FSEC Advisory Board Meeting

April 15, 2022

FSEC Energy Research Center

UNIVERSITY OF CENTRAL FLORIDA

Agenda

9:30 a.m.	**Welcome and Introductions** **Roll Call** *Recognition of UCF President Cartwright*	**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, *Director, FSEC*
10:20 a.m.	Florida Energy Office Report	Kelley Smith Burk, *Director, Office of Energy, FDACS*
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, *U.S. Department of Energy Demonstration Office*
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 Date and Agenda for Next AB Meeting (TBD)	Chris Castro
12:00 p.m.	Adjourn	Chris Castro

New Advisory Board Members

Dean Bushey

Vice President, Global Social Environmental Business, Hitachi

Brian Donnelly

Manager of Sustainability, Publix

Peter Hoeflich

Director of Generation Technology, Duke Energy

Paul Johnston

President, Watsco

Jeff Juger

Deputy General Manager, Jinko Solar

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

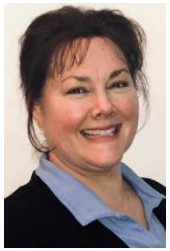
Jennifer Schaffer

Director, Clean Energy
Solutions, Florida Power &
Light Company

New Advisory Board Members

Justin Vandenbroeck

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

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Status of FSEC Programs

Jim Fenton, Director

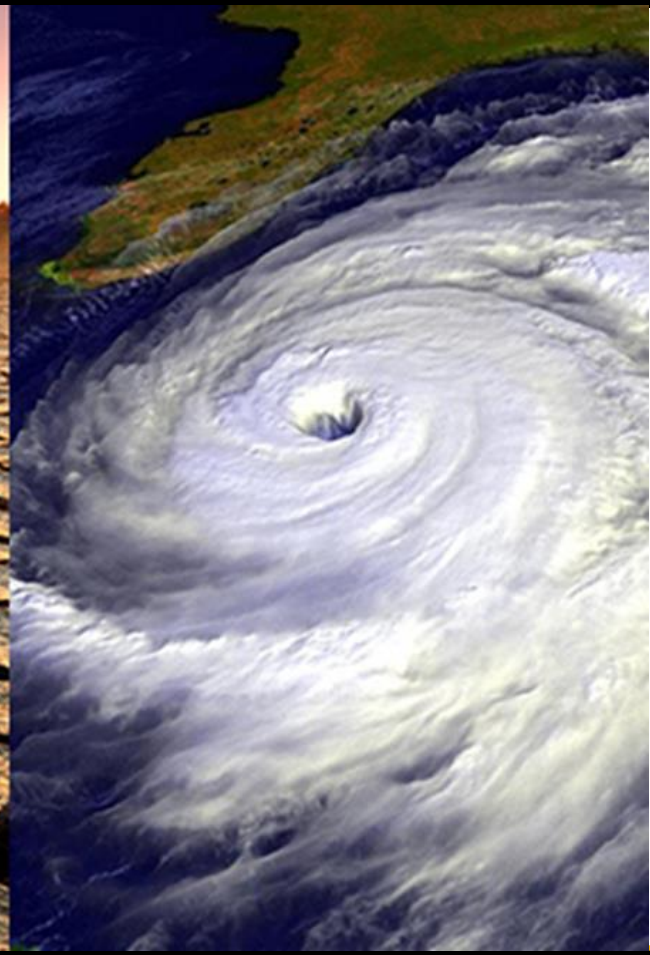
Advisory Board Meeting

April 15, 2022

FSEC Energy Research Center

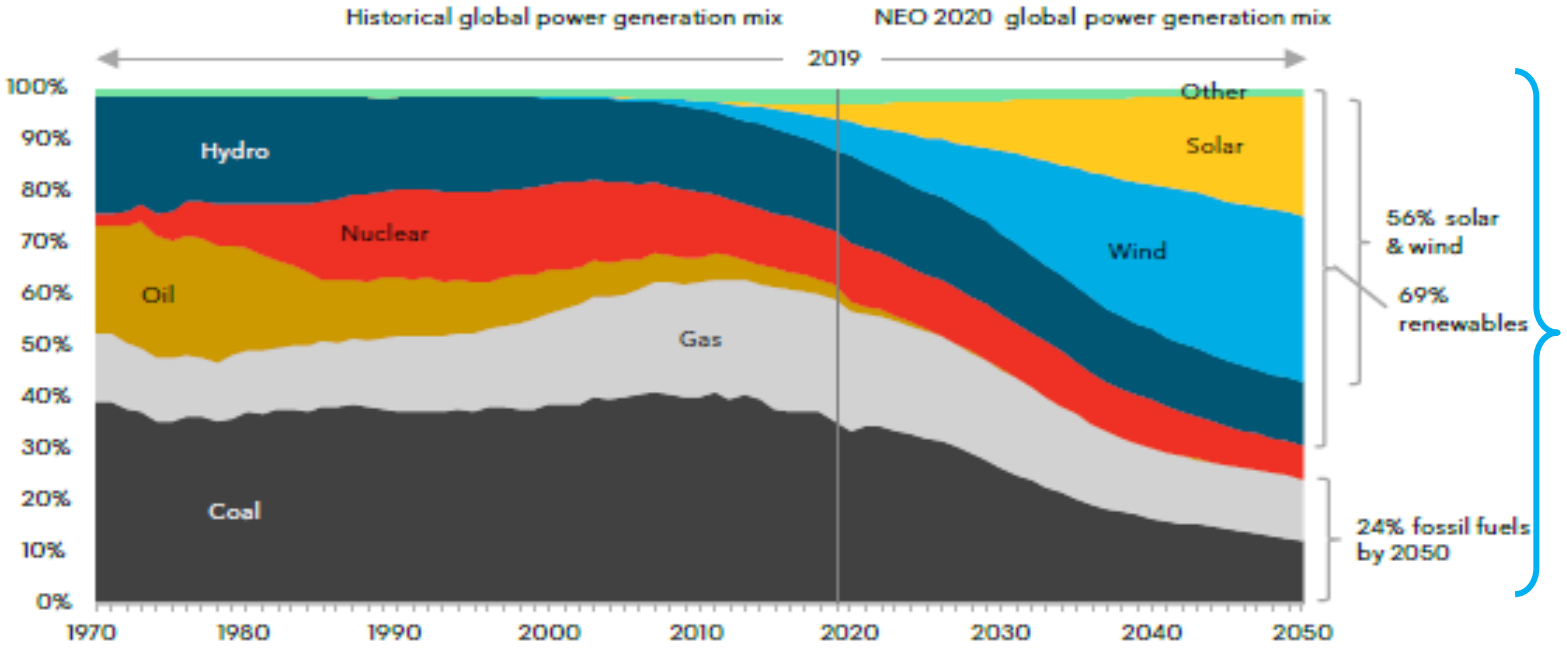
UNIVERSITY OF CENTRAL FLORIDA

Potential for “irreversible change”



BloombergNEF New Energy Outlook
2020 Economic Transition Scenario

Figure 2: Global electricity generation mix

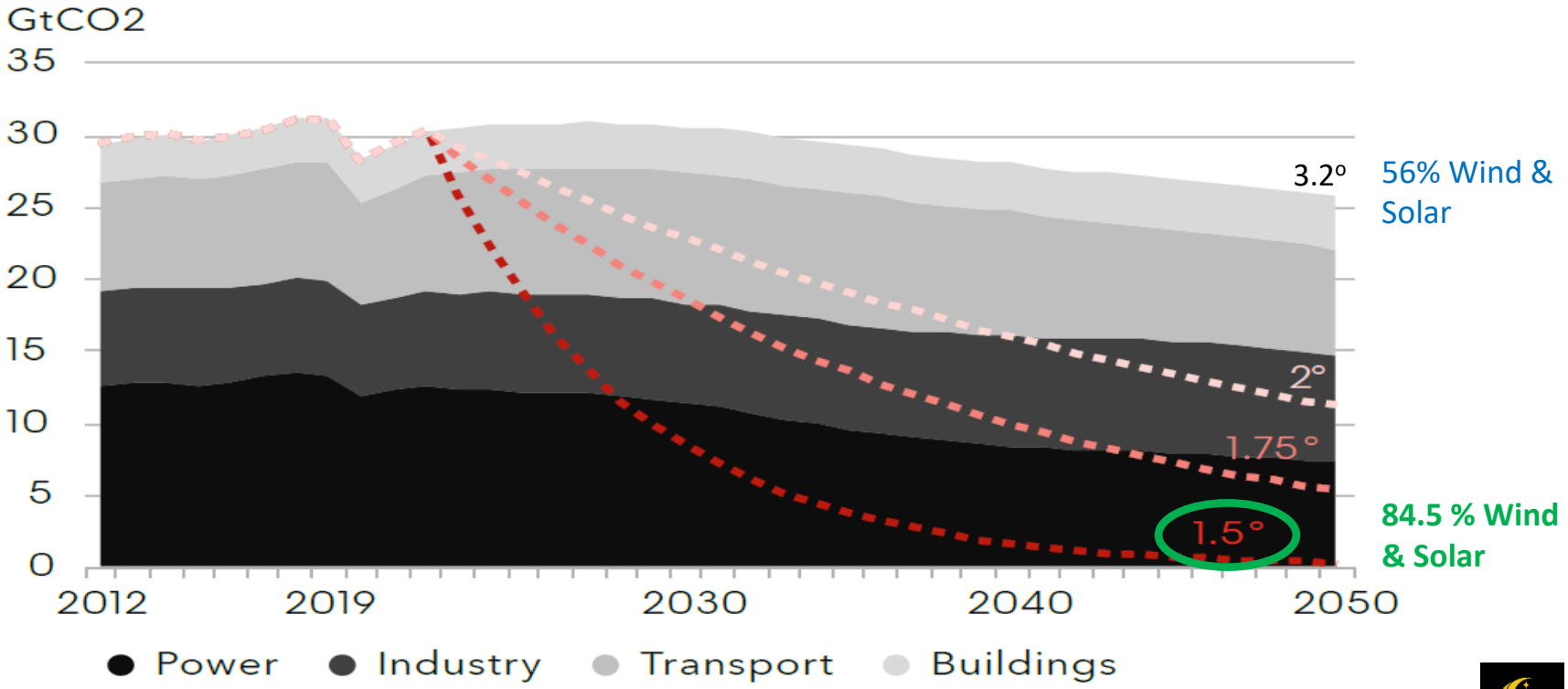


40,451 TWh in 2050

24,000 TWh in 2020

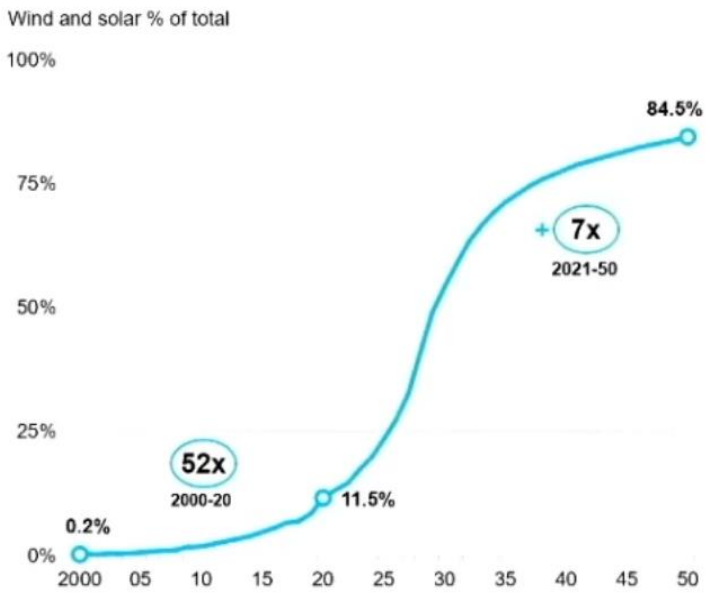
Source: BloombergNEF, IEA

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

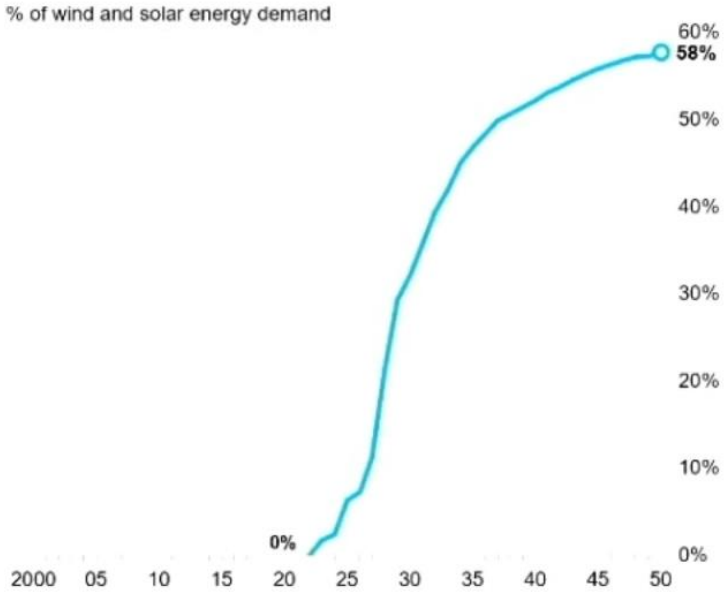


Source: BloombergNEF

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

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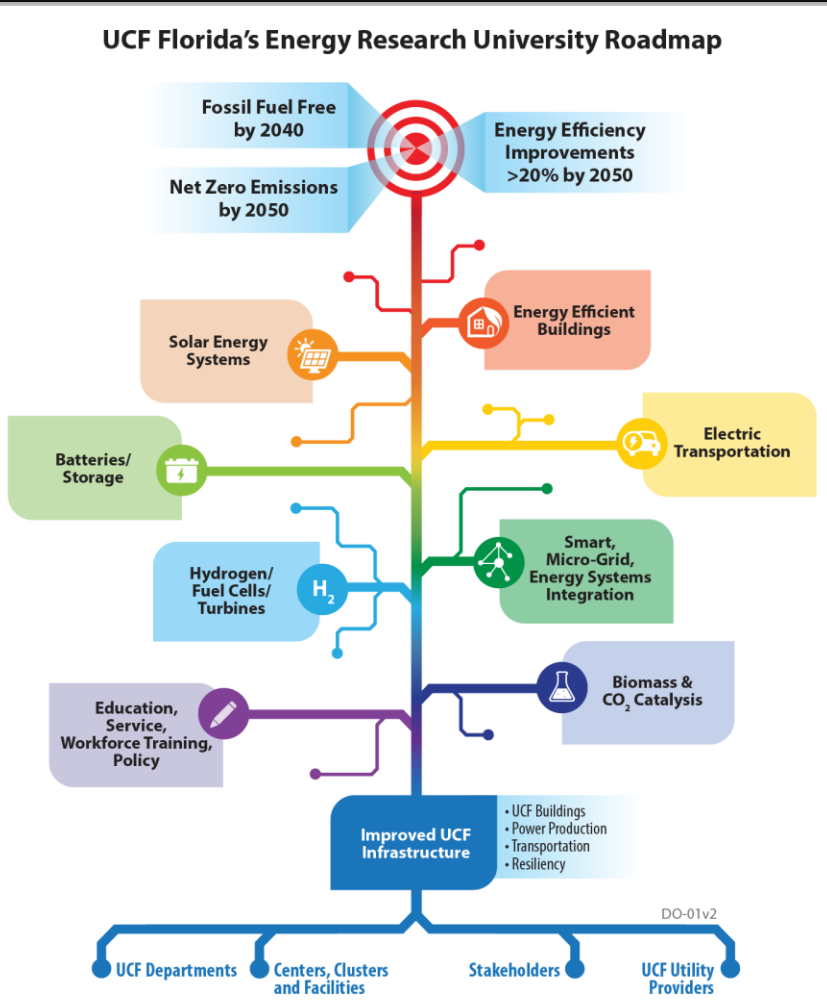
University Partnerships



- 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

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Current DOE-Funded Collaborative Partnerships

- **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*

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Current Contracts

- American Made Challenge Power Connector

- DOE Connected Heat Pump Water Heater Field Study

- 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

- 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

New projects

Current Contracts

ASHRAE

- 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)*

ASU Arizona State University

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

ATLANTIC HOUSING PARTNERS

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

OUC The Reliable One®

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

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

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Current Contracts

The Levy Partnership

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

OBANTARLA

- Methane Capture and Conversion to Liquid Methanol

OWENS CORNING

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

ICC-SRCC
SOLAR RATING & CERTIFICATION CORPORATION

- SRCC Portal Development

RESNET
RESIDENTIAL ENERGY SERVICES NETWORK

- Technical Support

SEI Associates

- Trane Trace 3D Plus Software Development Support

Tactical Energy

- Comparison of Real World Assisted Living Buildings with Baseline Models

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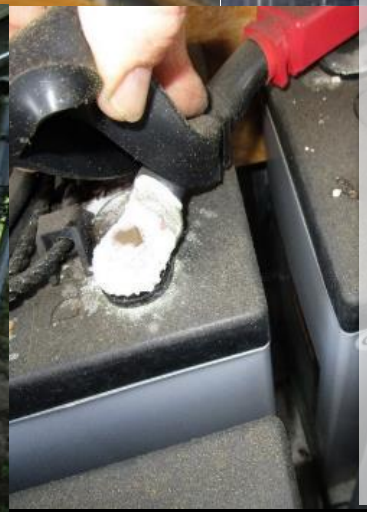
NEW AWARDS & PENDING CONTRACTS

EnergyPlus Software

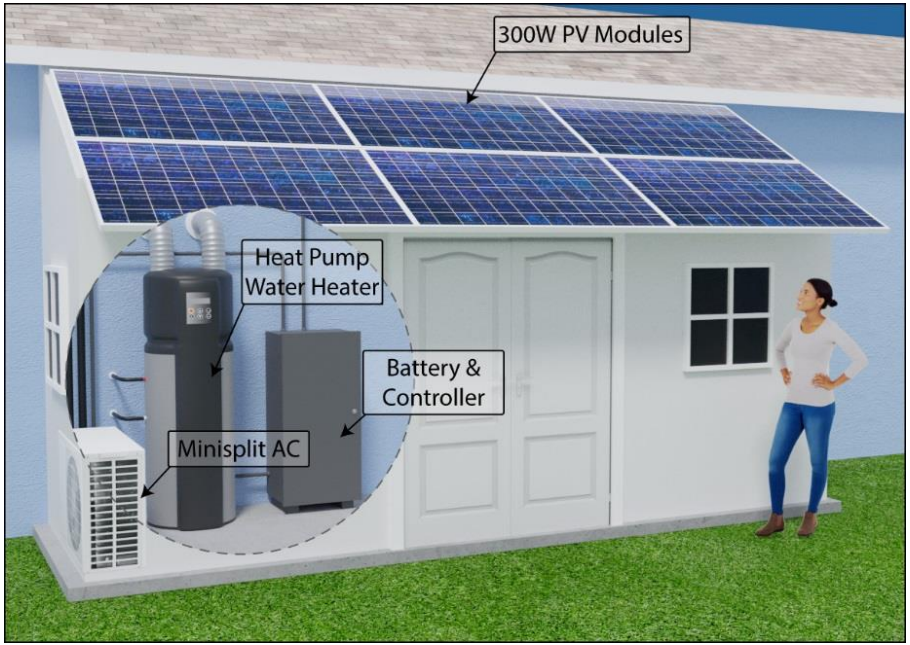
- $1M ($250K base, add-on each year)
- Department of Energy's EnergyPlus software whole-building energy simulation program development
- FSEC on core development team since 2001



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

PV GEMS (Phase 2)



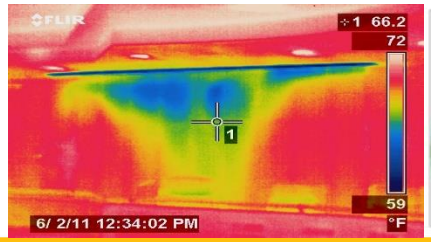
A pre-packaged retrofit solution targeting 75% reduction in space conditioning and water heating energy.

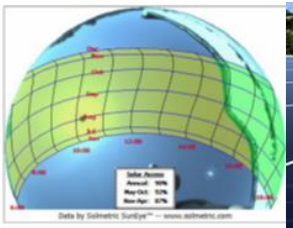
- PV GEMS: PV-Powered, Grid-Enhanced Mechanical Solution
- $4.4M ($3.6M + $885k cost share)
- Development of pre-production prototypes, demonstration in occupied buildings, and commercialization activities.
- **Seeking Large-scale Deployment Partners**: State & local govt, financing orgs & programs, utilities, affordable housing orgs, regional efficiency orgs, marketers.
- Partners: watsco COOLING THE AMERICAS, ROC usa Resident Owned Communities BETTER TOGETHER, Rheem, NASEO National Association of State Energy Officials, UCF

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

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





OBANTARLA

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

Energy Storage Project II

- 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

Power Conversion System (PCS) 500 KVA

DC Combiner

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

- Max Power: **186.3 KW**
- Capacity: **372 kWh**
- Nominal DC Voltage: **1331.2 V**
- Weight: **~7600 lbs**

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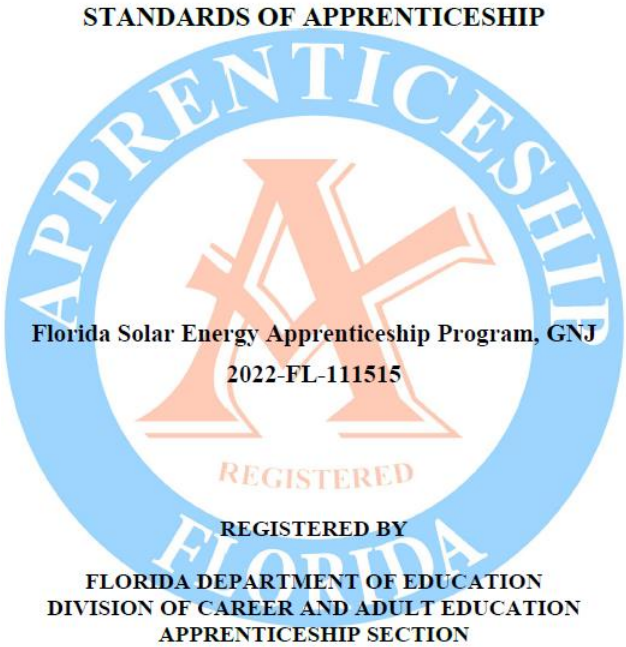
NEW PARTNERSHIPS

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



Bipartisan Infrastructure Law - Hydrogen Highlights

U.S. DEPARTMENT OF ENERGY

- **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 Koeppe
Shawn Rossignol	John Ledbetter
Mark Johnson	Kevin Huang

Southeast Energy Alliance

Scott McWhorter, Duke Energy, NextEra Energy and Siemens on FSEC ERC Advisory Board. UCF's FSEC Co-Champions in Production, Consumption and Workforce

Reasons for Hydrogen Hub in the Southeast

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

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

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

SpacePort – Sustainable rocket fuel manufactured locally using H2

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

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

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

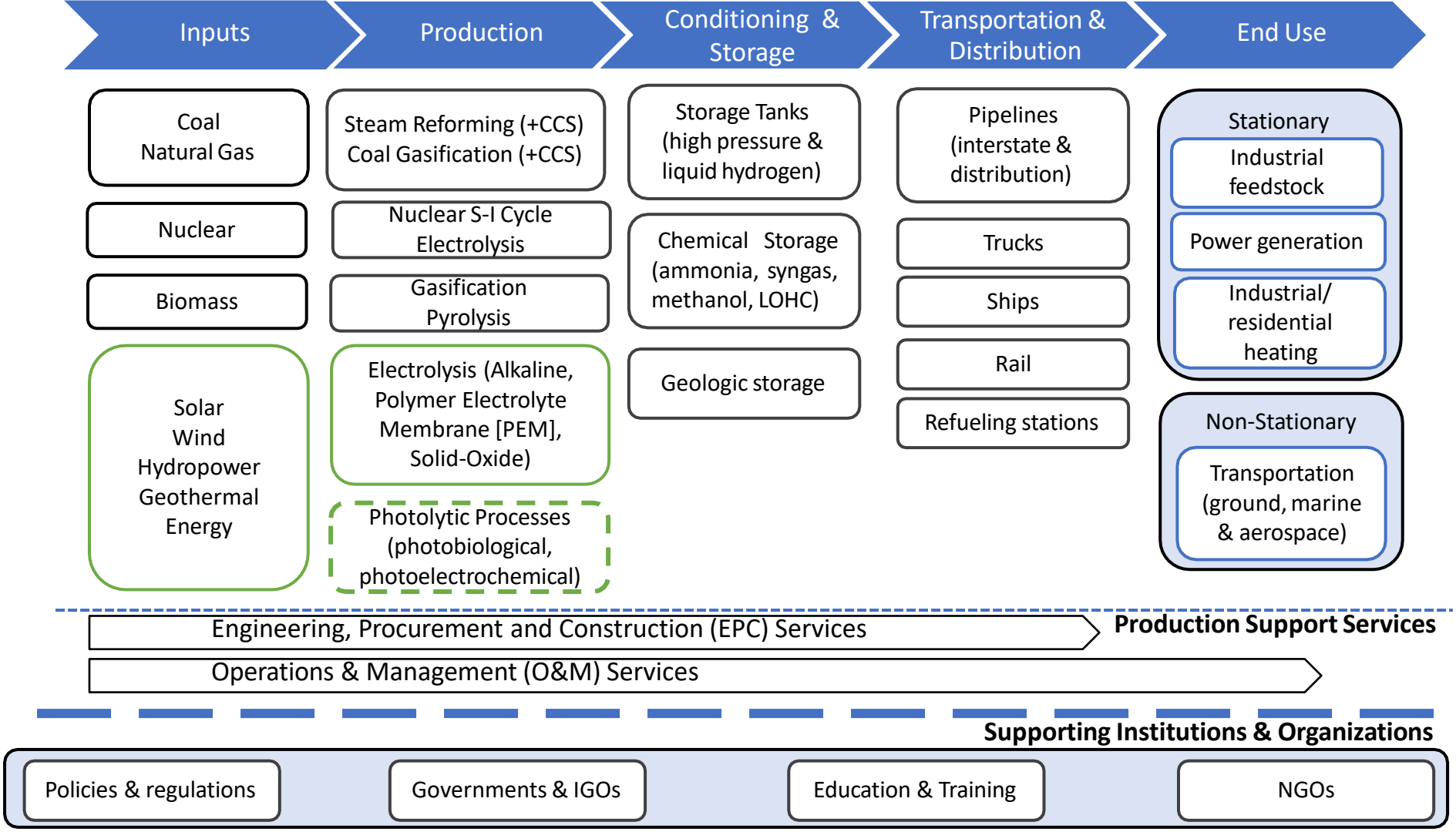
Cars, Light & Heavy Vehicle Manufacturing centered in SE (fuelcells!)

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

Proven Renewables – solar, hydropower, growing wind potential

Cars, Light & Heavy Vehicles within a 500 Mile Radius

Southeast H2 Energy Alliance

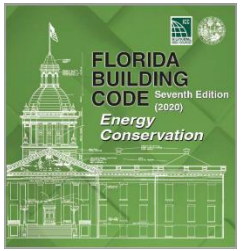

Inputs
Production
Conditioning & Storage
Transportation & Distribution
End Use
Coal
Natural Gas
Nuclear
Biomass
Solar
Wind
Hydropower
Geothermal
Energy
Steam Reforming (+CCS)
Coal Gasification (+CCS)
Nuclear S-I Cycle Electrolysis
Gasification
Pyrolysis
Electrolysis (Alkaline, Polymer Electrolyte Membrane [PEM], Solid-Oxide)
Photolytic Processes (photobiological, photoelectrochemical)
Storage Tanks (high pressure & liquid hydrogen)
Chemical Storage (ammonia, syngas, methanol, LOHC)
Geologic storage
Pipelines (interstate & distribution)
Trucks
Ships
Rail
Refueling stations
Stationary
Industrial feedstock
Power generation
Industrial/ residential heating
Non-Stationary
Transportation (ground, marine & aerospace)
Engineering, Procurement and Construction (EPC) Services
Operations & Management (O&M) Services
Production Support Services
Supporting Institutions & Organizations
Policies & regulations
Governments & IGOs
Education & Training
NGOs

PROGRAM UPDATES

Continuing Education

HVAC QI Training
4/8/2022

- In-person Training Resumed
- Recent Webinars:
  - Energy Code Updates: Residential & Commercial
  - Florida Green Building Certification course
  - Kwik Model & EnergyGauge



FGBC
FLORIDA GREEN BUILDING COALITION

EnergyGauge®
Energy and Economic Analysis Software

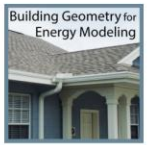
UCF

Continuing Education

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.

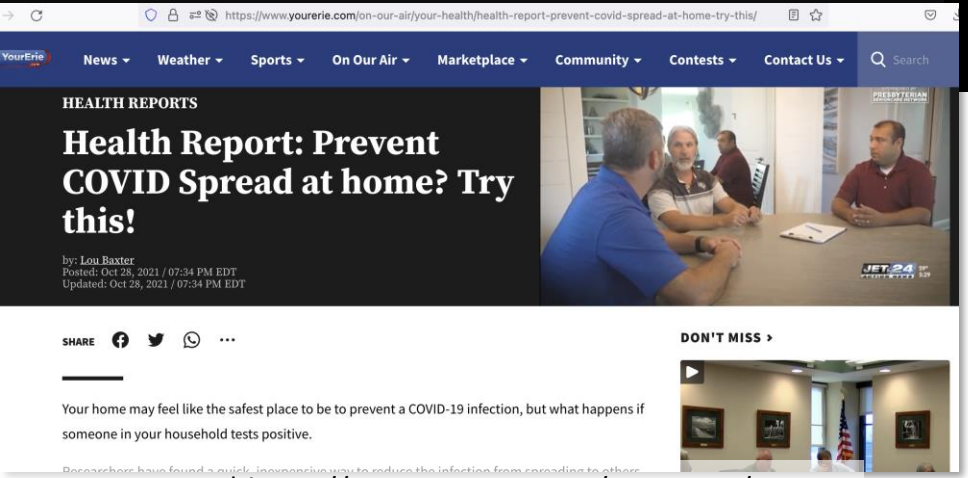
Entering Whole House Mechanical Ventilation in EnergyGauge USA

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.

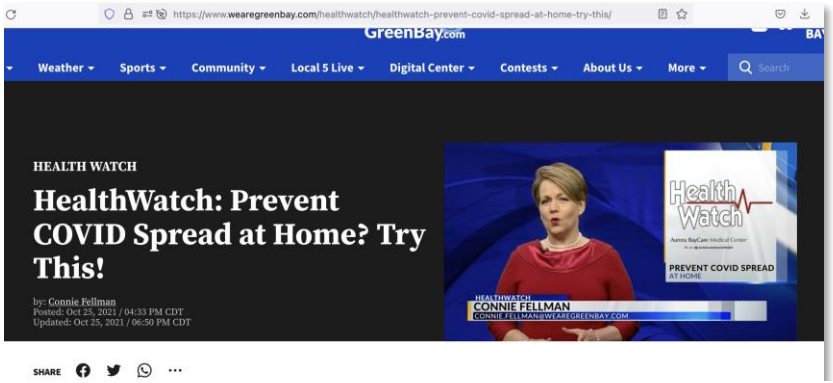
- Increased On-demand Course Offerings

FSEC IN THE NEWS

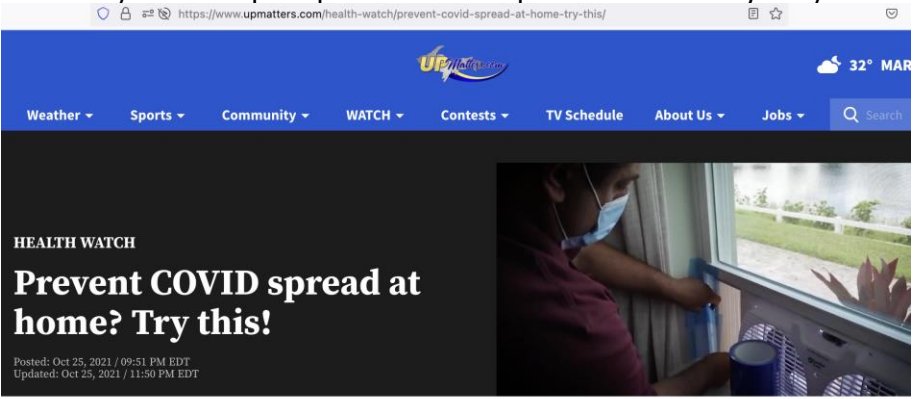
FSEC Isolation Zone Research In The News



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



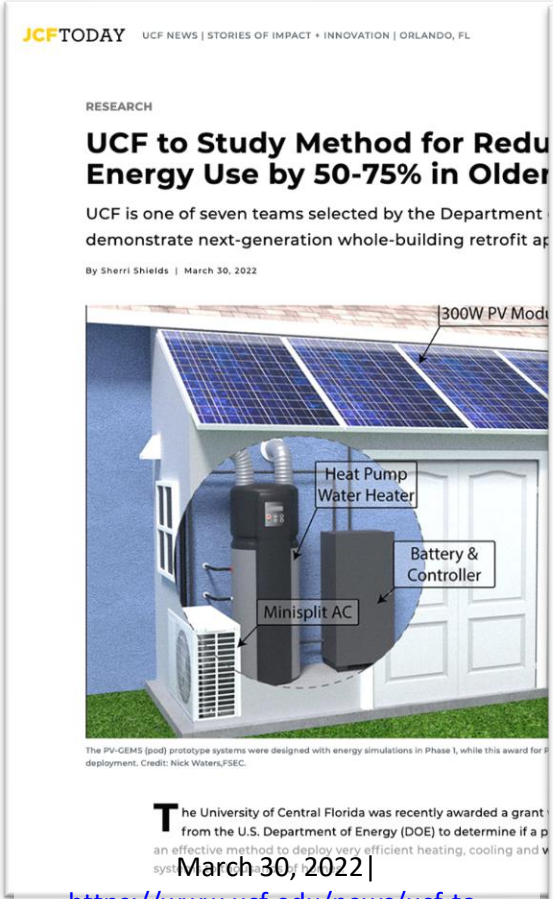
Oct. 25, 2021 | https://www.wearegreenbay.com/healthwatch/healthwatch-prevent-covid-spread-at-home-try-this/



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

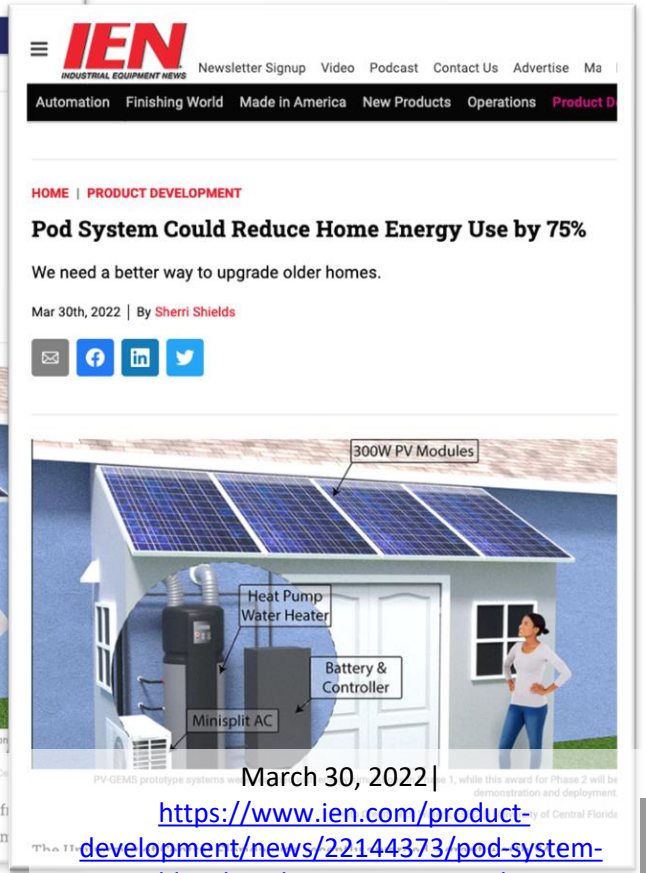
Oct. 23, 2021 | https://tittlepress.com/covid19/1234326/

UCF's FSEC In The News



March 30, 2022|
https://www.ucf.edu/news/ucf-to-study-method-for-reducing-energy-use-by-50-75-in-older-homes/

March 30, 2022|
https://www.mbtmag.com/best-practices/news/22144373/pod-system-could-reduce-home-energy-use-by-75



March 30, 2022|
https://www.ien.com/product-development/news/22144373/pod-system-could-reduce-home-energy-use-by-75

UCF's FSEC In The News


https://www.solarpowerworldonline.com/2022/04/new-florida-milestone-highlights-the-value-

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 Energ*

Registered apprenticeship programs (RAPs) are a proven workforce deve
employer-driven and worker-centric. They provide a pathway for new em
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/

UCF

Florida Green Transportation Expo

March 30-31, 2022 @ FSEC

FLORIDA SUSTAINABLE TRANSPORTATION & TECHNOLOGY

2022 EXPO

ARE YOU Registered?

BIODIESEL | COMPRESSED NATURAL GAS | ELECTRICITY | PROPANE

EnergyWhiz 2022

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

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

- 10-year master plan
- $87M investment

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

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

Questions?


UCF
FSEC Energy
Research Center
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