and as an additive used to strengthen composite materials. Garmor's manufacturing technology has been designed to tailor the oxidation level so that it can be uniquely matched to a given application. For example, Garmor's moderately oxidized, edge-functionalized graphene oxide is fully dispersible in water and can be deposited in thin films. This offers the potential for improved electronic displays, solar cells, water-based lubricants, and various hydrophilic polymer composites. Garmor's graphene can also be readily functionalized to accommodate non-polar environments.

HybridaSol, (Orlando FL – UCF Technology)
http://futureenergy.ultralightstartups.com/campaign/detail/809
Reduced PV degradation and increased PV output are achieved with a ThermoElectric (TE) cell printed on the substrate of the PV cell, then operating the TE cell as a Peltier cooler powered by the PV cell itself. Though diversion of any PV output seems self-defeating, favorable gains in net energy production are achieved by exploiting the large differences in the PV temperature-degradation curve (%Voc/oC) and the heat transport curve (Energyelectric/Energyheat) of the TE cell. Note the very short distances this heat must be transferred, from the PV wafer to the backplane (< 1 mm), and it becomes apparent very little parasitic energy is required from the PV cell. The economics then become attractive, provided the TE materials and process for manufacture of the PV-TE Hybrid are low cost.

HySense Technology, LLC, (Rockledge FL – UCF Technology)
http://megawattventures.com/2013finalists/hysensetech/
Manufactures chemochromic (color-changing) pigments for flammable gas leak detection applications. HySense Technology, LLC believes that in the current and future national energy portfolio, hydrogen and natural gas are two of the most important energy resources. However, keeping such flammable gases contained to establish a safe environment for producers and end utilizers is of utmost importance. Presently, the large majority of gas leak detection systems have been focused on the development of electronic sensors. Electronic sensors have several drawbacks including loss of sensitivity in the field due to the environmental effects, costs, and problems associated with power required on-site. Thus, a visually easy to detect leak detector can greatly enhance the market acceptance and expansion of these valuable energy sources.

Mesdi Systems Inc. (Orlando FL – UCF Technology)
http://megawattventures.com/2012/05/29/mesdi-systems-wins-100000-in-acc-clean-energy-challenge/
Mesdi Systems supplies next-generation spray equipment for manufacturing advanced coatings and chemical powders where high quality and product uniformity are vital. Applications requiring these high precision powders and coatings include lithium-ion batteries, solar cells, LED lighting, semiconductors, pharmaceuticals, and medical implants.

TALAWAH Technologies (Orlando FL – UCF Technology)
http://www.talawahtechnologies.com/
TALAWAH Technologies develop wireless hydrogen sensors and a proven communication system that all consume little battery power for detecting physical characteristics in complex environments. TALAWAH Technologies is founded on joint research conducted at the University of Central Florida and the National Aeronautic and Space Administration at Kennedy Space Center. TALAWAH Technologies has

commercialized the coherence multiplexed transceiver (CMT) for communication with surface acoustic wave (SAW) sensors. This partnership lead to the invention of the coherence multiplexed SAW sensor system in 2012 and demonstrated a working matrix of SAW sensors that were able to read temperature and range data at distances over 20 meters.

Energy Efficiency Company (Anderson, SC – UF Technology)
http://www.emerald-endeavors.com/
Company's second generation SMART gas sensors are thin-film based gas sensor for combustion applications. Transduction of the analyte composition and concentration is realized through impedance based measurements of an oxide electrode in a solid electrolyte electrochemical cell.

Florida FGT. LLC (Gainesville FL – UF)
http://www.floridafgt.com/
Florida FGT provides professional advice to forest and agricultural landowners on various aspects of the use of fast-growing Eucalyptus, Corymbia, Populus, Taxodium, and Pinus species.

Florida Sustainables (Gainesville, FL – UF Technology)
http://www.chem.ufl.edu/~miller/floridasustainables/
Florida Sustainables innovates and markets sustainable materials, especially biorenewable and degradable polymers designed to replace petroleum-based plastics. The company synthesizes polymers called polyesteracetals, providing the strength of petroleum-based plastics lacking in other "green" plastics made from PLAs — or polylactic acid. Their plastics stand up to heat better than current "green" plastics and are not brittle and noisy such as the bag of SunChips abandoned due to consumer complaints. They also degrade within five to 10 years of their usable life compared to 1,000 years for petroleum plastics, and they do not require the composting conditions of PLAs to break down.

Compressor Company (Houston TX – UF Technology)
http://www.oscomp-systems.com/
They deliver turnkey solutions that enable customers to transition to natural gas as an energy source, even if they do not have access to a pipeline. They successfully delivered commercial quantities of gas to a disconnected user. They are developing game-changing compression technology capable of efficiently compressing wet gas and multiphase streams to compression ratios that are an order of magnitude higher than existing technology.

NanoPhotonica, Inc. (Gainesville, FL – UF Technology)
http://www.nanophotonica.com/
NanoPhotonica is developing breakthrough nanomaterials, production techniques and associated products that will enable market-altering improvements to optoelectronic products. The company is developing a number of innovations that will transform both the flat panel display and solar panel/green energy sectors. For example, smartphones and camera displays will be able to operate with 50% less power than traditional LCDs. In addition, the production costs are anticipated to be 75% lower than display competitors, while still providing more vivid colors and greater ease of viewing. For display applications, the company's patented, all-solution-processable quantum dot light-emitting diodes technique (S-QLED®) allows fabrication of displays using ink-jet printing methods.

Fuel Cell Company (Fulton, MD – UF Technology)

http://www.redoxpowersystems.com/

The company was formed in 2012 by a group of scientists and engineers with extensive research, technical and managerial experience. They are pioneering major breakthrough Solid Oxide Fuel Cell technology. It is their solution for Distributed Power Generation and Transportation.

Solar Fuel Company (Gainesville, FL – UF Technology)

http://www.linkedin.com/pub/kevin-bowles/3/b76/b9

This is a high growth, solar, biofuels (non-biomass) company that uses a proprietary low pressure/high temperature thermochemical process and proprietary reactor to convert solar energy, water and CO_2 into fuel (hydrogen or syngas). Solar Fuel: 1) has a flexible, mobile footprint accommodating varying locations, 2) zero carbon footprint and 3) produces cost competitive, (non-subsidized) fuel. Solar Fuel has raised (late 2011) $3MM from the DOE, $35K from the University of Florida and completed a bench prototype. Solar Fuel is currently scaling the product and is in discussions with potential strategic partners including oil and gas, defense, utility, states and neighboring nations.

Solar Powder (Gainesville, FL, UF Technology)

http://www.research.ufl.edu/otl/pdf/startup/Solar_Powder_COS.pdf

Solar Powder is a solar-energy company that has developed an innovative technology that will set a new low cost point for solar energy. The technology behind Solar Powder uses CIGS, a semiconductor absorber layer composed of copper, indium, gallium and selenium. CIGS was chosen because of its high cell efficiency, high energy yield, and now with Solar Powder, its low cost of manufacturing when compared to other semiconductor material, such as crystalline. Solar Powder has developed a process for the synthesis of the CIGS absorber layer that addresses the major manufacturing cost factors challenged by other CIGS methods. This includes a proprietary nano-powder that is mixed with a secret Solar Powder solvent to allow for liquid application. Solar Powder solar panels can be produced at scale and high yield.

Omnii Sense, LLC (Jacksonville, FL, UNF Technology)

http://istart.org/startup-idea/business/omnii-sense-llc/9030

Omnii Sense LLC is a developer of intelligent wireless sensor networks that gather, record, and report real time data for multiple industries including energy, health, environmental, and security. The Omnii Sense "smart" sensor technology requires no human interaction once activated and no retrofitting to existing infrastructure. The sensors automatically establish a viable communication path, identify nearest neighbors, perform self-healing in the event of disruption, and can be used to detect everything from energy consumption, to microbes and chemical warfare agents.

Mud Power, Inc. (Saint Petersburg, FL – USF Technology)

https://qust.com/c/mud_power_inc

Mud Power has developed modular long-term power solutions that harness energy generated in a natural process by microorganisms found in marine sediments. Customers will be able to significantly increase the length and data resolution of their deployments located near the seafloor.

Trash 2 Cash-Energy LLC (Tampa, FL – USF Technology)

http://www.trash2cashenergy.com/

Trash 2 Cash converts landfill gas to customer specific liquid fuel. The proprietary gas to liquid process converts naturally produced landfill gas (LFG), composed mainly of methane and carbon dioxide to hydrocarbon fuels specific to the customer needs such as diesel fuel. Trash 2 Cash couples a patent pending Fischer Tropsch (FT) eggshell catalyst to an innovative process design, incorporating a novel tri-

reforming reaction to reduce the troublesome impurities found in crude bio-derived gases and produce desired syngas for the FT reaction. This alleviates many problems associated with accumulating municipal solid waste (MSW) in landfills and provides a domestic, sustainable, green fuel.

USF Technology transfer to New Energy Technologies Inc.* (Columbia MD, USF Technology)
http://www.newenergytechnologiesinc.com/technology/solarwindow
New Energy Technologies is not a university spin off; however they licensed USF SolarWindow™ technology, which enables see-through windows to generate electricity by 'spraying' their glass surfaces with New Energy's electricity-generating coatings – the subject of eleven patent filings.

Companies Formed But Did Not Survive:

CeramiPower, Inc. (Orlando FL – UCF Technology)
CeramiPower, Inc. was founded to develop ceramic based combustion products and combined heat and power unit (CHP) for both military and civilian applications.

Energy Management Professionals (Lutz, FL – USF Technology)
Energy Management Professionals (EMP) was formed to develop and commercialize new technologies that improve the energy efficiency of existing products and processes. The Company's particular focus was on energy generation utilizing thermodynamics, heat transfer and heat exchange, which are important to the heating, ventilation, air conditioning, and refrigeration ("HVACR") industries and to the current invention. EMP held the rights to two (2) patent-pending applications: ECOGEN Co- Generation System and ReadyPower Portable Power Storage Unit.

P.V. Integrated (Orlando FL – UCF Technology)
P.V. Integrated was formed to develop a novel process for low cost, high throughput manufacturing of CIGS Thin-Film solar cells.

UB-WiSystems, Inc. (Gainesville, FL – UF Technology)
http://megawattventures.com/teams/ubwisystems/
UB-WiSystems, Inc. was founded in May 2012 to provide ultra-low power transceiver solutions for Wi-Fi enabled consumer electronics

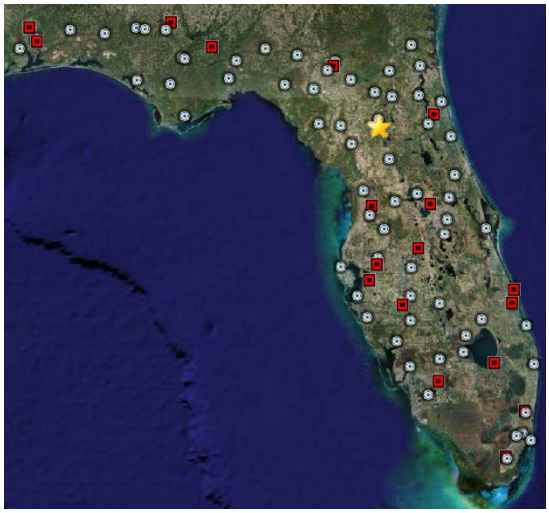
EDUCATION AND OUTREACH

Education – Focus on Workforce Development

FESC Education program has three focus areas: community college education at the Associate of Science and certificate level, nuclear energy education, and a Masters degree in Sustainable Energy. The Community Colleges offer an opportunity to develop a trained energy workforce through programming for both technician-level, two year students, as well as students planning on completing a Bachelors degree.

FESC partners with the Florida Advanced Technological Education Center (FLATE) to develop statewide energy curriculum frameworks for technical A.S./A.A.S. degree programs supporting existing and new energy business sectors. FLATE develops and processes these frameworks through the FL Department of Education. FLATE also develops new courses required for each new program of study. FLATE helps state and community colleges implement the new frameworks in their institutions. Together with the National Science Foundation-funded Energy Systems Technology Technicians (EST²) project team, FLATE has developed a new Alternative Energy Technologies degree which is now offered at five community colleges and also is in the process of developing a new Industrial Energy Efficiency specialization for the Engineering Technology (ET) Degree and associated College Credit Certificate which will be offered starting Fall 2014.

Outreach



FESC outreach program is led by Dr. Pierce Jones, Director of the UF Program for Resource Efficient Communities, and the program leverages the existing network of UF extension offices to reach out to every county in Florida. These outreach programs and products include targeted continuing education courses for licensed builders, architects, engineers, landscape architects, interior designers, and others. Also, the UF Program for Resource Efficient Communities is an interdisciplinary group that promotes the adoption of best design, construction, and management practices in new residential master planned developments.

The FESC outreach team has also developed educational outreach programs and materials (i.e., Fact Sheets) designed to deliver practical information and knowledge on energy-related topics to the general public as well as targeted to specific audiences such as builders, planners, engineers, architects, small businesses, local governments, and utilities through the Cooperative Extension Service and others. The list of Fact Sheets developed is given below.

List of FESC Fact Sheets

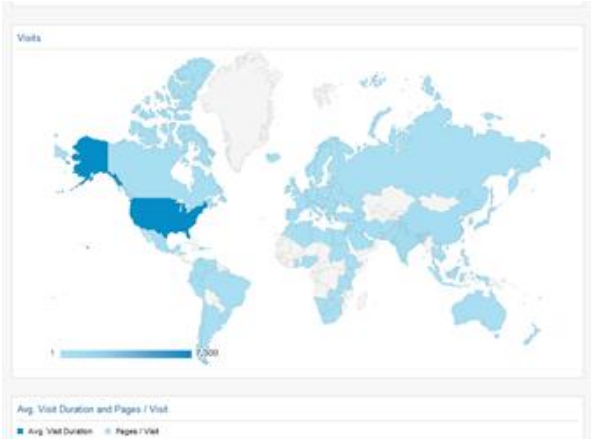
1. Green Jobs for Florida
2. Algae: A Future Fuel Source
3. Batteries for Home Electronics
4. Automobile Batteries
5. Smart Grid
6. Property Assessed Financing (e.g., PACE)
7. Institutional Sustainability
8. Air Conditioning
9. Appliances in General
10. Ceiling Fans
11. Comparing Homes for Energy Efficiency
12. The Duct System
13. Easy Steps to Improving Your Home's Energy Efficiency
14. ENERGY STAR Qualified Homes
15. Fluorescent Lighting
16. Green Certification Programs
17. Home Inspections
18. Incentive Programs for Energy Efficiency
19. Indoor Air Quality and Energy
20. Introduction to LED Lighting
21. The Irrigation System
22. Landscaping
23. Laundry Area
24. Water Heaters
25. Windows and Skylights
26. Caulking & Weather-Stripping
27. Dishwashers
28. House Design & Room Location
29. Insulation for Your Home
30. Radiant Barriers
31. Refrigerators & Freezers
32. Swimming Pools
33. The Roof
34. Ventilation
35. Whole-House Systems Approach to Energy Efficiency
36. Tankless Water Heaters
37. Tips for becoming a Water-Wise Floridian
38. Programmable Thermostats
39. Home Energy Analysis
40. Net zero energy homes (ZEHs)
41. Florida's Zero Energy Demonstration Homes
42. GHG Case Study: Utility Home Energy Efficiency Rebate Programs (Gainesville Regional Utilities)
43. GHG Case Study: Preserving Natural Areas for Carbon Sequestration
44. Carbon Challenge

45. An Introduction to Carbon Footprints
46. Carbon Cap & Trade
47. Preserving Natural Areas for Carbon Sequestration
48. Reducing Landscape Inputs
49. Green Building Ordinance (Gainesville, FL)
50. Reducing VMT (Vehicle Miles Traveled) via Clustered Development (Restoration, FL)
51. Reducing Road Infrastructure via Clustered Development (Restoration, FL)
52. Utility Home Energy Efficiency Rebate Programs (Gainesville Regional Utilities)
53. Reducing the Area and Inputs of Managed Landscapes (Restoration, FL)

Web Site link for fact Sheets: http://www.floridaenergy.ufl.edu/?page_id=273

FESC Web Site and e-Newsletter

FESC Web Site (www.FloridaEnergy.ufl.edu) continues to be an important communication tool for our program. It is updated regularly to remain current and to better serve our users. Based on a Google Analytics report, the FESC web site was viewed by 9,690 (78.33% new visitor and 21.67% returning visitor) Google visitors during the period Oct 1, 2012 to April 15, 2013. The viewers visited 24,146 pages. Viewers were from US, Canada, India, China, Europe, Middle East, Russia, South America, Australia, and Africa as shown in the map below.



FESC e-Newsletter: FESC prepares and distributes electronic newsletters every other month to over 700 FESC industry/faculty contacts. The e-newsletter provides the current events and funding opportunities. It highlights the accomplishments of FESC faculty and Florida industry. It also covers global energy related news. The newsletters are posted at FESC web site: http://www.floridaenergy.ufl.edu/?page_id=1999

FESC USER FACILITIES

FLORIDA ATLANTIC UNIVERSITY

Southeast National Marine Renewable Energy Center

Web Site Link: *http://snmrec.fau.edu*

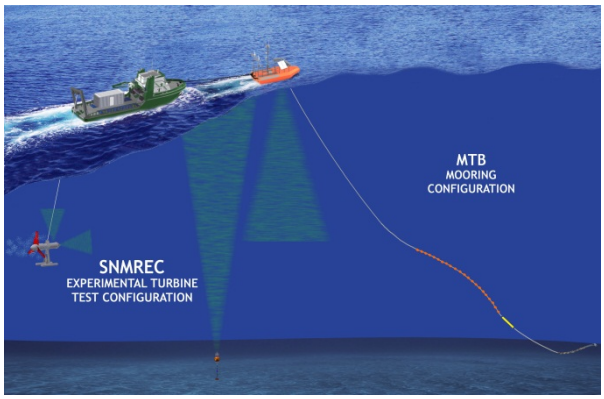
Director: Sue Skemp

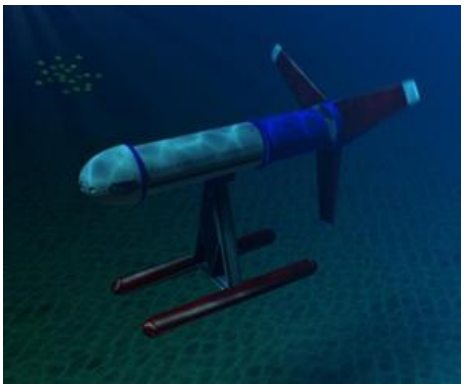
Contact Information
Email: snmrec@fau.edu Phone: 561-297-0956

Description
The Southeast National Marine Renewable Energy Center (SNMREC) at Florida Atlantic University is investigating the challenge of harnessing the power of the Gulf Stream for the generation of base load electricity, a unique contribution to a broadly diversified portfolio of renewable energy for the nation's future. Working in a systematic fashion toward the implementation of a full-scale, at-sea testing facility for industrial prototypes, current work includes developing testing infrastructure and protocols for components and complete generating systems and, in the process, fielding critical environmental monitoring systems so that the nature and sensitivity of the resource itself can be understood and effects of single-system deployments can be examined before commercial-scale arrays are designed. The SNMREC's strategy to accelerate commercial development of Marine & Hydrokinetic (MHK) projects includes technology R&D, testing, environmental research and measurement, policy, regulatory, and economic research, and education and outreach.

Lab Capabilities: In-lab technology testing is underway with scaled generator dynamometer capabilities which not only provide a platform to test offshore electrical systems before use, but also simulate offshore grids. Corrosion and bio-fouling facilities allow for investigation of new materials and coatings which will be necessary to ensure the efficacy of long term commercial device array deployments, and a recirculating flume tank is used to determine early-stage proof-of-concept and to test mooring and device dynamics before greater expense and risk is incurred testing offshore at larger scales.

Open Water Capabilities: An offshore scaled device test berth (approximately 12 nm offshore of Ft. Lauderdale, FL) is under construction and will be installed for up to 100kW max instantaneous power production and/or 7m rotor diameter turbine testing. This initial group of industrial devices will provide insight into individual device extraction methods, dynamics, and basic system operability. A generic 20kW experimental research turbine is also under construction which will allow for subsystem or component testing and development. In addition, it will provide methodology and support infrastructure available for commercial 1:20 scale prototype device testing.





Fee Schedule

Facility use is negotiated on a per-proposal basis and can include analysis and test design/planning services.

FLORIDA INTERNATIONAL UNIVERSITY

Wall of Wind Testing Facility (WoW)

Website: http://wow.fiu.edu

Contact Information

Dr. Arindam Gan Chowdhury, Laboratory Director
Email: chowdhur@fiu.edu Phone: (305) 348-0518

Roy Liu-Marques, Testing Services
Email: rliumarq@fiu.edu Phone (305) 348-4392

Description
The 12-fan Wall of Wind (WoW) at FIU is the largest and most powerful university research facility of its kind and is capable of simulating a Category 5 hurricane – the highest rating on the Saffir-Simpson Hurricane Wind Scale. For more than a decade, FIU researchers and engineers have planned, designed and redesigned numerous concepts and models that have all contributed to the science and technology behind this state-of-the-art machine.

Due to increased demand for higher wind speed testing, FIU has taken yet another step forward with its 12-fan WoW. The new system is capable of performing controlled and repeatable to-scale testing in flows that replicate the type of CAT 5 level winds seen during Hurricane Andrew – one of the costliest storms in US history. This facility will not only fill the void where most current win-structure experiments fail, it has the potential to be as influential to wind engineering as crash testing is to the automobile industry.

FIU brings together the critical elements of wind testing to achieve comprehensive results for its clients. To do this, an expert team of wind engineers and scientific researchers integrates the unique capabilities of the Wall of Wind and the Titan America Structures Lab with the analytical tools of Computational Fluid Dynamics (CFD) simulation. At the WoW, tests can be described by three categories: 1) non-destructive (aerodynamic), 2) destructive (failure) and 3) wind-driven rain. For the non-destructive tests, a comprehensive instrument inventory is available to capture data of wind-induced forces, moments, strains, pressures, displacements, among others.

Fee Schedule
To be determined by the scope of work.

Advanced Materials and Engineering Research Institute (AMERI)

Web Site Link: http://ameri.fiu.edu/home/About.html

Contact Information

Dr. Arvind Agarwal, Director, AMERI and Professor of Materials Engineering
Email: agarwala@fiu.edu *Phone:* (305) 348-1701 Fax: (305) 348-1932
Mr. Neal Ricks, Manager, AMERI Email: ricksn@fiu.edu

Description

The Advanced Materials Engineering Research Institute (AMERI) provides an open access equipment infrastructure to support materials research and engineering over a broad range of technology and capabilities. The Institute provides analytical instrumentation, materials characterization, and process development laboratories to support faculty and industry in the development and characterization of new materials over the continuum from the nanoscale to bulk materials.

The Analytical Instrumentation Laboratory contains a field emission scanning electron microscope (FESEM), a 200 kev Transmission Electron Microscope (TEM), Atomic Force Microscope (AFM), X-ray diffraction, thermal (DSC, TGA, DMA, dilatometer flush diffusion, and mechanical testing (uniaxial/biaxial Instron, creep). Process Development laboratories for ceramic processing (sol-gel, tape casting, milling), polymer processing, metal processing, and arc melting, thermal processing (air, vacuum, hydrogen, controlled atmosphere furnaces) are available to support faculty and student researchers.

The Institute contains the Motorola Nanofabrication Research Facilities, which is supported by a class 100 clean room and nanofabrication capabilities including e-beam lithography and optical photolithography. Fabrication of nano/micro electromechanical systems (N/MENS) can be accomplished by a combination of nanolithography, reactive ion etching, and thin film deposition by a variety of techniques (e-beam, sputtering, filament evaporation, cvd).

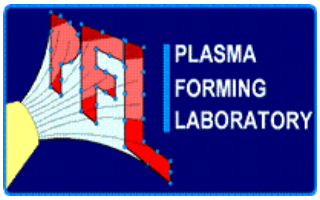
In addition to supporting research within the graduate program in materials science within the Department of Mechanical and Materials Engineering, the Institute supports faculty across all departments (physics, chemistry, geology, biology) in materials based research.

Fee Schedule:
Please visit AMERI website *http://ameri.fiu.edu/*

Plasma Spray Forming Laboratory

Web Site Link: *http://web.eng.fiu.edu/agarwala/laboratories/PlasmaFormingLab.html*

Contact Information



Dr. Arvind Agarwal, Department of Mechanical and Materials Engineering

Email: agarwala@fiu.edu *Phone:* (305) 348-1701 Fax: (305) 348-1932

Description

This lab makes use of plasma-based techniques to synthesize:

- Near Net Shape Structures by Rapid Prototyping
- Bulk Nanostructured Components
- Advanced Ceramic and Metallic Nanocomposites
- Multilayered Functional Coatings
- Synthesis of Nanostructured Composite Powders

Click Here for Demo

Plasma Spray Forming Laboratory is a 1300 square feet facility. The equipment list is given below:

- Praxair Plasma Spray System
- Plasma Power Source Model PS-1000
- Plasma Control Console Model 3710
- Powder Feeder Model 1264
- Plasma Spray Gun Model SG-100 (internal and external powder injection capability)
- Localized inert shroud creating facility
- Plasma Spray Booth with CNC turntable
- Fanuc S 100 Robot with RF controller
- Three-axis Gantry Robot
- Thermach AT-1200 Powder Feeder, 0-15 RPM
- Accuraspray-g3 Single Head Plasma Inflight Sensor
- Raytek Optical Pyrometer (-10 to 1200C) with integrated software and PC for continuous temperature monitoring
- 4-channel B-Type (0 to 1700C) and K-Type (-200 to 1250C) Thermocouple with OM-CP-QUADTEMP Data Acquisition System and OM-CP-IFC110 Windows Software
- Grit Blaster
- Ultrasonic Cleaning Bath
- Density Measurement Kit
- ER Advanced Ceramics 755RMV Jar Mill
- Sieves and Sieve Shaker
- Work Bench with all machine tools
- Rotating Ball Mills and blenders
- Low Speed and High Speed Diamond Saws
- Positron Adhesion Tester
- Optical Microscope (upto 1600X)
- Electrostatic Spray Facility for Polymer Coating Synthesis

Computational Facilities in Plasma Forming Laboratory:

- 2 Pentium IV, 3.40 GHz, 2 GB RAM desk top computer
- 3 Pentium IV, 2.6 GHz desk top computers
- 1 Pentium IV, 2 GHz notebook computer
- 2 Pentium IV, 3.20 GHz, 3.5 GB RAM desk top computer
- Software in Plasma Forming Laboratory
- CaRIne Crystallography 4.0: For geometric visualizations of interfaces, surfaces, crystals, real lattices in 3D, reciprocal lattices in 3D and 2D and for comprehending stereographic projections and X-ray diffraction patterns.
- FactSage 6.0: A thermochemical software and database package to understand phase diagrams, feasibility of chemical reactions, compel equilibrium in multicomponent, and multiphase systems.
- Hyper Chem 7.5: Modeling software to compute thermodynamic energies based of molecular mechanics and dynamics models for various configurations and crystal geometry.
- SimDrop 3.0 software: For simulating splat formation with thermal and kinetic history as experienced in thermal spraying.

Fee Schedule:

Please contact Prof. Agarwal at agarwala@fiu.edu

FLORIDA STATE UNIVERSITY

Aeropropulsion, Mechatronics and Energy Building

Web Site Link: *http://www.eng.fsu.edu/me/research/ame.html*

Contact Information
Dr. Chiang Shih, Chair
Email: shih@eng.fsu.edu *Phone:* (850)410-6321 Fax: (850)410-6337

Description
This 60,000-square-foot state-of-the-art facility supports advanced research in aerospace and aviation, mechatronics (robotics) and sustainable energy engineering. The Aero-Propulsion, Mechatronics and Energy Building houses laboratories, equipment, offices and other infrastructure necessary to carry out the university's research mission in several key areas seen as crucial to the economic development of the state and nation.

Among the organizations that is housed in this $23 million facility are Florida State's Energy and Sustainability Center (ESE) which features an energy material processing lab, dry room for battery assembly; Institute for Energy Systems, Economics and Sustainability (IESES); the university's Center for Intelligent Systems, Control and Robotics (CISCOR); and the Florida Center for Advanced Aero-Propulsion (FCAAP), a State University System Center of Excellence that is headquartered at FSU.

As its name indicates, the research that takes place within the Aero-Propulsion, Mechatronics and Energy Building focuses on three key areas:

- **Aero-propulsion**: The discipline of aero-propulsion deals with transportation systems and other objects that move through air, influencing the design and fabrication of aircraft, spacecraft, automotive transport, and all manner of vehicles in motion. The relevant research areas cover fundamental science topics such as aerodynamics, fluid mechanics, acoustics, thermal physics and turbulence, as well as practical applications such as combustion improvement, active control of flow separation, supersonic jet noise suppression, lift/thrust enhancement and drag reduction.
- **Mechatronics**: The term mechatronics, a combination of mechanics and electronics, was first used in Japan in the 1960s. From a technical perspective, it is the synergistic integration of mechanical, electrical, control and computer systems to create functional products. Mechatronics has become the enabling technology responsible for industrial innovations in numerous economic sectors, including automobiles, alternative energy, aerospace, electronics and defense. The field of mechatronics generally covers topics such as robotics, micro-electro-mechanical-systems (MEMS), intelligent systems, automated guided vehicles and smart materials.
- **Energy**: Seeking new energy resource that are more efficient and cost-effective and that minimize effects on the environment is among the most critical issues that the world will have to grapple with in the 21st century. The Aero-Propulsion, Mechatronics and Energy Building houses research labs for organizations that are focused on exploring reliable, affordable, safe and clean energy technologies, including projects such as Florida State's Off-Grid, Zero-Emission Building; solar-thermal systems; a photo bioreactor for algae growth; and fuel-cell and advanced battery technologies.

Next-Generation Polysonic Wind Tunnel

On September 1, 2010, the National Science Foundation awarded the Florida Center for Advanced Aero Propulsion (FCAAP) $3.2 million for the development of a next-generation Polysonic Wind Tunnel. The wind tunnel will create a unique shared resource to produce fundamental advances in gas dynamics and material science as well as develop transformational flow control technologies. The wind tunnel will be housed at FSU in the Aero-Propulsion, Mechatronics and Energy Building.

Fee Schedule: TBD

Center for Advanced Power Systems (CAPS)

Web Site Link: http://www.caps.fsu.edu/

Director: Dr. Steiner Dale

Contact Information
Steve McClellan
Email: mcclellan@caps.fsu.edu Phone: (850) 645-2157 Fax: 850-644-7456

Description
The 34,000 sq. ft. CAPS research, development, test and demonstration facility is located in Innovation Park in Tallahassee, Florida. CAPS is a multidisciplinary research center organized to perform basic and applied research to advance the field of power systems technology and provides a secure infrastructure and environment for all types of sensitive research. CAPS emphasis is on application to electric utility, defense, and transportation, as well as, developing an education program to train the next generation of power systems engineers. The research focuses on electric power systems modeling and simulation, power electronics and machines, control systems, thermal management, high temperature superconductor characterization and electrical insulation research. FSU also has The Energy and Sustainability Center which addresses challenging alternative energy issues through innovative solutions for consumers and industry. The Center promotes industry, government, and academia collaboration and participation in critical research activities moving beyond the stage of initial demonstration to commercialization.

Fee Schedule:
Facility use is negotiated on a per-proposal basis.

Institute for Energy Systems, Economics and Sustainability

Web Site Link: http://www.ieses.fsu.edu/

Director: Dr. David Cartes

Contact Information
Email: sims@ieses.fsu.edu Phone: 850-645-9232

Description
The *Institute* is a public resource to carry out scholarly basic research and analysis in engineering, science, infrastructure, governance and the related social dimensions all designed to further a sustainable energy economy. The *Institute* unites researchers from the disciplines of engineering, natural sciences, law, urban and regional planning, geography, and economics to address sustainability and alternative power issues in the context of global climate change. IESES offers administrative and program support to researchers, partners and collaborators.

Grant Proposal and Administration Support: Proposal development, preparation and submission; grants management; requisition and authorization of payments of purchased items; reconciling ledgers, monthly financial reports, re-budgeting and budget amendments; office space, hiring staff and managing travel.

Program Services: Public and private sector resource identification and partnership development; interdepartmental and state-university wide resource development; promotion of our research partners and collaborators in print, electronic media and through participation in statewide, national and international conferences.

Fee Schedule: Negotiated on a per-proposal basis.

National High Magnetic Field Laboratory (NHMFL)

Web Site Link: http://www.magnet.fsu.edu/about/ and https://users.magnet.fsu.edu/
Director: Dr. Greg Boebinger

Contact Information
NHMFL has 7 user programs. The contact information for each user program is listed below.

Magnet Lab User Facilities			
Facility	**Location**	**Director**	**Help With Requests**
Advanced MRI and Spectroscopy	Gainesville	Joanna Long	Joanna Long
DC Field	Tallahassee	Eric Palm	Eric Palm
Electron Magnetic Resonance	Tallahassee	Stephen Hill	Jurek Krzystek Andrew Ozarowski
High B/T	Gainesville	Neil Sullivan	Neil Sullivan
Ion Cyclotron Resonance	Tallahassee	Alan Marshall	Amy McKenna Colleen Davis
Nuclear Magnetic Resonance	Tallahassee	Bill Brey Tim Cross	Riqiang Fu Zhehong Gan Ashley Blue
Pulsed Field	Los Alamos	Chuck Mielke, Facility Director Jonathan Betts, Head of the Pulsed Field User Program, Contact person to help with requests	Chuck Mielke Jonathan Betts

Description

The **National High Magnetic Field Laboratory** offers the highest magnetic fields for use by the international community of scientific visitors. Many of the magnets and experimental techniques are highly specialized, yet broadly applicable to research in physics, materials science, chemistry, biochemistry, biology and even biomedicine. Every year over 1100 scientists and engineers use the National High Magnetic Field Lab facilities. Graduate students and Nobel laureates, researchers from academia and the corporate world, they travel from across the globe for a chance to work with the unique instruments and experienced staff at our three locations. First and foremost, the Mag Lab exists for these users and the cutting-edge research they conduct here as they seek to expand the boundaries of scientific knowledge. The Users Hub is dedicated to them and their needs. It is divided into two sections: User Programs and User Services.

User Programs: The Mag Lab has seven user programs located across three campuses. The lab also has a number of important in-house research programs that complement the user programs through development of new techniques and equipment.

Fee Schedule

Access to NHMFL magnets is open to all qualified scientists and engineers via a competitive proposal process. If a proposal is approved, facility usage is free of charge provided the researcher intends to publish the results in open literature. Proprietary research done at the Magnet Lab must enter into a cost sharing arrangement. All user facilities accept proposals throughout the year. The online system for submitting a proposal and requesting magnet time is located at https://users.magnet.fsu.edu/.

FLORIDA SOLAR ENERGY CENTER

http://www.fsec.ucf.edu/en/

Photovoltaic – Module Testing and Certification

Web Site Link: http://www.fsec.ucf.edu/en/certification-testing/PVmodules/index.htm

Contact Information
Stephen Barkaszi
Email: barkaszi@fsec.ucf.edu or pvmodule@fsec.ucf.edu Phone: 321-638-1473

Description
The Florida Solar Energy Center is required by Section 377.705 of the Florida Statutes to develop standards and certify all solar energy equipment manufactured or sold in Florida. To meet the requirements of the Florida Statutes, FSEC has developed a PV Module and PV System Certification program that protects the public interest and advances the use of renewable technologies. The objectives of the program are to:

- Provide Florida residents with reliable, safe and high quality PV system designs.
- Provide a means for consumers to obtain a summary of their certified PV system design including the installer's name, address, telephone number and Florida contractor's license number.
- Provide Florida consumers and/or agency officials with the expected power output of certified PV systems using accurate PV module performance ratings.
- Provide a PV system design approval certificate with a checklist that list the items that require compliance with National Electrical Code. The certificate and checklist can be used by local building officials for both the issuing of permits and the inspection of installed PV systems.

To satisfy these objectives, FSEC has developed a PV Module and System Certification processes. These certification processes are intended to be simple and straightforward.

Fee Schedule:
Facility use is negotiated on a per-proposal basis.

Photovoltaic Materials Laboratory

Web Site Link: http://www.fsec.ucf.edu/en/about/facilities/pv_mat_lab.htm

Contact Information
Neelkanth Dhere
Email: dhere@fsec.ucf.edu *Phone:* 321-638-1442

Description
Photovoltaic Materials Laboratory performs research in the areas of thin film solar cells for terrestrial & space application; Photoelectrochemical Water Splitting for Hydrogen Generation; High Voltage Bias Testing of Thin Film PV Modules; and Tribological coatings. The research details are given at the web site.

Fee Schedule: Facility use is negotiated on a per-proposal basis.

Solar Thermal Collection Test Laboratory

Web Site Link: http://www.fsec.ucf.edu/en/certification-testing/STcollectors/index.htm

Contact Information
Email: thermal@fsec.ucf.edu *Phone:* 321-638-1426

Description
The FSEC testing program evaluates solar collectors to determine that they meet the certification standards. Testing and certification of both glazed (hot water) and unglazed (pool heating) collectors is a State of Florida-mandated activity. All collectors and systems sold or manufactured in Florida must be certified by FSEC. The details are given at the web site.

Fee Schedule
Testing fee information can be found at: http://www.fsec.ucf.edu/en/publications/pdf/FSEC_Thermal_Test_Fees_2010_Final_17-May-10.pdf

Solar Thermal Systems Test Laboratory

Web Site Link: http://www.fsec.ucf.edu/en/certification-testing/STsystems/index.htm

Contact Information
Email: thermal@fsec.ucf.edu *Phone:* 321-638-1426

Description
The FSEC testing program evaluates ICS (Batch solar water heater) and Thermosiphon systems to determine that they meet the certification standards. The Florida Solar Energy Center (FSEC) is responsible for approving all solar water heaters that are sold or manufactured in Florida. The system approval process was mandated by the Florida State Legislature as part of the Solar Energy Standards Act which required that beginning in 1980 all solar energy systems manufactured or sold in Florida meet standards established by FSEC.

The FSEC standards program has been designed to meet the intent of the legislation while also helping the Florida solar industry to develop quality products, aiding building departments in product approval, and instilling confidence in the consumer who chooses to use solar energy in their residence or business. The details are given at the web site.

Fee Schedule: Testing fee information can be found at: http://www.fsec.ucf.edu/en/publications/pdf/FSEC_Thermal_Test_Fees_2010_Final_17-May-10.pdf

Advanced Energy Research Division (AERD) Labs

Web Site Link: http://www.fsec.ucf.edu/en/about/facilities/hydrogen_fuelcell_lab.htm

Director: Dr. Ali Raissi
Contact Information
Dr. Ali Raissi
Email: ali@fsec.ucf.edu *Phone:* 321-638-1407

Description

Research activities of the FSEC's Advanced Energy Research Division (AERD) are carried out within three fully equipped laboratories (Class B & C – total of 5,000 square foot), and a 1,500 square foot field facility. These laboratories are:

- Alternative Fuel Lab
- Instrumentation Lab
- Fuel Cell Lab

These laboratories and the field facility meet and/or exceed the design and safety requirements imposed by the Florida State Fire Marshall and all the state and federal codes (NFPA 45 Standard on Fire Protection for Laboratories Using Chemicals, NFPA 50A Standard for Gaseous Hydrogen Systems at Consumer Sites, and NFPA 70 National Electric Code) for handling large volumes of hazardous and flammable gases and chemicals including both gaseous and liquid hydrogen. The field facility is fitted with explosion proof electrical systems and meets NFPA 50B Code "Liquefied Hydrogen Systems at Consumer Sites."

AERD labs are equipped with the state-of-the-art analytical instruments including: a JEOL GCmate-II GC/MS-MS for determining elemental compositions, unit's special features include: linked-scan MS/MS for structure determination, high-resolution selected ion monitoring (SIM), programmable temperature heated direct insertion probe with separate ion source chambers for EI and CI operation and for analysis of volatile solid samples, and link to NIST library search routines; two SRI 8810 gas chromatographs (GC) equipped with TCD, FID & FPD; a Shimadzu GC equipped with TCD & FID; a Perkin-Elmer (PE) GC equipped with TCD & FPD; a Varian refinery GC; a Buck Scientific GC; and a Dionex DX 500 Gradient Ion Chromatograph/ HPLC with AD20 absorbance detector; an Altamira AMI 200 catalyst characterization instrument capable of TPD-MS, TPR-MS, TPO-MS, and TPRx-MS; a Perkin-Elmer Spectrum 100 FTIR with Universal ATR Accessory (UATR); an Autoclave Engineers BTRS-jr lab reactor system; a CDS Analytical pyroprobe 1000 with three modes of operation; a PE Diamond Differential Scanning Calorimeter (DSC) equipped with Hyper DSCTM technology for automated unattended operation over the temperature range of -170°C to 300°C and fast heating and cooling rates (as high as 500°C/min); a PE Diamond TG/DTA-MS system equipped with ThermoStar bench-top quadrupole MS with closed ion source for mass range of 1-300 amu and a detection limit of less than 1 ppm.

Labs also house a Shimadzu UV/VIS scanning spectrophotometer; a Hach UV/VIS; an IR spectrophotometer; a PMI BET surface area analyzer; several PEM electrolyzers, three complete, fully automated (operating from LabView environment) thermovolumetric analyzers (ranging in size from 160 mL to 2 L); a Hiden Isochema HTP1-V volumetric sorption analyzer capable of operating at 100 bar and 500^{o}C; a Hitachi TM3000 tabletop SEM; Ranson Digital Sonifier 450 W sonicator Model No. 450, EDP: 100-214-239; two 1 kW Newport solar simulators Model No. 91190-1000 (equipped with AM1.5 global, AM1.0 & 0.0 filters); two glove-boxes equipped with purification systems for reducing moisture and oxygen to the ppm level and vacuum systems with Schlenk glassware for handling materials under inert conditions; two Carver hot presses; a SPEX CertiPrep 8000M high-energy ball mill; and two Retsch ball mill units; two PARSTAT® 2273 potentiostats controlled by the PowerSuite software (Princeton Applied Research); complete electrochemical test equipment; assortment of computerized data acquisition and control systems; an induction furnace and a collection of ovens, autoclaves, AC and DC power supplies and assortment of pumps and balances.

The fuel cell lab is equipped with devices ranging from that needed for the MEA fabrication to complete in-situ electrochemical diagnostic systems. There are four Scribner Associates test stands, several potentiostats and frequency response analyzers, and a one of a kind MEA Durability Test System, (MEADS) that allows long term testing of eight fuel cells, simultaneously. The in-situ electrochemical diagnostics facility includes a test stand, a load box and a frequency response analyzer – constituting a

complete FC test station capable of using either 5 or 25 cm^2 single cell hardware. AERD's field facility houses the pilot-scale biomass gasification/Fischer-Tropsch synthesis plant.

AERD's computational and modeling capabilities include: Gaussian '03, GaussView™, CAChe, AspenPlus™ CPS, FACTSage, FLUENT CFD platform and GE's GateCycle™ program.

The list of equipment in each lab is given below.

Alternative Fuel Lab (AERD Lab Room 101)	**Instrumentation Lab (AERD Lab Room 103)**
SRI 8610 C GC and	Retsch Ball Mill (2)
SRI 8610 A GC	Shimadzu UV-VIS
Denton Vacuum System	PE Diamond DSC
Ziess Microscope	Hach UV-VIS
Minolta CR-10 Colorimeter	Altamira AMI 200 TPD-MS
Varian GC-TCD/FID	PE Diamond TG/DTA-MS
PE Sulfur GC-FID/FPD	PMI BET
Shimadzu Refinery GC-FID	Dionex DX-500 IC-HPLC
Buck Scientific GC	Jeol GCmate-II GC-MS/MS
Varian 3400 GC-TCD/FID	PE Spectrum 100 FTIR
Chemiluminescence Analyzer	Hiden Isochema HTP1-V Volumetric Sorption Analyzer
Environics Multi-Gas Calibrator	Varian GC-MS (ion selective)
Glove box (2)	CDS Analytical Pyro-probe 1000
Spex Certi Prep Ball Mill	Autoclave Engineers BTRS-jr Lab Reactor
Fluent CFD Platform	Potentiostat Parstat 2273
Fuel Cell Lab (AERD Lab Room 109)	Newport Solar Simulator (2)
8-Channel FC MEA Durability Test System (MEADS)	Cryocooler & Accessories
Potentiostat (2)	Carver hot press (2)
Scribner Associates 850C Fuel Cell Test Stand (4)	Electrolyzers (3)
Teledyne Medusa	Ranson Digital Sonifier 450 W Model 450
	MEA Prep Unit
	Hitachi TM3000 Tabletop SEM

Fee Schedule: A mini proposal is requested from each applicant describing the service(s) needed. The fee will be determined based on the service needs. The proposal will be submitted to Dr. Ali Raissi at: ali@fsec.ucf.edu.

Manufactured House Laboratory

Web Site Link: http://www.fsec.ucf.edu/en/about/facilities/mhl.htm

Director: Rob Vieira

Contact Information
Rob Vieira
Email: robin@fsec.ucf.edu *Phone:* 321-638-1404

Description
The Manufactured Housing Laboratory (MH Lab) is a 1600 ft2 ENERGY STAR® manufactured home that will serve as a training center and building science laboratory.

It features two completely separate space conditioning systems, an in-the-attic duct system with a package unit heat pump, and a floor-mounted duct system with a split system heat pump. An interior duct system was also recently installed. The MH Lab is a real-world training and research center used to conduct system-level residential research and to demonstrate building problems and solutions. Researchers and students investigate topics such as airflow and pressure measurement, moisture control, methods of duct leakage testing and repair, ventilation strategies, and analysis and correction of indoor air quality source control problems.

Fee Schedule: Facility use is negotiated on a per-proposal basis.

Building Science Laboratory

Web Site Link: http://www.fsec.ucf.edu/en/about/facilities/bldg_sci_lab.htm

Director: Rob Vieira
Contact Information
Rob Vieira
Email: robin@fsec.ucf.edu *Phone:* 321-638-1404
Description

The Building Science Lab is unique in its ability to vary the building airtightness, air leakage and thermal boundary parameters in a controlled fashion and evaluate their interactions with both conventional and advanced HVAC systems. Its purpose is to advance the understanding of building science and proper application of HVAC equipment through research and training. The design of this building is based upon recent developments in building science and has the flexibility to address a wide range of issues. It has the ability to mechanically adjust infiltration rates with custom ventilation fans and it also has a modular wall on the west façade for testing solar heat gain. The Building Science Lab is ideally suited to hands-on building science and HVAC systems training. In addition to housing the training, it serves as a live training model. Trainees see in real time the pressure and air flow response of the building as air flow rates, barriers to flow and pathways to flow are changed at the turn of a switch.

Fee Schedule: Facility use is negotiated on a per-proposal basis.

Flexible Roof Facility

Web Site Link: http://www.fsec.ucf.edu/en/about/facilities/frf.htm

Director: Rob Vieira
Contact Information
Rob Vieira
Email: robin@fsec.ucf.edu *Phone:* 321-638-1404

Description

The Flexible Roof Facility (FRF) is an FSEC Buildings Research division test facility in Cocoa, Florida designed to compare the performance of different residential roofing systems. The facility can evaluate five roofing systems at a time against a control roof with a vented attic and dark shingles.

The intent of the testing is to evaluate how roofing systems impact summer residential cooling energy use and peak demand. To make these evaluations, each of the 6 separate attic "cells" is heavily instrumented with sensors measuring temperatures of the shingles, roof deck, attic space and ceiling plane. Data are collected throughout the summer each year and then analyzed. The details are given at the web site.

Reserving a Test Cell: While FSEC uses several cells each year for ongoing research, there are typically two or more cells available for use by outside companies or organizations desiring to have a roof system or product tested. For more information on reserving an FRF test cell, click here to contact Danny Parker.

Fee Schedule: Our standard research contract for one cell of the Flexible Roof Facility is $14,973. This price includes use of the cell, standard instrumentation and our standard report which will (at a minimum) compare the cell to a reference vented attic with a dark shingle roof and a reference vented attic with a white metal roof (see the 2003 FRF report at http://fsec.ucf.edu/en/publications/pdf/FSEC-CR-1475-04.pdf as an example). Tear off of the existing roof and installation of the new roof is not included in this price. Tear off and installation are the responsibility of the individual, organization or company reserving the test cell(s), and all roof work must be done by a licensed and insured contractor.

Flexible Residential Test Structures

Web Site Link: http://blog.floridaenergycenter.org/echronicle/tag/flexible-residential-test-facility/
Director: Rob Vieira
Contact Information
Rob Vieira
Email: robin@fsec.ucf.edu *Phone:* 321-638-1404

Description
Construction of the flexible residential test structures was completed in December 2011. The purpose of the two side-by-side test houses is to conduct side-by-side testing of varying residential energy efficiency strategies and/or systems and to have a base house in which to compare the measured results. A

preliminary measurement of temperature during passive load conditions indicates the buildings track each other well. A number of DOE staff toured the facility when they visited the Florida Solar Energy Center in January 2011, after FSEC had been awarded a four year research contract in which the facility will play a significant role.

Completed flexible residential test structures on FSEC campus.

Fee Schedule: Facility use is negotiated on a per-proposal basis.

Climate-Controlled A/C Laboratory

Web Site Link: http://www.fsec.ucf.edu/en/about/facilities/cc_ac_lab.htm

Director: Rob Vieira

Contact Information
Rob Vieira
Email: robin@fsec.ucf.edu *Phone:* 321-638-1404

Description
FSEC's on-site environmental facilities are capable of testing air-conditioners and heat pumps with cooling/heating capacities up to 3.5 tons. The facility *(photo right)* is made up of an indoor chamber, an outdoor chamber, and a computerized control room. The environmental chamber's indoor and outdoor conditions are maintained automatically with a laboratory grade data acquisition and control system. Full automation allows complete flexibility for parametric testing. The control room houses a data acquisition and control system and is responsible for monitoring instrumentation output, controlling psychrometric chamber temperature and humidity conditions, and controlling compressor, indoor fan, and outdoor fan speeds.

Fee Schedule:
Facility use is negotiated on a per-proposal basis.

UNIVERSITY OF CENTRAL FLORIDA

Materials Characterization Facility (MCF)

Part of Advanced Materials Processing and Analysis Center (AMPAC)

Web Site Link: http://www.ampac.ucf.edu/facilities/MCF.php
Available equipment techniques are listed at the web site.

Director: Dr. Sudipta Seal

Contact Information
Email: ampacmcf@ucf.edu Phone: 407-882-1500 Fax: 407-882-1502
Address: 12443 Research Parkway, Suite 304, Orlando, FL 32826

Description
The Materials Characterization Facility (MCF) is dedicated to providing researchers and industrial partners a place to perform characterization and analysis to advance research; classroom education and hands-on training in the use of state-of-the-art characterization equipment; user-friendly support services with expert advice and data interpretation; and to enhance competitiveness of industrial partners and boost economic development of the Central Florida region.

MCF occupies about 7,000 sq. ft. of space and is supported by 3 full-time research engineers and a full-time facilities coordinator. Collaboration with other Universities is encouraged.

AMPAC is an interdisciplinary research and education center for materials science and engineering located at the University of Central Florida (UCF). Our work intersects with research areas including biology, medicine, energy, microelectronics, and nanotechnology. Materials science and engineering (MSE) is an interdisciplinary field that impacts almost every application area. Finding or developing a material with the right properties, or with affordable fabrication costs, or appropriately characterizing the material composition and/or structure to enable development of specific material properties, is often the limiting factor and enabling technology in most applications.

AMPAC faculty, affiliated faculty, and graduate students conduct in-depth research in materials science and engineering to address the requirements of several applications including energy, microelectronics, nanotechnology, green energy, life sciences, optics, aerospace, and bioengineering with the goals of enhancing scientific understanding and promoting industrial development and economic growth. With research expenditures totaling more than $3.6M per year, the UCF materials science and engineering research efforts are supported by a number of government agencies, including national laboratories, as well as private industries. The nine AMPAC faculty and 71 students alone author over 80 refereed publications and 100 presentations per year at national and international conferences.

Fee Schedule:
Facility use is negotiated on a per-proposal basis.

Advanced Microfabrication Facility (AMF)

Part of Advanced Materials Processing and Analysis Center (AMPAC)

Web Site Link: http://www.ampac.ucf.edu/facilities/AMF.php
Available equipment techniques are listed at the web site

Director: Dr. Sudipta Seal

Contact Information
Karen Glidewell
Email: Karen.Glidewell@ucf.edu Phone: 407-882-1500

Description
The Advanced Microfabrication Facility (AMF) is a multi-user cleanroom facility dedicated to provide university researchers and industrial and government partners the capabilities to perform cutting edge research, and training and education of students in the use of the available equipment for fabrication and testing of microdevices. AMF consists of a 600 sq. ft. class 100 facility and a 2500 sq. ft. class 1000 facility.

The AMF is supported by a research associate, a graduate student assistant, and a facilities coordinator to assist all users in use of and training on the AMF equipment. Collaboration of UCF researchers with other universities, government agencies, and industrial companies is strongly encouraged.

Fee Schedule:
Facility use is negotiated on a per-proposal basis.

NanoScience Technology Center (NSTC)

Web Site Link: http://www.nanoscience.ucf.edu/index.php and
http://www.nanoscience.ucf.edu/equipment/

Director: Dr. Sudipta Seal
Contact Information
Email: nano@ucf.edu Phone: 407-882-1578 Fax: 407-882-2819
Address: 12424 Research Parkway Suite 400 Orlando, FL 32826 (Research Pavilion 4th Floor)

Description

The NanoScience Technology Center (NSTC) was formed in 2005. The NanoScience Technology Center occupies the entire 4th floor of the Research Pavilion building in UCF's Research Park. It contains over 20,000 sq. ft. of advanced chemical, materials development, and biological laboratories in support of a wide range of multidisciplinary research projects.

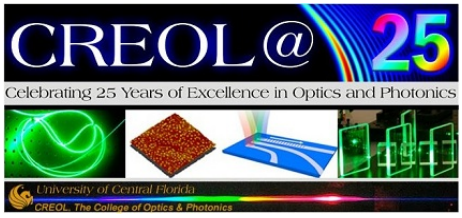
The common goal and purpose of this center is to strongly promote interdisciplinary research. Research opportunities in areas as diverse as Green Energy, Functional Nanomaterials, Computer/Mathematical Simulations, Assistive Robotics, Quantum Dynamics, Bioimaging, NanoElectronics & NanoPhysics, Integrated Device Development and Advanced Materials have been explored.
The equipment list is given at: *http://www.nanoscience.ucf.edu/equipment/*

Fee Schedule:

Facility use is negotiated on a per-proposal basis.

CREOL – The College of Optics and Photonics

Web Site Link: http://www.creol.ucf.edu/Research/Facilities.aspx



Director: Dr. Bahaa Saleh, Dean

Contact Information
Dr. Bahaa Saleh, Dean
Email: besaleh@creol.ucf.edu Phone: 407-823-6800

Description
The research activities of College of Optics and Photonics (COP) faculty span the spectrum from basic science and physics of optics, photonics, and related phenomena, to prototype development and demonstration of feasibility in applications. The faculty vigorously pursues joint research projects with industry, academia, and government laboratories. The main facilities of the COP are housed in a state-of-the-art 96,000 sq. ft. building dedicated to optics and photonics research and education. The list of laboratories in this facility is given at the web site.

Fee Schedule: Facility use is negotiated on a per-proposal basis.

UNIVERSITY OF FLORIDA

Florida Institute for Sustainable Energy - Energy Technology Incubator

Web Site Link: ***http://www.energy.ufl.edu/index.php?src=technology_incubator***

Contact Information
Dr. Luisa **Amelia** Dempere, *Director*
Major Analytical Instrumentation Center (MAIC) & FISE Technology Incubator
Associate Engineer, Research Service Centers, College of Engineering, University of Florida
Email: ldemp@mse.ufl.edu *Phone:* (352) 392-6985 *Fax: (352) 392-0390*

Description
Florida Institute for Sustainable Energy (FISE) at UF brings together the broad research capabilities of UF under one umbrella to develop energy efficient technologies, sustainable practices, policy analyses, and provide energy education to assist the government, utility and energy companies. FISE Energy Technology Incubator is the commercialization arm of the institute. It is established with $4.5 million Center of Excellence award from the State of Florida. This energy technology incubator is used to transition energy research to commercial products and processes. The FISE Energy Technology Incubator includes a Prototype Development & Demonstration Laboratory and Biofuel Pilot Plant.

Fee Schedule: Facility use is negotiated on a per-proposal basis.

UF Stan Mayfield Biorefinery Pilot Plant

Web Site Link: *http://fcrc.ifas.ufl.edu/pilotplant/*

Contact Information
Dr. Shelia Gomez
Email: spgomez@ufl.edu Phone: (352) 392-0237 Fax: (352)392-5922
Pilot Plant Location: Perry FL

Description
This facility has two pilot plants. The small scale pilot plant that was located at the University of Florida, Gainesville FL, was moved to Perry FL recently.

The Biofuel Pilot Plant serves as a platform to accelerate successful commercialization of bioethanol. The pilot plant is used to develop and improve production processes, test production feasibility from various plant substrates and residues available in Florida, and demonstrate all unit operations needed for commercialization. This pilot plant has state of the art equipment including biomass processing equipment, biomass reactor, fermenters, centrifuge, distillation column, testing equipment.

The pilot plant is a testimony of the more than two decades of research efforts done at the Florida Center for Renewable Chemicals and Fuels to convert biomass such as bagasse, forestry and wood wastes, and other organic materials to ethanol. The technology used in the conversion process uses genetically engineered E. coli bacteria that target the sugars in the cellulosic component of the biomass materials.

The large scale facility is state funded ($20M) research/demonstration pilot plant to provide a platform for research and improvements and for design engineering to construct full scale plants of 20-50 million gallons of ethanol per year is operational now. Energy crops, agricultural residues and forestry residues, and municipal green waste could support over 200 such plants in Florida, creating employment, improving the environment, and ensuring that Florida is doing its part to promote energy independence.

Fee Schedule: Facility use is negotiated on a per-proposal basis.

Nanoscience Institute for Medical & Engineering Technologies (NIMET) and Nanoscale Research Facility (NRF)

Web Site Link: http://nimet.ufl.edu/ and http://nrf.aux.eng.ufl.edu/

Contact Information

NIMET: Jack Judy (jack.judy@ufl.edu) Phone: (352) 392-4931

NRF: Brent Gila (bgila@ufl.edu) Phone: (352) 273 2245

Address: UF-NIMET 100 Center Drive, Gainesville, FL 32611

Description

Nanoscience Institute for Medical and Engineering Technologies (NIMET) and the Nanoscale Research Facility (NRF) at UF provide support for major research center initiatives in the areas of nano-and-micro-scale science and technology (NMS&T). Facility is open to all faculty, staff, and collaborators. It provides state-of-the-art equipment for research, education, nanofabrication, and prototype development of nano-materials, MEMS and NEMS devices, and sensors in NMS&T.

NIMET was created to focus and coordinate research and educational activities at the University of Florida in the fields of nanoscale science and nanotechnology (NS&T). Research in nanoscience and related fields at UF has developed in several colleges and now involves the research of over eighty faculty and staff in physics, chemistry, biology, medicine, engineering, and materials science.

The NRF is a two story building with seven functional areas:

- A Class 100-1000 cleanroom facility for nanofabrication and bio processing
- Advanced electron, optical, and surface imaging laboratories
- Core research laboratories for synthesis, processing, characterization, assembly, and testing of nanoscale materials, devices and sensors
- General laboratory space for interdisciplinary research collaborations
- Offices for faculty, staff and users
- Interactive spaces for conferences, informal gatherings, user administration, and surroundings conducive to multidisciplinary interactions
- Building support and utility handling areas.

The NRF resource and equipment list is given at : https://nrf.aux.eng.ufl.edu/resources/default.asp

Fee Schedule:
Facility use is negotiated on a per-proposal basis.

Wayne K. and Lyla L. Masur HVAC Laboratory

Web Site Link: http://plaza.ufl.edu/sasherif/HVACLaboratory.htm

Contact Information
Email: sasherif@ufl.edu Phone: (352) 392-7821 Fax (352) 392-1071
Dr. S.A. Sherif, Professor of Mechanical and Aerospace Engineering,
Founding Director Wayne K. and Lyla L. Masur HVAC Laboratory,
Director Industrial Assessment Center,
Co-Director Southeastern Center for Industrial Energy Intensity Reduction (SECIEIR)
Department of Mechanical and Aerospace Engineering,
University of Florida,
232 MAE Bldg. B, P.O. Box 116300,
Gainesville, Florida 32611-6300, U.S.A.
http://www.mae.ufl.edu/facultylist/ShowData.php?ID=57

Description

The Wayne K. and Lyla L. Masur HVAC Laboratory was inaugurated in February 1995 in a ceremony attended by dignitaries from the University of Florida and the local, regional, and national American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) community. The Laboratory was founded by Dr. S.A.Sherif, Professor of Mechanical and Aerospace Engineering, employing a significant cash donation from the Masur family. Wayne Masur is a successful alumnus of the Mechanical Engineering Department at UF. The Laboratory serves both an instructional and a research mission. Among its research capabilities is a unique experimental facility designed to study frost and ice formation on industrial freezer coils under ice foggy conditions. The Laboratory also includes an air-conditioning demonstration facility, a cooling tower simulator, an air-water heat pump system, and a chilled-water system with an artificial load simulator. Currently there is an effort to install a system with multi-air handling units and variable flow control capability for air conditioning applications. Most recently, experimental research was completed for the US Air Force to develop deployable heat pump units employing rotary vane expanders. Over 50 different investigations have been conducted in the Laboratory and hundreds of students have taken part in different instructional and research activities since its creation in 1995. The Laboratory is housed in Room 110 of the Mechanical and Aerospace Engineering Building B on Gayle Lemerand Drive. For laboratory tours contact Dr. Sherif at (352) 392-7821.

Fee Schedule:
Negotiated on a case-by-case basis (project based).

Major Analytical Instrumentation Center

Web Site Link: *https://maic.aux.eng.ufl.edu/about.asp*

Contact Information
Dr. Luisa **Amelia** Dempere, *Director*
Major Analytical Instrumentation Center (MAIC) & FISE Technology Incubator
Associate Engineer, Research Service Centers, College of Engineering, University of Florida

Email: *ldemp@mse.ufl.edu* *Phone:* (352) 392-6985 *Fax: (352) 392-0390*

Description
The Major Analytical Instrumentation Center (MAIC) is a materials characterization and analysis facility established to provide analytical support for Florida's scientific and engineering community in meeting the challenge of technology development. MAIC is a user oriented facility that provides service to the university system and the industrial & commercial community.

The equipment list includes Scanning Electron Microscope, Auger Spectroscopy, Electron Probe Microanalysis, Direct Write (nScrypt), Electron Probe Microanalysis, ESCA/XPS, Focused Ion Beam, Mass Spectrometer, X-Ray Diffraction, Screen Printer, Spin Coater, Surface Metrology, Tape Caster, furnaces, wire bonder, viscometer, and Potentiostat & FRA. The complete list is given at https://maic.aux.eng.ufl.edu/resources/default.asp.

MAIC offers Membership Program that is intended to provide a more complete and efficient service to industrial and commercial users of the facilities at the MAIC. This program allows companies and industry to obtain preferred use-rates, priority in use of MAIC facilities, data analysis and interpretation, priority/lower rates or free registration for MAIC short courses and workshops, instrumentation

appointments through the internet, access to remote operation of MAIC electron microscopes, current information regarding MAIC activities, new services, instrumentation and techniques, the MAIC Newsletter, and recognition as a MAIC affiliate in MAIC publications, brochures, and presentations.

Fee Schedule:
The facility user rates are posted at https://maic.aux.eng.ufl.edu/exsetup.asp

Particle Analysis Instrumentation Center (PAIC)

Web Site Link: http://perc.ufl.edu/sc/about.asp

Contact Information
Gary Scheiffele *at 352-846-1733*
Email: scheiffe@ad.ufl.edu
Reach PAIC by filling out the Inquiry Form at: https://perc.ufl.edu/ccb/sc/inquiry.asp?id=new

Description
PAIC at UF is an integral part of the Particle Engineering Research Center (PERC) at the University of Florida. It includes state-of-the-art instrumentation for particle characterization and analysis. The 17,000 square foot space includes six analytical laboratories, two processing labs, and a 5000 square foot testbed with a high bay area, a two-ton crane, a loading dock, compressed air, and other necessities required to conduct pilot scale experiments. The testbed and laboratories house equipment for assisting research groups with routine measurements as well as validation and demonstration of process and product ideas developed by research teams and the PERC's Industrial Partners. The Research & Development Facility creates the centerpiece of a world-class operation in particle science and technology.

Fee Schedule: Inquiry form is requested from each applicant describing the service(s) needed. The fee will be determined based on the service needs.

UNIVERSITY OF SOUTH FLORIDA

USF Nanotechnology Research and Education Center (NREC)

Web Site Link: http://www.nrec.usf.edu/

Director: Ashok Kumar

Contact Information
Robert Warner, Assistant Director
Email: tufts@usf.edu *Phone: 813.974.5274*

Description

The Nanotechnology Research and Education Center (NREC) housed in the 15,000 square foot Nanotech I building at the University of South Florida has five laboratories available for user access. A Class 1000, 1800 square foot Cleanroom, Thin Film Lab, Metrology Suite, Electrical Test/Packing Lab, and Wet Chemistry Lab. In addition, there are 4 full-time technical staff and one office staff to run the facility.

Thin Film Laboratory

The laboratory contains an aluminum thermal evaporator, a four pocket Ebeam evaporator, a rapid thermal anneal tool, and a multi-chambered sputter tool. Various metals are available in either pellet or sputter target form.

Metrology Suite

This suite of rooms contains a FEI TF20 Transmission Electron Microscope with STEM, EDS and Gatan digital imaging options, a Digital Instruments Atomic Force Microscope, a Panalytical XPert Pro Materials Research Diffractometer, a Field Emission Hitachi S800 Scanning Electron Microscope with EDS capabilities, a Hitachi SU-70 Ultra High Resolution Scanning Electron Microscope Schottky FE-SEM with nanolithography capabilities, EDS and Gas Injection, and a FEI Quanta 3D Dual Beam Focused Ion Beam. Various optical microscopes and material preparation table top tools are also available to support the sample preparation aspect of the major equipment.

Electrical Test/Package Laboratory

This laboratory contains Models 6200/6000 Micromanipulator probe stations, a HP 4280A 1 MHz C Meter & C-V Plotter, a HP4145B Semiconductor Parameter Analyzer, a HP 4284A Precision LCR Meter, a HP 4294A Precision Impedance Analyzer a Dektak Profilometer, and a K&S 4123 Wire Bond station.

Wet Chemistry Laboratory

This laboratory contains a solvent and an acid/base wet bench to support chemical processes such as nickel and gold electroplating. The lab also contains a MA 1006 Micro Automation wafer dicing saw, a tape mounter, a Buehler saw, wire saw, and polisher for material preparations.

Device Fabrication Laboratory/Cleanroom

This laboratory contains equipment to support optical contact lithography, wet chemical cleaning/etching, film thickness/profile measurement, furnace oxide growth, doping, contact anneals, low pressure chemical vapor deposition, plasma dry etching, deep reactive ion etching, plasma enhanced chemical vapor deposition and other more specific research techniques and processes. Photomask fabrication is also available for most designs with features larger than 2 microns.

Cleanroom Process/Equipment Capability Detail

- Three Wet benches – Chemically clean samples and substrates; chemically etch films and substrates, general chemical processes. Services: Exhausted bench with deionized water guns and dump rinsers, nitrogen blow guns, process timers, and plenum flush.
- Develop & Spinner Hoods – Develop photoresists, photoresist stripping, general solvent cleaning. Services: Deionized water gun and dump rinser, nitrogen blow guns, and process timers.
- Soft/Hard bake ovens and hot plates
- Karl Suss Masker Aligner – Align mask sets for patterning waters. Capable of handling 2, 3, and 4" wafers. Supports down to 1 micron technology.
- Quintel Mask Aligner
- Two Photoresist Spinners – Laurel Technologies Spinner – capable of spinning fragment samples up to 8" wafers. Integrated Technologies Spinner - Capable of spinning fragment samples up to 6" wafers. For photoresists, spin on dopants, spin on glasses and polymers.
- Mititoyo Ultraplan FS-110 microscope – Long working distance microscope with video still picture capture and onscreen critical dimension measurement capability. Contains bright and dark field, polarized light, Nomarski, and reflected and transmitted illumination capabilities together with extra-long working distance objectives and fraction of a micron resolution.
- Rudolph Ellipsometer – Capable of measuring film thickness and index of refraction on many different types of films.
- Nanospec 210 film thickness tool for patterned structures.
- Veeco Dektak 150 State of the art profilometer with film stress option.
- Sopra Spectroscopic Ellipsometer
- Veeco Wyco D9100 Optical Profilometer
- Alphastep Profilometer – Capable of measuring film or substrate surface features with nanometer resolution.
- BTI Furnaces (Two banks, 8 Tubes) – Four inch wafer capable tubes. Each tube has three heating zones. Computer controlled recipe storage and process controller. Spin on and solid source dopants n and p types, contact anneal, dry and pyrogenic oxidations. LPCVD undoped polysilicon films.
- Plasma Therm 700 – PECVD and Plasma Etcher – Plasma etcher used for ashing, nitride etching, SiC etching. PECVD α-Silicon, SiO_2, and Si_xN_y films.
- Four point probe station for measurement of sheet resistivity.
- AMS 100 Deep Reactive Ion Etcher – Capable of high aspect ratio etching of glass, quartz, silicon dioxide, silicon and silicon carbide films and substrates.
- GCA 3600F Pattern Generator capable of producing 5x5 inch chrome on glass photo masks or reticules
- GCA 3696 Photorepeater
- Denton Gold & Chrome thermal evaporator

Fee Schedule

Facility use is negotiated on a per-proposal basis.

FLORIDA INSTITUTE OF TECHNOLOGY

Oak Ridge Associated Universities (ORAU)

Web Site Link: http://www.orau.org/

Contact Information
T. Dwayne McCay, Florida Tech Executive Vice President and Chief Operating Officer, ORAU Councilor at (321) 674-8889
or Monnie E. Champion, ORAU Corporate Secretary, at (865) 576-3306 or (865) 576-3306
or online at www.orau.org.

Description

Since 1989, students and faculty of Florida Tech have benefited from its membership in Oak Ridge Associated Universities (ORAU). ORAU is a consortium of 98 colleges and universities, and a contractor for the U.S. Department of Energy (DOE) located in Oak Ridge, Tennessee. ORAU works with its member institutions to help their students and faculty gain access to federal research facilities throughout the country; to keep its members informed about opportunities for fellowship, scholarship and research appointments; and to organize research alliances among its members. Through the Oak Ridge Institute for Science and Education (ORISE), the DOE facility that ORAU operates, undergraduates, graduates and postgraduates, as well as faculty enjoy access to a multitude of opportunities for study and research. Students can participate in programs covering a wide variety of disciplines including business, earth sciences, epidemiology, engineering, physics, geological sciences, pharmacology, ocean sciences, biomedical sciences, nuclear chemistry and mathematics.

Appointment and program length range from one month to four years. A comprehensive listing of these programs and other opportunities, their disciplines and details on locations and benefits, can be found in the ORISE Catalog of Education and Training Programs, which is available at www.orau.gov/orise/educ.htm or by calling either of the contacts below. ORAU's Office of Partnership Development seeks opportunities for partnerships and alliances among ORAU's members, private industry and major federal facilities. Activities include faculty development programs such as the Ralph E. Powe Junior Faculty Enhancement Awards, the Visiting Industrial Scholars Program, consortium research funding initiatives, faculty research and support programs and services to chief research officers.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Institute for Materials Science and Nanotechnology (IMSN)

Director: Gordon L. Nelson, Ph.D., Vice President for Academic Affairs and Professor, Chemistry, Interim Director.

Contact Information
Email: nelson@fit.edu *Phone: (321)674-8480*

Description

The IMSN mission is to enhance and expand materials research and outreach at Florida Tech and advance nanotechnology research and outreach by promoting joint multi-investigator research, encouraging interdisciplinary and trans-disciplinary research, coordinating shared faculty infrastructure, recruiting scholars and students, coordinating presentation of materials- and nanotechnology related activities to external governmental and non-governmental agencies, foundations and industry, and promoting collegiality and cohesiveness within the university in the area of materials and nanotechnology. The 21-institute faculty come from diverse engineering and science disciplines. Current research funding of participating faculty is approximately $4 million, including research, instrumentation and participation in multi-investigator projects.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Institute for Energy Systems (IES)

Director: Y.I. Sharaf-Eldeen, Ph.D., P.E., Associate Professor, Mechanical and Aerospace Engineering, and Stephane Bucaille, Ph.D., Assistant Professor, Electrical Engineering, Co-Directors.

Contact Information
Email: eldeen@fit.edu or sbucaille@fit.edu *Phone: (321)674-8124 or (321)674-8425*

Description
The mission of the IES is to provide an intellectually stimulating environment for faculty and students to conduct funded research in areas of national need. National energy policy identifies these needs to be: (1) increasing domestic energy supplies; (2) increasing America's use of renewable and alternative energy; (3) increasing energy conservation and efficiency; (4) developing a comprehensive delivery system; (5) enhancing national energy security and international relationships; and (6) sustaining the nation's health and environment.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Harris Institute for Assured Information (HIAI)

Director: Richard A. Ford, Ph.D., Harris Professor for Computer Science in Assured Information, Director.

Contact Information
Email: rford@cs.fit.edu *Phone: (321)674-8590*

Description
The mission of the Harris Institute for Assured Information is to promote interdisciplinary approaches to computer security and trustworthy computing through education, research and outreach by providing a single point of contact for students, faculty, funding agencies and businesses, and by crossing traditional academic disciplines to promote innovation. Information assurance is the discipline dedicated to providing users with trustworthy data. As such, the institute focuses on new technologies for protecting

people and organizations from vulnerabilities that can lead to theft of information, malicious code infection or data destruction.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Institute for Research on Global Climate Change

Director: Robert Van Woesik, Ph.D., Professor, Biological Sciences

Contact Information
Email: rvw@fit.edu *Phone: (321)674-7475*

Description
Over the next century, the Earth's average surface temperature is predicted to rise above temperatures that have not been experienced for over 400,000 years. Such a change in climate will consequently increase the risk of drought, erratic weather, sea-level rise, ocean warming and wildlife diseases. The mission of the institute is to: (1) foster climate-change research that will lead to improved decision-making, from local to international levels; (2) provide world-class research opportunities for undergraduate and graduate researchers; and (3) promote interdisciplinary collaborations leading to new understandings of climate change and adaptation. Since the end of 2009 when the institute was initiated, researchers have published over 60 scholarly articles on climate change in international journals.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Center for Remote Sensing (CRS)

Director: Charles R. Bostater Jr., Ph.D., Associate Professor, Environmental Sciences and Physical Oceanography

Contact Information
Email: bostater@fit.edu *Phone: (321)674-7113 or (321)674-7278*

Description
The center's purpose is to encourage excellence in the development and application of remote sensing science and technology. It is organized as a collaborative center among and between faculty within the College of Engineering, College of Science and College of Aeronautics. Under the authority of the Space Grant Act of 1988, Florida Tech is a member of the Southeastern Space Consortium and the Florida Space Grant Colleges Consortium. The center has consulted and provided services to defense contractors, NASA centers and contractors, the Department of Energy and its subcontractors, state of Florida water management agencies, the Department of State and U.S. Department of Education, and is affiliated with foreign institutions and organizations. Facilities for remote sensing teaching and research include the ERDAS Image Analysis System, Evans Library, the Geographical Information Systems Laboratory, the Marine and Environmental Optics Laboratory and the Synoptic Meteorological Laboratory. Various laboratories and facilities in academic and research computing; computer science; aerospace, computer,

electrical and mechanical engineering; physics and space sciences; and space systems are also available. Field studies can be conducted through the College of Aeronautics' fleet of aircraft. The university operates several small boats and charters a well-equipped vessel for offshore, estuarine and river work. Center faculty offer a wide variety of courses at the graduate and undergraduate level, including environmental satellite systems and data, hydroacoustics, digital image processing, and environmental optics for remote sensing.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

National Center for Hydrogen Research (NCHR)

Web Site Link: http://research.fit.edu/nhc/

Director: *Mary H. McCay, Ph.D., Research Professor, Mechanical and Aerospace Engineering*

Contact Information
Email: mmccay@fit.edu *Phone:* 321- 674-8803

Description
The NCHR was established with funding from NASA to perform research and development concerning the application of hydrogen as a fuel for airborne platforms. It is currently pursuing the development of an interdisciplinary hydrogen and fuel cell technology academic program under the sponsorship of Department of Energy (DOE). The objectives of this program are to develop undergraduate modules, enquiry-based laboratory experiments and a graduate area of specialization academic program that will enable the growth of research and development in the arena of hydrogen and fuel cell technology. Faculty associated with the center are currently conducting research in computational modeling of fuel cells, fiber-optic sensors suitable for safety applications and systems monitoring, hydrogen storage mediums, the interaction of hydrogen with materials and hydrogen purification techniques.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Collaborative International Research Centre for Universal Access (CIRCUA)

Web Site Link: http://circua.fit.edu/

Director: Gisela Susanne Bahr, Ph.D., Associate Professor, Industrial/ Organizational Psychology, Executive Head

Contact Information
Email: gbahr@fit.edu *Phone: (321)674-7613*

Description
The Collaborative International Research Centre for Universal Access (CIRCUA) is an international research center with worldwide membership that promotes universal access and e-inclusion. CIRCUA's motto calls for removing barriers to modern technology in the information society. CIRCUA's objectives are: (1) advancing research and development for an inclusive information society; (2) leading the systematic

growth of interaction science by drawing on expertise in cognitive and computer sciences; (3) creating global partnerships that result in international collaborations and products; and (4) networking and fusing multidisciplinary expertise globally. CIRCUA's international center head is Florida Tech's Dr. Bahr. CIRCUA's European center head is Dr. Ray Adams, University of Middlesex, London, and Churchill College, Cambridge, both in England.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Center for High Resolution Microscopy and Imaging (CHRMI)

Director: *Michael Grace, Ph.D., Associate Dean, College of Science and Associate Professor, Biological Sciences, Director.*

Contact Information
Email: mgrace@fit.edu *Phone: (321)674-8194*

Description
The Center for High Resolution Microscopy and Imaging is a multidisciplinary laboratory providing state-of-the art light and fluorescence microscopy, transmission electron microscopy, scanning electron microscopy, scanning probe microscopy and x-ray microanalysis of natural and artificial materials. The CHRMI contains necessary equipment and expertise to prepare almost any kind of sample for microscopic evaluation, to image sample surfaces and cross-sections at very high resolutions and to analyze elemental compositions of materials. Support staff maintains instrumentation and trains users in sample preparation and analyses of microstructure and microchemistry. Image collection is both film-based and digital. Support platforms provide detailed image analysis capabilities.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Center for Ferrate Excellence (COFE)

Web Site Link: http://research.fit.edu/cofe/

Director: *Virender K. Sharma, Ph.D., Professor, Chemistry*

Contact Information
Email: vsharma@fit.edu *Phone: (321)674-7310*

Description
In recent years, the higher oxidation states of iron (ferrates) have become of interest because they can safely and efficiently clean polluted water without harmful byproducts. The ferrate compound may be used as an oxidant, disinfectant, coagulant and for industrial green purposes. Ferrate has thus become advantageous over other commonly used chemicals in the wastewater industry. Applications of ferrate include treatment of common pollutants and emerging contaminants such as arsenic, estrogens and pharmaceuticals. The ferrate compound has also attracted interest for applications in green chemistry because the byproducts of its use, iron oxides, are environmentally friendly. Recently, the technology developed at Florida Tech has made a breakthrough in synthesizing liquid ferrate, which, unlike

competing products, is stable for at least two weeks. This liquid product will open new opportunities for novel applications of ferrate. The intellectual property on the ferrate technology is being developed for licensing to bring it to the marketplace. This center offers technology, production and application as well as on-site engineering, testing and analysis.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Center for Corrosion and Biofouling Control (CCBC)

Web Site Link: http://research.fit.edu/ccbc/

Director: Geoffrey W.J. Swain, Ph.D., Professor, Oceanography and Ocean Engineering

Contact Information
Email: swain@fit.edu *Phone: (321)674-7129*

Description
The mission of the center is to understand the processes of biofouling and corrosion, and to develop and apply innovative solutions for control and prevention. Its objectives are to advance the state-of-the-art in corrosion and biofouling control; to establish mutually beneficial collaborative relationships with local, national and international university, government and industrial partners; and to provide graduate and undergraduate students a world-class research and educational experience that prepares them for both academic and industrial professional opportunities. Current research activities include testing and evaluation of antifouling systems; investigation of hydrodynamic performance of ship hull coatings; the development of autonomous underwater hull cleaning systems; investigating the mechanisms of adhesion and release of fouling to novel biocide-free coating systems; and monitoring the performance of antifouling coatings through dry dock inspections.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Federal Aviation Administration Center of Excellence for Commercial Space Transportation

Director: Samuel T. Durrance, Ph.D. Professor, Physics and Space Sciences, and Daniel R. Kirk, Ph.D., Associate Professor, Mechanical and Aerospace Engineering, Co-Directors

Contact Information
Email: sdurranc@fit.edu *Phone: (321)674-7313*

Description
The center is a partnership of academia, government and private industry addressing the current and future challenges for commercial space transportation. The center encompasses four primary research areas: (1) space traffic management and operations; (2) space transportation operations, technologies and payloads; (3) human spaceflight; and (4) space transportation industry promotion.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Center for Entrepreneurship and New Business Development (CENBD)

Director: S. Ann Becker, Ph.D., Dean, Nathan M. Bisk College of Business

Contact Information
Email: abecker@fit.edu *Phone: (321)674-7327*

Description
The Center for Entrepreneurship and New Business Development integrates entrepreneurial education, training and research in pursuit of enterprise creation, sustainability and growth. The center fosters partnerships among students, faculty, community members and entrepreneurs. These partnerships support an educational environment bridging theory and practice in pursuit of early-stage innovation, business leadership and new business ventures. The center encompasses the Women's Business Center (WBC) and the Entrepreneurial Training Services (ETS) program. The WBC is funded by a cooperative agreement with the U.S. Small Business Administration, offering technical assistance for nascent entrepreneurs and small businesses. The ETS program offers entrepreneurs intensive training on business development, supported by business faculty, community leaders and business area experts.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Wireless Center of Excellence (WICE)

Web Site Link: http://research.fit.edu/wice/

Director: Ivica Kostanic, Ph.D., Associate Professor, Electrical and Computer Engineering

Contact Information
Email: kostanic@fit.edu *Phone: (321)674-7189*

Description
WICE is devoted to creating a new generation of wireless engineering professionals through education and research. Driven by its academic program, WICE considers wireless to be any system or device that relies on electromagnetic-wave propagation to perform one or more of its functions. This context includes such diverse applications as radar, global positioning, location and sensing, as well as the broader class of communications systems such as satellites, point-to-point/multipoint, WLAN and wireless WAN. In partnership with industry, WICE offers the opportunity for faculty, and undergraduate and graduate students to engage in research and to study wireless concepts in a variety of courses. Research areas include propagation modeling, wireless systems engineering, personal communications systems, wireless sensors and multimedia communications, while also supporting simulation, fabrication and measurement of wireless communications and other systems and components. Laboratory test equipment includes Grayson's Spectrum Tracker, and spectrum and vector network analyzers, oscilloscopes, microwave amplifiers, oscillators and mixers, signal generators and associated active and passive RF devices. The laboratory performs experimental investigation using the anechoic chamber and screen room facilities.

WICE is supported by significant laboratory facilities as described under "Electrical Engineering" in the Degree Programs section.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Florida Center for Automotive Research (FCAR)

Director: *Pei-feng Hsu, Ph.D. Professor and Head, Mechanical and Aerospace Engineering, Interim Director*

Contact Information
Email: phsu@fit.edu *Phone: (321)674-8092*

Description
The mission of the Florida Center for Automotive Research is to develop an automotive engineering program with both research and educational components in order to leverage its engineering research capability in the development of highly fuel-efficient hybrid or conventional vehicles. The center will provide the academic research capability to support hybrid vehicle production. The center will also provide solutions to challenging technical problems encountered in design and manufacturing, enhance Florida's reputation for automotive research and attract automotive supplier/original equipment manufacturer (OEM) operations to Florida.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

College of Engineering Center for Space Commercialization

Director: Daniel R. Kirk, Ph.D., Associate Professor, Mechanical and Aerospace Engineering, Interim Director

Contact Information
Email: dkirk@fit.edu *Phone: (321)674-7622*

Description
The mission of the College of Engineering Center for Space Commercialization is to identify, promote and support the use of space to provide goods or services of commercial value, and to support U.S. aerospace industries and NASA needs toward a profitable commercialization of space. The center seeks to foster multidisciplinary collaboration among researchers from highly diversified scientific, engineering and business communities including universities, businesses and government entities.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Vero Beach Marine Laboratory (VBML)

Web Site Link: http://research.fit.edu/vbml/

Director: Junda Lin, Ph.D., Professor, Biological Sciences

Contact Information
Email: jlin@fit.edu *Phone: (321)674-7587*

Description
VBML is located on four acres of oceanfront property in nearby Vero Beach. This facility serves as a field station for the university in support of research and teaching in the marine sciences. The beachfront location of VBML provides ready access to field study sites for work on the biology of coastal organisms and for studies of physical and geological processes of the coastal zone. Major research efforts at the laboratory are related to mariculture and marine biology/ecology. A two-story building, equipped with seawater tables and a flow-through system, supports research on mariculture and ecology of marine organisms. Several greenhouses and large tank systems are available for studying aquaculture, behavior and ecology of marine animals. Classrooms, offices and dry laboratory facilities are provided in the main laboratory building.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Microelectronics Laboratory

Director: Susan K. Earles, Associate Professor, Electrical and Computer Engineering

Contact Information
Email: earles@fit.edu *Phone: (321)394-2171*

Description

This microelectronics facility is designed to be a teaching laboratory as well as an advanced research laboratory. A microelectronics fabrication course is taught to graduate and undergraduate students. In this course, students complete, fabricate and test a variety of electronic devices such as photovoltaic devices and hydrogen sensors. Research conducted in the facility includes polymer-based and silicon-based electronic and optoelectronic devices. The 3,800-sq.-ft. facility has all support services needed for modern semiconductor research including a 3,000-sq.-ft. clean room and areas dedicated to circuit testing and equipment maintenance. Equipment in the laboratory includes ultraviolet photolithography, diffusion furnaces, a thin-film evaporator, wet chemistry benches, and measurement and inspection equipment. The advanced research laboratory presently features a scanning probe microscope, plasma enhanced deposition and lasers for teaching and research.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Laser, Optics and Instrumentation Laboratory (LOIL)

Web Site Link: http://research.fit.edu/loil/

Director: Kunal Mitra, Ph.D., Professor, Mechanical Engineering and Chelakara Subramanian, Ph.D., P.Eng (UK), Professor, Aerospace Engineering, Co-Directors.

Contact Information
Email: kmitra@fit.edu *Phone: (321)674-7131*

Description
LOIL exploits current technologies in continuous wave and short-pulse lasers and optics to develop new techniques for measuring and characterizing material properties. Faculty and graduate students are involved in analyzing the interaction of these lasers with different materials for various applications. Biomedical applications focus on detecting and irradiating cancer/tumors and in homogeneities in tissues. Material characterization/processing applications involve detection of defects in materials such as debonding of thermal protection tile systems and thermal response of materials subjected to high-energy radiation. Remote sensing applications focus on lightning detection in cloud media and landmines in shallow waters. The challenge of integrating laser sources, system optics, instrumentation, measurement schemes and data acquisition provides students with new learning experiences in these areas. Major equipment currently in use includes mode-locked short-pulse laser, Q-switched pulsed laser, short pulse diode laser, high-power continuous wave lasers, ultrafast photodetectors, sampling head oscilloscope, streak camera, miscellaneous optics and optical accessories, thermal camera and an image processing system.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Wind and Hurricane Impacts Research Laboratory (WHIRL)

Web Site Link: http://research.fit.edu/whirl/

Director: Jean-Paul Pinelli, Ph.D., P.E., Professor, Civil Engineering

Contact Information
Email: pinelli@fit.edu *Phone: (321)674-8085*

Description
WHIRL is dedicated to the study of the effects and impacts of windstorms including hurricanes, tornadoes and thunderstorms, and other related meteorological hazards (e.g., flooding and tidal surges) on the natural environment and manmade structures. The laboratory involves a multidisciplinary team of engineers, scientists and business experts. It takes advantage of a geographic location in the heart of Florida's Space Coast to serve the needs of industry, government and the public in wind hazard mitigation. The laboratory's activities include research on mitigation of losses of life, property and the environment; education of the public through dissemination of information; and the development of a multidisciplinary program of study focused on wind engineering and wind-related socioeconomic studies and analyses. Research topics in the laboratory include action of strong winds and storm surges on structures; evaluation of codes, standards and retrofitting techniques for buildings and infrastructure

systems; risk assessment for existing structures, coastal erosion, sediment transport and environmental damage due to storm surges and floods; development of remote sensing tools for assessing and monitoring hurricane damage, wind speed and flood levels; fundamental wind and meteorological research; wind tunnel modeling and testing; and statistical studies, analysis of economic impacts and development of potential damage maps for hurricane hazards in Florida.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Dynamic Systems and Controls Laboratory (DSCL)

Web Site Link: http://coe.fit.edu/mae/labs/sys.php

Director: Hector Gutierrez, Ph.D., P.E., Associate Professor, Mechanical Engineering and Y.I. Sharaf-Eldeen, Ph.D., P.E., Associate Professor, Mechanical Engineering, Co-Directors

Contact Information
Email: hgutier@fit.edu *Phone: (321)674-7321*

Description
DSCL supports a variety of research activities in dynamic systems for mechanical and aerospace applications: (1) real-time monitoring and control of the flexible dynamics in launch vehicles including design, characterization and system integration of distributed actuators such as cold gas thrusters; (2) use of Fiber Bragg grating arrays to monitor and control in real-time multi-modal vibrations in aerospace structures; (3) in electrical machinery, the design, analysis, characterization and testing of novel machine topologies such as dual armature generators; (4) characterization of the liquid slosh dynamics in upper stage propellant tanks; and (5) magnetic suspension technology, computer-based instrumentation and mechatronics. Current and past research activities include: (1) realtime control of structural vibrations based on magneto-rheological (MR) dampers; (2) magnetic suspension systems for high-precision positioning applications; (3) characterization of surface tension and contact angle in novel propellants; (4) rotating machinery monitoring and fault diagnosis, online vibration and angular motion measurements; (5)analyses to develop condition monitoring; (6) maintenance information systems for power generation, transmission systems and components in rotating machinery.

Fee Schedule
Facility use is negotiated on a per-proposal basis.

Robotics and Spatial Systems Laboratory (RASSL)

Web Site Link: http://research.fit.edu/rassl/

Director: Pierre M. Larochelle, Ph.D., Assistant Dean, College of Engineering and Professor, Mechanical Engineering

Contact Information
Email: pierrel@fit.edu *Phone: (321)674-7274*

Description

RASSL is dedicated to the development of robotic mechanical systems that generate spatial (i.e., 3-dimensional) motion and force transmission. RASSL seeks to advance the design methodologies for these challenging systems as well as techniques for their use in industrial and consumer applications. Equipment includes a Motoman SV3 XRC robot, an Adept/Mobile Robotics PowerBOT and several systems developed by RASSL.

Fee Schedule

Facility use is negotiated on a per-proposal basis.

Ralph S. Evinrude Marine Operations Center

Director: Captain Timothy Fletcher, Manager

Contact Information

Email: tfletcher@fit.edu *Phone: (321)727-7930*

Description

The center houses small outboard-powered craft and medium-sized workboats. These vessels are available to graduate students and faculty for teaching and research use in the tributaries and the Indian River Lagoon (IRL). The facility has a variety of other resources available and is located on Crane Creek in Melbourne, approx. 1.5 mile from the main campus. The IRL is a national estuary and is the most biodiverse estuary system in North America. The Florida Tech national champion crew team, champion concrete canoe team, Sailing Club and scientific diving program safety office are also housed at the center.

Fee Schedule

Facility use is negotiated on a per-proposal basis.