FSEC 7-yr. External Review

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UCF’s FSEC Leads in Energy

Building America
U.S. Department of Energy

PVMC
U.S. PHOTOVOLTAIC MANUFACTURING CONSORTIUM

Regional Test Centers
Differentiating PV Quality

Go Solar Florida

Electric Vehicle Transportation Center

Clean Cities Coalition

Drive Electric Florida

EnergyWhiz
Connecting Schools, Teachers, and Students with Solar Energy

UCF’s FSEC
A Research Institute of the University of Central Florida
Strengths

• Unique, differentiated building energy science, PV testing and characterization (e.g. hot humid microclimate), and electric vehicle systems integration capabilities
• Personnel with specific expertise and credibility in energy-related fields
• Partnership development and coordination, key relationships with industry
• Familiarity with program goals and funding opportunities in DOE and other select federally-funded programs

Challenges and Opportunities

• Lack of well articulated, integrated strategic plan and communications (both internal and external stakeholders)
• Decreasing and changing funding opportunities from traditional sources
  – Shift in energy space to understanding impact of wide-scale deployment of distributed energy generation and building efficiency, systems integration may provide an opportunity for FSEC to expand beyond traditional funding sources.
• Lack of fundamental research, and institutional / enterprise-level coordination across UCF
  – Cluster hire represents unique opportunity to better integrate FSEC and UCF academic programs through hiring complimentary capabilities to drive fundamental research versus FSEC’s applications research
PV, EV, and Your Home at Less Than $1 a Gallon
by James M. Fenton

Home Energy Efficiency Retrofits and PV Provide Fuel for Our Cars
by James M. Fenton

PV and Batteries: From a Past of Remote Power to a Future of Saving the Grid
by David K. Click

The Role of V2G in the Smart Grid of the Future
by Richard A. Raustad

Fuel Cell Vehicles as Back-Up Power Options
by Paul Brooker, Nan Qin, and Nahid Mohadesi

EV Fast Charging, an Enabling Technology
by Charles Borsdorf and Andrea Edwards

www.electrochem.org/dl/interface
Creating and retrofitting homes that are twice as energy efficient as standard homes through research and industry partnerships

- Recipient of 8 Building America “Top Innovations” awards
- Awarded $14 M DOE funds and $1.3 M in cost share since 2006.

*Eric Martin, PI, presents overview*

*Danny Parker, presents Phased Deep Retrofit project*
EVs for sustainable transportation and a framework for more solar to be integrated into the “Smart Grid”

- Only U.S. DOT University Transportation Center on Electric Vehicles
- Awarded $5.6 M DOT funds and $2.8 M in cost share from 2013 to 2017

Dave Block, PI
Rich Raustad, Technical Lead, presents overview
An Industry-led consortium driving collaborative projects in c-Si PV

- U.S. DOE SunShot Program funded at $10M
- Currently 14 active collaborative projects in metrology and feedstock/wafering
  - Diamond Wire Failure Mode Analysis
  - Multi-functional Oxide Passivating Films
  - Predictive Metrology
  - Prototype Diamond Wire Metrology System
  - Casting/Wafering Impact on Cell Performance

*Winston Schoenfeld, PI, presents overview*
Addressing challenges in the commercialization of PV

- Provides independent validation of performance and durability of modules, inverters, and components
- The hot and humid climate at FSEC provides critical data for existing and new PV technologies
- Awarded $1.07 M DOE funds since 2011 through the concept, development and implementation of the RTC program since 2011

*Stephen Barkaszi, PI, presents overview*
Foundations for Engineering Education for Distributed Energy Resources (FEEDER)

- DOE-sponsored program to provide Grid Engineering for Accelerated Renewable Energy Deployment (GEARED)
- Aimed at educating the current and future utility industry workforce (capable of making electric energy systems sustainable, economic, reliable, and robust)
- UCF/FSEC is one of three nationwide centers
- DOE funding of $3.2M (total award $4.8M with industry match and other cost share) for the period 2013-2018
FSEC K-12 Education and Professional Development for Teachers

- **EnergyWhiz Event at FSEC**
  - Expecting 1000 participants
  - 2015 EnergyWhiz Expos in Tallahassee, Gainesville and Orlando

- **Student Groups**
  - 4th grade to college level
  - Over 1000 students

- **Teacher Workshops**
  - Solar Schools, Hydrogen, Solar Cookers, Photovoltaics

- **Presentations, Special Events and Other Outreach**
  - STEM focused
  - Over 30,000 students
Advancing the energy, economic, and environmental security of the state by promoting the growth of electric vehicle ownership and accompanying infrastructure

- Support and accelerate the adoption of plug-in electric vehicles by engaging and educating the public, businesses, and policy-makers; facilitating collaboration; and supporting EV-friendly policy and programs.
- Statewide organization representing electric vehicle stakeholders, including automobile manufacturers, infrastructure providers, government, academic and environmental interests.
- Provides collaboration with EVTC

Colleen Kettles, Coordinator, presents overview
• https://www.facebook.com/driveelectricflorida/videos/vb.464504620359407/634925536650647/?type=2&theater
The FEEDER Team

Universities

- University of Florida
- University of Central Florida
- University of Arkansas
- University of South Carolina
- University of Pittsburgh
- Auburn University
- University of Kentucky

Utilities

- AEP Kentucky Power
- OUC The Reliable One
- Southern Company
- TVA
- FPL
- Duke Energy

National Labs

- Los Alamos National Laboratory
- NREL

Supporting Industries

- ABB
- Siemens
- Mitsubishi Power Systems
- OSIsoft
- Schneider Electric
- SAIC
- NPI-PT
- OSDI
- S&C
- Leidos
- Texas Instruments
- United Technologies

FEEDER Consortium

- 6,000 Students: Power & Energy
- 100,000 Utility Employees
- 14
- 500,000 Industrial Employees

Test Beds, Research, Collaborations
EnergyWhiz Event & Expos

- Hydrogen Challenge
- Energy Innovations
- Junior Solar Sprint
- Bright House Solar Energy Cookoff
- Critter Comfort Cottage
- Electrathon

FSEC Research → Curriculum Development, Professional Development, Student Outreach
FLORIDA SOLAR ENERGY CENTER — A Research Institute of the University of Central Florida

- NASA KSC
- UCF (FSEC Advanced Energy Division)
- HySense Technology

FSEC Continuing Education

- PV Systems Design and Installation
- PV Technologies and Business Opportunities
- Solar Water and Pool Heating Systems
- Residential Energy Raters
- Building Energy Codes
- ENERGY STAR New Homes
- Green Buildings
- Weatherization
SSTN Activities

- 28 workshops conducted
- PV, solar water heating, design and commissioning, code official, first responder, marketing
- 73 educational institution partners
  - 132 instructors trained
- Code Official Solar PV Workshops
  - 480 code officials trained
- First Responders and PV Workshop
  - 23 first responders trained
A Florida multi-university program to enhance and expand the use of solar energy and other renewable energy and energy efficiency technologies in the state of Florida

- UCF portion of project was a multi-task R&D effort that supported both FSEC and UCF Electrical Engineering
- Tasks in biomass, PV, solar thermal and building efficiency
- State funding for FSEC of $4.1M July 2008 – December 2012
Membrane Electrode Assembly Fabrication
US DOE High Temperature Membrane Working Group

- 11 teams developed advanced membranes for 120°C
- Ex situ and in situ characterization
- Recommend most-promising materials
- Work with membrane suppliers to maximize performance
- Managed the U.S. DOE’s High Temperature Membrane Working Group
- DOE funding of $2.6 M with $0.6 M cost share, 2006 – 2012
Solar Schools Programs

Innovation Education

The EnergyWhiz Olympics is all about clean energy and creative kids. Each year, on the first Saturday in May, hundreds of students converge at the Florida Solar Energy Center in Cocoa, Florida to participate in renewable energy themed events.

Take a look at our EnergyWhiz video and see for yourself.

Featured Story
Energy Matters
The video at the link below provides a brief yet effective look at energy’s role in making our world function. It can be used as an overview, introduction or summary lesson and is less than five minutes in length.


About Us
The SunSmart Schools Program has worked to increase the deployment of solar energy systems to Florida schools and colleges, which has been funded through several grant awards.

The SunSmart E-Shelter Program provides 10kW photovoltaic systems with battery back-up to schools that are designated as emergency shelters.

Solar System Performance Data of Florida SunSmart E-Shelter Schools

Select A School

Select A County

Select A Utility
Southeast Solar Training Network (SSTN)

Train the Trainer—Provide solar training to southeast states’ public educational institution instructors

- Provide trainers with methods, tools, curriculum and resources to develop local training programs
- Ensure that training programs create high quality solar installations
- FSEC has been awarded $1.1 M in DOE funds since October 2011, with a program end date of June 2015.