

FSEC Advisory Board Meeting

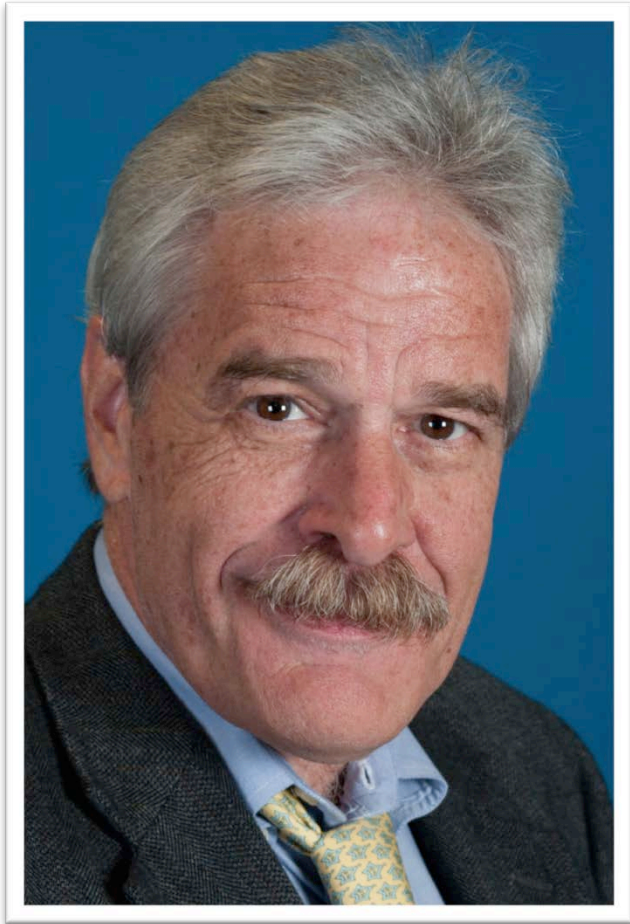
October 21, 2021



UCF

**FSEC Energy
Research Center**

UNIVERSITY OF CENTRAL FLORIDA

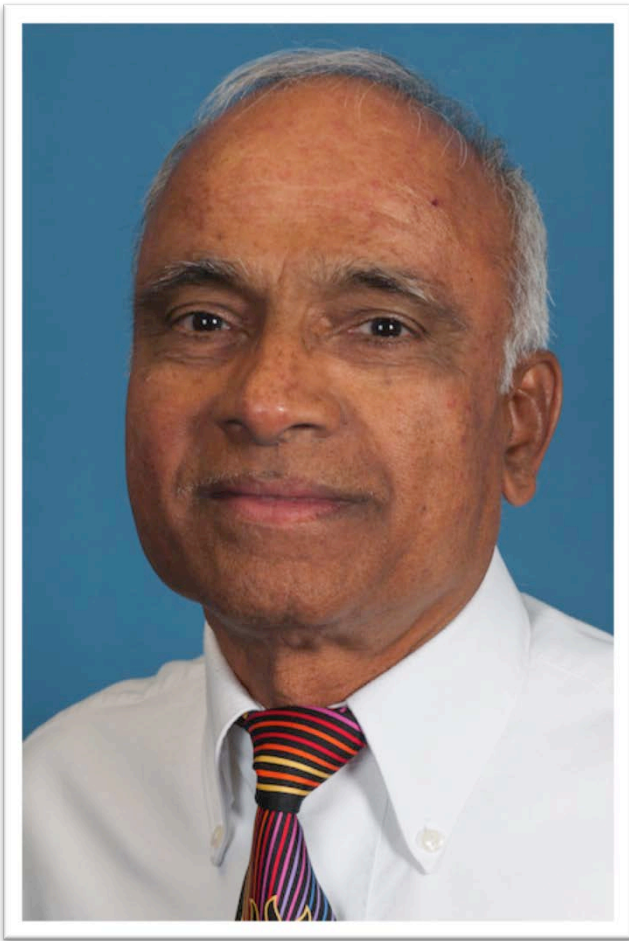


In Memory Of

Steve Gorman

1951 – 2021

Steve was a former FSEC Advisory Board member and an icon in the solar energy industry. He devoted his career to the mission of bringing solar thermal to the masses.



In Memory Of Neelkanth Dhere

1938 – 2021

Dr. Dhere retired from FSEC in 2017 after 27 years of service.

He was a national pioneer in the research and development of vacuum deposition, thin-film PV cells.

His students now work at hi-tech companies such as Apple, Applied Materials, Intel, Lam Research, and Motorola.

FSEC Advisory Board Meeting — AGENDA

9:30 a.m.	Welcome and Introductions	Chris Castro, <i>Chair, FSEC Advisory Board; Director of Sustainability & Resilience, City of Orlando</i>
	Roll Call	Sherri Shields, <i>FSEC</i>
9:40 a.m.	Approval of March 31, 2021 Meeting Minutes	Chris Castro
9:45 a.m.	Status of FSEC Programs	Jim Fenton, <i>FSEC</i>
10:05 a.m.	Infectious Disease Isolation Zone Research	Chuck Withers, <i>FSEC</i>
10:20 a.m.	BREAK	
10:25 a.m.	Florida Energy Office Report	Kelley Smith Burk, <i>Director, Office of Energy, FDACS</i>
	Florida Legislative Session Report	Louis Rotundo, <i>Principal, Louis Rotundo and Associates</i>
10:40 a.m.	Strategic Plan Update: Metrics	Bill Grieco, <i>Vice Chair, FSEC Advisory Board; CEO, RAPID Manufacturing Institute™</i>
10:55 a.m.	The US DOE Loan Programs and Energizing Climate Justice Through Virtual Power Plants	James P. Barrett, Senior Consultant, US DOE Loan Programs Office (LPO)
11:20 a.m.	Roundtable Discussion: How the DOE Loan Program Could Help Achieve Climate Justice	James Barrett joins state, local and housing representatives. <i>Kelley Smith Burk moderates.</i>
11:55 a.m.	New Business/Discussion Date and Agenda for Next AB Meeting (TBD)	Chris Castro
12:00 p.m.	Adjourn	Chris Castro



Marlin Vaughn
Cogeneration Operator
The Walt Disney Company

FSEC Advisory Board Meeting — AGENDA

9:30 a.m.	Welcome and Introductions	Chris Castro, <i>Chair, FSEC Advisory Board; Director of Sustainability & Resilience, City of Orlando</i>
	Roll Call	Sherri Shields, <i>FSEC</i>
9:40 a.m.	Approval of March 31, 2021 Meeting Minutes	Chris Castro
9:45 a.m.	Status of FSEC Programs	Jim Fenton, <i>FSEC</i>
10:05 a.m.	Infectious Disease Isolation Zone Research	Chuck Withers, <i>FSEC</i>
10:20 a.m.	BREAK	
10:25 a.m.	Florida Energy Office Report	Kelley Smith Burk, <i>Director, Office of Energy, FDACS</i>
	Florida Legislative Session Report	Louis Rotundo, <i>Principal, Louis Rotundo and Associates</i>
10:40 a.m.	Strategic Plan Update: Metrics	Bill Grieco, <i>Vice Chair, FSEC Advisory Board; CEO, RAPID Manufacturing Institute™</i>
10:55 a.m.	The US DOE Loan Programs and Energizing Climate Justice Through Virtual Power Plants	James P. Barrett, Senior Consultant, US DOE Loan Programs Office (LPO)
11:20 a.m.	Roundtable Discussion: How the DOE Loan Program Could Help Achieve Climate Justice	James Barrett joins state, local and housing representatives. <i>Kelley Smith Burk moderates.</i>
11:55 a.m.	New Business/Discussion Date and Agenda for Next AB Meeting (TBD)	Chris Castro
12:00 p.m.	Adjourn	Chris Castro

Status of FSEC Programs

Jim Fenton, Director

Advisory Board Meeting

October 21, 2021



UCF

**FSEC Energy
Research Center**

UNIVERSITY OF CENTRAL FLORIDA

FSEC IN THE NEWS



Broad Coalition Forms "Southeast Electric Transportation Regional Initiative (SETRI)" To Accelerate EV Market Expansion

Over 60 stakeholders collaborate to leverage transportation electrification opportunities in Southeast

NEWS PROVIDED BY

[Southeast Electric Transportation Regional Initiative \(SETRI\)](#) →

Sep 22, 2021, 10:00 ET

SHARE THIS ARTICLE



ATLANTA, Sept. 22, 2021 /PRNewswire/ -- A broad coalition of organizations from the business, education, government and non-profit sectors has launched the [Southeast Electric Transportation Regional Initiative \(SETRI\)](#). SETRI has been designed to address one of the region's most pressing needs toward realizing the benefits of electric transportation, namely greater coordination and collaboration among key stakeholders.

SETRI aims to address regional market challenges such as electric vehicle (EV) charging and infrastructure gaps, accessibility, EV model availability and cost, policy guidance, and consumer awareness while unlocking untapped opportunities for economic development, jobs growth, enhanced energy security, and reduced environmental impacts opportunities.

Indeed, [over 60 public and private organizations](#) are founding signatories to [SETRI's Memorandum of Understanding \(MOU\)](#) aimed at accelerating the benefits of electric transportation for the region. This coalition includes charging companies, utilities, automakers, public officials, city planners, non-profit organizations, and universities and other research institutions. The coalition will leverage the expertise and resources needed to help state leaders navigate the transition to electric mobility. To accelerate regional transportation electrification growth throughout the Southeast, SETRI intends to:

- Promote regional EV market development,
- Conduct education and outreach to consumers and decision-makers,
- Coordinate state electrification efforts and university research, and
- Collaborate with transportation electrification efforts outside the Southeast.

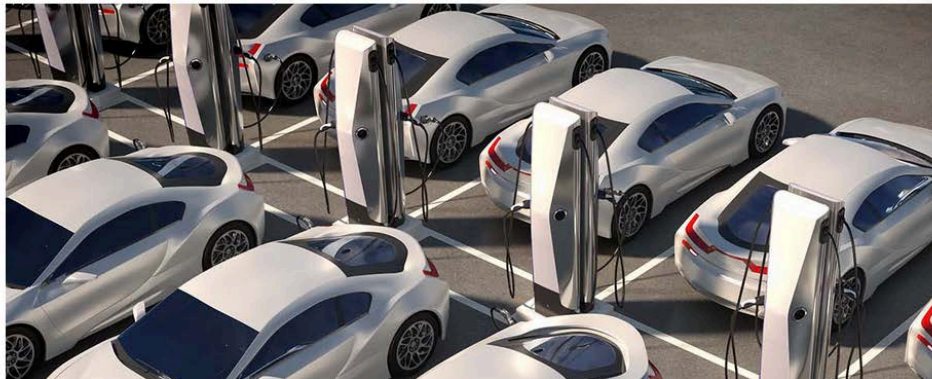
<https://www.prnewswire.com/news-releases/broad-coalition-forms-southeast-electric-transportation-regional-initiative-setri-to-accelerate-ev-market-expansion-301382869.html>

SCIENCE & TECHNOLOGY

UCF Part of New Regional Movement to Accelerate Adoption of Electric Vehicle Transportation

UCF's FSEC Energy Research Center is a leader in electric transportation study and it is ready to help the new group charge on.

BY SHERRI SHIELDS | SEPTEMBER 27, 2021



<https://www.ucf.edu/news/ucf-part-of-new-regional-movement-to-accelerate-adoption-of-electric-vehicle-transportation/>

 A screenshot of a news article from Space Coast Daily. The article title is "UCF Knights Part of New Regional Movement to Accelerate Adoption of Electric Vehicle Transportation". The byline is "By Space Coast Daily // October 1, 2021". The main headline is "ALL ELECTRIC SYSTEM COULD TRIGGER AN ECONOMIC BOON OF UP TO \$47B". The article includes social media sharing icons for Facebook, Twitter, LinkedIn, and Digg. The background image shows a large campus building with a lake in the foreground.

SPACE COAST DAILY .com

NEWS CRIME SPORTS HEALTH BUSINESS

THINGS TO DO WEATHER SC D TV LOCAL

NEWS TICKER > Legendary Brevard Junior College Coach Jim Oler Inducted into Space Coast Sports Hall of

Home » UCF Knights Part of New Regional Movement to Accelerate Adoption of Electric Vehicle Transportation

UCF Knights Part of New Regional Movement to Accelerate Adoption of Electric Vehicle Transportation

By Space Coast Daily // October 1, 2021

ALL ELECTRIC SYSTEM COULD TRIGGER AN ECONOMIC BOON OF UP TO \$47B

SHARE f t in digg su

<https://spacecoastdaily.com/2021/10/ucf-knights-part-of-new-regional-movement-to-accelerate-adoption-of-electric-vehicle-transportation/>

SCIENCE & TECHNOLOGY

UCF Researchers Validate Simple Method to Minimize COVID Spread in Single-Family Home

The researchers found that a basic isolation zone for a contagious person could be created with little cost and effort.

BY SHERRI SHIELDS | AUGUST 4, 2021



- Video produced by Ivanhoe Broadcast Media

- 1,670 visitors
- 9,232 page views
- 551 comments on projects
- 86 projects
- 18 schools
- 9 recorded interviews
- 17 topical videos



<https://vimeo.com/544816870>





EnergyWhiz
Empowering Student Innovation for a Clean Energy Future

EVENTS & COMPETITIONS HOW TO PARTICIPATE RESOURCES SPONSOR VOLUNTEER STORE

LOGIN

Events & Competitions

Go to an EnergyWhiz event site...


EnergyWhiz	EnergyWhiz Virtual	EnergyWhiz Regional
		
Cocoa, FL – April 30, 2022	February 14-18, 2022	Multiple Locations and Dates

EnergyWhiz Virtual:
February 14-18, 2022

EnergyWhiz (at FSEC):
April 30, 2022

- Sponsors Needed
- Elementary to college students
 - Junior Solar Sprint
 - Energy Transfer Machine
 - Energy Innovations
 - Critter Comfort Cottage
 - Junior Solar Sprint





ENERGYWHIZ

Empowering Student Innovation for a Clean Energy Future


Learn how you can become a sponsor and reach more than 1,000 people.

Elizabeth Myron
321.638.1007
elizabeth.myron@fsec.ucf.edu

FSEC Energy Research Center
1679 Clearlake Road
Cocoa, FL 32922

ENERGYWHIZ

Empowering Student Innovation for a Clean Energy Future



Virtual: **February 14-18, 2022**
On Location: **April 30, 2022**

EnergyWhiz is a forum for students to demonstrate their science, technology, engineering, art and mathematics (STEAM) capabilities through project-based learning activities that are energy-focused.

Critter Comfort Cottage

Students' design, construct and market energy-efficient, eco-friendly pet homes for any critter of their choosing.

Energy Innovations

Student teams design, engineer and market full-scale, renewable energy-powered devices that have real world applicability.

Energy Transfer Machine

Teams transform materials into Rube Goldberg-type machines that perform a specified task and then submit a video of their success.

Energy Inspired Art


Create any media, technique, visual, performance, musical or literary art inspired by renewable energy, energy efficiency or climate science.

Junior Solar Sprint

Each team produces a model-sized solar-powered car that is judged on technology, craftsmanship, innovation and performance.


Solar Energy Cook-off


Combining engineering, construction and culinary art, students design, build and then use their cooker, to produce an original dish.



FSEC Energy Research Center
UNIVERSITY OF CENTRAL FLORIDA

In partnership with





www.energywhiz.com

EW2022V

COMMERCIAL Energy Code Track

Fluor Training Track

Home energy ratings provide a standardized measure of energy costs and efficiency. Following the prerequisites, courses should be taken in order, as indicated below.

RESIDENTIAL COURSES

UCF FSEC Energy Research Center
UNIVERSITY OF CENTRAL FLORIDA

Presented by

Building Science Training Opportunities

<https://energyresearch.ucf.edu/education/continuing-education/>

Training and certification courses are geared towards a variety of practitioners, professionals, and the general public.



Residential and commercial buildings courses are offered. Continuing Education credits are available for many courses.



TECHNOLOGY TRANSFER

FSEC has 117 patents,



EnergyWhiz is students to develop engineering, and capabilities through learning, held across Florida in renewable energy development throughout the coaches and m



1679 Clearlake
Cocoa, FL 32922



The Gossamer Wind Ceiling Fan

The Results

This fan is the basis of the ENERGY STAR®

More than **2M** fans sold

More than **\$40Millio**

6 | FSEC ENERGY RESEARCH CENTER



BUILDINGS RESEARCH

FSEC's extensive buildings research program regularly receives funding from federal and state agencies as well as the private sector. Research determines the effectiveness of building codes and methods for improving the codes. They test innovative HVAC systems that focus on efficiency, greater moisture removal or reducing duct system heat and losses. FSEC's buildings research is conducted in the lab and then to identify ways to improve indoor quality when whole house ventilation systems are deployed.

FSEC researches a variety of energy system improvements to homes in a humid climate using, two onsite, heavy instrumented and identical side-by-side homes with simulated occupancy.

Working with innovative builder reliable, cost-effective measure efficient homes. The FSEC-led Building America partnership is the national Residential Construction is the national Building America partnership. Florida Habitat for Humanity affiliates, throughout the United States. They engineering principles that lead to existing housing, and ultimately, building energy codes and standards.

4 | FSEC ENERGY RESEARCH CENTER

Hydrogen



FSEC originated the concept of the Zero Energy Home, developing the FSEC has extensive expertise in user-specific development and

Energy Research, Development and Education

As Florida's statewide energy research center, FSEC has a 46-year history of basic and applied research excellence, which has grown in scope to include solar energy, high performance buildings, sustainable transportation, energy storage, energy systems integration, education and training. As a result of FSEC's extensive research capabilities, its programs are nationally and internationally recognized.

The University of Central Florida's FSEC Energy Research Center in Cocoa has 46 years of experience in energy research.



2 | FSEC ENERGY RESEARCH CENTER



SOLAR RESEARCH


FSEC's solar energy research, testing and demonstration programs validate the performance of small- to large-scale photovoltaic (PV) systems; identify cell-level manufacturing improvements; and, issue code-compliant PV system certifications for solar installers. These programs provide a

measure of quality control and reliable field performance.

PV systems floating on water bodies (floatovoltaics) are the latest innovation in PV system deployment. FSEC is leading a U.S. Department of Energy funded that is monitoring floating solar systems

FSEC is leading a nationwide research project on floating solar systems. One located in Orlando. Photo: Orlando Utilities Commission


FSEC ENERGY RESEARCH CENTER



EXPLORE

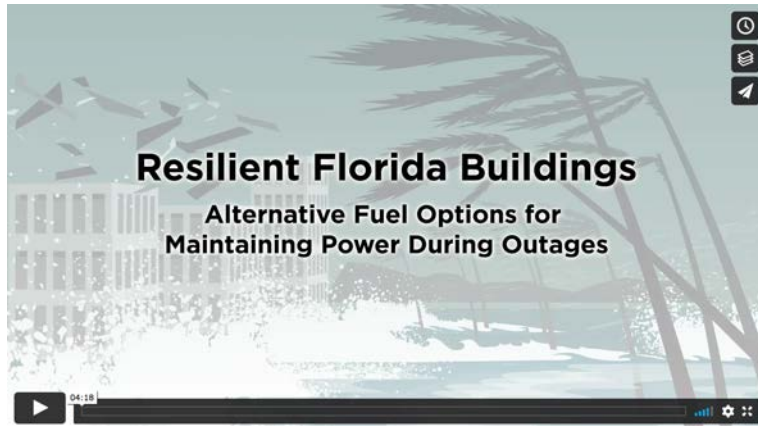
FSEC Energy Research Center

energyresearch.ucf.edu





Videos



<https://vimeo.com/527856308>



<https://vimeo.com/557714520>



EnergyWhiz: 1 min video

<https://vimeo.com/434436180>

- Instructional videos for virtual EnergyWhiz
 - webpage design
 - judging
 - Topical presentations

CURRENT CONTRACTS

Current DOE-Funded Collaborative Partnerships



SOLAR ENERGY
TECHNOLOGIES OFFICE
U.S. Department Of Energy

- **Gaining Fundamental Understanding of Critical Failure Modes and Degradation Mechanisms in Fielded Photovoltaic Modules via Multiscale Characterization**, *K. Davis*
- **Reliability and Power Degradation**, Sub from CWRU, *K. Davis*
- **Characterization of Contact Degradation in c-Si PV Modules**, *K. Davis*
- **Fabrication of Passivating Contact Solar Cells**, *K. Davis*
- **Low Cost Printing Techniques**, *K. Davis*
- **Education Materials for Professional Organizations Working on Efficiency and Renewable Energy Developments (EMPOWERED)**, *C. Kettles*
- **Developing PID susceptibility models for Bifacial Technologies**, *H. Seigneur*
- **PV System Research Impacting LCOE**, *H. Seigneur*
- **Quantifying and Valuing Fundamental Characteristics and Benefits of Floating Photovoltaic Systems**, *J. Sherwin*
- **Secure and Resilient Operations Using Open-Source Distributed Systems Platform (OpenDSP)**, *W. Sun*

New projects



Current DOE-Funded Collaborative Partnerships



U.S. DEPARTMENT OF
ENERGY

Energy Efficiency & Renewable Energy

- **Investigation of the Prevalence and Energy Impacts of Residential Comfort System Faults – Hot Humid and Hot Dry Climates,**
E. Martin
- **PV-GEMS: Photovoltaic Powered, Grid Enhanced Mechanical Solution,**
E. Martin
- **Reimagining HVAC for New Manufactured Housing,**
(Subaward from Slipstream),
D. Chasar
- **Indoor Air Quality Field Study in New US Homes,**
E. Martin
- **Energy Codes: Comparing Performance in a Changing Technological Environment,**
P. Fairey
- **EnergyPlus Development,**
L. Gu (Renewal in process)



- American Made Challenge Power Connector



- Residential Buildings Subject Matter Expert Technical, Outreach and Research and Development Support
- Whole Building Modeling and Simulation Software



Pacific Northwest
NATIONAL LABORATORY

- DOE Connected Heat Pump Water Heater Field Study



- PV Lifetime Hot and Humid Climate Flash Testing



- Enabling large-scale adaptive integration of technology hubs to enhance community resilience through decentralized urban food-water-energy nexus decision



- Alternative Fuel Resiliency Plan
- SunSmart Schools E-Shelter Maximization Project (\$1M added)



- Estimating Internal Moisture Generation Rates in Occupied New Homes



- Reliability Evaluation of Bifacial and Monofacial Glass/Glass Modules with EVA and Non-EVA Encapsulants

Associated Gas Distributors of Florida

- Commercialization of Renewable Natural Gas in Florida
- Updating AGDF Model Costs and Equipment

ATLANTIC HOUSING P A R T N E R S

- Calculate Multifamily Utility Allowances and Support Existing PV Operations and New Installations



DRIVE ELECTRIC
— USA —

- Raise Awareness and Adoption of EVs Across U.S.



- Demonstration of Integrated Hydrogen Production and Consumption for Improved Utility Operations

A.F.Mensah

- Controller design and demonstration of Integrated Battery Storage System



SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

- Partnered with Hanson Professional Services and Central Florida Clean Cities Coalition to Develop an Energy Efficiency and Sustainability Plan



The Levy Partnership

- *[Sub-Award]* Maximizing the Effectiveness of Ductless Heat Pumps in Existing Homes by Demonstrating Integrated Controls



- Lab and Field Evaluation of Condensation Potential in Buried Ducts in Vented Attics Located in the Hot and Humid Climate Zones



SOLAR RATING
& CERTIFICATION
CORPORATION™

- SRCC Portal Development



- Technical Support

SEI Associates

- Trane Trace 3D Plus Software Development Support

Tactical Energy

- Comparison of Real World Assisted Living Buildings with Baseline Models

NEW AWARDS & PENDING CONTRACTS



SunSmart E-Shelter Schools MAX Project

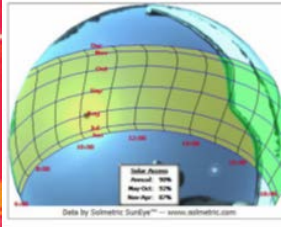
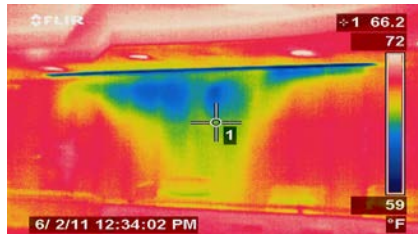
- Inspections & Repairs
- Additional \$1M from FDACS to make upgrades in 55 of 113 systems
- Replace batteries, upgrade inverters, or other needed repairs
- Supply chain challenges



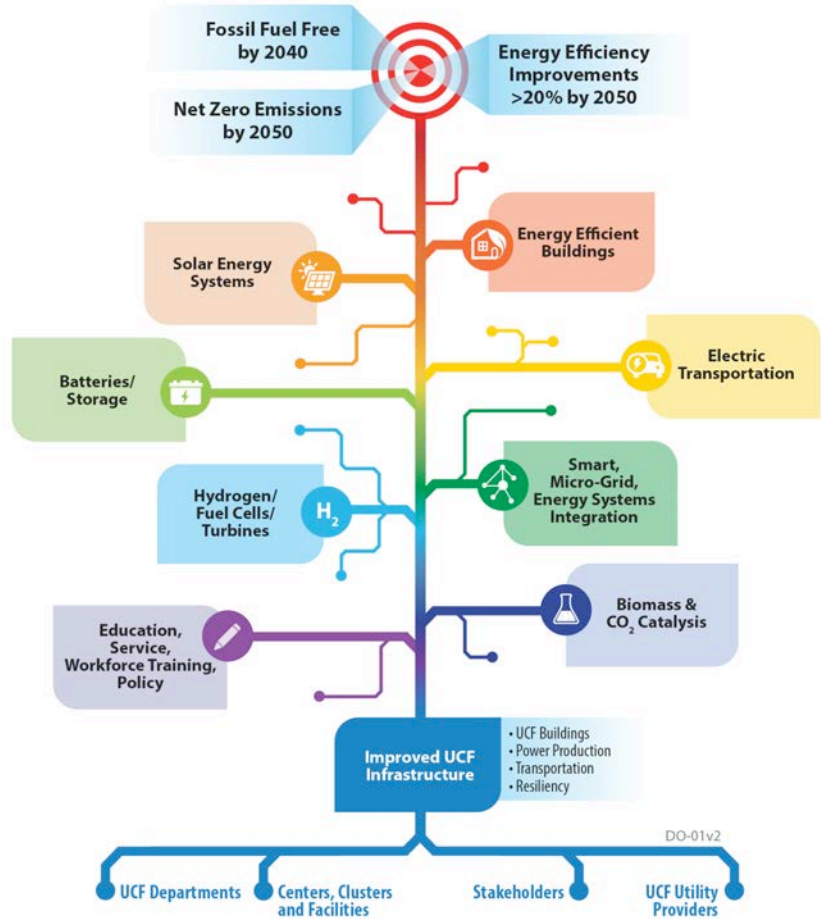


FDACS Florida Energy Investment Collaborative Pilot Program Objectives:

- Identify and prioritize highest impact, cost-effective, and timely energy sustainability projects
- Monitor/validate project deployments
- Create a streamlined project execution process
- Provide technical assistance to educate state and community decision-makers about sustainable energy practices
- Create a best practices document based on this project to be used with future communities.

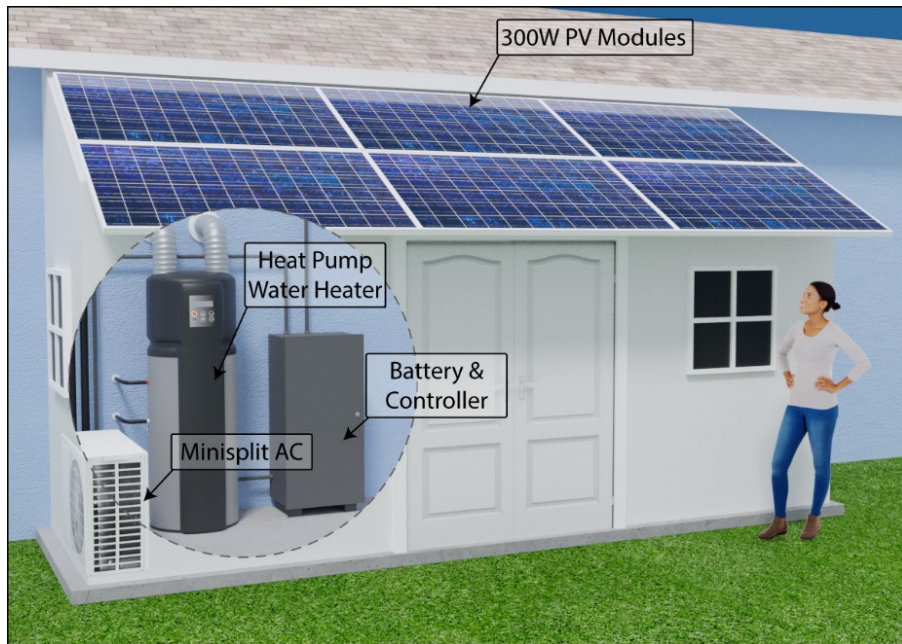


University Partnerships



- FSEC working with main campus faculty and Facilities
- Energy transition plan – Facilities & FSEC
- University sustainability plan
- UCF unique to have three utility companies (Duke Energy, OUC, FPL)

UPCOMING PROPOSALS



PV GEMS: PV-Powered, Grid-Enhanced Mechanical Solution

SUMMARY: A pre-packaged retrofit solution targeting 75% reduction in space conditioning and water heating energy.

- Fourteen Phase 1 teams submitting proposals for five Phase 2 awards.
- Phase 2 funds intended for development of pre-production prototypes, demonstration in occupied buildings, and commercialization activities.
- **FSEC currently seeking commercialization partners:** design, manufacturing, marketing, distribution, installation, financing, etc.
- Contact: Eric Martin, martin@fsec.ucf.edu

Dynamic Demand Response for Grid Services in a High PV Penetration Feeder

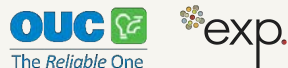
Control Number 2206-1590
 Requested Federal Funds:
 \$7 M, Cost Share: \$4.4 M

Team

Prime:
 University of
 Central Florida

PI:
 Richard Raustad,
 Project Director

Partners

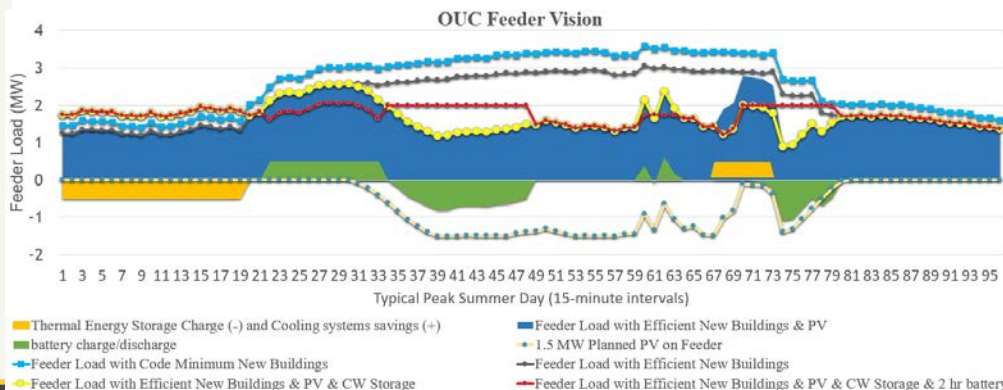


Impacts

Demonstrate methods for grid-interactive buildings to provide valuable support to the grid in a high-PV penetration scenario without compromising occupancy comfort. This will enable an increase in variable PV generation while maintaining the high level of grid reliability that utilities have demonstrated.

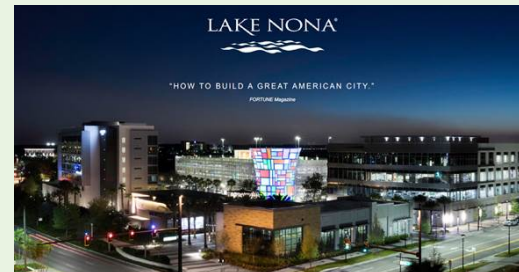
Summary

Shift cooling loads through chiller and air conditioner set point controls, dispatching battery energy storage, and modulating EV charging in real time via utility signals. Feeder load current 2 MW, future 4 MW, solar 1-2 MW. Evaluate TES via dynamic simulation.



Improvement Goal

Electric demand will be reduced by 15-30% and flexed by 30% through optimized infrastructure and software controls demonstrated in an urban area



The demonstration will include 3 hotels, 3 office buildings, 2 garages, a chiller plant, up to 180 EV charging stations, 1 MW of solar PV at a parking garage, and will install DC-coupled battery (500kW/2000kWh) and EV charging (8x60kW)

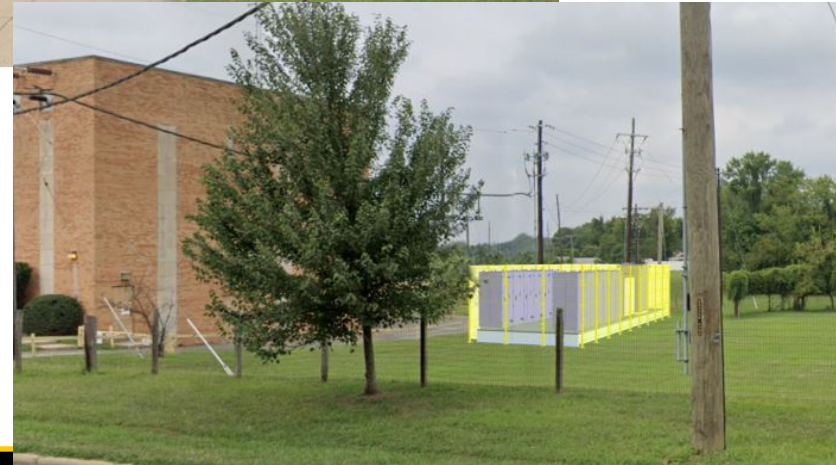


A.F.Mensah

- A.F. Mensah, Inc. (AFM) is a cleantech company
- **Developer, Systems Integrator, and Operator of solar and battery storage projects**
- Clients include Electric Utilities, Municipalities, and Institutions.
- **Projects & Accomplishments**
 - Solar + Storage Virtual Power Plants
 - Commercial Solar + Storage Microgrids
 - Battery Storage Projects for renewable grid integration, ancillary services and distribution grid enhancement.
 - 2nd Life Electric Vehicle Battery Integration

Partnership with UCF Driver – Substation Deferral Project

- Exelon Utilities Substation.
- Located in Oxon Hill, Maryland.
- **Defer construction of a planned substation.**
- **Peak shaving and grid emergencies.**
- **Ancillary Services: Frequency Regulation and Spinning Reserves**
- \$4.6M Cost; \$11M Value.

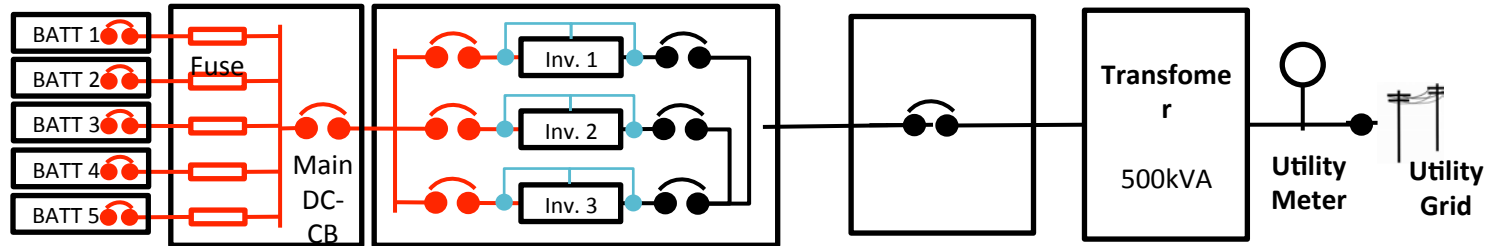


Controller design and demonstration of Integrated Battery Storage System

R&D Partnership with UCF - Key Tasks

A.F.Mensah

- Design **Unified Control Strategy: Battery Inverter, PV, Grid, EV, & Other resources.**
- Design and test Innovative **GaN Inverter** for battery storage applications. (High Power Density)
- **Test Bed** for Exelon Project for Acceptance Test as shown below: **500kW/2MWh Lithium Ion Phosphate System.**



- We remain committed to continue funding and driving research at UCF/FSEC in lockstep with our business expansion.
- UCF/FSEC Partnership and Florida Presence are key for our growth and expansion.

Questions?



UCF

**FSEC Energy
Research Center**

UNIVERSITY OF CENTRAL FLORIDA