FSEC Advisory Board Meeting

October 24, 2024

Agenda

Time	Description	Speaker
9:30 a.m.	**Welcome**	**Jen Szaro, Chair, FSEC Advisory Board; President & CEO, AESP**
	Introductions (Roll Call)	Sherri Shields, Communications Director, FSEC
9:40 a.m.	Approval of April 25, 2024 Minutes	Jen Szaro, Chair
9:45 a.m.	Status of FSEC Programs & KPIs	Jim Fenton, Director, FSEC
10:30 a.m.	Florida Energy Office Report	Brooks Rumenik, Director, Office of Energy, FDACS
10:40 a.m.	Florida Legislative Session Report	Louis Rotundo, Principal, Louis Rotundo and Associates
10:50 a.m.	50th Anniversary Celebration & Fundraising	Sherri Shields, Communications Director, FSEC & Garrett Preisser, Executive Director for Advancement, UCF
11:00 a.m.	Break	10 Minutes
11:10 a.m.	Repurposing Stranded Methane into Low-carbon Methanol	Paul Yelvington, Chief Technology Officer, M2X
11:40 a.m.	Technical and Ecological Findings from Floating Solar Research Project	Manjunath Matam, Assistant Research Professor, FSEC Rebecca Hernandez, Associate Professor of Ecology, Energy, and Sustainability, UC Davis
12:15 a.m.	New Business Date and Agenda for Next AB Meeting	Jen Szaro, Chair
12:30 p.m.	Adjourn to Lunch	All

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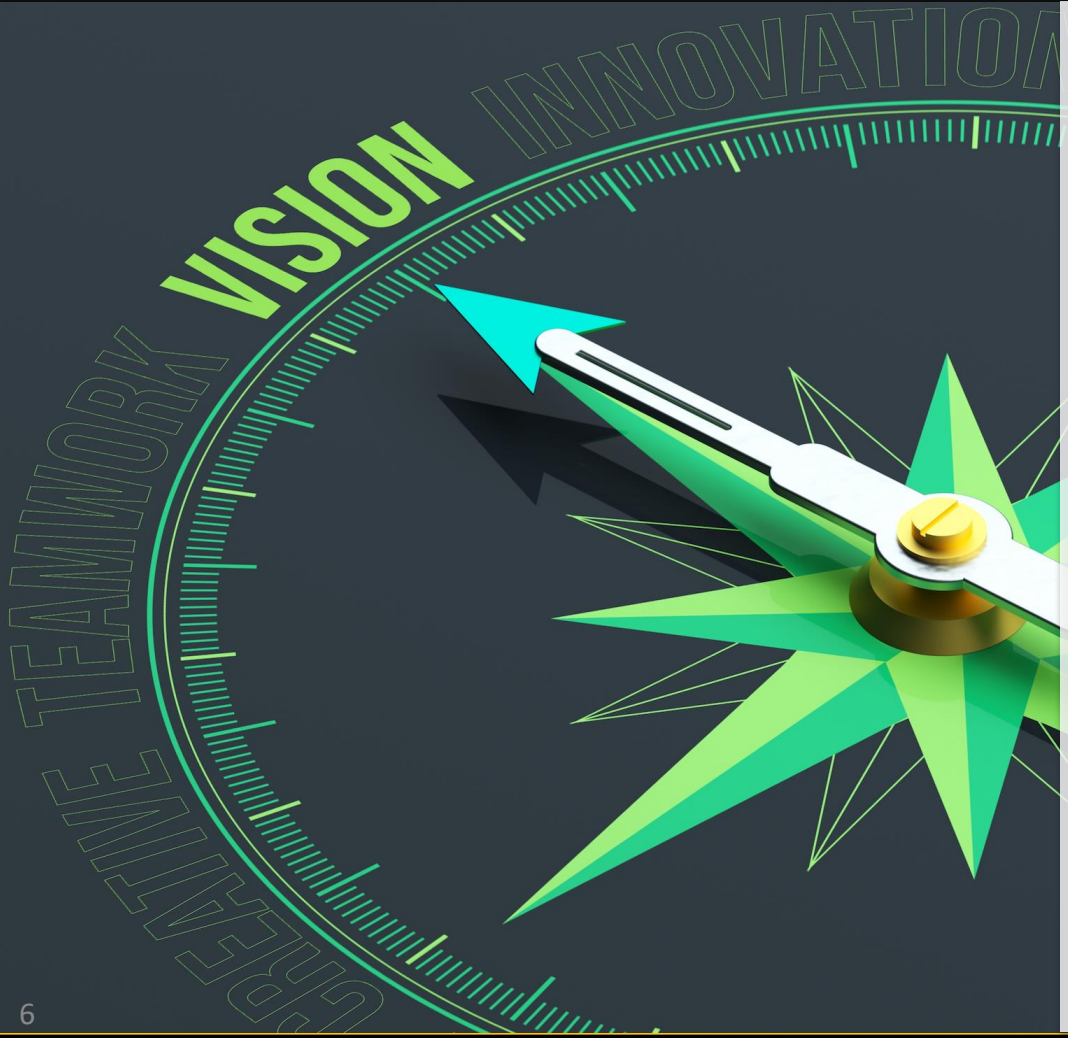
Status of FSEC Programs & KPIs

Jim Fenton, Director

Advisory Board Meeting

October 24, 2024



FSEC VISION

Promote the rapid transition to a sustainable energy economy through renewable energy, energy efficiency, and sustainable transportation research, demonstration, and education.

UCF

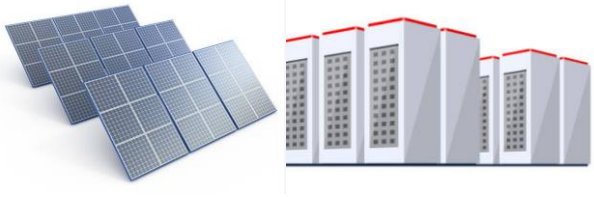
FSEC MISSION

Develop, research, and evaluate energy technologies that enhance the environment and economy, and transfer the results to the public, students and practitioners.

FSEC Principal Energy Programs

Energy Efficient Buildings

Grid Modernization/Energy Systems Integration



Solar Energy/Storage Systems

Electric Transportation

Hydrogen/Catalysis

Education, Service, Workforce Training, Policy

Advisory Board Partners

Consumers

BranchPattern

CITY OF ORLANDO

ORANGE COUNTY GOVERNMENT FLORIDA

Publix

UNIVERSAL ORLANDO RESORT

The Walt Disney Company

Builders/ Consultants

HNTB

C.T. HSU + ASSOCIATES, P.A.
ARCHITECTURE • PLANNING • INTERIOR DESIGN

kb HOME

LifeStyle SINCE 1984 solar-powered HOMES

Nova CHARGE Empowering The Future

Palm Harbor Homes

esa

Electric Utilities

DUKE ENERGY

FMPA MUNICIPAL POWER

FPL

KUA KISSIMMEE UTILITY AUTHORITY

OUC The Reliable One

Manufacturers

innventure

HITACHI Inspire the Next

JinKO Solar Building Your Trust in Solar

MITSUBISHI ELECTRIC COOLING & HEATING

saft

TRANE TECHNOLOGIES watsco

Associations/ Government

AESP

DRIVE ELECTRIC FLORIDA

FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

FlaSEIA Florida Solar Energy Industries Association

GULF COAST ENERGY NETWORK

SHEA SOUTHEAST H2 ENERGY ALLIANCE

UCF

FSEC Project Current Partners

Buildings Technology Office

SEI Associates

Tactical Energy

Associated
Gas Distributors
of Florida

NEW CONTRACT AWARDS

Department of Energy: R&D to Decarbonize Buildings Under the DOE BENEFIT (Building Energy Efficiency Frontiers & Innovation Technologies) Program

- **Topic 2: Innovative, Replicable Low-Cost Roof and Attic Retrofits.**
  "Improving Energy Efficiency and Moisture Control Using Lower-Cost Construction Methods to Unvent Attics in Hot Humid Climates."

  This project aims to simplify and reduce costs for attic retrofits by demonstrating and validating the concept of ***burying ducts with blown-in insulation while converting the attic from a vented to unvented (sealed) attic without the need for more costly spray foam in hot-humid climates***.

  Partners: Owens Corning & St. Johns Housing Partnership | $1.2 million | PI: C. Withers

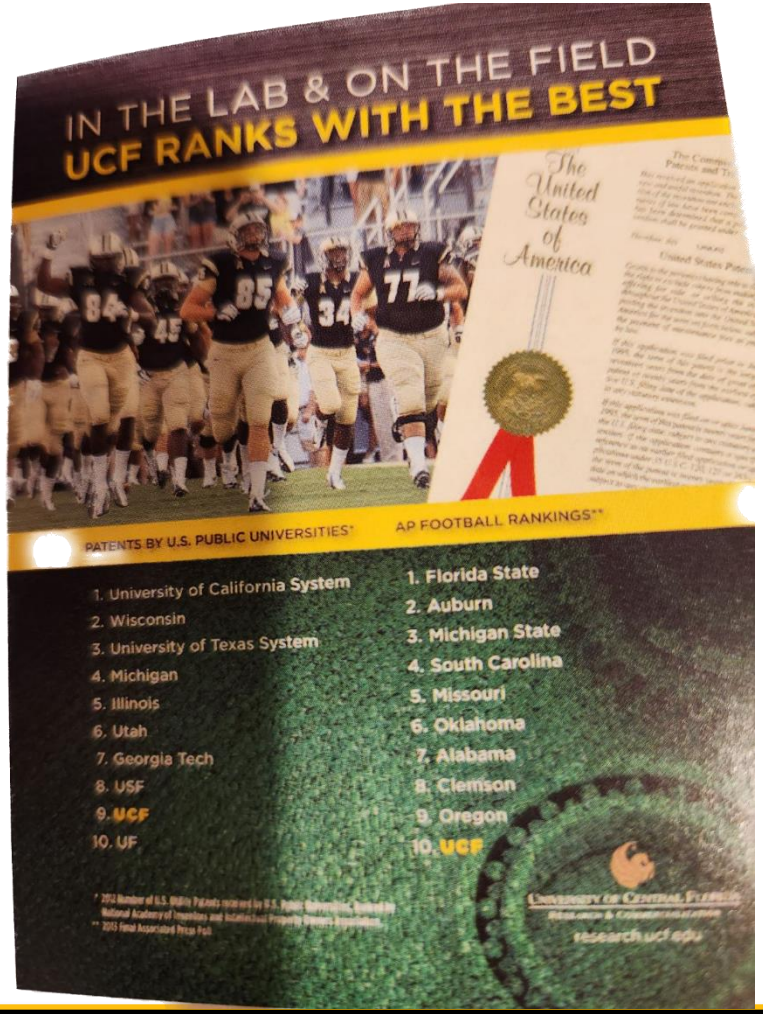
Department of Energy: R&D to Decarbonize Buildings Under the DOE BENEFIT (Building Energy Efficiency Frontiers & Innovation Technologies) Program

- **Topic 3: Building Resilience and Electricity Capacity Constraints**
  Subtopic 3B: Resilient Cooling Solutions for Overheating Protection in Buildings
  "Mitigating Extreme Heat Events in Hot Humid Climates."

  The University of Central Florida and partners will develop and demonstrate an ***affordable, energy-efficient, portable cooler to maintain indoor thermal comfort and survivability during extreme heatwaves***.

  Partners: Transaera and Southeast Energy Efficiency Alliance | $1.4 million |
  PI: D. Chasar

FSEC Ranks in Top 10



- UCF Number one Money Making Patent FSEC Gossamer Wind Ceiling Fan
- Number 2 in US Universities in Solar
- Number 1 in US in Buildings Research

FSEC UCF

New Awards

- **“Validated Automation of 90.1 PRM and S-PRM in Commonly Used Simulation Tools”** | Karpman Consulting | Subcontract| 1/1/25 - 12/30/2027 |Budget $466,281 | PIs: B. Nigusse & M. Swami
- **“Establishing and Testing a Building Codes and Resilience Field Study Methodology”** | National Association of State Energy Officials (NASEO) | 1/2025-6/2029 | Subcontract |Budget $415,000 | PI: K. Fenaughty
- **“A Novel MAZE Connection Technique for Optimal Performance Floating Solar PV System”** | Florida High Tech Corridor's Industry Innovation (Duke Energy) Program | 10/1/24 - 9/30/25 | $75,000 | M. Matam
- **“Optimal Design and Integration of Hydrogen Energy System with Solar and Peaker Plants”** | Florida High Tech Corridor's Industry Innovation (Duke Energy) Program | 10/1/24 - 9/30/25 | $75,000 | Y. Wang
- **Team-up on Tackling Crises of Energy and Climate** | Albany State University | 4/1/2024-12/31/2024 | $30,000 | H. Seigneur

New Awards

- **Energy Assessments in Assisted Living Facilities** | Florida Natural Gas Association | 7/30/2024-12/31/2024 | $13,500 | C. Withers
- **Update and maintenance of RESNET National Building Registry schemas** | Residential Energy Service Network, Inc. (RESNET) | 6/18/2024-12/31/2024 | $20,401 | P. Fairey
- **Review and Consider Technical Changes Incorporated in HB 267 with respect to section R402 Energy Conservation Code Compliance with R20 Sealed Attics** | State of Florida Department of Business and Professional Regulation | 7/1/2024-6/30/2025 | $25,000 | R. Vieira
- **Trane Trace 3D Plus Software Development Support Task Order #1** | S.E.I Associates | 7/17/2024-7/16/2025 | $170,397 | R. Raustad
- **2024 IECC Code Study (Task Order #6)** | Residential Energy Service Network, Inc. (RESNET) | 9/18/2024-12/31/2024 | $21,581 | P. Fairey
- **Zero Carbon Performance Code Implementation** | City of Fort Collins | 9/24/2024-9/30/2025 | $116,222 | K. Fenaughty

CURRENT PROGRAMS

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
- **EnergyPlus Software Development and Technical Assistance**
  L. Gu
- **"Automation of Performance-based Compliance Quality Control and Reporting"**
  B. Nigusse

FSEC UCF

Additional Current Contracts

Buildings

- **“Automation of Performance-based Compliance Quality Control and Reporting” |** Karpman Consulting | Subcontract| 10/1/2024 - 6/30/2025|Budget $204,746 | PIs: B. Nigusse & M. Swami
- **EnergyPlus Software Development and Technical Assistance: Task Order 03** | Alliance for Sustainable Energy, LLC (NREL) | 1/12/24 - 12/15/24 | $210,000 | PI: Lixing Gu, Co-PI’s: R. Raustad and B. Nigusse
- **Updating AGDF Model Costs and Equipment for the Associated Gas Distributors of Florida** | Associated Gas Distributors of Florida | EOC: 12/31/2024 | $9,920 | R. Raustad
- **Valencia College Energy Transition Plan** | Hanson Professional Services Inc. | EOC: 12/30/24 | $15,000 |C. Kettles
- **Florida Energy Investment Collaborative** | Florida Department of Agriculture and Consumer Services | 10/12/2022-4/30/2025 | C. Withers
- **Lab and Field Evaluation of Condensation Potential in Buried Ducts in Vented Attics Located in the Hot and Humid Climate Zones** | Owens Corning Corporate Services | 10/20/2020-2/28/2025 | $57,500 | PI: J. Sonne, Co-PI’s: C. Withers

Additional Current Contracts

Buildings

- **Trane Trace 3D Plus Software Development Support Task Order #1** | S.E.I Associates | 7/17/2024-7/16/2025 | $170,397 | R. Raustad
- **Buildings Upgrade Prize Technical Assistance** | Alliance for Sustainable Energy LLC/ National Renewable Energy Laboratory (NREL) | 2/7/2024-9/30/2025 | $9,908 | E. Martin
- **Energy Analysis and Performance Testing of Multifamily Dwellings** | Atlantic Housing Partners | 1/1/2019-12/31/2024| PI: D. Chasar, Co-PI: K. Fenaughty
- **Florida Energy Investment Collaborative** | Florida Department of Agriculture and Consumer Services | 10/12/2022-4/30/2025 | C. Withers
- **FSEC Support to Ventamatic Phase 2** | Ventamatic, Inc. | 11/1/2022-12/31/2024 | PI: J. Sonne, Co-PIs: D. Chasar, E. Martin, C. Withers

Additional Current Contracts

Solar

- **2023 Solar Roof Installation Research Project FSEC Flexible Residential Test Facility** | GAF Energy LLC | 5/17/23-10/31/25 | J. Sonne
- **PV Module Testing for Degradation** | Florida Power & Light Company | EOC: 12/31/2024 Dates | $100,000 |H. Seigneur
- **Developing PID susceptibility models for Bifacial PV module technologies** | U.S. Department of Energy | 8/1/2021-12/31/2024| H. Seigneur
- **Gaining Fundamental Understanding of Critical Failure Modes and Degradation Mechanisms in Fielded Photovoltaic Modules via Multiscale Characterization**| U.S. Department of Energy | EOC: 2/28/2027 | $62,076 | H. Seigneur
- **Materials Data Science for Stockpile Stewardship** | Case Western Reserve University | 9/15/2022-9/30/2027 | $81,600 | M. Li

Battery

- **Controller design and demonstration of Integrated battery-Inverter storage system** | A.F. Mensah | 8/19/2021-12/31/2024| I. Batarseh

Additional Current Contracts

Transportation

- **Equitable Mobility Powering Opportunities for Workplace Electrification Readiness (EMPOWER)** | U.S. Department of Energy | EOC: 6/30/2025 | $73,000 | C. Kettles

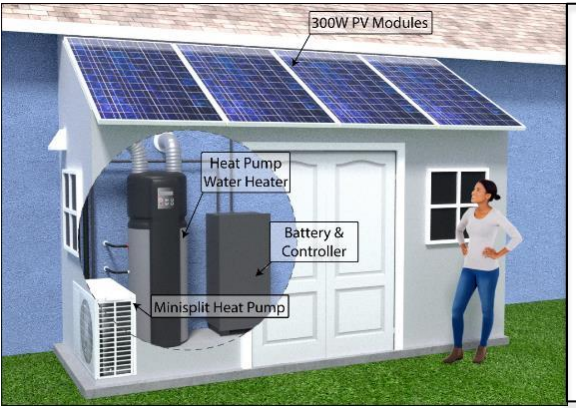
Workforce

- **FLEXIBLE Load Adaptation Training for Energy Services Professionals** | The Association of Energy Services Professionals (AESP) | EOC: 5/31/2025 | $30,000 | C. Kettles
- **Pathways to Career Opportunities Grant (PCOG) Program** | Florida Department of Education | 7/1/2023 - 12/31/2024 | $254,317 | PI: C. Kettles, Co-PI: S. Schleith

Hydrogen/Catalysis

- **Demonstration of Integrated Hydrogen Production and Consumption for Improved Utility Operations** | Orlando Utilities Commission | EOC: 2/28/2027 | J. Fenton
- **Benchscale Methanol Synthesis Process Development & Testing** | M2X Energy | EOC: 12/29/2024 | N. Muradov
- **Next Generation Process Development for Stranded Gas Conversion to Low-Carbon Fuels and Chemicals** | M2X Energy Inc. | 4/5/2024 – 3/31/2025 | $267,916 | N. Muradov

Energy Systems Integration



- PV GEMS: PV-Powered, Grid-Enhanced Mechanical Solution
- $4.4M ($3.6M + $885k cost share)
- Focus is on manufactured housing application.
- Planning demonstrations in MA, CO, TX, OR, NC and GA.
- **Current activity:**
  - First demonstration community visited and audited/ instrumented first house for pre-retrofit data collection.
  - One down, 11 to go…

Partners:

PV-GEMS Deployment Advisory Group

ROC usa® Resident Owned Communities BETTER TOGETHER

watsco COOLING THE AMERICAS

Rheem

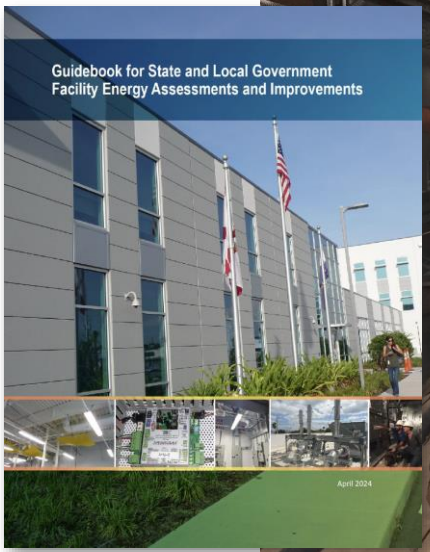
NASEO National Association of State Energy Officials

PI's: Eric Martin and Carlos Colon

UCF

Pilot: Government Building Sustainability

- **Objective:** Enable local governments to identify and prioritize cost-effective opportunities for Energy Efficiency Measures (EEMs) and on-site solar energy
- Pilot project with FDACS to test objective
  - Identify EEM and solar feasibility
  - Created replicable process
  - Provided technical assistance on sustainable energy improvement
  - Perform Measurement and Verification (M&V)
  - Created best-practices guidebook
  - Principal Investigator: Chuck Withers



https://publications.energyresearch.ucf.edu/wp-content/uploads/2024/04/FSEC-CR-2126-24_Energy-Audit-Guidebook.pdf

Solar Workforce Initiatives

- Florida Solar Energy Apprenticeship Program
- Moss & Associates Solar Apprenticeship
- Solar For All Workforce Development

EVENTS & NEWS

Spark STEM Fest

Presented by: UCF Office of Research

Next Event Date: February 14-17, 2025

IGNITE INNOVATION

Middle School Science Bowl

When?
Saturday, February 22, 2025
8:30 a.m. to 5:00 p.m.

Where?
Florida Solar Energy Center (FSEC)
1679 Clearlake Road
Cocoa, FL 32922

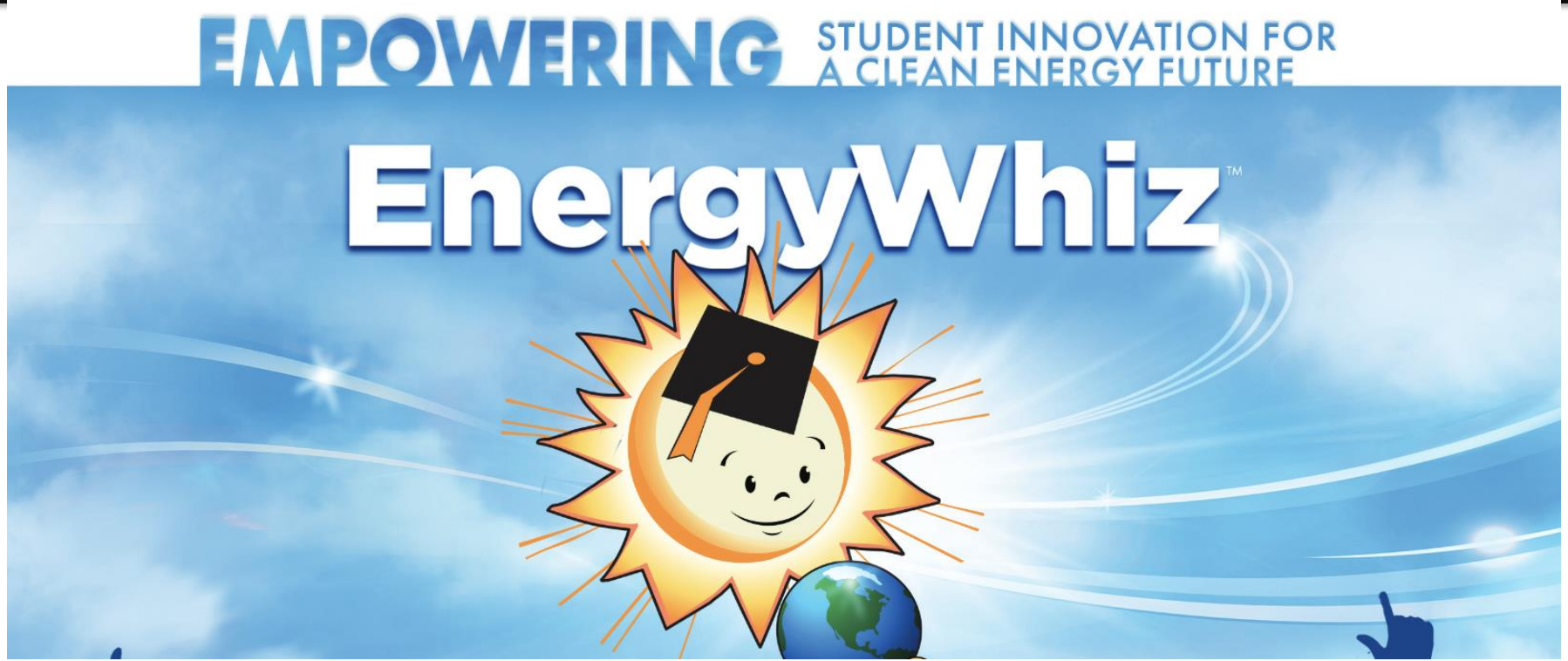
NSB NATIONAL SCIENCE BOWL® *a competition like no other . . .*

The **National Science Bowl for Middle School** is an activity of the U.S. Department of Energy's Office of Science, which encourages middle school students to excel in mathematics, science and engineering.

For more information: https://science.osti.gov/wdts/nsb

The **Space Coast Science Education Alliance (SCSEA) Florida Middle School Science Bowl** is one of 50 regional qualifying middle school science bowl competitions held throughout the U.S. **The winning team from this regional event will then compete in the National Science Bowl Finals held April 24 - April 28, 2025.**

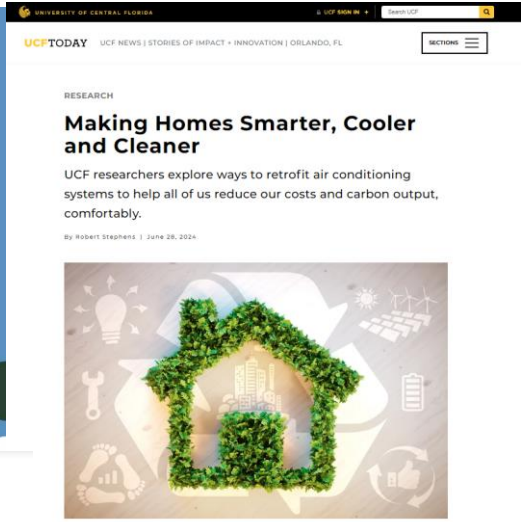
FSEC™ UCF


EMPOWERING STUDENT INNOVATION FOR A CLEAN ENERGY FUTURE
EnergyWhiz™
April 26, 2025 at FSEC
Produced by
FSEC
UCF UNIVERSITY OF CENTRAL FLORIDA
In Partnership with
Supported by
FPL solar now
SCAN TO LEARN MORE
ENERGYWHIZ.COM

50TH ANNIVERSARY – 2025

In the News

- Dr. Jim Fenton joins the SHEA Governing Board
- Making Homes Smarter, Cooler and Cleaner
- Here's why Florida utilities are building lots of solar farms
- DOE Invests $32 Million to Help Eliminate Natural Gas Flaring at Oil Production Operations



OPINION | Guest Column

Craig Pittman

Here's why Florida utilities are building lots of solar farms

The Sunshine State is finally living up to its nickname for solar energy, but we could be doing much more.

FSEC

UCF

In the News

- More electric school buses are coming soon to Central Florida
- Discussion with Energy Leaders Hanson Professionals
  - Part 1 – YouTube
  - Part 2 – YouTube
- UCF mechanical engineering student receives FEWC's inaugural scholarship
- Space Coast community honors Brevard County's top science teacher with awards

Bill Bradford, P.E.
Senior Vice President
Hanson Professional Services
Energy, Sustainability and
Resiliency Principal

HANSON

James Fenton, Ph.D.
Director
FSEC Energy Research Center

FSEC

BBN BREVARD BUSINESS NEWS online at BrevardBusinessNews.com

UCF mechanical engineering student receives FEWC's inaugural scholarship; nonprofit organization

By Sherri Shields
sherri@fsec.ucf.edu
Director
Communications & Marketing
Florida Solar Energy Center

ORLANDO (Aug. 26, 2024) — The Florida Energy Workforce Consortium launched a new scholarship this year promoting careers in energy. Timothy Gallagher, a mechanical engineering student at the University of Central Florida, is one of two recipients of this inaugural award. Each recipient received a check for $2,000 to further engineering is in my blood," said Gallagher. "Working at FSEC has given me an opportunity to see first-hand the variety of jobs in the energy sector, and I'm excited about my future in this industry."

● About FEWC

The Florida Energy Workforce Consortium Inc. is a nonprofit organization committed to informing people in their communities about the stable, rewarding, and well-compensated careers in the energy industry. The Consortium strives to lead the effort to support the energy sector stakeholders by creating organized approaches to identify and meet the current and future workforce needs, by leveraging all available resources of government, industry, education, and labor in the state. To learn more, visit https://www.getintoenergyflorida.com.

● About FSEC

The Florida Solar Energy Center® (FSEC®), a research institute at the University of Central Florida, is the state's premier energy research institution. Created by the Florida Legislature in 1975 to advance research, development, and education in solar energy, FSEC's focus includes renewable energy, energy efficiency, and sustainable transportation research, demonstration, and education. For more information, call (321) 638-1015 or visit energyresearch.ucf.edu.

BBN BREVARD BUSINESS NEWS online at BrevardBusinessNews.com

Space Coast community honors Brevard County's top science teachers with awards — four educators recognized

By Sherri Shields
sherri@fsec.ucf.edu
Director
Communications & Marketing
Florida Solar Energy Center

COCOA (Sept. 17, 2024) — Each year, the Space Coast Science Education Alliance (SCSEA) honors the top science teachers in Brevard County. The Exemplary Science Teacher Award is given in recognition of teachers who go above and beyond to foster a love of learning and develop science literacy among their students.

This year, four teachers received the distinguished award.

"It is a true honor to celebrate four of the most dedicated and talented science teachers in Brevard County," said Kevin Smith, president, SCSEA. "We are grateful for their contributions and the opportunity to recognize their hard work."

The 2024 Exemplary Science Teacher Award winners are:

- Elizabeth Youngs, Viera High School
- Nicole Nelson, South Lake Elementary School
- Alexandria Wicker, DeLaura Middle School
- Kayla Wildenthaler, Mila Elementary School

Additionally, award winner Youngs was also inducted into the SCSEA Science Teacher Hall of Fame. This recognition pays tribute to science teacher leaders with a long and distinguished record of inspiring excellence in science among their students and colleagues.

"The impact these educators have on their students and the schools they serve is invaluable," said Smith.

More electric school buses are coming soon to Central Florida

Central Florida Public Media | By Molly Duerig
Published January 13, 2024 at 7:00 AM EST

▶ LISTEN • 0:52

Orange County Public Schools / Via Twitter

In 2023, Orange County Public Schools became Florida's first school district to start operating electric school buses.

Orange County Public Schools (OCPS) and Seminole County Public Schools (SCPS) are two of four Florida public school districts recently selected for federal funding to buy electric school buses, according to the U.S. Environmental Protection Agency (EPA).

OCPS gets $5 million to expand the district's electric school bus program, after launching Florida's first such program last year. SCPS gets $525,000 to buy more than 15 clean school buses for its growing fleet, according to the EPA.

Jim Fenton, director of the Florida Solar Energy Center (FSEC) at the University of Central Florida (UCF), says just like all electric vehicles, electric school buses are healthier and more energy efficient than their gas-powered counterparts. But electrifying school buses can be a particularly pragmatic choice, he says, because school bus routes

Resilient Homes

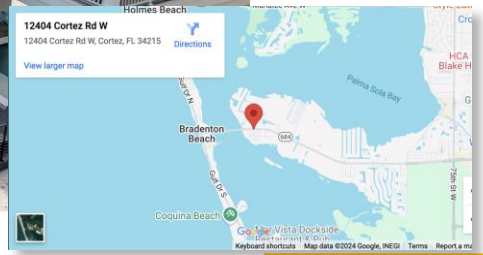
FAST COMPANY

PREMIUM DESIGN TECH WORK LIFE NEWS IMPACT PODCASTS VIDEO INNOVAT

10-11-2024 | IMPACT

Why this Florida neighborhood still has power

Florida's disaster-proof community of Hunters Point withstood yet another hurricane.



https://www.fastcompany.com/91207612/hurricane-milton-florida-neighborhood-hunters-point-power

[Photo: courtesy Pearl Homes]

"Residents who stayed through both hurricanes told CNN they suffered little to no damage. Neither the heavy surge flooding from Helene nor the strong winds from Milton devastated their homes. Solar power and battery storage kept the lights on all night and the following days."

- FSEC technical assistance covered all aspects of building science, solar system design and component selection, and above-code program certifications — started in conceptual design and ended with analysis and design development roadmap.

FSEC New Hires

FSEC New Positions

- **Dylan Colvin**, Assistant Professor 08/08/2024
- **Hamed Haggi,** Assistant Professor 08/08/2024
- **Manjunath Matam,** Assistant Professor 09/27/2024

FSEC New Hires

- **Christian Lopez**, Student, Solar Division 06/07/2024
- **Jason Szekely**, Student, Solar Division 09/16/2024
- **Collin West**, Student, Solar Division 05/16/2024
- **Ahmad Esmaeilzadeh**, Research Associate, Buildings 01/03/25
- **Erfan Asadipour**, Post Doc, Special Projects 01/03/25
- **Alireza Shantia**, Assistant In, Buildings 01/03/2025

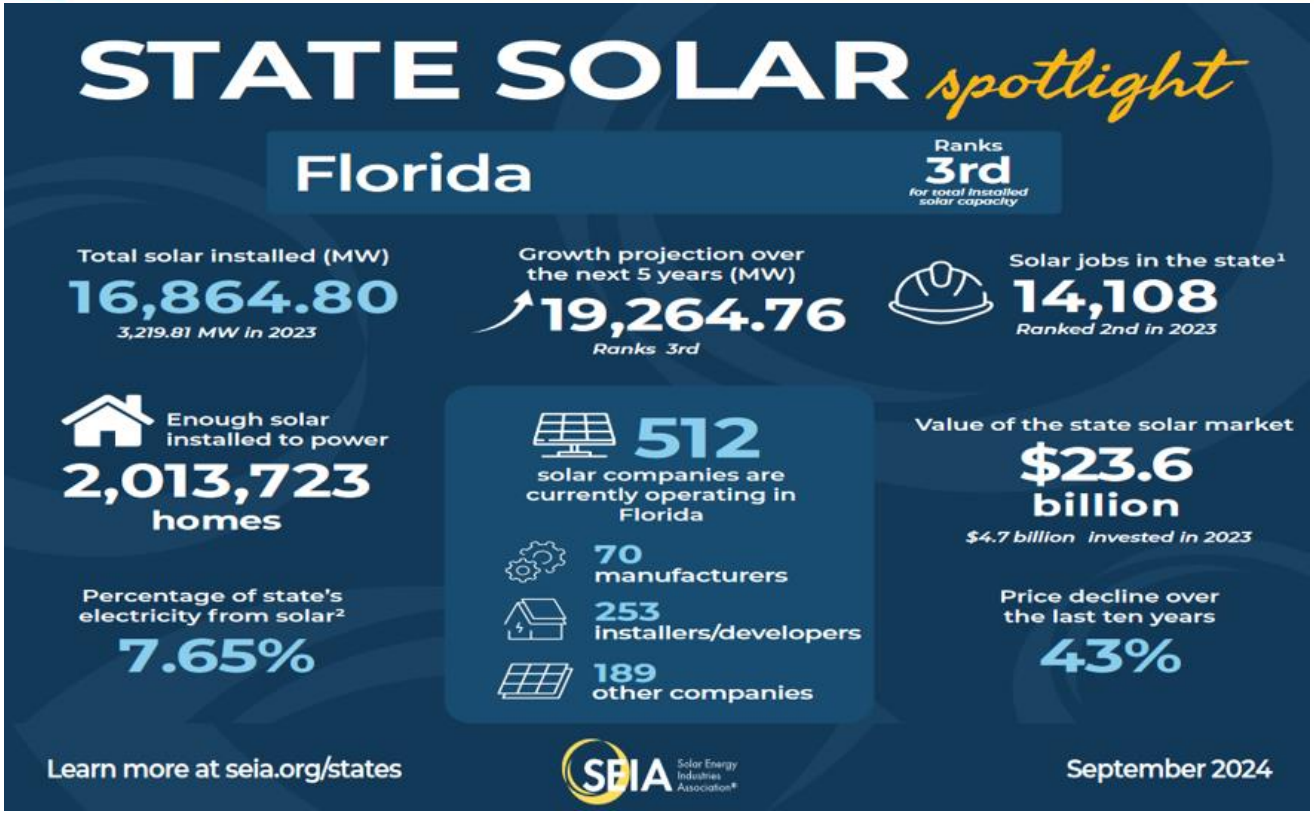
FSEC New Hires

FSEC Staff for Decarbonization Research

- **Randy Cragle,** OPS, Special Projects 09/06/24
- **Daniel Ramirez**, Post Doc, Special Projects 05/10/24
- **Veronica Rigo**, Research Program Coordinator, Special Projects 05/10/24
- **Jose Solorzano**, OPS, Special Projects 09/09/24
- **Ayden Weil**, OPS, Special Projects 08/16/24

U.S. Clean Energy Employment by Sector 2024

Total CE Job Rank	State	Clean Energy Jobs	CE Jobs per Capita	Share of all Energy + MV Jobs	Renewable Energy Jobs	Storage & Grid Jobs	Energy Efficiency Jobs	Biofuels Jobs	Clean Vehicle Jobs
3	Florida	175,572	17.8	49.9%	28,273	6,279	125,234	2,853	12,933



Vision for Florida

Spend Little to No Funds on Imported Transportation Fuels

Keep the Jobs and Wealth in Florida!

100% Renewables Using Florida Energy

- Building Energy Efficiency Improvements
- Utility & Rooftop Solar
- Energy Storage
- Transportation Electrification
- Smart-charging Electric Vehicles (V2G)

100% Renewables & Net Zero Emissions

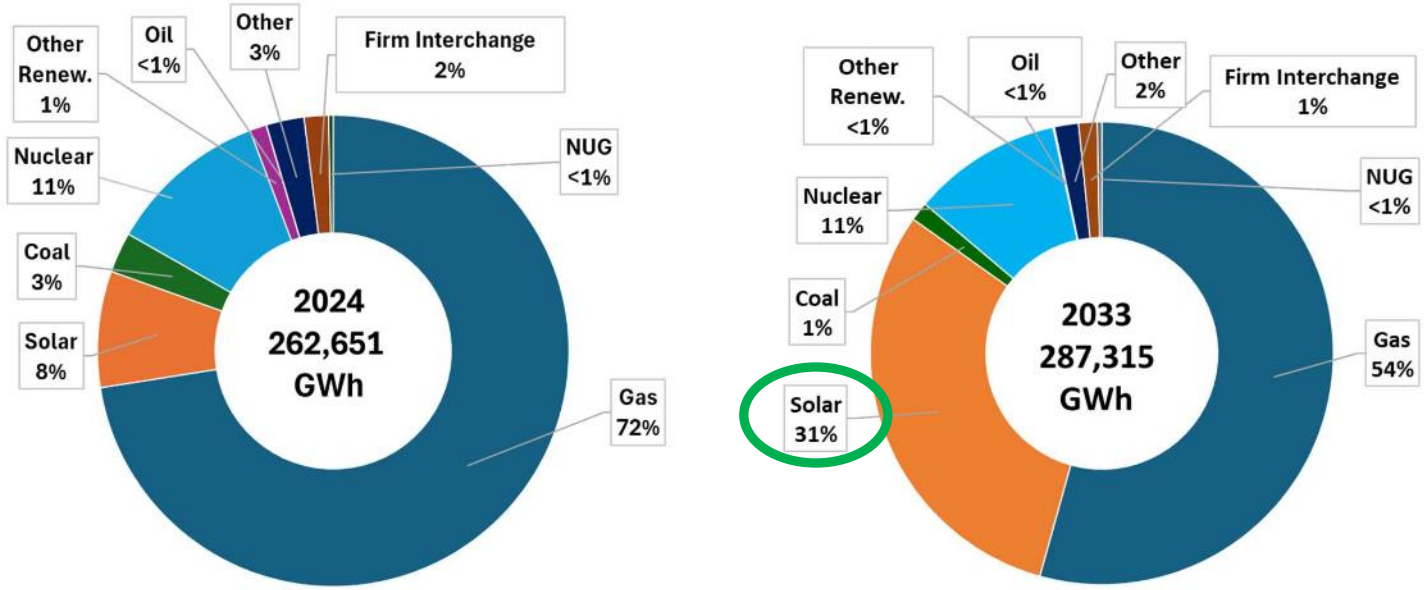
- Sustainable aviation fuels
- High-speed electric trains
- Hydrogen as a fuel and feedstock

Clean Energy Workforce Development

- Apprenticeship Programs

FSEC™ UCF

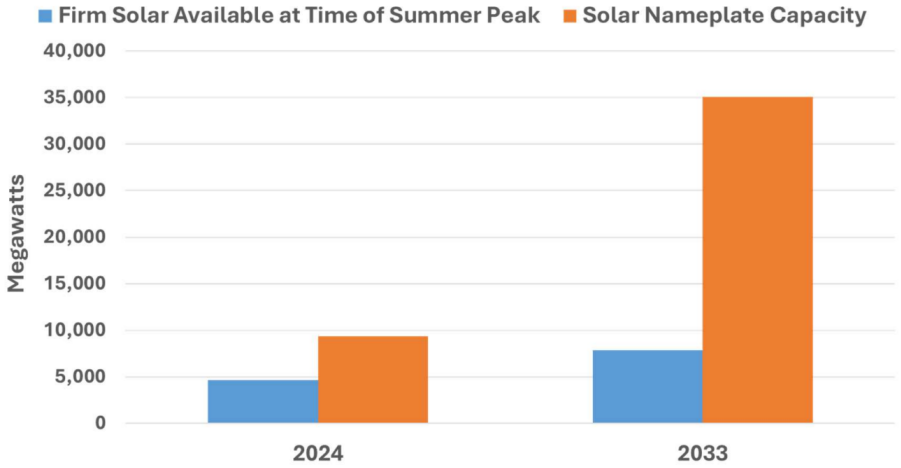
Florida Forecasted Generation Mix
Net Energy for Load (GWh)



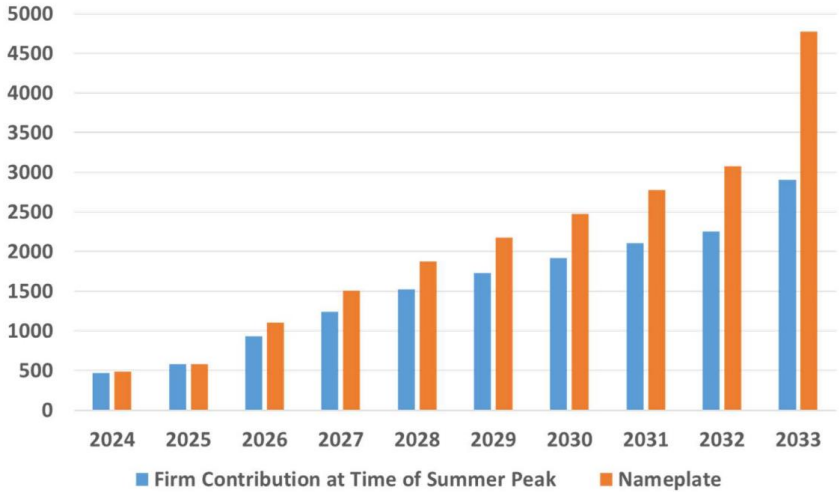
2024 Ten-Year Site Plans FRCC Overview Presentation, Vince Ordax, Sept 2024
https://www.floridapsc.com/pscfiles/website-files/PDF/Utilities/Electricgas/TenYearSitePlans//2024/FRCC_Presentation.pdf

Solar and Battery MWs

2024 TYSP Cumulative Solar Capability



2024 TYSP Battery Capability (MW)

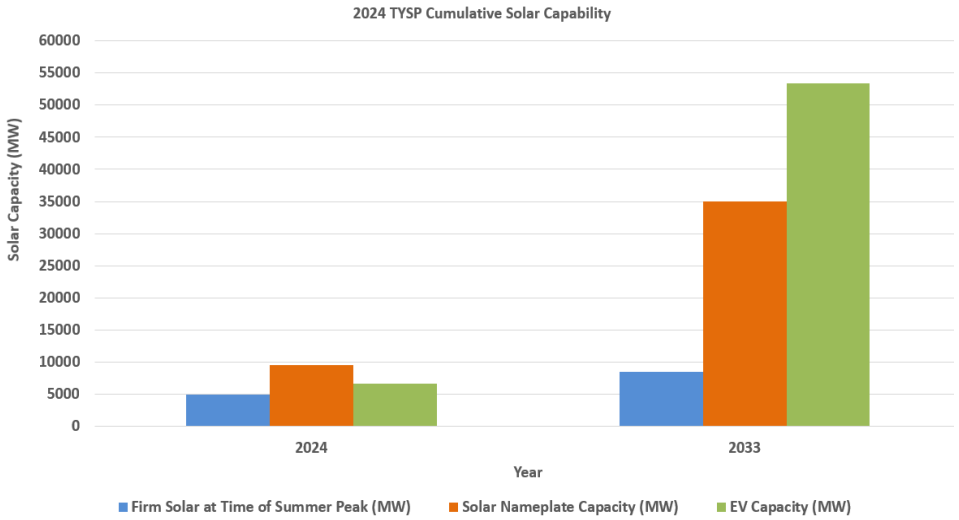


2024 Ten-Year Site Plans FRCC Overview Presentation, Vince Ordax, Sept 2024, Page 18 and 20
https://www.floridapsc.com/pscfiles/website-files/PDF/Utilities/Electricgas/TenYearSitePlans//2024/FRCC_Presentation.pdf

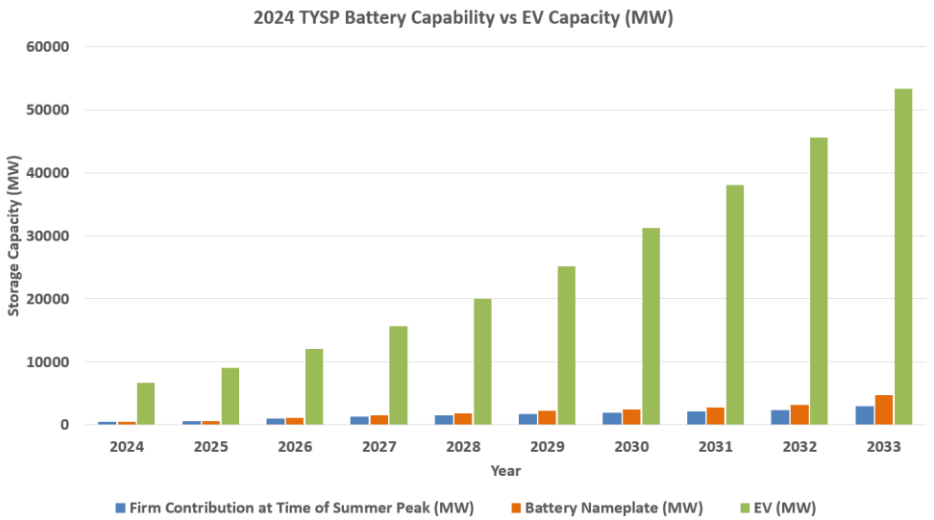
Solar, Battery and EV MWs

Opportunity for Virtual Power Plants and V2G

2024 TYSP Cumulative Solar and EV Bat Capability



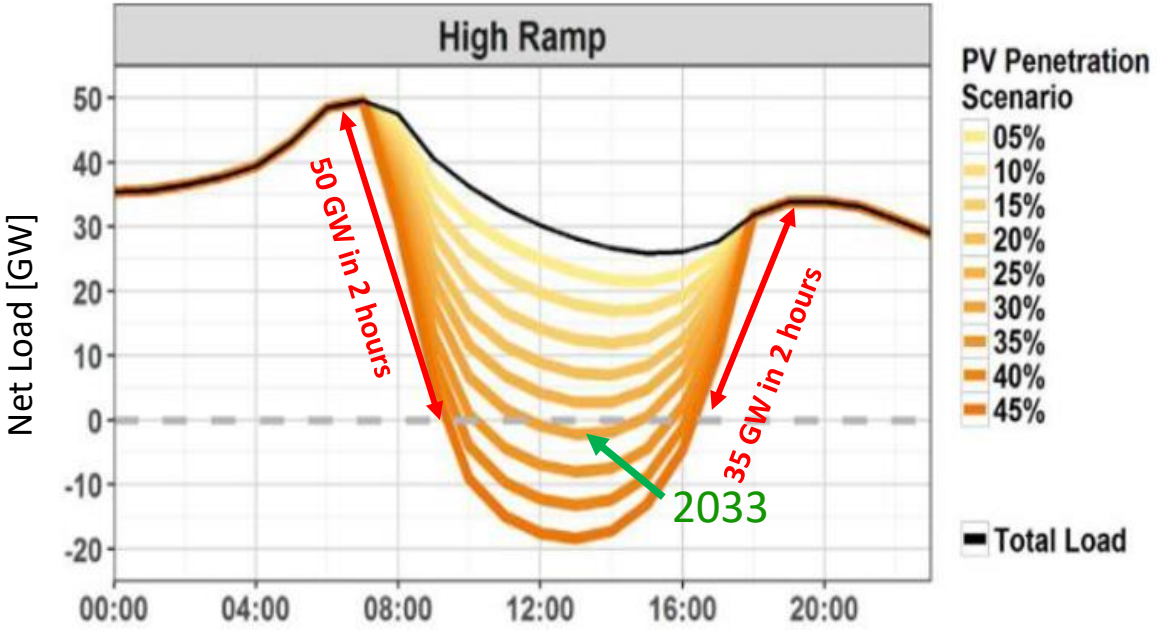
2024 TYSP Battery Capability (MW)



12.5 More Battery Power and Energy in EVs than Utility Batteries.

2024 Ten-Year Site Plans FRCC Overview Presentation, Vince Ordax, Sept 2024, Page 18 and 20 (**orange** & **blue**)
https://www.floridapsc.com/pscfiles/website-files/PDF/Utilities/Electricgas/TenYearSitePlans//2024/FRCC_Presentation.pdf
2023 PSC 10 year Site Plan, Nov 2023, Page 18 Table 2 **(green)**
https://www.floridapsc.com/pscfiles/website-files/PDF/Utilities/Electricgas/TenYearSitePlans//2023/Review.pdf

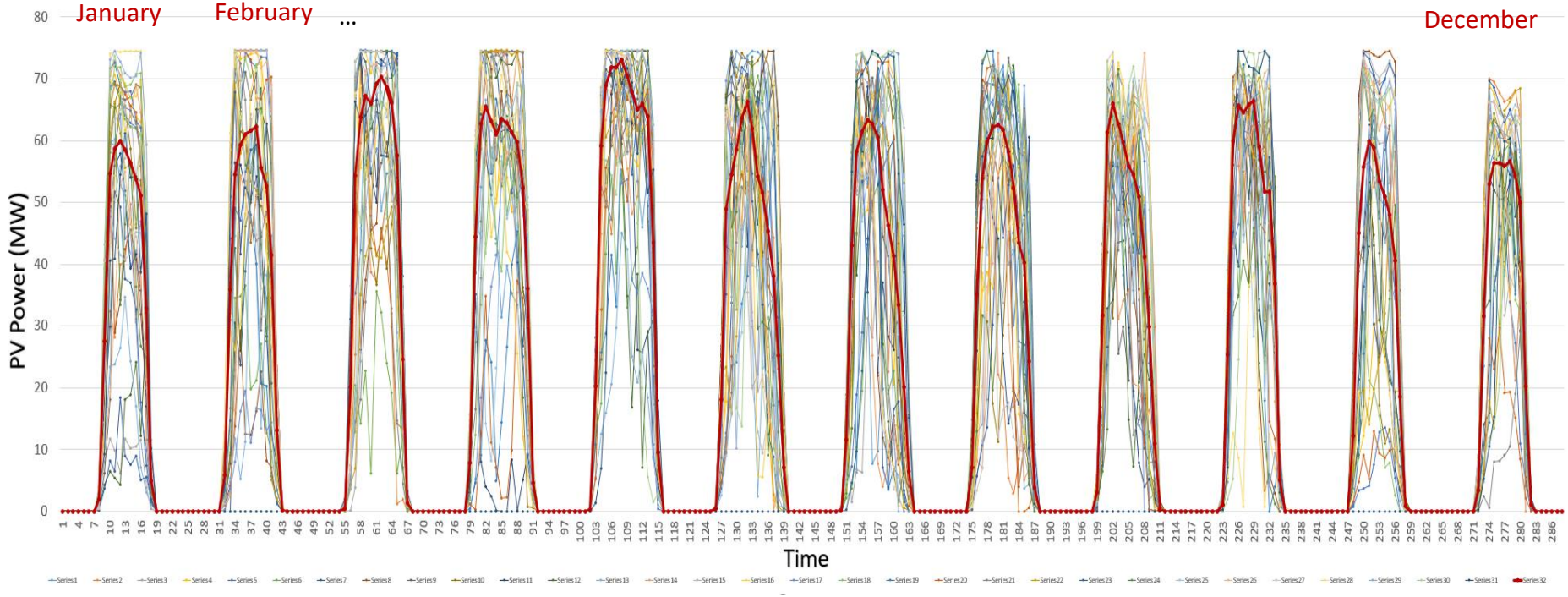
Increasing Renewable Penetration



*Duck curve in Florida during a day based on Florida Reliability Coordinating Council

- **Solution to steep ramp: Batteries** and **Hydrogen production** at utility scale can provide **both long and short duration capacity** as a controllable load. *Need PV as base load Powerplant?*

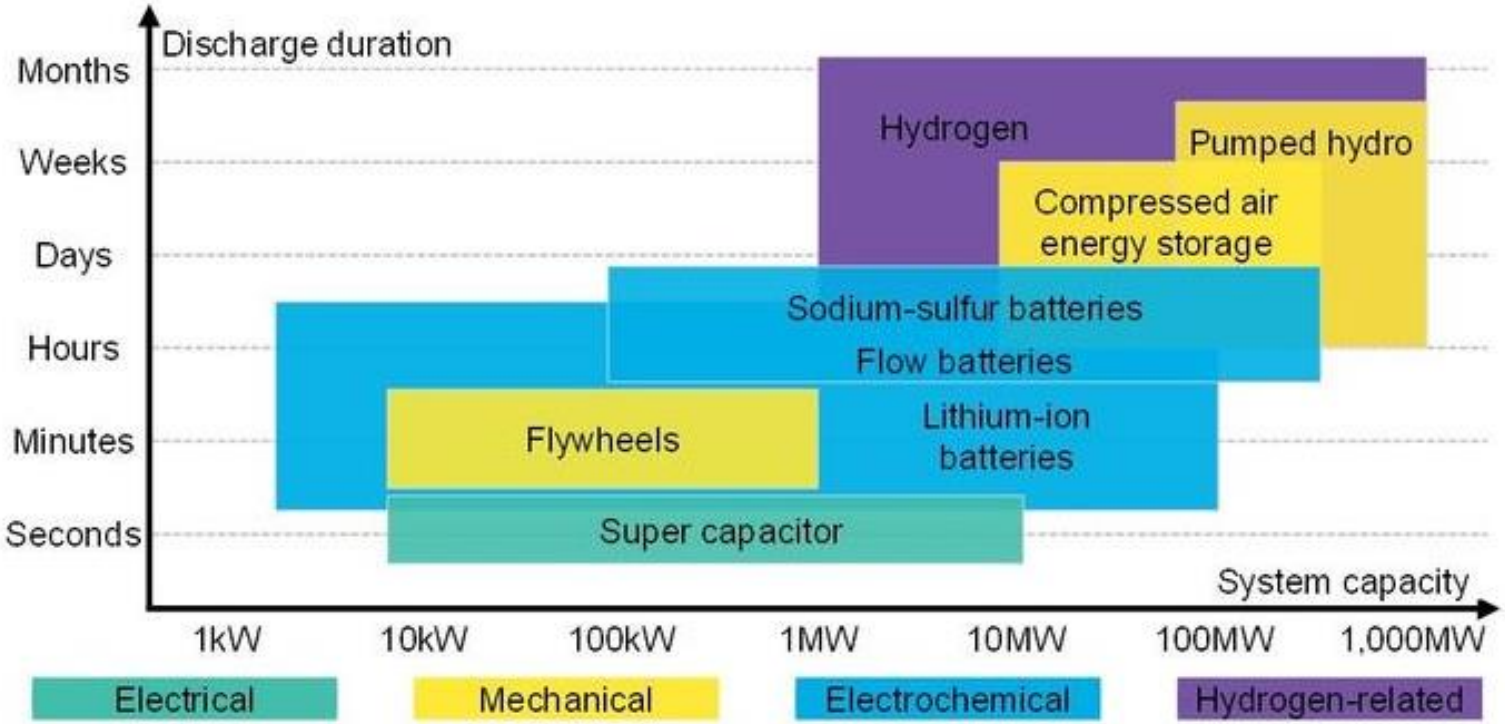
75 MW_{AC} Florida Solar Field



Solid red line is the representative day of each month

>12 hours of storage is required every day to operate as baseload powerplant!

Size and discharge durations by storage technology



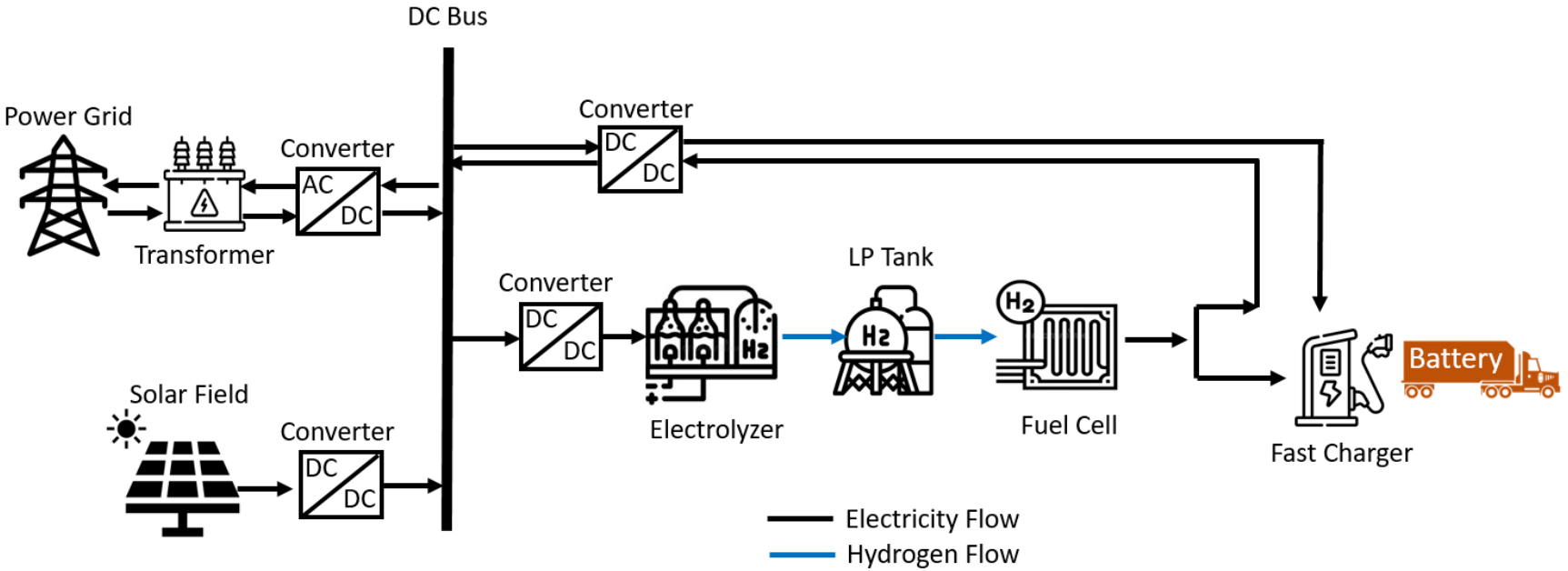
Source: Bloomberg New Energy Finance. Note: system capacities and discharge durations are based on general use, rather than technical limitations.

Provide 100% Renewable 75 MW_{AC} Electricity 24-hours a day 365 days a year (PV BPP)

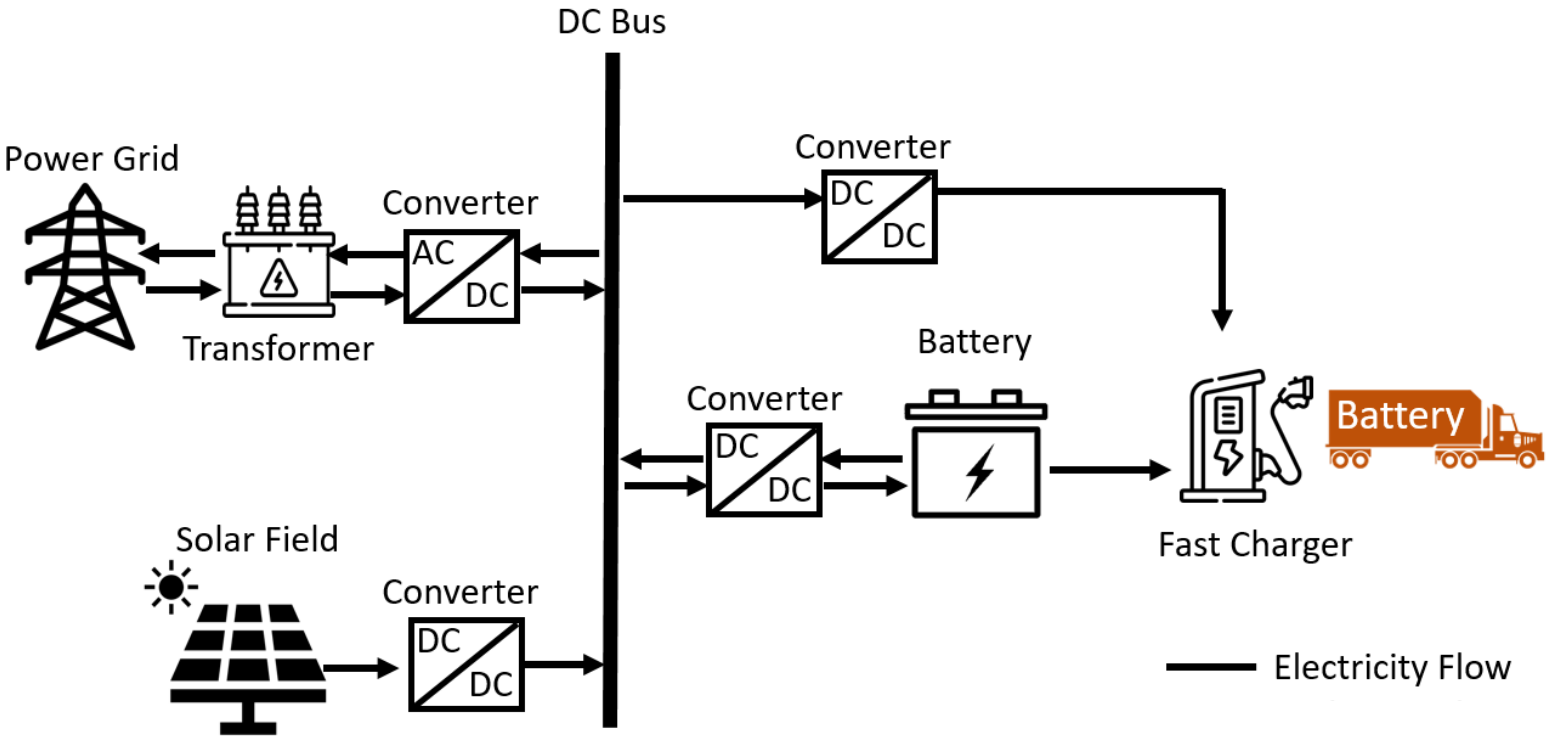
- Amounts and at what costs using PV + Electrolyzers + Hydrogen Storage + Fuel Cells (PV BPP H2)?
- Amounts and at what costs using PV + Li-ion Batteries (PV BPP Bat)?
- What is most valuable use of the 100% Renewable Electricity?

EV range 220 miles, 68.7 kWh battery capacity (3.2 miles/kWh)
Gasoline car 24.2 mpg

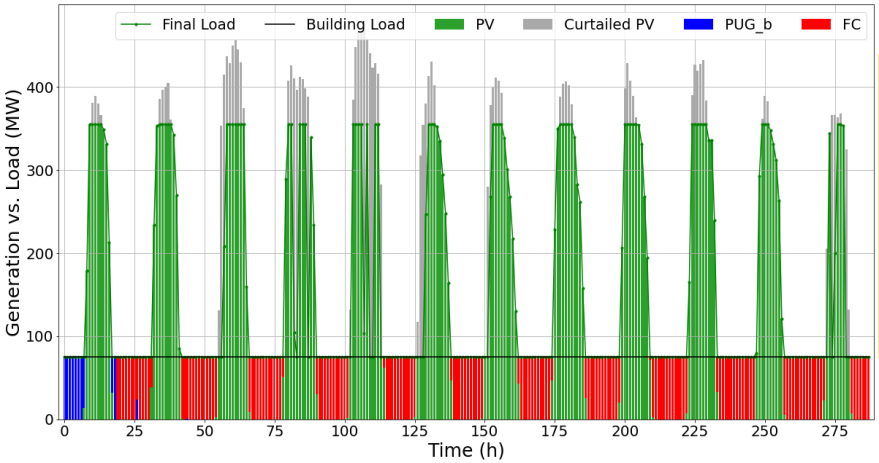
Baseload 75 MW_{AC} PV H2



Baseload 75 MW_{AC} PV Bat



75 MW BPP Using Hydrogen or Batteries



Hydrogen (low pressure)

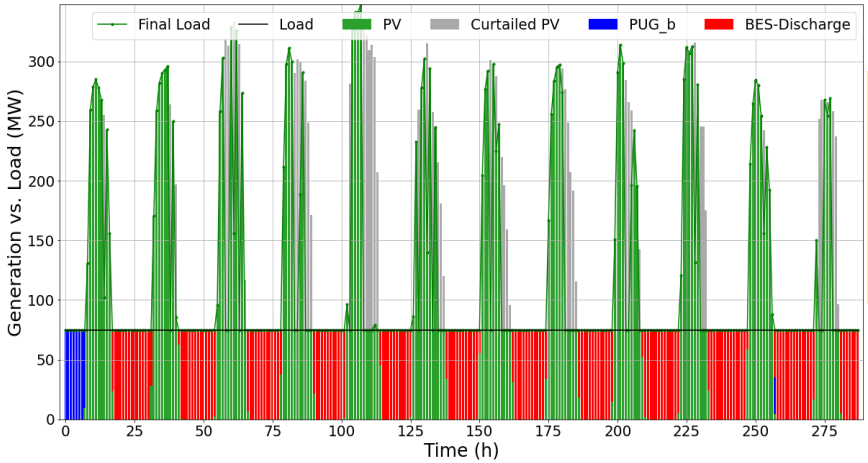
ELX size : 279.9 MW
FC size : 75 MW
Storage Tank size : 58415 kg

PV size : 475 MW

ELX capacity factor : 31.81%
FC capacity factor : 49.86 %

Average electricity price 2020 : $ 84.52 /MWh
Average electricity price in 2030 : $ 46.21/MWh
Average electricity price in 2050 : $ 33.53/MWh

Average H2 cost today : $ 2.03 /kg
Average H2 cost in 2030: $ 1.07/kg (~DOE Target)
Average H2 cost in 2050: $ 0.68/kg



Batteries (4-hour)

Battery size (Power) : 372.75 MW
Battery size (Energy) : 1491 MW

PV size : 348 MW

Battery capacity factor : 12.75 %

Average electricity price today : $ 95.17 /MWh

Average electricity price in 2030 : $ 63.21/MWh

Average electricity price in 2050 : $ 49.43/MWh

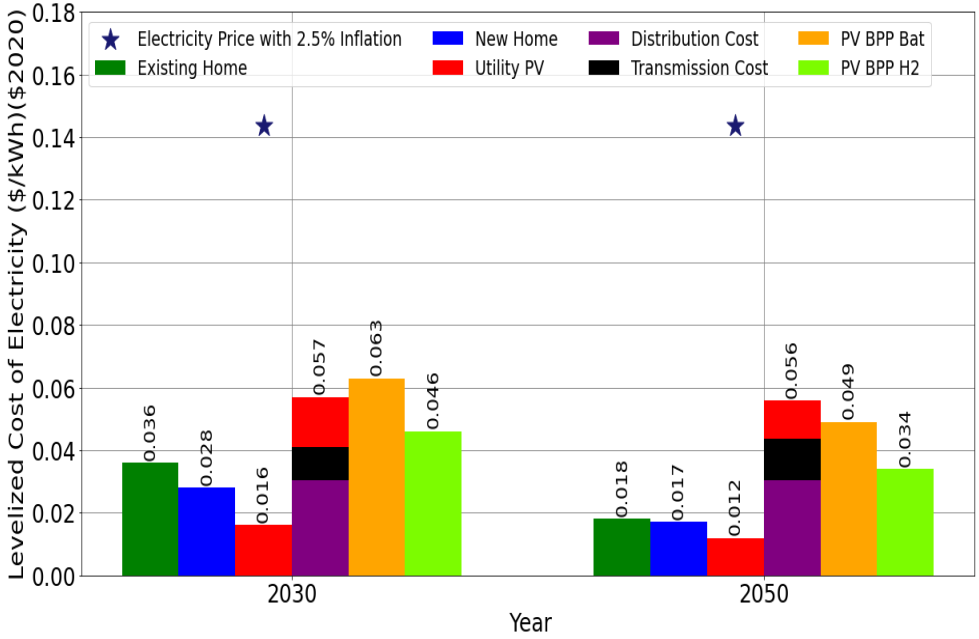
No ITC

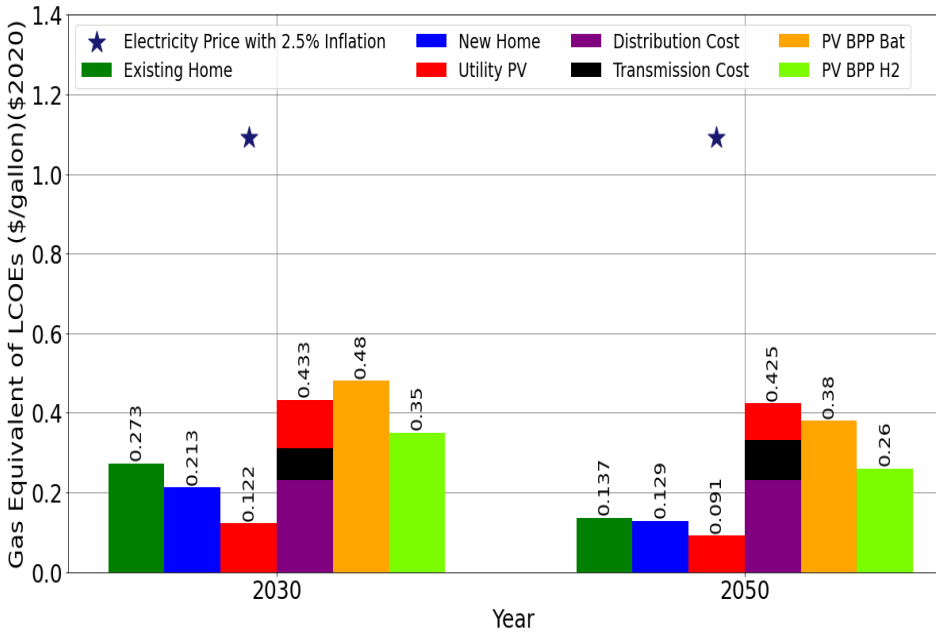
FSEC

UCF

Florida Wins as Solar Replaces Gasoline

Rooftop, Utility, and Utility BPP PV LCOE and Gasoline Equivalents





All owners of Solar PV make money off of Transportation Fuel at less than $1 per gallon. Utilities provide 100% Renewable Truck Stops which serves as Baseload Power Plants with no impact on the grid.

STRATEGIC PLAN KPIs

FSEC Strategic Plan (2020-2025)

KEY PERFORMANCE INDICATORS FY 2024

July 1, 2023 – June 30, 2024

Vision Statement

Promote the rapid transition to a sustainable energy economy through renewable energy, energy efficiency, and sustainable transportation research, demonstration, and education.

Mission Statement

Develop, research, and evaluate energy technologies that enhance the environment and economy, and transfer the results to the public, students and practitioners.

KEY PERFORMANCE INDICATORS FY 2024

Goal I: Enhance FSEC's prominence in core programs of sustainable energy research and development					
Metric	**FY 2020 Baseline**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**
1.1 The three-year rolling average of C&G and other external salary funding will equal or exceed 200% of current year E&G salary funding by 2025.	106%	92%	100%	124%	123%
1.2 Achieve at least five new funding sources by 2025 (results are cumulative).	N/A	5	(3) 8	(3) 11	(2) 13
1.3 Create 12 secondary joint appointments at FSEC by 2025.	3	6	6	6	6 + 4 in progress
1.4 Recruit four energy faculty jointly with academic units by 2025.	0	0	0	0	2
1.5 Convert five post-doctoral students to assistant research professors by 2025.	0	0	0	2	2
1.6 Increase the number of faculty serving as new PIs or Co-PIs to two per year.	0	0	0	0	1
1.7 Invest 2% of annual expenditures in research and educational equipment.	<1%	<1%	<2%	<2%	<2%

KEY PERFORMANCE INDICATORS FY 2024

Goal II: Deploy FSEC's distinctive assets to support the clean energy sector's response to society's greatest challenges as underscored by the United Nation's First Assessment Report and UCF's Campus Master Plan					
Metric	**FY 2020 Baseline**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**
2.1 Assist at least two local governments per year in identifying and quantifying sustainable energy goals.	1 (one)	2	0	0	1
2.2 Decrease non-renewable (NR) per capita (PC) energy consumption in Florida by one percent per year (as annual compound rate of change).	194.4 MBtu per capita	187.3 MBtu per capita (-3.7%/year)	169.3 MBtu per capita (-6.7%/year)	178.7 MBtu per capita (-2.8%/year)	178.1 MBtu per capita (-2.2%/year)
2.3 Publish an annual "Research You Can Use" compendium of key findings and replicable programs developed by FSEC.	0	0	0	4	2
2.4 Increase the yearly number of Publications, Presentation of Professional Papers and Other Presentations to two per each research & teaching faculty FTE.	50	130	166	159	109
2.5 Increase the number of intellectual property developments to one per 15 faculty FTE per year.	5	5	1	~1	1

KEY PERFORMANCE INDICATORS FY 2024

Goal III: Maintain FSEC's broad base of academic and industry affiliations and stakeholders that support and inform our research, development, education and training initiatives					
Metric	**FY 2020 Baseline**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**
3.1 Lead one statewide clean energy event each year.	None	1	2	2	1
3.2 Increase number of external partnerships relevant to the FSEC mission by 50% by the year 2025.	50	121	69	57	114
3.3 Establish a 50% industry, 25% academic/NGO, and 25% government representation on the FSEC Advisory Board by 2025.	71%/10%/19%	74%/13%/13%	85%/3%/12%	72%/11%/17%	83%/7%/10%
3.4 Increase intra- and inter-university research collaborations by 20% by the year 2025.	35	236	56	61	81

KEY PERFORMANCE INDICATORS FY 2024

Goal IV: Elevate and expand FSEC's educational programming					
Metric	**FY 2020 Baseline**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**
4.1 Increase access to energy education and training opportunities for 20,000 students, teachers, and workers over the next five years.	10,600	3,752	5,579	8,730	10,793
4.2 Support the increase of clean energy jobs in Florida to 200,000 by the year 2025.	166,032	149,624	158,467	165,857	172,115
4.3 Increase experiential opportunities at FSEC for undergraduate, graduate and post-doctoral students to a rate of 10 per year by 2025.	4	64	28	35	51
4.4 Contribute to the creation of an Energy Sustainability certificate or graduate program by Fall 2025.	0	1	1	Completed	NA

KEY PERFORMANCE INDICATORS FY 2024

Goal V: Increase stakeholder and constituent awareness of FSEC and its programs, services and training offerings					
Metric	**FY 2020 Baseline**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**
5.1 Increase website visits by 10% per year through 2025.	334,006	324,672 (-3%)	583,062 (70.1%)	680,732 (16.8%)	603,336 (-12.8%)
5.2 Increase media coverage of FSEC by 10% per year through 2025.	13	40 (362%)	44 (10%)	63 (43%)	135 (114%)
5.3 Produce four short videos per year through 2025.	1	4	8	8	18
5.4 Add 1.00 FTE staff dedicated to information and outreach in 2020.	N/A	0	1	0	0
5.5 Produce a Florida Energy Research and Education Capabilities document and update on a regular basis.	V1	V2	V3+	V4+	V5+
5.6 Distribute an FSEC annual report (hard copy and electronically) to 5,000 stakeholders by the year 2025.	0	0	0	In progress	In progress

KEY PERFORMANCE INDICATORS FY 2024

Goal VI: Nurture an inclusive and diverse FSEC faculty, staff, and stakeholder base					
Metric	**FY 2020 Baseline**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**
6.1 Increase engagement of PhDs and PhD Students in FSEC research activities to 14 by 2025.	11	40	48	42	12
6.2 Increase diversity by hiring more women, minorities and multi-cultural faculty, staff, and students.	28 (43%)	20 (32%)	39 (62%)	50 (62%)	48 (61%)
6.3 Appoint additional women, minorities and multi-cultural members to the FSEC Advisory Board.	13 (38%)	12 (40%)	15 (44%)	16 (44%)	13 (45%)

FSEC Strategic Plan (2025-2030)

- Current FSEC Strategic Plan adopted by the FSEC Advisory Board on April 16, 2020 for the 2020 – 2025 timeframe
  - FSEC Executive Committee drafted the plan
  - Advisory Board Task Force appointed to refine the plan
- Updated plan for the period 2025 to 2030 is needed
  - Draft plan developed by FSEC Executive Committee (2/28/2025)
  - Advisory Board Task Force refines the plan (3/28/2025)
  - Plan to be adopted at Spring 2025 AB Meeting (TBD)

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9:30 a.m.	**Welcome**	Jen Szaro, Chair, FSEC Advisory Board; President & CEO, AESP
	Introductions (Roll Call)	Sherri Shields, Communications Director, FSEC
9:40 a.m.	Approval of April 25, 2024 Minutes	Jen Szaro, Chair
9:45 a.m.	Status of FSEC Programs & KPIs	Jim Fenton, Director, FSEC
10:30 a.m.	Florida Energy Office Report	**Brooks Rumenik, Director, Office of Energy, FDACS**
10:40 a.m.	Florida Legislative Session Report	Louis Rotundo, Principal, Louis Rotundo and Associates
10:50 a.m.	50th Anniversary Celebration & Fundraising	Sherri Shields, Communications Director, FSEC & Garrett Preisser, Executive Director for Advancement, UCF
11:00 a.m.	Break	10 Minutes
11:10 a.m.	Repurposing Stranded Methane into Low-carbon Methanol	Paul Yelvington, Chief Technology Officer, M2X
11:40 a.m.	Technical and Ecological Findings from Floating Solar Research Project	Manjunath Matam, Assistant Research Professor, FSEC Rebecca Hernandez, Associate Professor of Ecology, Energy, and Sustainability, UC Davis
12:15 a.m.	New Business Date and Agenda for Next AB Meeting	Jen Szaro, Chair
12:30 p.m.	Adjourn to Lunch	All

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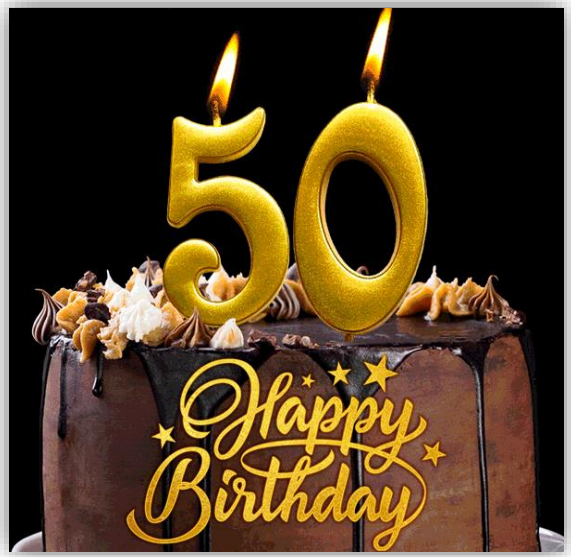
50TH ANNIVERSARY – 2025

50th Anniversary

- We are planning ways to celebrate
- We are also partnering with the UCF Foundation to provide an opportunity to invest in FSEC



High Visibility Fundraising

- Goal: People can donate for infrastructure with high visibility
- Consistent with FSEC mission
- Front parking lot solar canopy
- Expanded charging area with solar canopy

Solar Canopy in Front Parking Lot

- Canopy approximately 45’ x 140’
- 115 to 130 kW
- At $3/W cost might be $350,000 to $400,000

picture from https://bungalower.com/2015/02/22/i-wish-this-was-a-solar-parking-lot-2/

FSEC

UCF

Solar Canopy and Expanded Charging Area

- Current: Two working public charging level 2 parking spots
- Vision: additional
  - o two level 2,
  - o two fast level 3 (150kW+) chargers,
  - o two hyper-fast (350kW) chargers
- Able to recharge busses when students visit
- Also provides some research opportunities for customer peak reduction with batteries
- New charging: $600,000
  Solar canopy: $120,000

Special thanks to Roger Messenger and Mindy O'Neil of LLC Engineers for volunteering electrical engineering services

FSEC

UCF

What great ideas do you have?

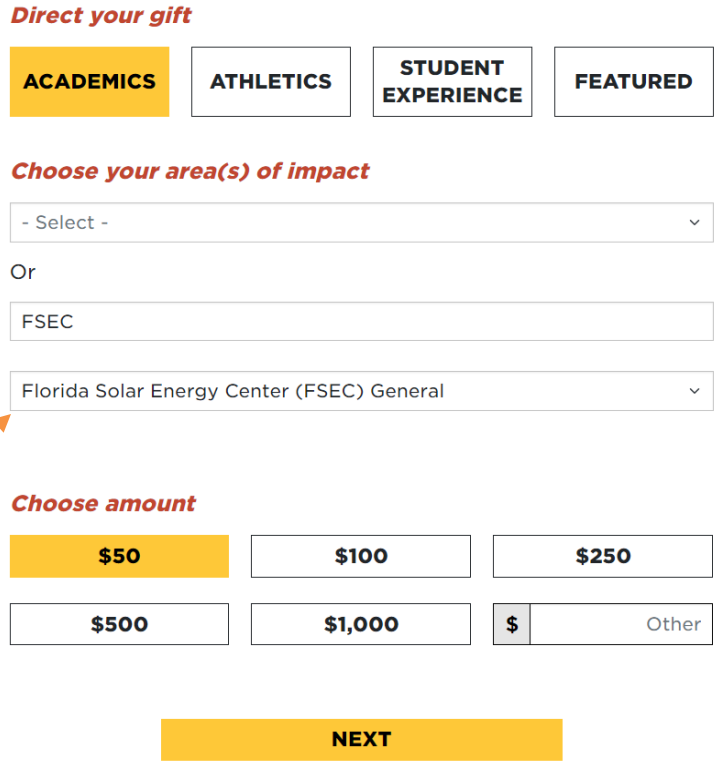
- Do you have suggestions of companies or individuals who may provide substantial gifts that we can approach?

UCF Foundation – FSEC Account

Donating to FSEC

Website:
https://foundation.ucf.edu/givenow

In the areas of impact, type “FSEC” and select
“Florida Solar Energy Center (FSEC) General”



50th Anniversary Opportunities

- Feb. 10th: ASHRAE Winter Conference, Tour FSEC (3-5pm)
- Feb. 14-17th: SPARK STEM FEST at Orlando Science Center
- **Feb. ??: EEBA Training @ FSEC *(Coincide w/ Big Event?)***
- April 10th: UCF Day of Giving (Online Fundraising Event)
- April 26th: EnergyWhiz (Celebration of Earth Day too)
- May 12-14: FlaSEIA Summit
- **Spring Advisory Board Meeting** June 5 *(Big Event June 6)*
- July 24-25, 2025: Southeast Building Conference, Orlando
- September 8-11, 2025: SEIA RE+ 2025 conference, Las Vegas, NV
- **October**: National Energy Awareness Month *(Big Event?)*
- Feb. 17-19, 2026: Int'l Builders Show in Orlando

Suggestions for speakers:

- UCF President Cartwright
  Bill Nelson
- Larry Kazmerski
- Dave Block
- Buddy Dyer
- Clint Bullock
- Chris Castro
- Kevin Lynn
- M.J. Soileau
- Others?

10-minute

BREAK

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PAUL YELVINGTON

Chief Technology Officer, M2X

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MANJUNATH MATAM

Assistant Research Professor, FSEC

REBECCA HERNANDEZ

Associate Professor of Ecology, Energy, and Sustainability, UC Davis

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Next Advisory Board Meeting

Meeting: **Thursday, June 5, 2025**

50th Anniversary Event: **Friday, June 6, 2025**