

FSEC Advisory Board Meeting

April 15, 2022



UCF

**FSEC Energy
Research Center**

UNIVERSITY OF CENTRAL FLORIDA

Agenda

9:30 a.m.	Welcome and Introductions Roll Call <i>Recognition of UCF President Cartwright</i>	Chris Castro, Chair, FSEC Advisory Board; Director of Sustainability & Resilience, City of Orlando Sherri Shields, FSEC
9:50 a.m.	Approval of October 21, 2021 Meeting Minutes	Chris Castro
9:55 a.m.	Status of FSEC Programs	Jim Fenton, <i>Director, FSEC</i>
10:20 a.m.	Florida Energy Office Report	Kelley Smith Burk, <i>Director, Office of Energy, FDACS</i>
10:35 a.m.	Networking Break	
10:45 a.m.	Energy Storage Research at FSEC	Adje Mensah, A.F. Mensah, Inc.
11:05 a.m.	Overview of the Office of Clean Energy Demonstrations	Melissa Klembara, <i>U.S. Department of Energy Demonstration Office</i>
11:35 a.m.	Workforce Programs/Solar Apprenticeship	Colleen Kettles, Director, Workforce and Business Development Division
11:45 a.m.	Election for New Chair and Vice-Chair	
11:55 a.m.	New Business/Discussion	Chris Castro

New Advisory Board Members



Dean Bushey

Vice President, Global
Social Environmental
Business, Hitachi



Paul Johnston

President, Watsco



Brian Donnelly

Manager of Sustainability,
Publix



Jeff Juger

Deputy General Manager,
Jinko Solar



Peter Hoeflich

Director of Generation
Technology, Duke Energy



Bruce Lindsay

Business Development,
Thermal Energy Storage
Trane Technologies

New Advisory Board Members



Ashraf Mahmoud

Director of Operations,
Saft Batteries



Rob Rickman

Area Sales Manager,
Mitsubishi Electric Trane
HVAC LLC



Scott McWhorter

Chairman, Southeast
Hydrogen Energy Alliance



Jennifer Schaffer

Director, Clean Energy
Solutions, Florida Power &
Light Company

New Advisory Board Members



Justin Vandebroek

President, Florida Solar
Energy Industry
Association



Tamara Waldmann

Director, Florida Distributed
Generation, Strategy, and
Policy, Duke Energy



Marlin Vaughn

Cogeneration Operator,
The Walt Disney Company



Kristy Walson

Principal,
TLC Engineering Solutions

Agenda

Agenda

9:30 a.m.	Welcome and Introductions	Chris Castro, <i>Chair, FSEC Advisory Board; Director of Sustainability & Resilience, City of Orlando</i> Sherri Shields, <i>FSEC</i>
	Roll Call <i>Recognition of UCF President Cartwright</i>	
9:50 a.m.	Approval of October 21, 2021 Meeting Minutes	Chris Castro
9:55 a.m.	Status of FSEC Programs	Jim Fenton, <i>Director, FSEC</i>
10:20 a.m.	Florida Energy Office Report	Kelley Smith Burk, <i>Director, Office of Energy, FDACS</i>
10:35 a.m.	Networking Break	
10:45 a.m.	Energy Storage Research at FSEC	Adje Mensah, <i>A.F. Mensah, Inc.</i>
11:05 a.m.	Overview of the Office of Clean Energy Demonstrations	Melissa Klembara, <i>U.S. Department of Energy Demonstration Office</i>
11:35 a.m.	Workforce Programs/Solar Apprenticeship	Colleen Kettles, <i>Director, Workforce and Business Development Division</i>
11:45 a.m.	Election for New Chair and Vice-Chair	
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

April 15, 2022

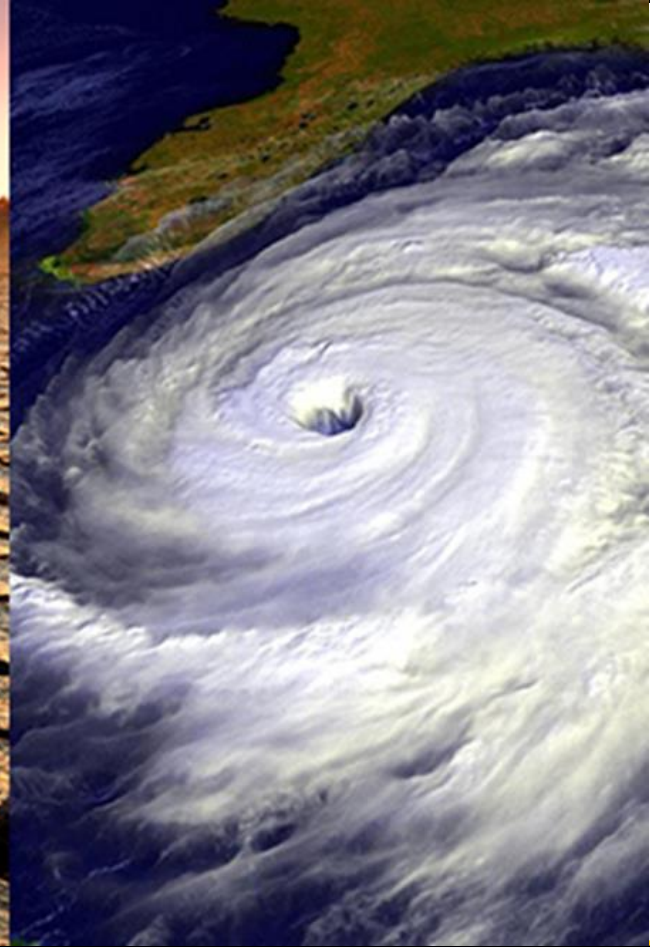


UCF

**FSEC Energy
Research Center**

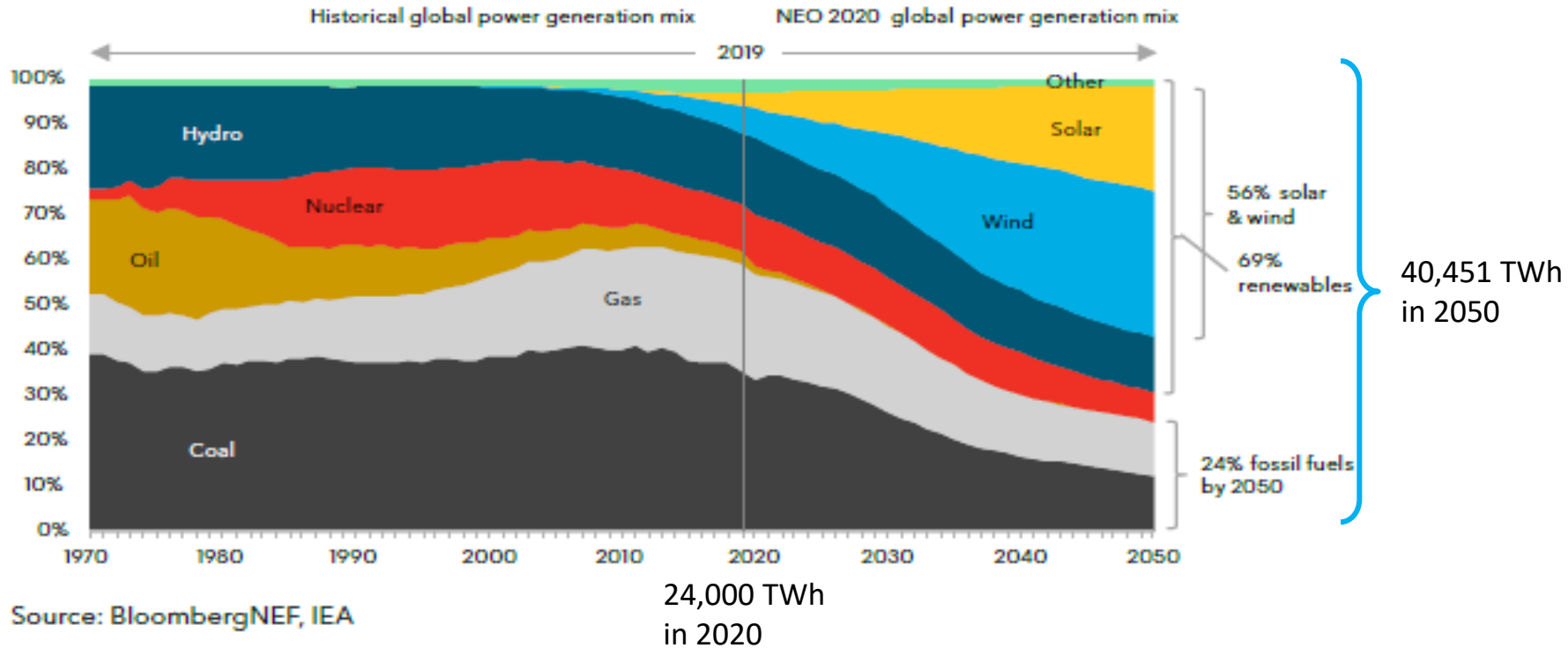
UNIVERSITY OF CENTRAL FLORIDA

Potential for “irreversible change”

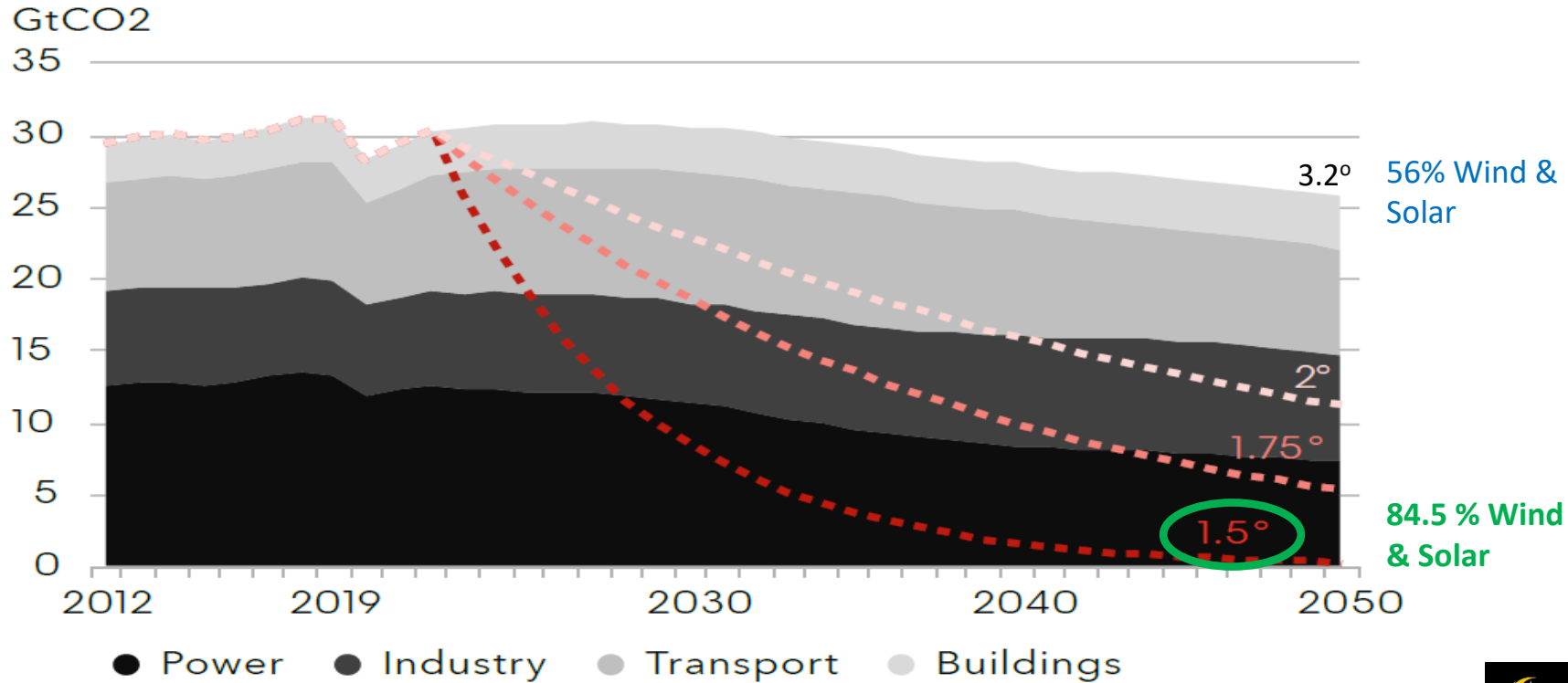


BloombergNEF New Energy Outlook 2020 Economic Transition Scenario

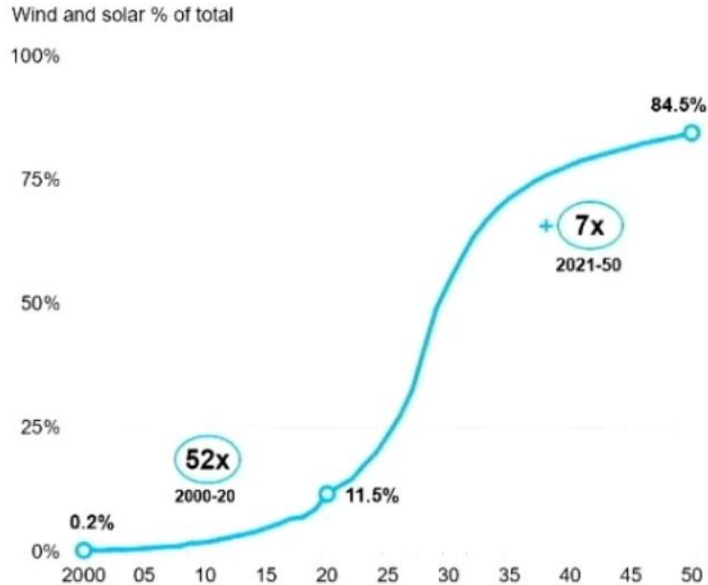
Figure 2: Global electricity generation mix



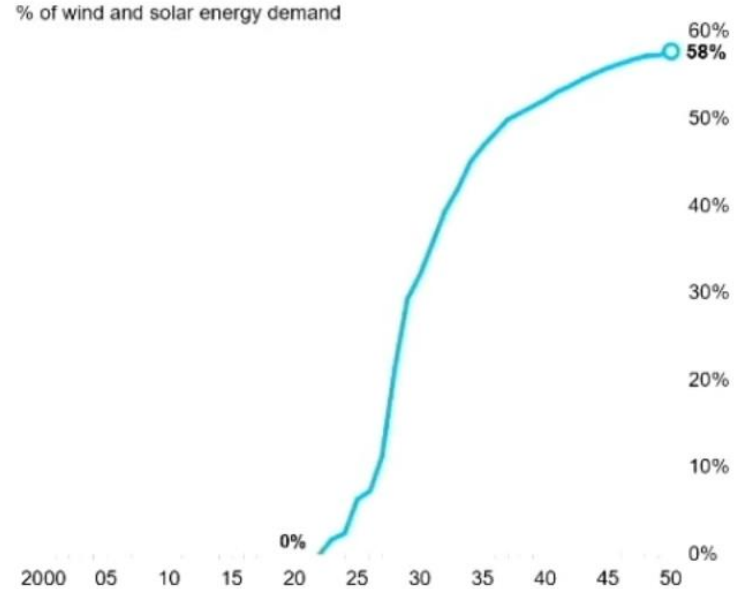
Emissions in the Economic Transition Scenario, by sector, and a range of carbon budgets



Renewable energy has scaled... ... but has a long way to go



Green hydrogen has not scaled at all... ... but it could scale, massively



In 2050 102,000 TWh of Electricity, 84.5 % wind and solar, 58% of which is used to make hydrogen to achieve NZE

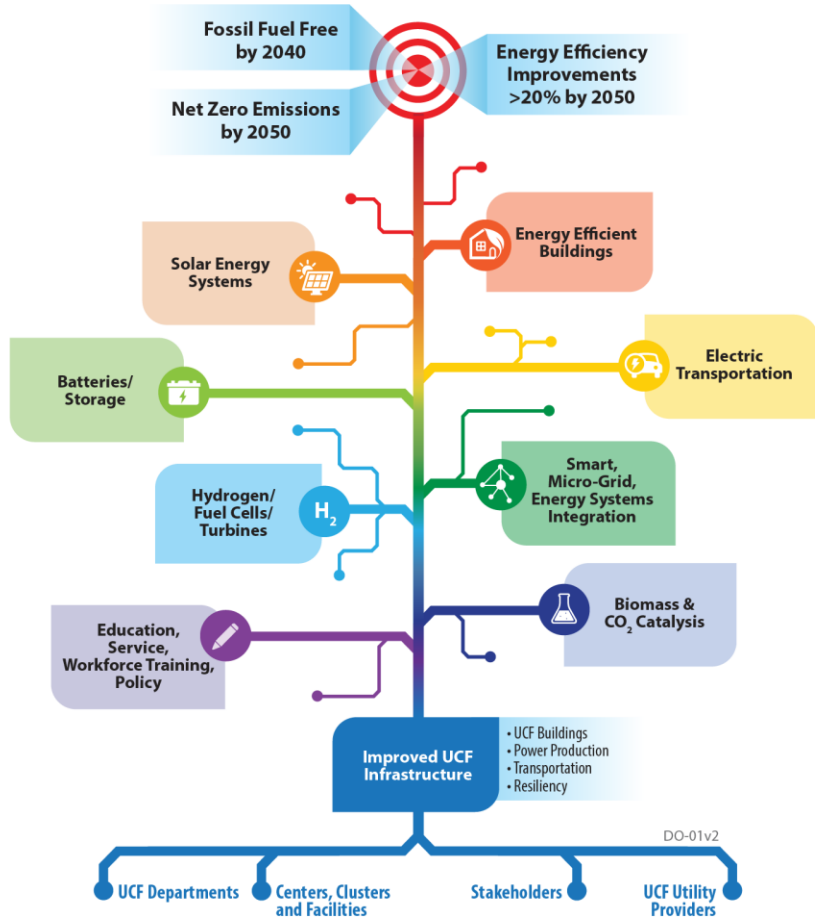
BNEF Summit London October 18-19, 2021

BNEF Talk: Peak Scaling by Jon Moore, CEO, BloombergNEF solar and wind and then hydrogen

<https://about.bnef.com/summit/london/videos/?vid=641126950>



University Partnerships



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



CURRENT CONTRACTS

Current DOE-Funded Collaborative Partnerships



U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

Buildings Technology Office

- **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, Phase 2**
E. Martin
- **Reimagining HVAC for New Manufactured Housing, Phase 2 (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 Software Development,**
L. Gu

New projects



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*

Current Contracts



- American Made Challenge Power Connector



- Residential Buildings Subject Matter Expert Technical, Outreach and Research, and Development Support
- Whole Building Modeling and Simulation Software
- Deep Energy Retrofit Technical Assistance
- Test and Data Acquisition Equipment Installation in Homes With Different Attic Designs



Pacific Northwest
NATIONAL LABORATORY

- DOE Connected Heat Pump Water Heater Field Study



- PV Lifetime Hot and Humid Climate Flash Testing
- Long-term Outdoor PV Evaluations
- Operational Support for Meteorological Instrumentation at the Florida Regional Test Center (FL RTC)



- 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



- Estimating Internal Moisture Generation Rates in Occupied New Homes

Associated Gas Distributors of Florida

- Updating AGDF Model Costs and Equipment



DRIVE ELECTRIC — USA —

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

A.F.Mensah

- Controller design and demonstration of Integrated Battery Storage System (*Deliverable to utility*)



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

ATLANTIC HOUSING

P A R T N E R S

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



The *Reliable One*®

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



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



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



- Methane Capture and Conversion to Liquid Methanol



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



- 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

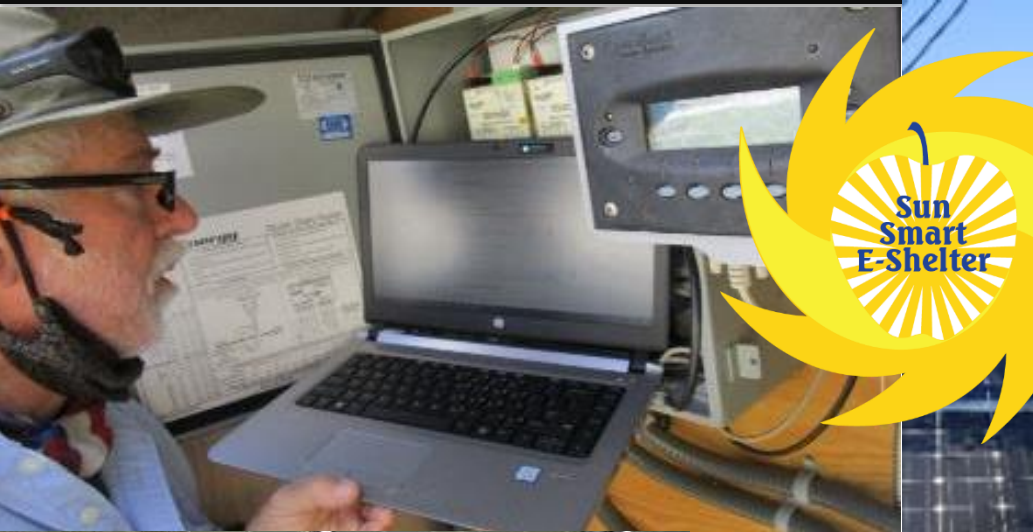
NEW AWARDS & PENDING CONTRACTS



EnergyPlus Software



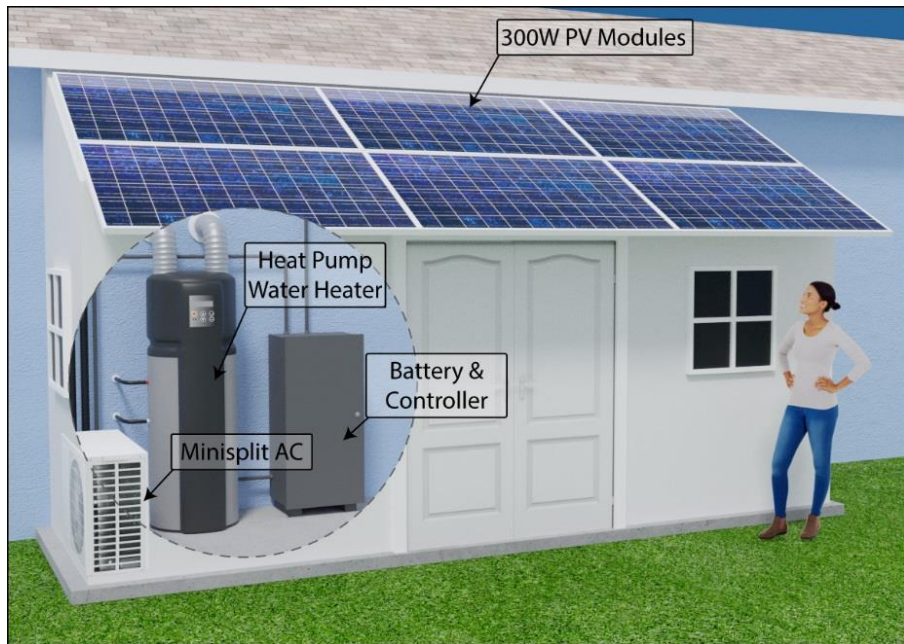
- \$1M (\$250K base, add-on each year)
- Department of Energy's EnergyPlus software whole-building energy simulation program development
- FSEC on core development team since 2001



SunSmart E-Shelter Schools MAX Project

- Inspections & Repairs at 113 schools
- Additional \$1M from FDACS to make upgrades
- Replace batteries, upgrade inverters, or other needed repairs
- \$18M, 2002-present





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

Contact: Eric Martin, martin@fsec.ucf.edu

- PV GEMS: PV-Powered, Grid-Enhanced Mechanical Solution
- \$4.4M (\$3.6M + \$885k cost share)
- Development of pre-production prototypes, demonstration in occupied buildings, and commercialization activities.
- **Seeking Large-scale Deployment Partners:** State & local govt, financing orgs & programs, utilities, affordable housing orgs, regional efficiency orgs, marketers.
- Partners:

watsco
COOLING THE AMERICAS

ROC usa
Resident Owned Communities
BETTER TOGETHER



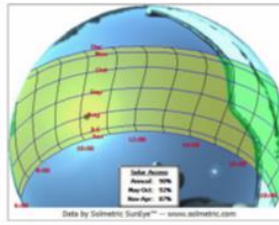
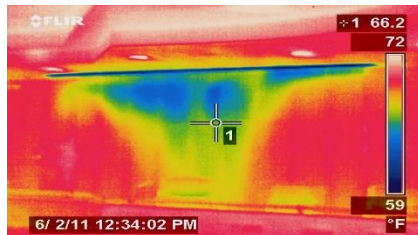
NASEO
National Association of
State Energy Officials





FDACS Florida Energy Investment Collaborative Model Program Objectives:

- Identify and prioritize solar, EV charging, and energy efficiency improvements to government buildings
- 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



SOLVE THE FLARING PROBLEM AND MONETIZE TRADITIONALLY UNECONOMIC GAS STREAMS

MISSION

- Methane capture and conversion to liquid methanol
- 16k flare sites globally
- 2nd Award: \$330k = \$180k + \$150k Florida High Tech Corridor Council match

- Permanent energy storage demonstration system at FSEC (\$1.7M)
- Industry Partners
 - High Tech Corridor Council
 - Adje Mensah, Inc.
 - Smart Charging Technologies, LLC
- UCF Partners
 - Engineering College Cost Share
 - Office of Research Cost Share
 - *Provost Request for Cost Share*

A.F.Mensah

- Controller design and demonstration of Integrated Battery Storage System
(Deliverable to utility)



Energy Storage Pilot Project



Step up Transformer: 500 KVA
(480 V/600V)



Power Conversion System (PCS) 500 KVA



DC Combiner



- Max Power: **186.3 KW**
- Capacity: **372 kWh**

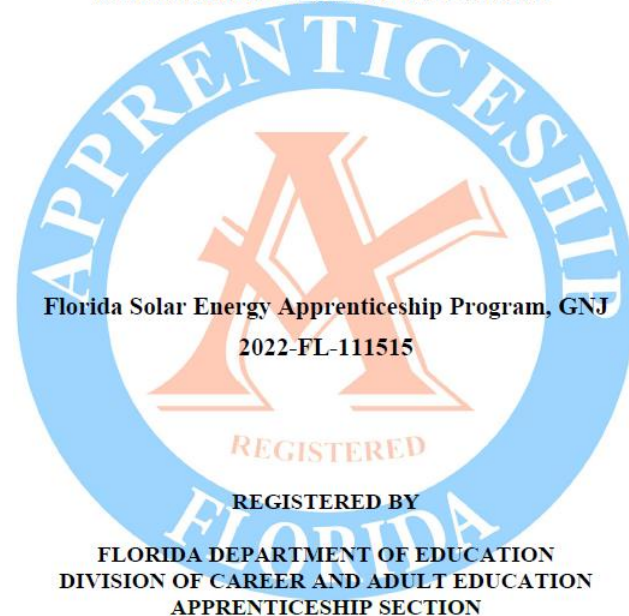
- Nominal DC Voltage: **1331.2 V**
- Weight: **~7600 lbs**

NEW PARTNERSHIPS

Solar Energy Technician

- **First and only solar apprenticeship program in the country registered with the US Department of Labor**
- FSEC and FlaSEIA partnership
- Pathway to solar contractor license or higher education
- FSEC developing and producing online training and instructional materials

STANDARDS OF APPRENTICESHIP



- **Covers \$9.5B** for clean hydrogen:
 - \$8B for at least four regional clean hydrogen hubs
 - \$1B for electrolysis research, development and demonstration
 - \$500M for clean hydrogen technology manufacturing and recycling R&D



President Biden Signs the Bipartisan Infrastructure Bill on November 15, 2021.

Photo Credit: Kenny Holston/Getty Images

- **Aligns with Hydrogen Shot priorities by directing work to reduce the cost of clean hydrogen to \$2 per kilogram by 2026**
- **Requires developing a National Hydrogen Strategy and Roadmap**

About Southeast Energy Alliance



- 2006 Organized as the South Carolina Hydrogen and Fuel Cell Alliance
- 2020 Reconstituted as Southeast Hydrogen Energy Alliance
- 2021 Commissioned SE Green H2 Supply Chain Study
- 2022 Southeast Clean H2 Hub Collaboration (convening stakeholders)

- January 27 Orientation Conference
240+ registered
- February 2, 3, 4, 7 and 8 Working Groups 1 – 5 Workshops
Average 45/WG registered
—160+ organization,
260+ professionals,
5 WGs, 12 WG Task Forces
- WGs Met as Required
— 31 Multiple times total
- March 17 Consolidation Conference
—Organizing SE H2 plan and Clean H2 RFI Response
- March 21 USDOE Clean H2 RFI Response



Board of Directors

Chairman / Consultant: Scott McWhorter

Treasurer: Ted Motyka

Advisor: David Doctor 



Sarah Adair



Geovanni Castano



Darrell Scott



Thomas Koeppel



Shawn Rossignol



John Ledbetter



Mark Johnson



Kevin Huang

Reasons for Hydrogen Hub in the Southeast



5 of the U.S. Largest Utilities (Dominion, Duke Energy, NextEra, Southern Co, TVA)



3.96B GDP (20+% of U.S.)



Proven Renewables – solar, hydropower, growing wind potential



Approximately 85M population (1/4 of the U.S.)



Major U.S. Ports, inland ports, largest rail system in the U.S., interstate corridors



4 major NASA sites and over 85 military sites (22 major installations)



Unique natural gas and fossil pipelines (gateway to the NE)



Cars, Light & Heavy Vehicle Manufacturing centered in SE (fuelcells!)

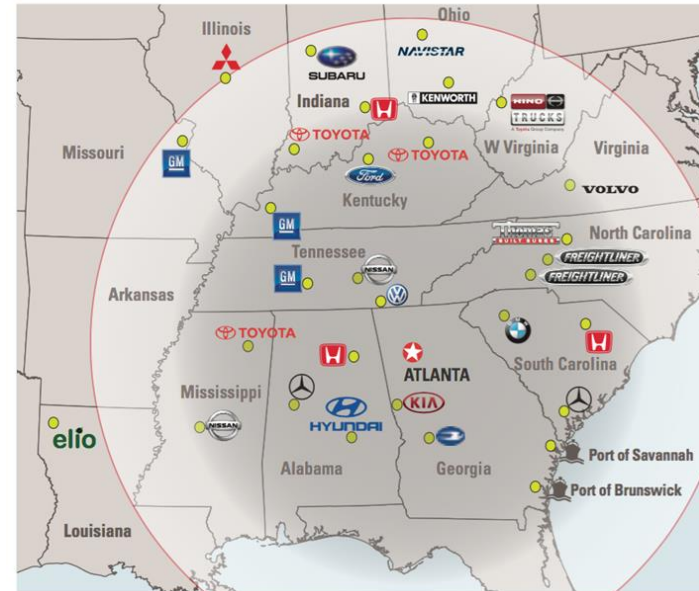


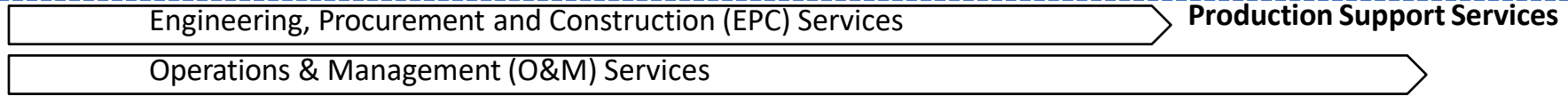
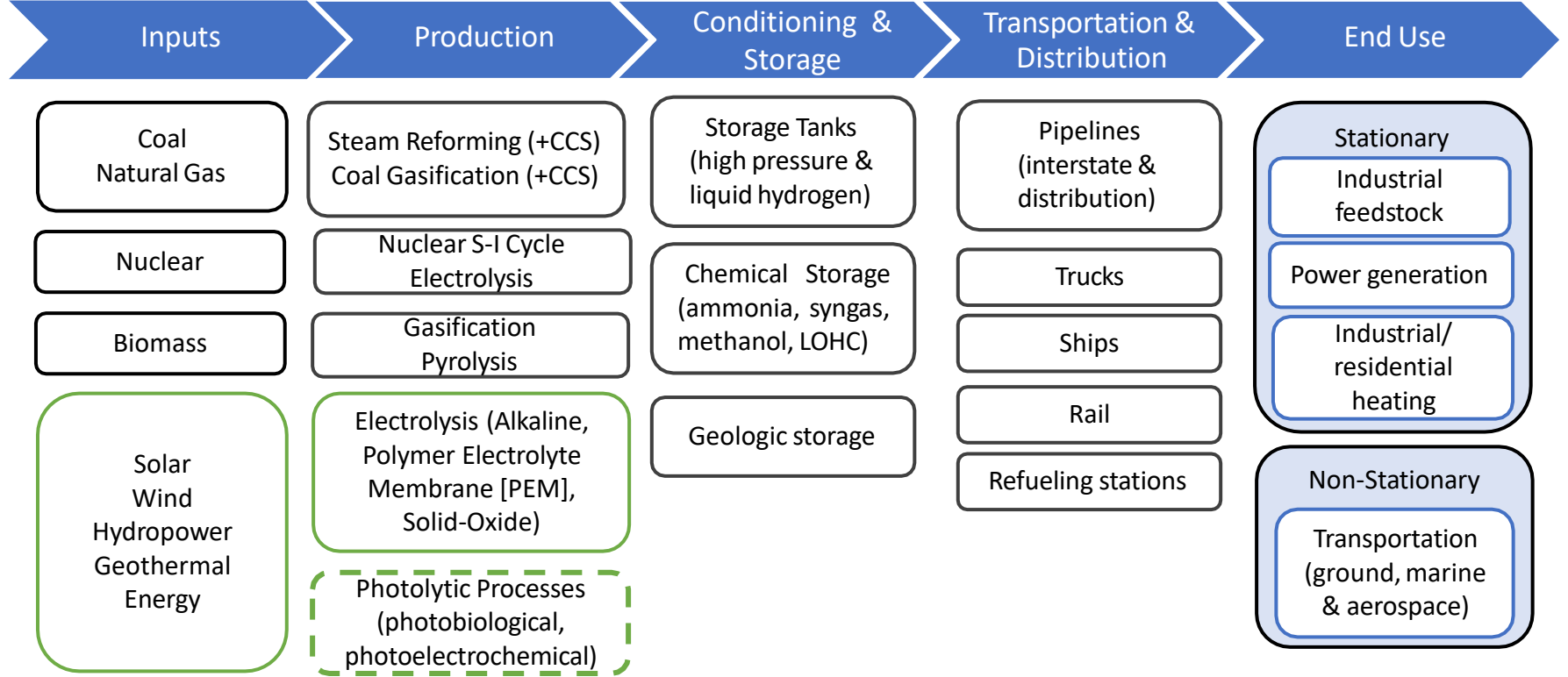
SpacePort – Sustainable rocket fuel manufactured locally using H2



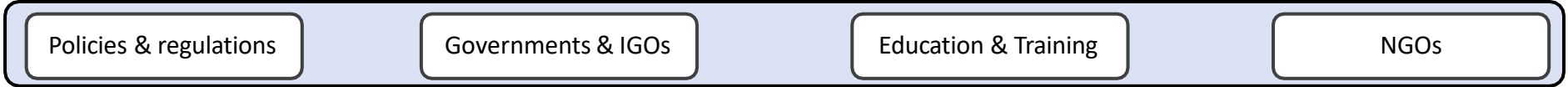
4 DOE National Laboratories (JLab, NETL, ORNL, SRNL)

Cars, Light & Heavy Vehicles within a 500 Mile Radius





Supporting Institutions & Organizations

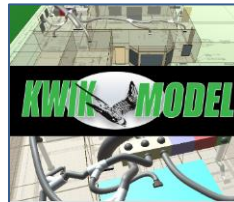
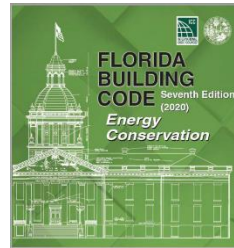


PROGRAM UPDATES

Continuing Education



- In-person Training Resumed
- Recent Webinars:



- Energy Code Updates: Residential & Commercial
- Florida Green Building Certification course
- Kwik Model & EnergyGauge

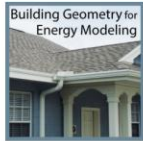


https://energyresearch.ucf.edu/education/continuing-education/

90%

Residential Energy Modeler Track (Online)

This educational track involves four courses and a test at the end. All of these courses can be taken online. Becoming a Certified Residential Energy Modeler is a great first step in your Energy Modeling career.



Building Geometry for Energy Modeling (Online)

A free, 1-hour online course. Learn about the building geometry measurements and calculations needed for residential modeling.



Building Science for Energy Modeling and Field Inspection (Online)

This online course provides the basics of building science to better understand how to model residences for their energy use.



From Blueprints to Residential Energy Code Compliance (Online)

This is an interactive course where you will learn to measure blueprints and complete take-off sheets for Residential Energy Code compliance.



EnergyGauge Pro Hands-On (Online)

Learn all about EnergyGauge USA using a sample project house and the latest Energy Conservation Code. Earn 3 CILB CEUs.



Residential Energy Modeler Exam (Online)

After having completed the four courses in this track, take this test to earn your certification.



Entering Whole House Mechanical Ventilation in EnergyGauge USA

This free course describes how to enter whole house mechanical ventilation systems in EnergyGauge USA. It includes how to calculate the requirements for ASHRAE 62.2 2010, 2013 and 2019.

- Increased On-demand Course Offerings

FSEC IN THE NEWS

FSEC Isolation Zone Research In The News


https://www.yourerie.com/on-our-air/your-health-report-prevent-covid-spread-at-home-try-this/

News Weather Sports On Our Air Marketplace Community Contests Contact Us Search

HEALTH REPORTS


Health Report: Prevent COVID Spread at home? Try this!

by: Lon Baxter
Posted: Oct 25, 2021 / 07:34 PM EDT
Updated: Oct 25, 2021 / 07:34 PM EDT



SHARE Facebook Twitter Messenger ...

DON'T MISS >



Your home may feel like the safest place to be to prevent a COVID-19 infection, but what happens if someone in your household tests positive.

Oct. 28, 2021 | <https://www.yourerie.com/on-our-air/your-health/health-report-prevent-covid-spread-at-home-try-this/>


https://www.upmatters.com/health-watch/prevent-covid-spread-at-home-try-this/

Weather Sports Community WATCH Contests TV Schedule About Us Jobs Search

HEALTH WATCH

Prevent COVID spread at home? Try this!

Posted: Oct 25, 2021 / 09:51 PM EDT
Updated: Oct 25, 2021 / 11:50 PM EDT



SHARE Facebook Twitter Messenger ...

Oct. 25, 2021 | <https://www.upmatters.com/health-watch/prevent-covid-spread-at-home-try-this/>

ORLANDO, Fla. (Ivanhoe Newswire)— Your home may feel like the safest place to be to prevent a COVID infection, but what happens if someone in your household tests positive? Researchers have

DuckDuckGo blocked this content to prevent Facebook from tracking you!

https://www.wearegreenbay.com/healthwatch/healthwatch-prevent-covid-spread-at-home-try-this/


GreenBay.com

Weather Sports Community Local 5 Live Digital Center Contests About Us More Search

HEALTH WATCH

HealthWatch: Prevent COVID Spread at Home? Try This!

by: Connie Fellman
Posted: Oct 25, 2021 / 04:33 PM CDT
Updated: Oct 25, 2021 / 06:50 PM CDT



Oct. 25, 2021 | <https://www.wearegreenbay.com/healthwatch/healthwatch-prevent-covid-spread-at-home-try-this/>

Tittle PRESS Entertainment Fashion Health Sports Tech World Business Crypto HOT

Covid19

Researchers find new way to reduce the spread of COVID-19 in homes

BY NEWSDESK - OCTOBER 23, 2021 - 2 MINUTE READ

ORLANDO, Fla. (Ivanhoe Newswire) – Your home may seem like the safest place to prevent COVID-19 infection, but what if someone in your household tests positive? Researchers have found a quick, inexpensive way to reduce the spread of infection to

Oct. 23, 2021 | <https://tittlepress.com/covid19/1234326/>

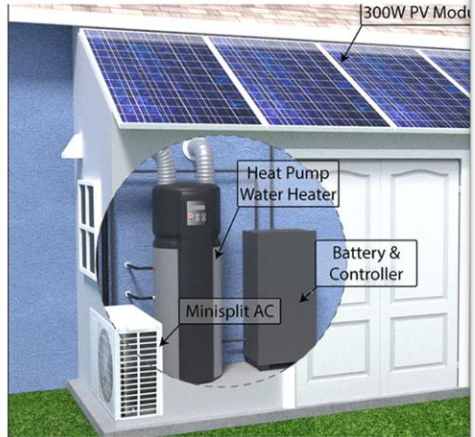


RESEARCH

UCF to Study Method for Reducing Energy Use by 50-75% in Older Homes

UCF is one of seven teams selected by the Department of Energy to demonstrate next-generation whole-building retrofit approaches.

By Sherri Shields | March 30, 2022



The PV-GEMS (pod) prototype systems were designed with energy simulations in Phase 1, while this award for Phase 2 will be demonstrated and deployment. Credit: Nick Waters, FSEC.

The University of Central Florida was recently awarded a grant from the U.S. Department of Energy (DOE) to determine if a pre-packaged pod is an effective method to deploy very efficient heating, cooling and water systems in older homes. **March 30, 2022 |**

<https://www.ucf.edu/news/ucf-to-study-method-for-reducing-energy-use-by-50-75-in-older-homes/>

Manufacturing Business Technology

Newsletter Signup Video

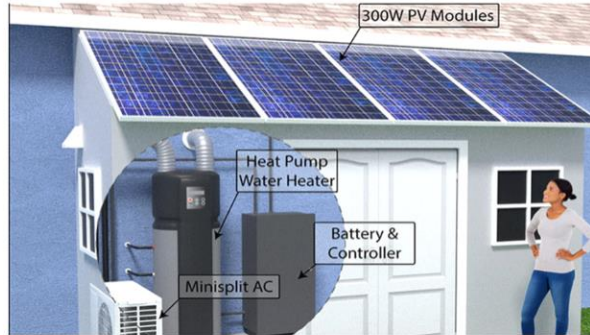
Best Practices Business Intelligence Cloud Computing CRM

HOME | BEST PRACTICES

Pod System Could Reduce Home Energy Use by 75%

We need a better way to upgrade older homes.

Mar 30th, 2022 | By Zenaida Gonzalez Kotala, University of Central Florida



PV-GEMS prototype systems were designed with energy simulations in Phase 1, while this award for Phase 2 will be demonstrated and deployment. Credit: Nick Waters, FSEC @ University of Central Florida

March 30, 2022 |

The University of Central Florida was recently awarded a grant from the U.S. Department of Energy (DOE) to determine if a pre-packaged pod is an effective method to deploy very efficient heating, cooling and water systems in older homes. **March 30, 2022 |** <https://www.mbtmag.com/best-practices/news/22144373/pod-system-could-reduce-home-energy-use-by-75>

INDUSTRIAL EQUIPMENT NEWS

Newsletter Signup Video Podcast Contact Us Advertise Mail

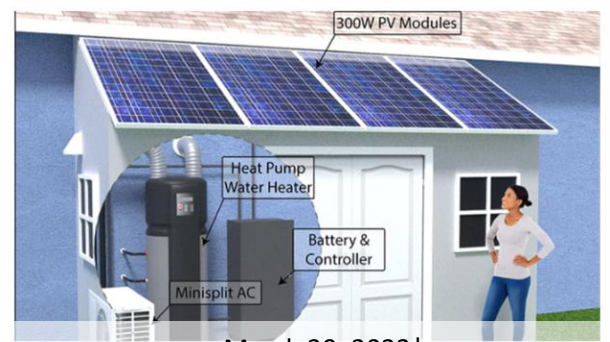
Automation Finishing World Made in America New Products Operations Product Development

HOME | PRODUCT DEVELOPMENT

Pod System Could Reduce Home Energy Use by 75%

We need a better way to upgrade older homes.

Mar 30th, 2022 | By Sherri Shields



PV-GEMS prototype systems were designed with energy simulations in Phase 1, while this award for Phase 2 will be demonstrated and deployment. Credit: Nick Waters, FSEC @ University of Central Florida

March 30, 2022 |

The University of Central Florida was recently awarded a grant from the U.S. Department of Energy (DOE) to determine if a pre-packaged pod is an effective method to deploy very efficient heating, cooling and water systems in older homes. **March 30, 2022 |** <https://www.ien.com/product-development/news/22144373/pod-system-could-reduce-home-energy-use-by-75>



Solar Power World

TOP SOLAR CONTRACTORS ARTICLES ▾ POLICY ▾ MARKETS ▾ PRODUCTS ▾ SUBSCRIBE RESOUR

New Florida milestone highlights the value of apprenticeships for the solar industry

By SPW | April 7, 2022

Share

By Richard Lawrence, program director, Interstate Renewable Energy

Registered apprenticeship programs (RAPs) are a proven workforce development employer-driven and worker-centric. They provide a pathway for new employees to earn a higher level salary while learning the trade through a combination of on-the-job classroom instruction, with progressive wage increases as they learn and

Florida Solar Energy Apprenticeship Program

Apprenticeships benefit employers and workers

Apprenticeships offer substantial benefits for employers and workers. Through the structured training components both on the job and in the classroom, employers can ensure that workers obtain the knowledge and skills needed to perform the job in an efficient, safe, and professional manner. The commitment to training and wage progression results in higher retention and job satisfaction, as well as higher quality work with fewer defects and accidents. The Construction Industry Institute has found that each dollar invested in craft training returns between \$1.30 to \$3.00 in benefits in the form of increased productivity and reductions in turnover, absenteeism, rework and other areas.

April 7, 2022 | <https://www.solarpowerworldonline.com/2022/04/new-florida-milestone-highlights-the-value-of-apprenticeships-for-the-solar-industry/>



FLORIDA SUSTAINABLE TRANSPORTATION & TECHNOLOGY

2022 EXPO

ARE YOU
Registered?



BIODIESEL



COMPRESSED
NATURAL GAS



ELECTRICITY

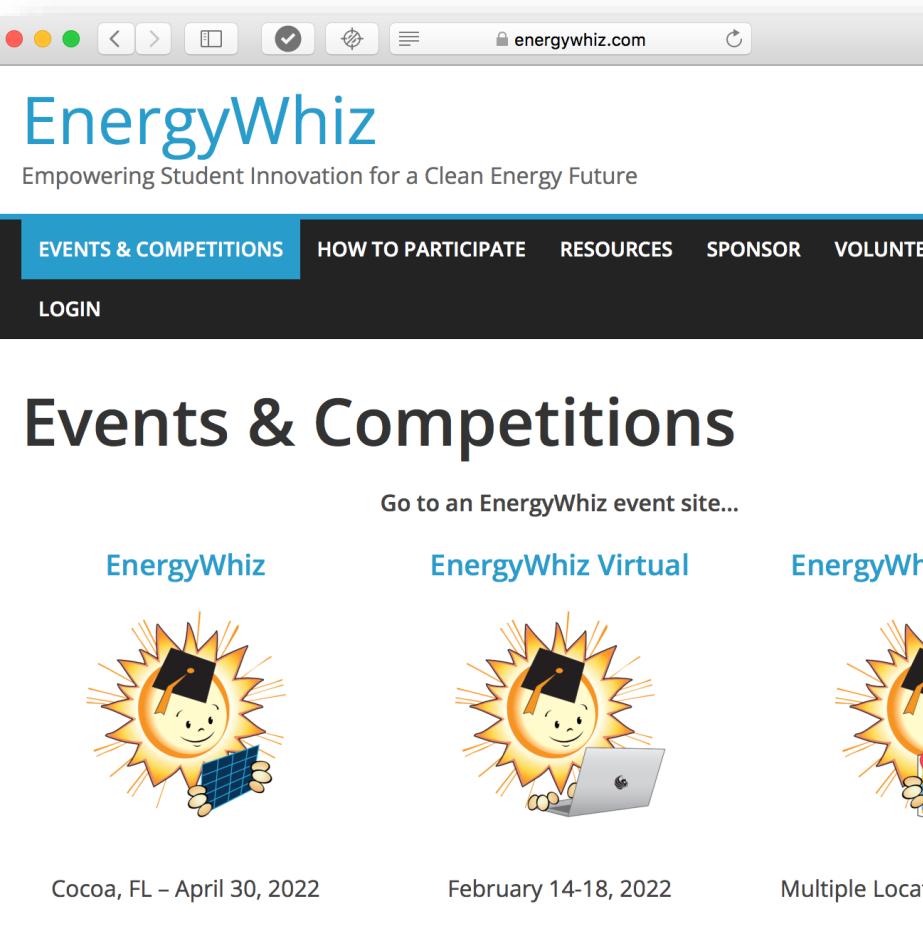


PROPANE

Florida Green Transportation Expo

March 30-31, 2022 @ FSEC





EnergyWhiz Virtual:

February 14-18, 2022

EnergyWhiz (at FSEC):

April 30, 2022

- Elementary to college students
 - Junior Solar Sprint
 - Energy Transfer Machine
 - Energy Innovations
 - Critter Comfort Cottage
 - Junior Solar Sprint
- Partners: FDACS, EFSC



EFSC Cocoa Campus Master Plan

- 10-year master plan
- \$87M investment



An artist's rendering shows the new main entrance from Clearlake Road at EFSC Cocoa Campus and the STEM Building for science classrooms and labs included in an \$87 million 10-year Master Plan.

- New facilities for fields such as aerospace technology, engineering technology and advanced manufacturing, and new planetarium.



The Cocoa Quad will be reimaged with a new Advanced Technologies building seen center left and a revitalized amphitheater.

Questions?



UCF

**FSEC Energy
Research Center**

UNIVERSITY OF CENTRAL FLORIDA