FSEC Advisory Board Meeting
October 30, 2017
AGENDA

10:00 a.m.	Welcome and Introductions	Dave Winslow, Chair
10:10 a.m.	Approval of March 3, 2017 Meeting Minutes	Dave Winslow, Chair
10:15 a.m.	Status of FSEC Programs	Jim Fenton
10:30 a.m.	Publix's Energy Response During Hurricane IRMA Report of Florida Energy Office	Mike Faas Tony Morgan
11:00 a.m.	US DOE's PV Regional Test Center (RTC) Program Opportunities for Partnership [Today 20 industry partners and 549 kW of PV at five sites (one at FSEC)]	Laurie Burnham, RTC Program Dir., Sandia Nat'l Labs
11:30 a.m.	Florida Power & Light Battery Technologies Showcase and Opportunities for Partnership	Cory Ramsel Sr. Director FPL Development
12:00 p.m.	UF Solar Gators Formula Sun Grand Prix	Chris Komarav, Student UF
12:15p.m.	Lunch (Buffet) UF Solar Gators Formula Sun Grand Prix (show and Tell)	
1:05 p.m.	UCF Energy Update	Dave Norvell
1:15 p.m.	City of Orlando Energy Update	Chris Castro
1:25 p.m.	Development of Working Groups Update Utility and Commercial Consumers	Jennifer Szaro Jim Fenton
1:50 p.m.	Board Business ▪ Date and Agenda for Next PAB Meeting ▪ Other Board issues	Dave Winslow, Jim Fenton
2:00 p.m.	Adjournment	

Federally Funded Industrial Collaborative Partnerships

Building AMERICA
U.S. Department of Energy

EVTC
Electric Vehicle Transportation Center

Central Florida Clean Cities Coalition

U.S. PHOTOVOLTAIC MANUFACTURING CONSORTIUM
PVMC

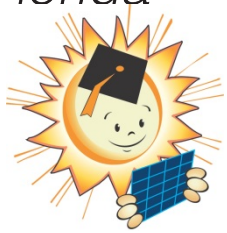
SOLAR TRAINING NETWORK
POSITIVE CONNECTIONS. POWERFUL CAREERS.

FEEDER
Foundations for Engineering Education for Distributed Energy Resources

Regional Test Centers
Differentiating PV Quality

Drive ELECTRIC Florida

GO SOLAR | FLORIDA



ENERGYWHIZ
Connecting Schools, Teachers, and Students with Solar Energy

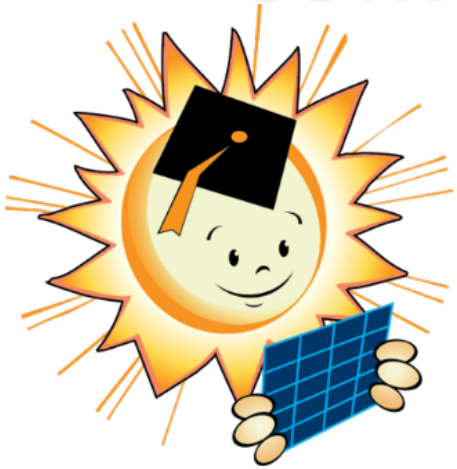
PV, EVs, Energy Efficient Buildings, Load Management, Batteries, Alternative Fuels, Hydrogen, Fuel Cells, Smart Grid Electronics, V2X, Training & Education

FSEC

Education and Training Opportunities

- UCF energy focus encompasses FSEC, Facilities, two Faculty Clusters, Engineering and Science departments
- Mission of research and responsibility
- Exploring new degree and certificate offerings
- Corporate and Workforce Training
- Professional Development for Educators

Community Engagement



- STEM Enrichment
- State and Regional Expos
- Federal Funding through AEOP
- Seeking Sponsors

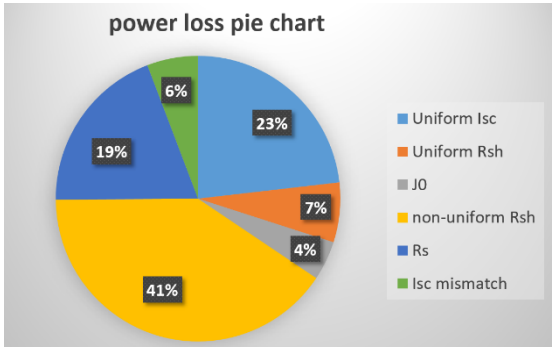
PV Manufacturing Research

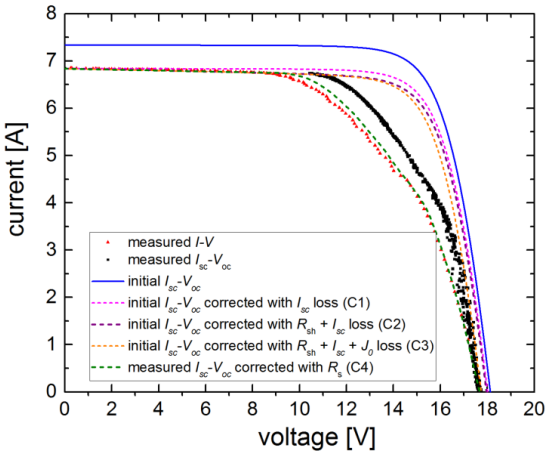
- **P.I.**: Kris Davis
- **Funding:** $1.58 million, DOE SunShot, PVRD 2
- **Project Focus:** Development of new measurement techniques to detect and reduce contact degradation in PV modules
- **Partners:** Arizona State University, Rochester Institute of Technology, and BrightSpot Automation

https://today.ucf.edu/ucf-energy-researchers-receive-3-1-million-make-solar-affordable/

PV System Research Impacting LCOE

- **P.I.:** Joe Walters
- **Funding:** $1.6 million, DOE SunShot, PVRD 2
- **Project Focus:**
  High resolution monitoring system, Algorithm development and validation, Diagnostic and Prognostic capability, LCOE model development
- **Partners:**
  Sandia National Laboratories (PV system monitoring), NextEra Energy (parent to FPL), OSISoft (performance monitoring software), Pordis (hardware, string level monitoring), FSEC (PV system monitoring, module characterization)





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Two PVRD2 Subcontracts

- **Case Western University Lead**
  Reliability and Power Degradation Rates of PERC Models Using Differentiated Packaging Strategies and Characterization Tools
- **Brightspot Automation, LLC Lead**
  Improving Solar Panel Durability through Novel Panel Designs, Advanced Manufacturing Equipment, and Field Retrofits to Existing Systems

Unlocking the High Efficiency Potential of Bifacial Silicon Solar Cells by Advanced but Simplified Techniques

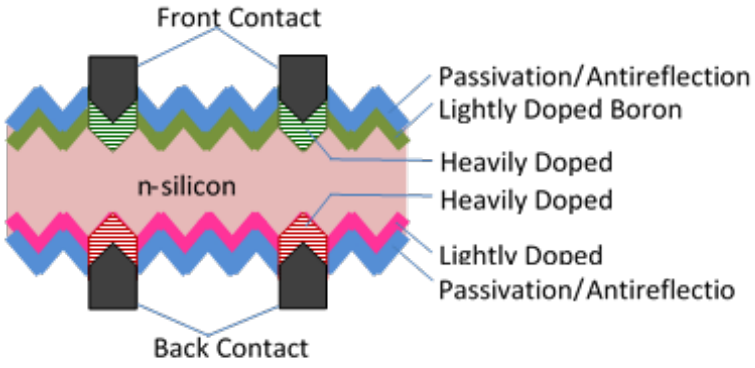

Figure 3: Bifacial Silicon Solar Cell.

Source of Funding (2 Year Project)	Amount
Agency Funding	
REET, Florida Department of Agriculture and Consumer Services	$400,000
Cost Share	
Oxford Instruments	$110,700
Florida Solar Energy Center (FSEC) / UCF	$151,981
BRIDG / ICAMR	$100,000
Total Project Cost	**$762,681**

- Develop bifacial silicon solar cells with simplified but innovative manufacturing techniques targeting high conversion efficiency (>23%)
- Fast-track technology transfer through partnership with industry players:
- Exploit economic benefits in the state of Florida by creating jobs, improving energy efficiency and attracting investments.

Team

- Dr. Ngwe Zin (PI)
- Prof. Winston Schoenfeld (co-PI)
- Prof. Kris Davis (co-PI)
- Dr. Hubert Seigneur (team member)
- Ms. Sara Bakhshi (graduate student)

Baseline Indoor Air Quality Field Study in Occupied New US Homes: Hot Humid and Mixed Humid Climates

Prime Recipient	EERE funds: $573.5K	Cost share: $63.7K (10%)

University of Central Florida, Florida Solar Energy Center
PI: Eric Martin
Co-PI's: Chuck Withers, Dave Chasar, and Jeff Sonne

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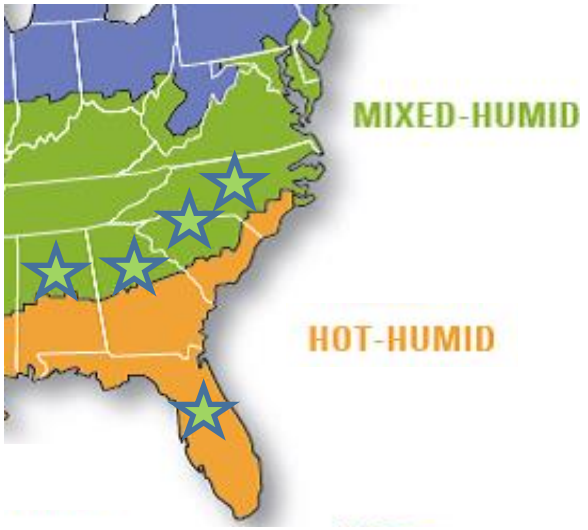
Creating Energy Independence

- Summary: 32 homes in each of two climate regions (64 homes total) with varying house and ventilation characteristics, about half meeting ASHRAE 62.2 mechanical ventilation requirements.
- Impact: Targeting the warm-humid region of the Southeastern US enables a dataset where the influence of outdoor moisture can be a focus for investigation.
- Project Goals:
  - Measure time-integrated and temporal profiles of humidity and contaminants of concern; monitor the use of ventilation equipment; and track activities impacting pollutant emissions.
  - Characterize the prevalence, type, and installed performance of mechanical ventilation equipment in new homes; explore regional variations in system designs and performance.
  - Investigate associations of indoor humidity and contaminant levels with the presence of control measures including ASHRAE 62.2 compliant mechanical ventilation.



Key Takeaway: Data for researchers to use to determine the relationships among air flows in homes indoor air quality, and indoor moisture in the hot humid and mixed humid climates.

Integrated HVAC Control Methods for Supplemental High Efficiency Mini-Split Heat Pumps in Existing Homes

Prime Recipient	EERE funds: $283.5K	Cost share: $31.5K (10%)

University of Central Florida, Florida Solar Energy Center
PI's: Eric Martin, Karen Fenaughty, and Danny Parker
Partners: Mitsubishi and AirCycler

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Creating Energy Independence

- Summary: Continue investigation of a low-cost space conditioning upgrade for existing homes using a supplemental mini-split. Enhance comfort and energy savings with integrated control strategies.
- Impact: Previous FSEC research documented 34% average heating/ cooling savings in 10 Florida existing homes using supplemental mini-split.
- Project Goals:
  - Improve thermal distribution with automated fan cycling of existing central system.
  - Improve energy savings and comfort through integrated control device that controls both the existing central system and supplemental mini-split.
  - Evaluate existing central system end-of-life options through

Key Takeaway: Runtime of a low efficiency existing central system can be offset with a high efficiency supplemental system. Supplemental system provides redundancy if central system fails.

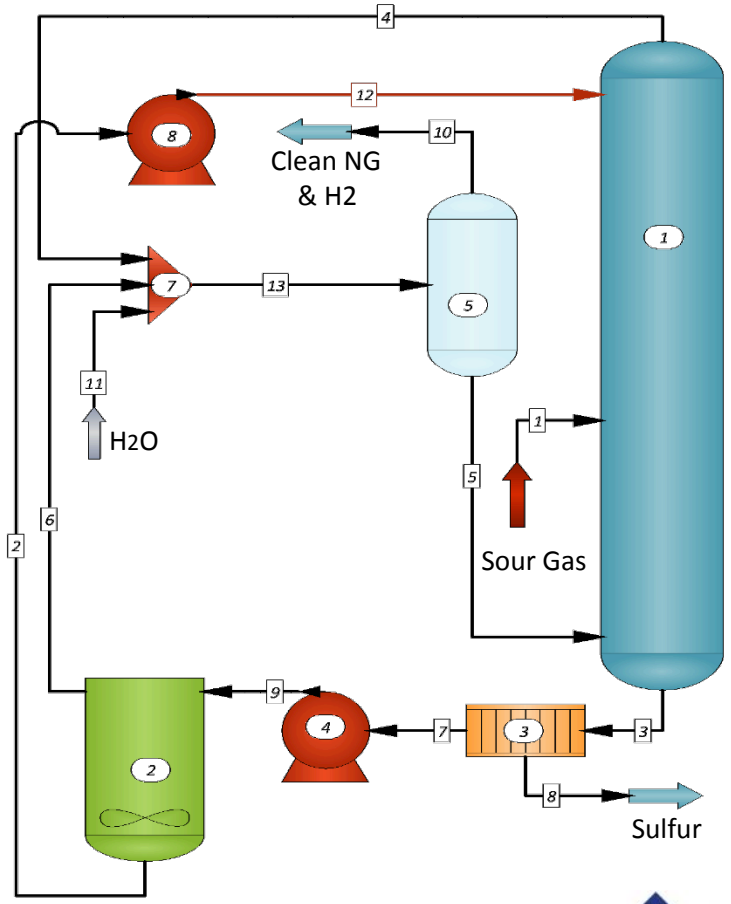
Test and Evaluation of Cryogenic Fluid Capacitor

- **PI:** Ali Raissi
- **Agency Funding**: $50k
- The aim of this research is to evaluate the energy storage capacity of liquefied gasses and the relative simplicity of high pressure gas bottles, while limiting the downfalls associated with both methods. By exploiting a unique attribute of nano-porous aerogel materials, many important industrial gases such as hydrogen, methane, etc. can be stored in a molecular surface adsorbed state at densities on par with liquid state, at low to moderate pressure, and then supplied as a gas, on-demand, to a point of interest. Laboratory-scale prototypes of the system have been developed at and tested by the NASA-KSC.
- **Project Partners:** NASA SSC

  MetaVista Inc.

Sub-Quality NG Treatment with Simultaneous Hydrogen Recovery

- **PI:** Ali Raissi
- **Co-PIs:** Paul Brooker, Nazim Muradov, Nan Qin
- **Phase 1 Funding**: $263k
- **Phase 2 Funding**: $1.75M
- **Focus:** Phase 1 of project will focus on the optimization of a UCF-FSEC licensed process (to GRT). This is a hybrid thermochemical & electrochemical sour gas cleanup technology with simultaneous hydrogen recovery and sulfur sequestration. Phase 2 project will design, build and commission an industrial scale SQNG treatment plant to be installed in one of the gulf states.
- **Funded by:** Green Recycling Technologies, LLC of Chicago, IL



Transition

- Driven by DOE solicitations to **Industrial-Funded** Collaborative Partnerships
  - Value-added research for utilities, diverse state and federal agencies, manufacturers of energy-saving technology and industries that process and consume energy
  - Working groups that cooperatively steer FSEC into carrying out collaborative research that provides funding for FSEC researchers and is beneficial to the members of the Working group [Win-Win]
  - Opportunities with EV/PV/Energy Storage RD&D

Industrial-Funded Collaborative Partnerships

FSEC Offers

- Holistic and integrated approach for new and emerging energy systems (PV, Storage, EVs and Buildings)
- Real world performance, analysis and durability

Benefits to Industry

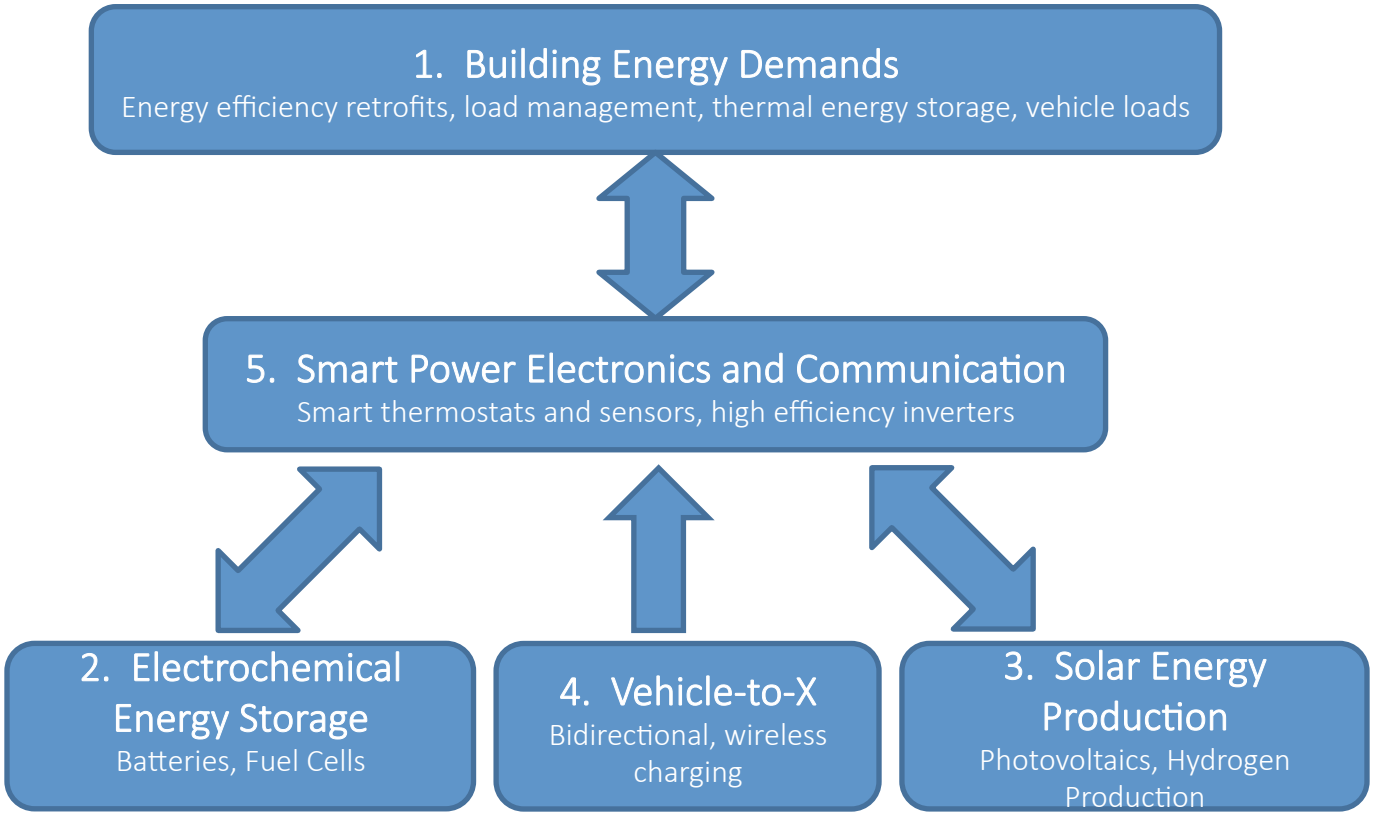
- Response moves from reactive to proactive
- Provides deeper insight into field performance
- Improved LCOE of an energy system
- New market opportunities through integration of multiple energy systems
- Aids grid integration of new energy systems

Vision for FSEC and for NSF ERC

Integrated Smart Building Energy Storage

Create the tools and processes for Net-Zero Energy Communities through the integration of next-generation smart energy storage, solar energy production, electric vehicles and advanced high frequency and efficient power-electronics systems, for increased shared-energy efficiency of community buildings and transportation, and improved grid resiliency.

Integrated Smart Building Energy Storage (IS-BEST) NSF ERC *Creating the tools and processes for Net-Zero Energy Communities*



Cross Cutting Research Areas

- Wide-Band Gap Semiconductors
- Materials, Packaging and Durability
- Electrochemistry and Solid State Science
- Hardware in the Loop
- Grid Integration
- Engineering Education
- Education for non-STEM community

IS-BEST NSF ERC Team

- **Universities:** University of Central Florida [Lead], Case Western Reserve University, Georgia Tech University, New Mexico State University, Washington University St. Louis, Illinois Institute of Technology
- **National Laboratories:** National Renewable Energy Lab, Idaho National Lab and Argonne National Lab
- **Community Partners**: Orlando, Cleveland, Atlanta, Chicago, Denver, Indian Reservations
- **Industrial Consortium:** Modeled after: cSi-PVMC, FEEDER, Drive Electric Florida, SEMATECH, SEPA
- **Industry Partners**: Building Controls, ESCOs, PV w/ Power Electronics, Batteries, H_2 Electrolyzers, fuel cells, EVs, EV infrastructure, Large Building owners, Utilities

Questions?

Energy Consumer Partners

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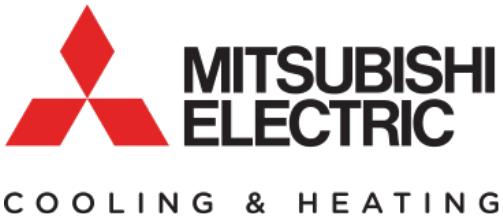
C.T. HSU + ASSOCIATES, P.A.



COOLING & HEATING

Utility Partners

OUC The Reliable One

DUKE ENERGY®

FPL®

Gulf Power

TECO ENERGY AN EMERA COMPANY

FMPA
Florida Municipal Power Agency
Community Power. Statewide Strength.®

Smart Electric Power Alliance