

FSEC Advisory Board Meeting

November 9, 2023



New Advisory Board Members



Carrie Black

Chief Sustainability &
Resilience Officer,
Orange County



Linda Dubea

External Affairs Manager,
Florida Power & Light



Status of FSEC Programs

Jim Fenton, Director

Advisory Board Meeting

November 9, 2023



Vision for Florida

Spend Little to No Funds on Imported Primary 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)
- Demand Response

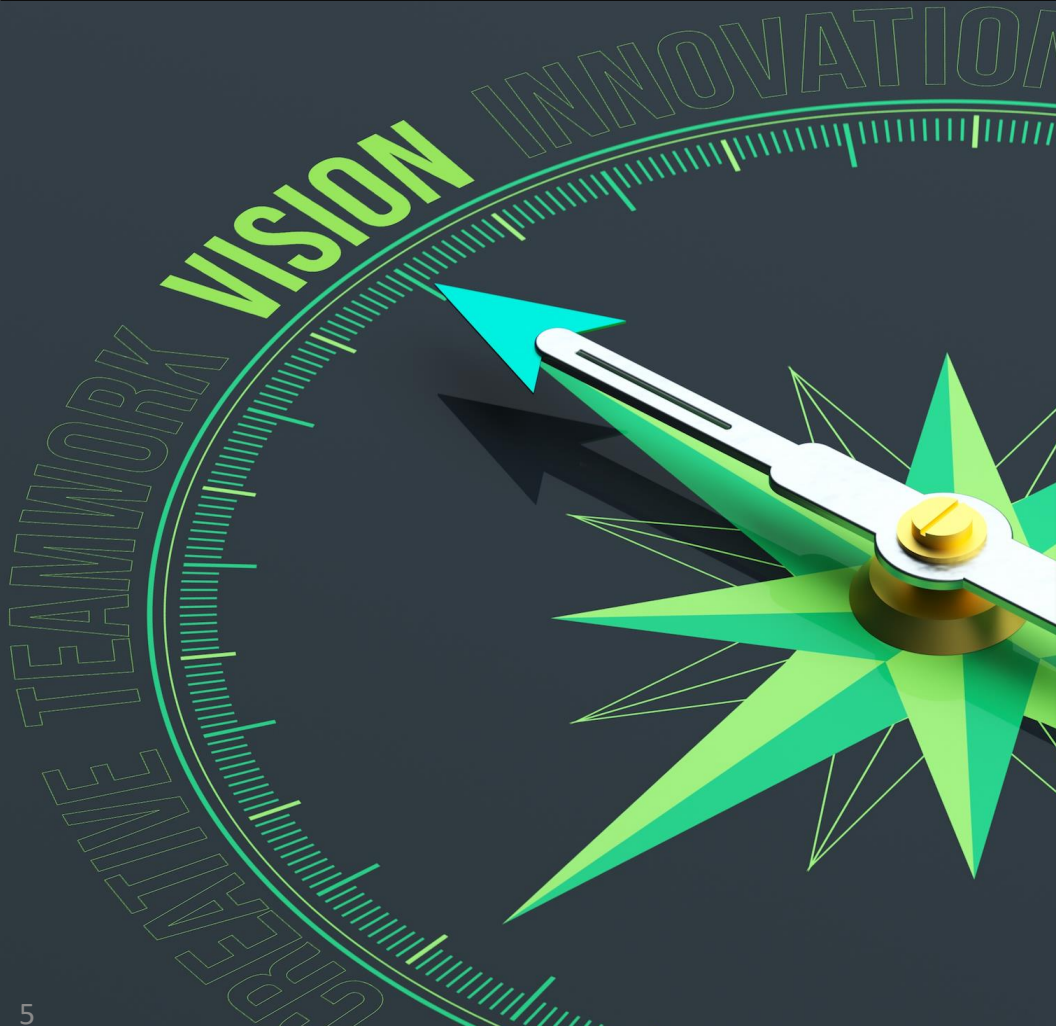
100% Renewables & Net Zero Emissions

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

Clean Energy Workforce Development

- Apprenticeship Programs





VISION

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



MISSION

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

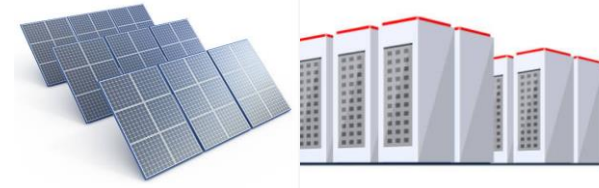
FSEC Principal Energy Programs



Energy Efficient Buildings



Grid Modernization/Energy Systems Integration



Solar Energy/Storage Systems



Electric Transportation



Hydrogen/Catalysis



Education, Service, Workforce Training, Policy



Advisory Board Partners

Energy Consumers



Builders/ Energy Providers



Electric Utilities



Manufacturers



Associations/ Government



FSEC Project Current Partners



A.F.Mensah



ATLANTIC HOUSING PARTNERS



SEI Associates

Tactical Energy



SOLAR RATING & CERTIFICATION CORPORATION

kaneka



Associated Gas Distributors of Florida



NEW CONTRACT AWARDS



New Contract Awards

- **2023 Solar Roof Installation Research Project FSEC Flexible Residential Test Facility** | GAF Energy LLC | 5/17/23 - 10/31/25 | \$65,000 | J. Sonne
- **Trane Trace 3D Plus Software Development Support** | S.E.I. Associates | 7/17/23 - 7/18/24 | \$144,000 | R. Raustad
- **Comparison of the 8th Edition Florida Building Energy Conservation Code with IECC 2024 & ASHRAE 90.1-2022 and IECC 2021 & ASHRAE 90.1-2019** | Florida Department of Business and Professional Regulation | 7/01/23 - 6/30/24 | \$136,511 | B. Nigusse
- **8th Edition (2023) Florida Building Code, Energy Conservation** | Florida Department of Business and Professional Regulation | 7/17/23 - 6/30/24 | \$25,000 | J. Sonne
- **Valencia College Energy Transition Plan** | Hanson Professional Services Inc. | 10/01/23 - 9/30/24 | \$15,000 | C. Kettles
- **PV-GEMS: Photovoltaic Powered, Grid Enhanced Mechanical Solution.** A pre-packaged approach providing high efficiency and resilient space conditioning, and water heating | U.S. DOE | EOC: 1/31/2026 | \$901,348 | E. Martin
- **Photonic Curing of Printed Copper Contacts for High Efficiency and Low-Cost Silicon Heterojunctions** | U.S. DOE SETO | 10/23 – 04/27 | Total \$1,868,887 – Federal \$1,494,911 | K. Davis
- **Materials Data Science for Stockpile Stewardship (MDS³) Center of Excellence** | U.S. DOE National Nuclear Security Administration (NNSA) | 09/22 – 09/27 | \$832,646 | K. Davis (PI), M. Li (Co-PI)



CURRENT PROGRAMS



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*
- **Clean, Affordable, and Resilient Energy Systems (CARES) for Socially Vulnerable and At-Risk Communities**, *K. Davis*
- **Photonic Curing of Copper Contacts**, *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*
- **Quantifying and Valuing Fundamental Characteristics and Benefits of Floating Photovoltaic Systems**, *C. Kettles, M. Matam*
- **Secure and Resilient Operations Using Open-Source Distributed Systems Platform (OpenDSP)**, *W. Sun*



Current DOE-Funded Collaborative Partnerships



U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

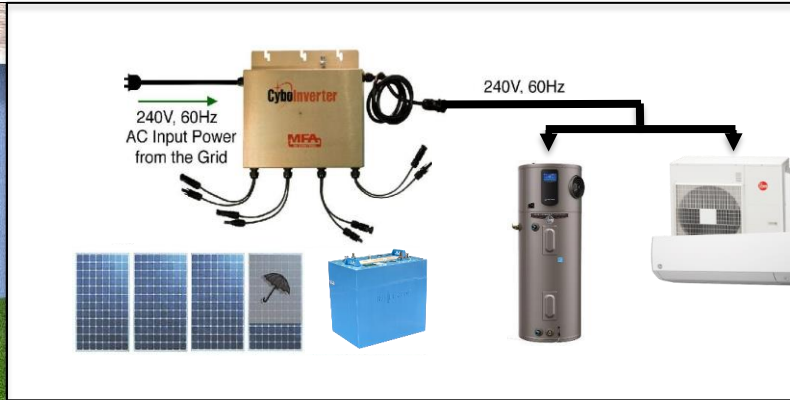
Buildings Technology Office

- **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
- **Equitable Mobility Powering Opportunities for Workplace Electrification Readiness (EMPOWER)**
C. Kettles
- **Energy Codes: Comparing Performance in a Changing Technological Environment**
P. Fairey
- **EnergyPlus Software Development and Technical Assistance**
L. Gu
- **Building Intelligence with Layered Defense Using Security-Constrained Optimization and Security Risk Detection (BUILD-SOS): A Probabilistic Approach**
Q. Sun



- **Updating AGDF Model Costs and Equipment for the Associated Gas Distributors of Florida** | Associated Gas Distributors of Florida | EOC: 12/31/2024 | R. Raustad
- **SunSmart Schools E-Shelter Maximization Project – Phase 1** | Florida Department of Agriculture and Consumer Services (FDACS) | EOC: 6/30/2024 | C. Kettles
- **Lab and Field Evaluation of Condensation Potential in Buried Ducts in Vented Attics Located in the Hot and Humid Climate Zones** | Owens Corning | EOC: 4/30/2024 | J. Sonne
- **Reimagining HVAC for New Manufactured Housing** | Slipstream | EOC: 6/30/2024 | D. Chasar
- **DRIVE (Developing Replicable, Innovative Variants for Engagement) for EVs in the USA** | Clean Fuels Ohio | EOC: 12/31/2024 | C. Kettles

- **Long-term Outdoor PV Evaluations** | Sandia National Laboratories | EOC: 9/30/2024 | H. Seigneur
- **Development of RESNET Building Registry XSD Schema Version 3** | Residential Energy Service Network, Inc (RESNET) | EOC: 12/31/2023 | P. Fairey
- **Demonstration of Integrated Hydrogen Production and Consumption for Improved Utility Operations** | Orlando Utilities Commission | EOC: 12/31/2024 | J. Fenton
- **Benchscale Methanol Synthesis Process Development & Testing** | M2X Energy | EOC: 12/29/2024 | N. Muradov
- **Flexible Load Adaptation Training (FLAT) for Energy Services Professionals** | The Association of Energy Services Professionals (AESP) | EOC: 5/31/2024 | C. Kettles
- **Equitable Mobility Powering Opportunities for Workplace Electrification Readiness (EMPOWER)** | U.S. Department of Energy | EOC: 6/30/2025 | C. Kettles



- PV GEMS: PV-Powered, Grid-Enhanced Mechanical Solution
- \$4.4M (\$3.6M + \$885k cost share)
- Focus is on manufactured housing application.
- Planning demonstrations in occupied homes in MA, CO, TX, OR, NC and GA.
- Currently constructing demonstration system prototype.

PI's: Eric Martin and Carlos Colon

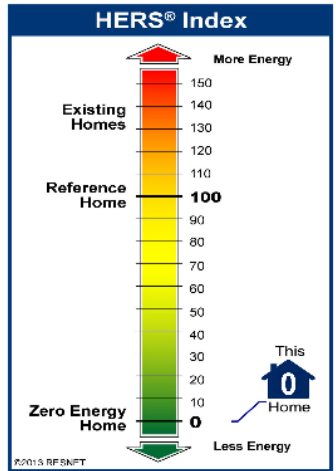
Partners:



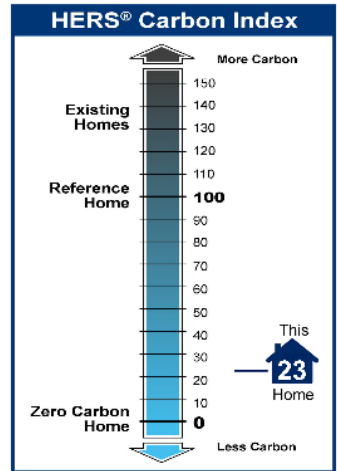
Getting to Zero

- Net Zero Energy IS NOT Net Zero Carbon
- Greenhouse gas emissions from electricity are quite dependent on the time of day and time of year that electricity is used.
- Principal Investigator: Philip Fairey

HERS INDEX SCORE | 0 ANNUAL SAVINGS | \$2450 HERS CARBON INDEX SCORE | 23



	This Home	Reference Home	Savings
Annual Energy Cost			
Electricity	\$1157	\$2447	\$1290
Natural Gas	\$0	\$0	\$0
LPG	\$0	\$0	\$0
Fuel Oil	\$0	\$0	\$0
On-Site Power	-\$1160	\$0	\$1160
Annual Energy Use			
Electricity (kWh/y)	9723	20564	10841
Natural Gas therms/y	0	0	0
LPG (gal/y)	0	0	0
Fuel Oil (gal/y)	0	0	0
On-Site Power (kWh/y)	-9746	0	9746
Annual Emissions			
CO2 (tons/y)	1.43	6.37	4.94
SO2 (lb/y)	-0.02	15.55	15.57
NOx (lb/y)	-0.01	12.85	12.86



HERS and RESNET are Trademarks of Residential Energy Services Network, Inc. www.resnet.us

EnergyGauge is a Trademark of the Florida Solar Energy Center www.fsec.ucf.edu

RC2021_6-6kW-elec_2400sf-2sty_Atlanta
 TMY: GA_ATLANTA_HARTSFIELD_INTL_AP | Design City: GA, ATLANTA_HARTSFIELD_INTL_AP

Philip Fairey 9999999
 Certified Rater I.D. Number

Signature Date 1/1/2016

The Home Energy Rating Standard Disclosure for this home should be provided. If not or if there are other questions please contact the Quality Assurance Provider: Florida Solar Energy Center | 1679 Clearlake Road, Cocoa, Florida 32922-5703 | Phone: (321)638-1492 e-mail: engauge@fsec.ucf.edu | www.energygauge.com/usares



Energy-Efficient Florida Residential HVAC

Energy Use

Rebates

SEER2

CO₂ Reduction

Ductless



Tax Credits

Selling

Efficiency

Humidity

Proper Placement

Sponsored by



FREE Live Webinar Series (6)

<https://courses.energyresearch.ucf.edu/hvac/>





FSEC[®] Live Webinars: 8th Edition (2023) Florida Energy Conservation Code

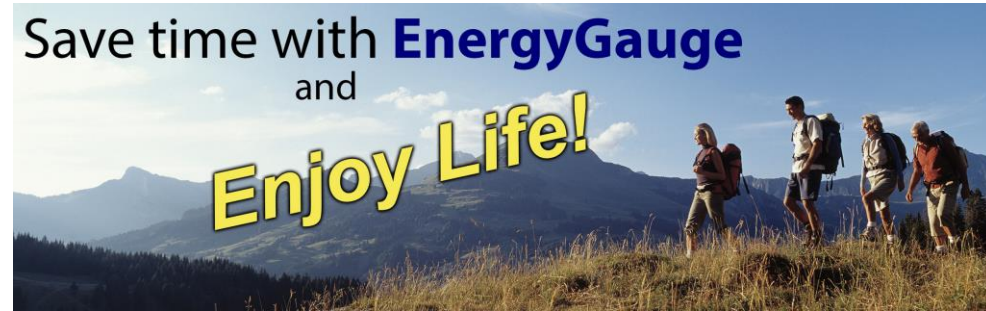
**Register now for November 29 & 30 classes! Last chance before
2023 energy code changes take effect.**

Explore all of FSEC's continuing education courses at

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



- EnergyGauge software updated
- Accredited by FBC



Challenges for Florida Government Buildings: Energy Efficiency and On-site Solar Energy

- Local Governments
 - 67 County, 411 Municipal, 95 School, >1,800 special districts
- Long-run federal financial assistance is substantially increasing
- More governments are motivated to find ways to increase sustainability
- Quality building energy auditing and analysis expertise is missing piece



- **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
 - Create replicable process
 - Provide technical assistance on sustainable energy improvement
 - Perform Measurement and Verification (M&V)
 - Create best-practices manuals
 - Principal Investigator: Chuck Withers





SunSmart Schools Emergency Shelter Program

2010-2014

- Funded by American Reinvestment and Recovery Act (ARRA), through FEO – \$10M

2019-Present

- 118 schools inspected
- 107 schools received new batteries
- Over \$2M from FDACS to make upgrades



Florida

SOLAR ENERGY

Apprenticeship  Program



Solar Energy Technician

- First solar apprenticeship program in the country registered with the US Department of Labor
- FSEC and FlaSEIA partnership
- FSEC producing online training and building hands-on lab facilities
- Ten apprentices currently enrolled



<https://florasolarapprentice.com/>





Solar Jobs, 2022

12,267



Jobs Added, 2022

506



% Growth, 2022

4.3%



State Ranking for Solar Jobs

2



State Ranking for Solar Jobs Per Capita

28



Projected Growth, 2023

8.2%



5-Year Growth, 2017-2022

42.8%

Source: <https://irecusa.org/florida-solar-and-clean-energy-jobs/>



Installation & Project Development

8,693



Manufacturing

1,206



Wholesale Trade & Distribution

1,005



Operations & Maintenance

1,065



All Others

299

Source: <https://irecusa.org/florida-solar-and-clean-energy-jobs/>

Florida is now adding more solar power than any other state

Sorry, California and Texas! Florida zoomed to the No. 1 spot for solar installations in the first half of 2023, despite a decidedly mixed policy landscape.

15 September 2023



<https://www.canarymedia.com/articles/solar/florida-is-now-adding-more-solar-power-than-any-other-state>

- “The Sunshine State connected 2,499 megawatts of solar-generation capacity to the grid during the first half of 2023, blowing away the 1,648 megawatts added by California and the 1,292 megawatts added by Texas, according to the most recent U.S. Solar Market Insight report from the Solar Energy Industries Association and energy consultancy Wood Mackenzie.”



- **Extreme Heat Guides:**

- Landscaping to Reduce Cooling Load
 - <https://basc.pnnl.gov/resource-guides/landscaping-reduce-cooling-load>
- Emergency Air Conditioning and Food Refrigeration
 - <https://basc.pnnl.gov/resource-guides/emergency-air-conditioning-and-food-refrigeration#edit-group-scope>
- Creating a Cool Room for Extreme Heat Events
 - <https://basc.pnnl.gov/resource-guides/creating-cool-room-extreme-heat-events>
- Cool Roofs and Walls to Reduce Heat Gain
 - <https://basc.pnnl.gov/resource-guides/cool-roofs-and-walls-reduce-heat-gain#edit-group-scope>
- Reducing Solar Heat Gain through Windows and Skylights
 - <https://basc.pnnl.gov/resource-guides/shading-and-solar-control-windows-and-skylights>
 - <https://basc.pnnl.gov/resource-guides/window-attachments-solar-control-and-energy-efficiency>

<https://basc.pnnl.gov/information/extreme-heat-overview>

SOLVE THE FLARING PROBLEM AND MONETIZE TRADITIONALLY UNECONOMIC GAS STREAMS

MISSION

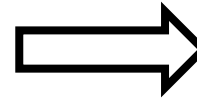
“Stopping flaring and venting is the single most impactful measure that can be taken to reduce methane emissions from the energy industry’s operations.”

– IEA 2023

- Methane capture and conversion to liquid methanol
- 16K flare sites globally

- Crude methanol characterizations

FOAK field test in ND



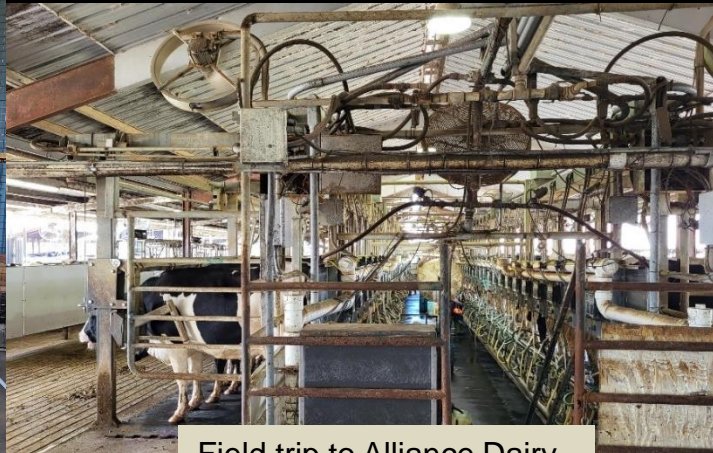
Sample shipped to FSEC for composition analysis and electrolysis study



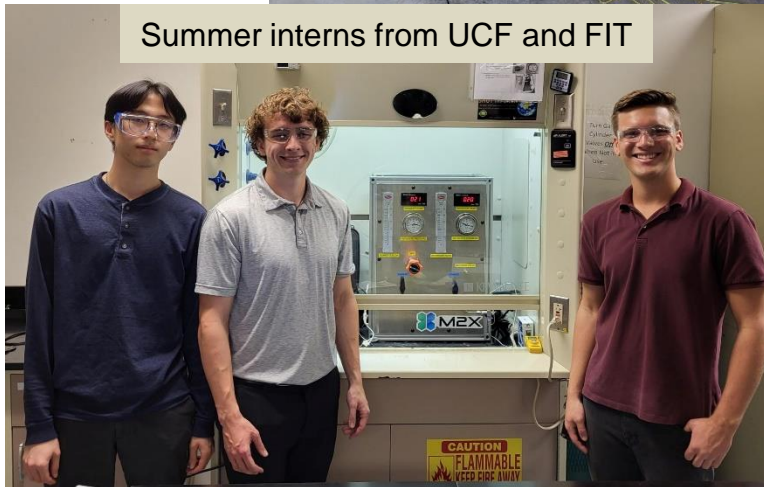
Catalytic oxidation
for tailgas treatment



M2X Energy



Summer interns from UCF and FIT

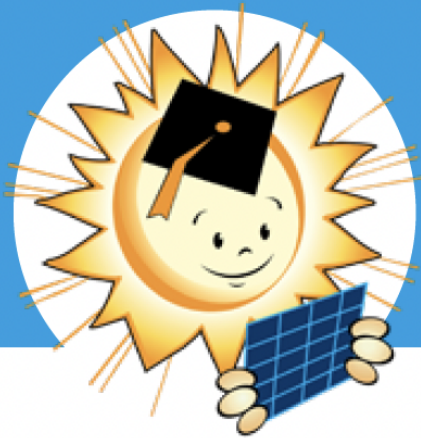


Field trip to Alliance Dairy
Biogas to RNG case study



EVENTS & NEWS





FSEC's EnergyWhiz

**Empowering Student Innovation
for a Clean Energy Future**

Sponsored by



EnergyWhiz is a celebration of student ingenuity, where K-12th graders showcase their renewable energy projects.



FSEC®
1679 Clearlake Rd
Cocoa, FL 32922

On-site @ FSEC: April 20, 2024

We Appreciate Our Volunteers!





- Middle School Science Bowl @ FSEC: **February 24, 2024**
- Regional competition open to all Florida middle schools
- **In need of volunteers and sponsorships**
- \$1000 sponsorship will cover all the costs for this event: Trophies, Medallions, Lunch for the students, teachers and volunteers
- Benefits:
 - Opportunity to speak to the students, parents and coaches at the event
 - Verbal and written acknowledgement as the key sponsor
 - Acknowledgement in the printed program distributed at the National event.
- Team from our regional event gets an all-expenses-paid trip to compete in the national event near Washington, D.C.
- Contact Susan Schleith for more info: susan@fsec.ucf.edu, 321-638-1017



Partnership
with FSEC



- **Inaugural Class of Residential Energy Services Network (RESNET®) Recognition of Women Pioneers in HERS® Industry**
 - Tei Kucharski
 - One of 20 women recognized



Tei Kucharski

Program Coordinator of
RESNET® Rating
Provider Energy Gauge
and member of
RESNET® Standards
Development Committee
200

- **Florida Solar Tax Credits, Incentives and Rebates**
<https://www.marketwatch.com/guides/solar/florida-solar-incentives/>
- **Florida fails to ask for federal funds to help poor people buy solar panels**
<https://floridaphoenix.com/2023/11/02/florida-fails-to-ask-for-federal-funds-to-help-poor-people-buy-solar-panels/>
- **Navigating the wild west of home solar power**
<https://www.wftv.com/news/action9/navigating-wild-west-home-solar-power/HWYM23WNGNBAPHVLY37AGYEXAE/>

Florida fails to ask for federal funds to help poor people buy solar panels

Was the failure on purpose? Or did some clown in Tallahassee drop the ball?



NOVEMBER 2, 2023 7:00 AM



MarketWatch Guides Solar

Florida Solar Tax Credits, Incentives and Rebates (November 2023)

Florida residents can take advantage of multiple solar incentives in the state, from the federal tax credit to property and sales tax exemptions.

Enter ZIP Code

Get My Free Quote

NEWS WEATHER EYE ON THE TROPICS VIDEO 9 INVESTIGATES ACTION 9

Updated: Nov 01, 2023



Written by Leonardo David Solar Writer

Florida has ranked among the...

WFTV 9

BREAKING NEWS | Woman shot by Ormond Beach police after charging...

ACTION 9

Navigating the wild west of home solar power



By Jeff Deal, WFTV.com

November 03, 2023 at 6:35 pm EDT

- **The Truth About the Future of Energy**
<https://www.ucf.edu/news/the-truth-about-the-future-of-energy/>
- **Floridians shouldn't have to choose between insuring their homes or having solar panels**
<https://www.tampabay.com/opinion/2023/06/10/floridians-shouldnt-have-choose-between-insuring-their-home-or-having-solar-panels-column/>
- **Is solar energy the solution to saving? Here's what you need to know.**
<https://www.clickorlando.com/news/local/2023/06/15/is-solar-energy-the-solution-to-saving-heres-what-you-need-to-know/>

SCIENCE & TECHNOLOGY

The Truth About the Future of Energy

It sounds like the tagline of a commercial: Renewable, affordable and better for the environment.

By Robert Stephens | May 26, 2023



OPINION | Guest Column

Heaven Campbell,
Angel Conlin

Floridians shouldn't have to choose between insuring their home or having solar panels | Column

Some homeowners worry that installing rooftop panels may make their homes more expensive to insure — or worse, not insurable at all. There's a better way.



The screenshot shows a news article from a website. The top navigation bar includes links for NEWS, WEATHER, NEWS 6+, GETTING RESULTS, TRAFFIC, FEATURES, SPORTS, WWMG, NEWSLETTERS, and a LIVE indicator. The article title is "Is solar energy the solution to saving? Here's what you need to know". Below the title is a sub-headline: "There's a big up front cost, but also tax credits". The article is by Lisa Bell, Anchor, published on June 15, 2023 at 1:51 PM, and updated on June 16, 2023 at 9:07 AM. Tags include Investigators, Solar Energy, Getting Results, Environment, Science, and Consumer. There is a sign-up form for newsletters with the text "Enter your email here!". At the bottom, there is a video player showing a news anchor and a guest, with a caption "GOING SOLAR OR NOT? ST. CLOUD, OSCEOLA COUNTY".

- **Emily Rawley**, Academic Support Coordinator II, Workforce & Business Development
- **Tabby Moye**, Contacts and Grants Specialist II, SET
- **Vanessa Aycart**, Maintenance Tech III, Facilities
- **Manjunath Matam**, Assistant Professor, Solar & Energy Systems Integration
- **Yifan Wang**, Assistant Professor, Special Projects
- **Andrew Ballen**, GRA (Mengjie Li), Solar & Energy Systems Integration
- **Shishir Singh**, GRA, Buildings Research
- **Luis Hernandez Babilonia**, Manager, Facilities
- **Angela Messer**, FSEC Training Specialist I, Buildings Research [starts Dec.]
- **Arnaldo Velez**, HVAC II, Facilities [starts end of Nov.]

UCF Undergrads

- **Nadia Khan**, Solar & Energy Systems Integration
- **Brent Thompson**, Solar & Energy Systems Integration
- **Alejandro Aparcedo**, Solar & Energy Systems Integration [starts 11/13]

Buildings

- Post-Doc – Readvertising
- Assistant In, (simulation) – In contract stage
- Admin Asst III – Interviewing

Hydrogen

- Assistant Research Professor, (process analysis)

Solar & Energy Systems Integration

- Two Assistant Research Professors (floating solar, durability)

Communications

- Information Specialist

Facilities

- Maintenance Technician I

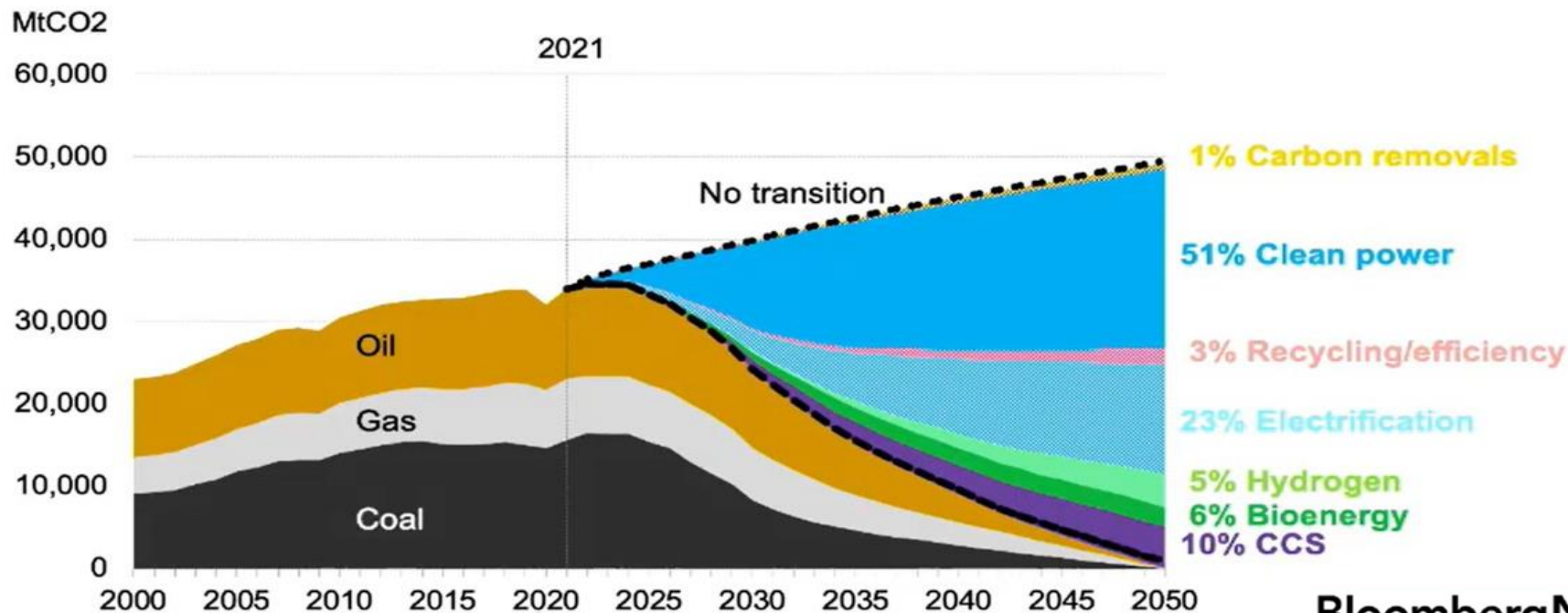
SUSTAINABILITY GOAL PARTNERSHIPS



Possible Paths to Net Zero Emissions by 2050

Clean power and electrification are the main drivers of emissions abatement

CO2 abatement by technology/type, Net Zero Scenario

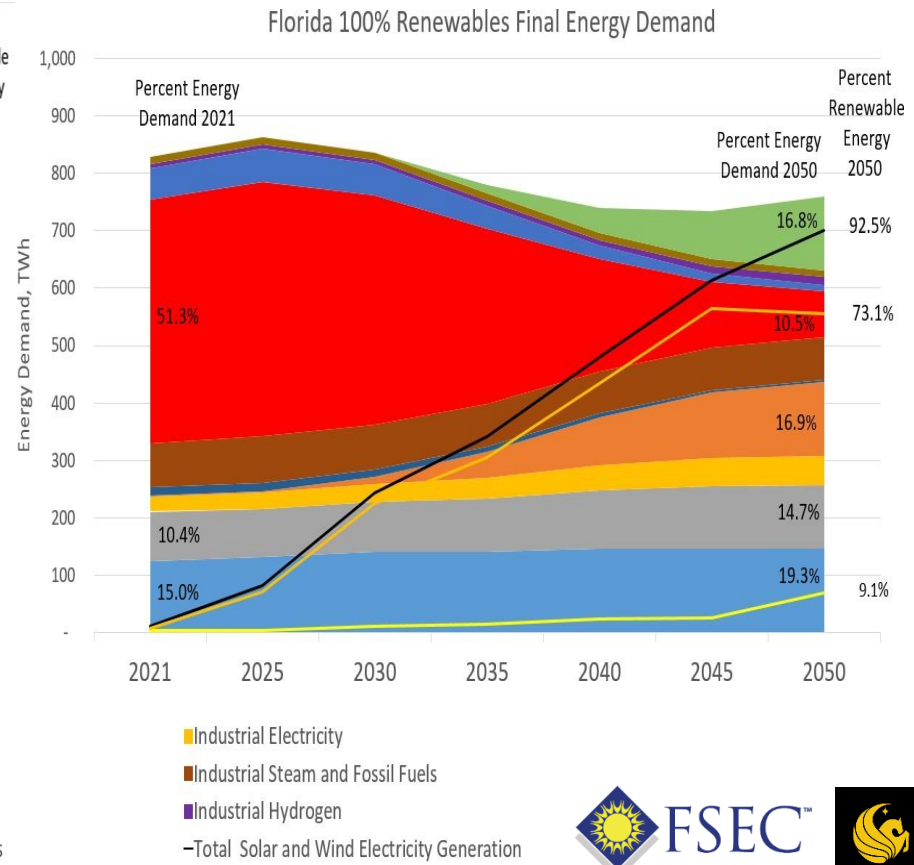
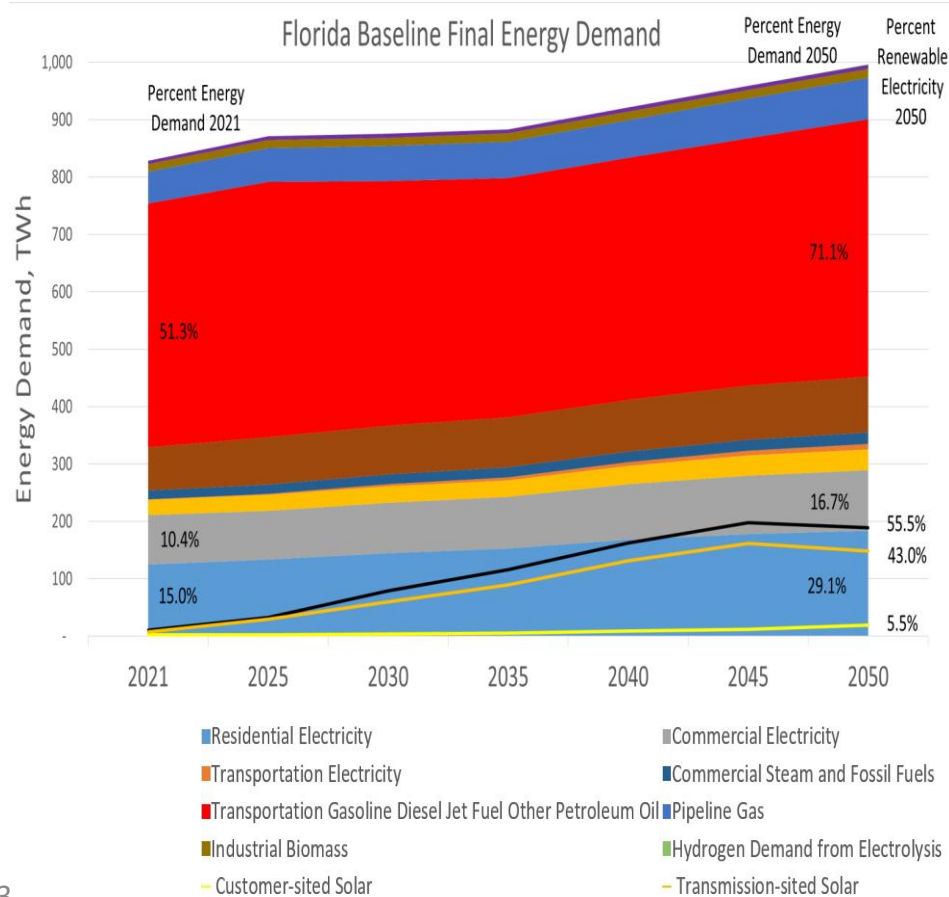


Source: BloombergNEF. Note: Abatement also includes fuel switching and other abatement technologies.

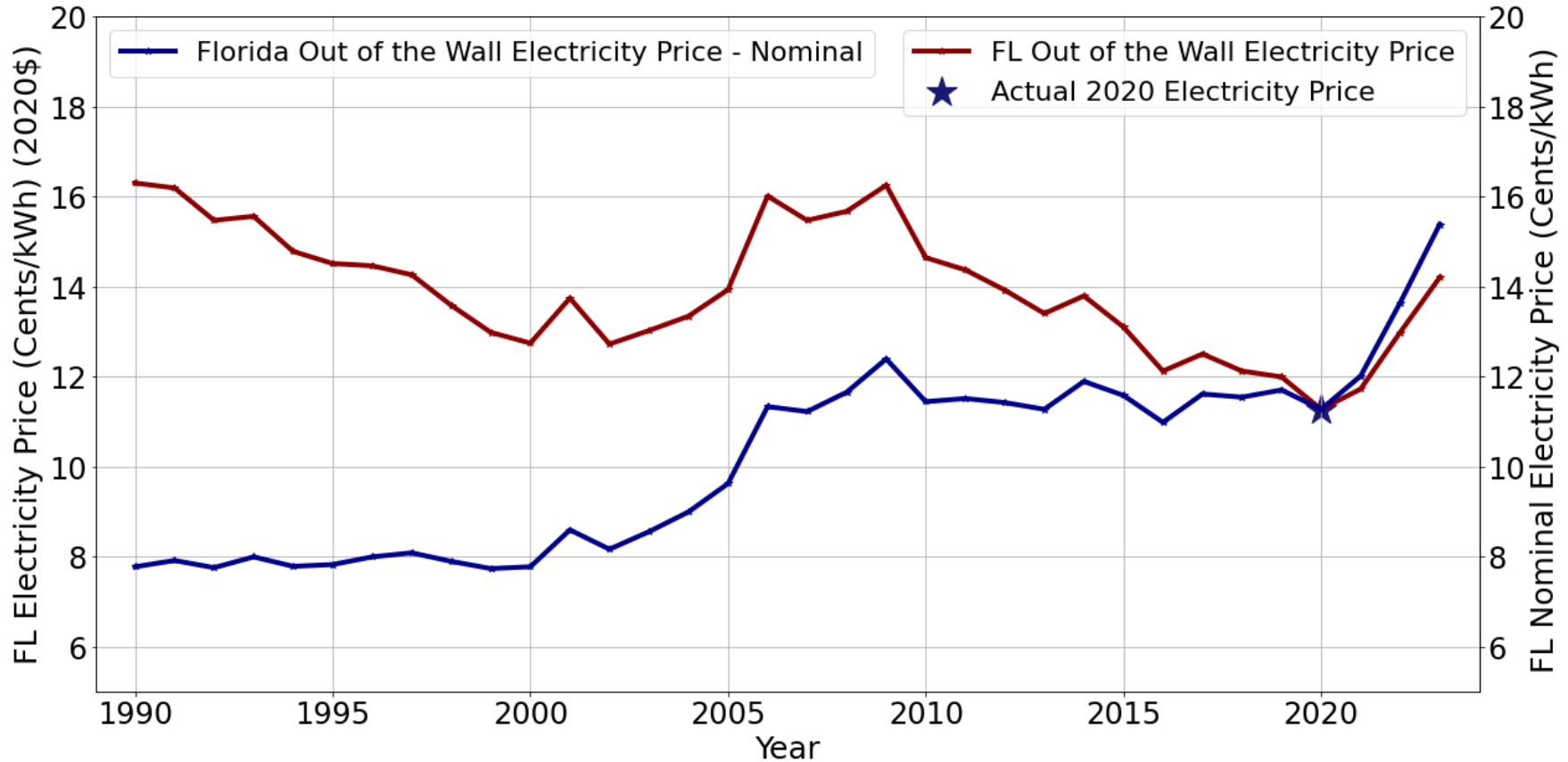
BloombergNEF

BNEF Summit San Francisco 2023

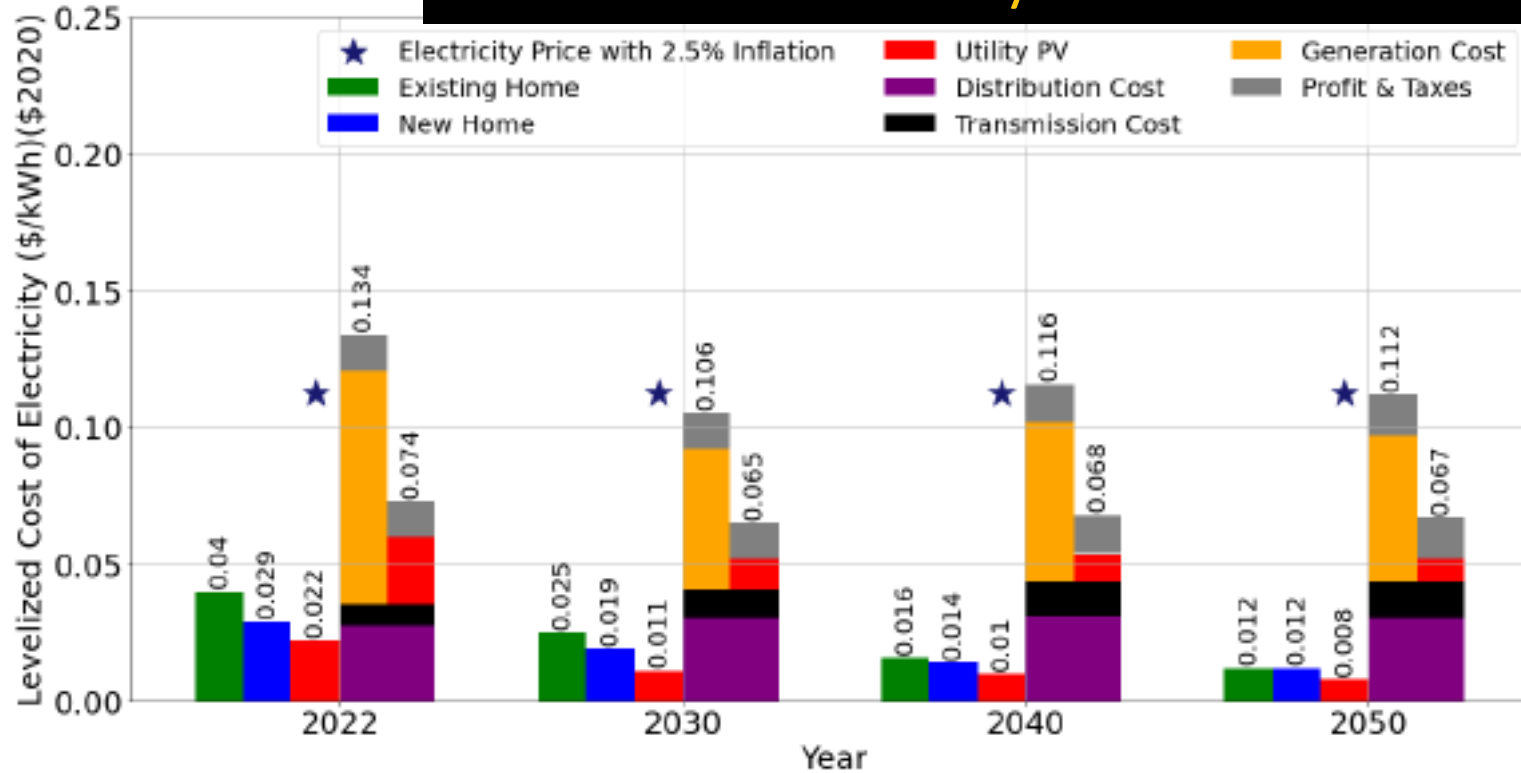
Florida Energy Demand



Florida Residential Electricity Prices

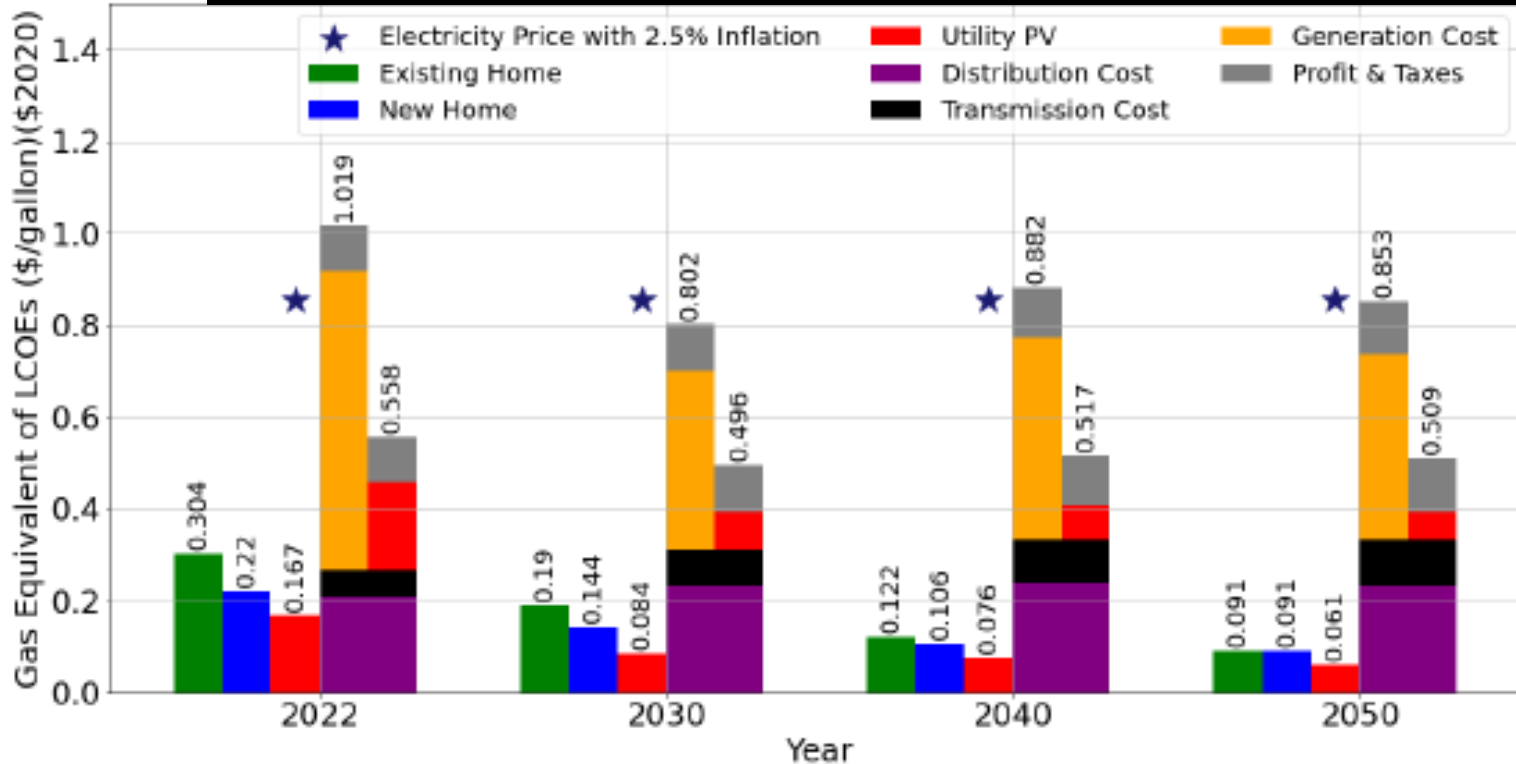


Residential and Utility Solar – Florida Electricity



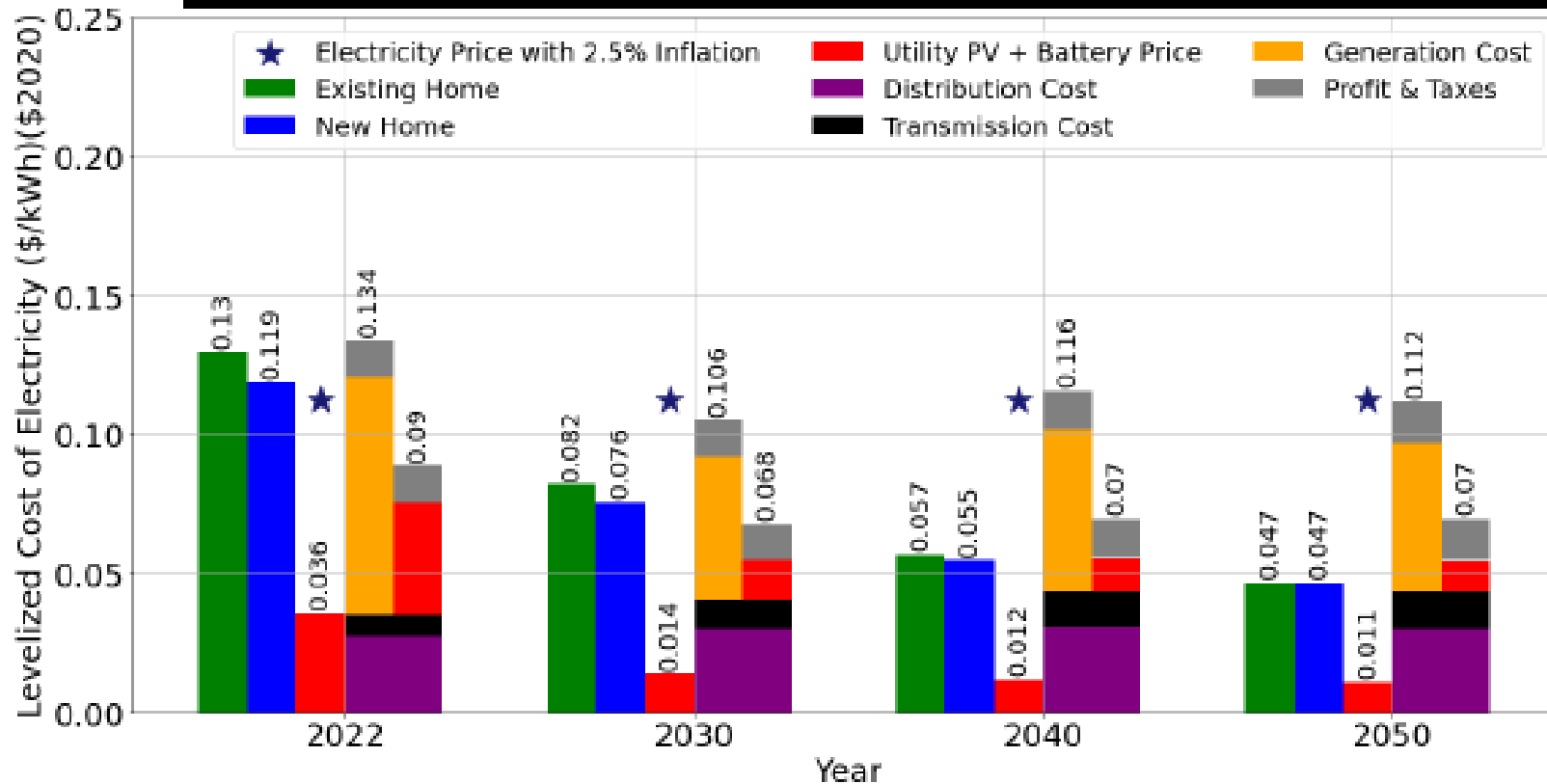
Florida Levelized Cost of Electricity; Two Residential PV Homes, Utility PV, and Residential Electricity "out of the wall," with 30% Federal Income Tax Credit Applied to Residential and Utility PV.

Residential and Utility Solar – Florida Gasoline Equivalent



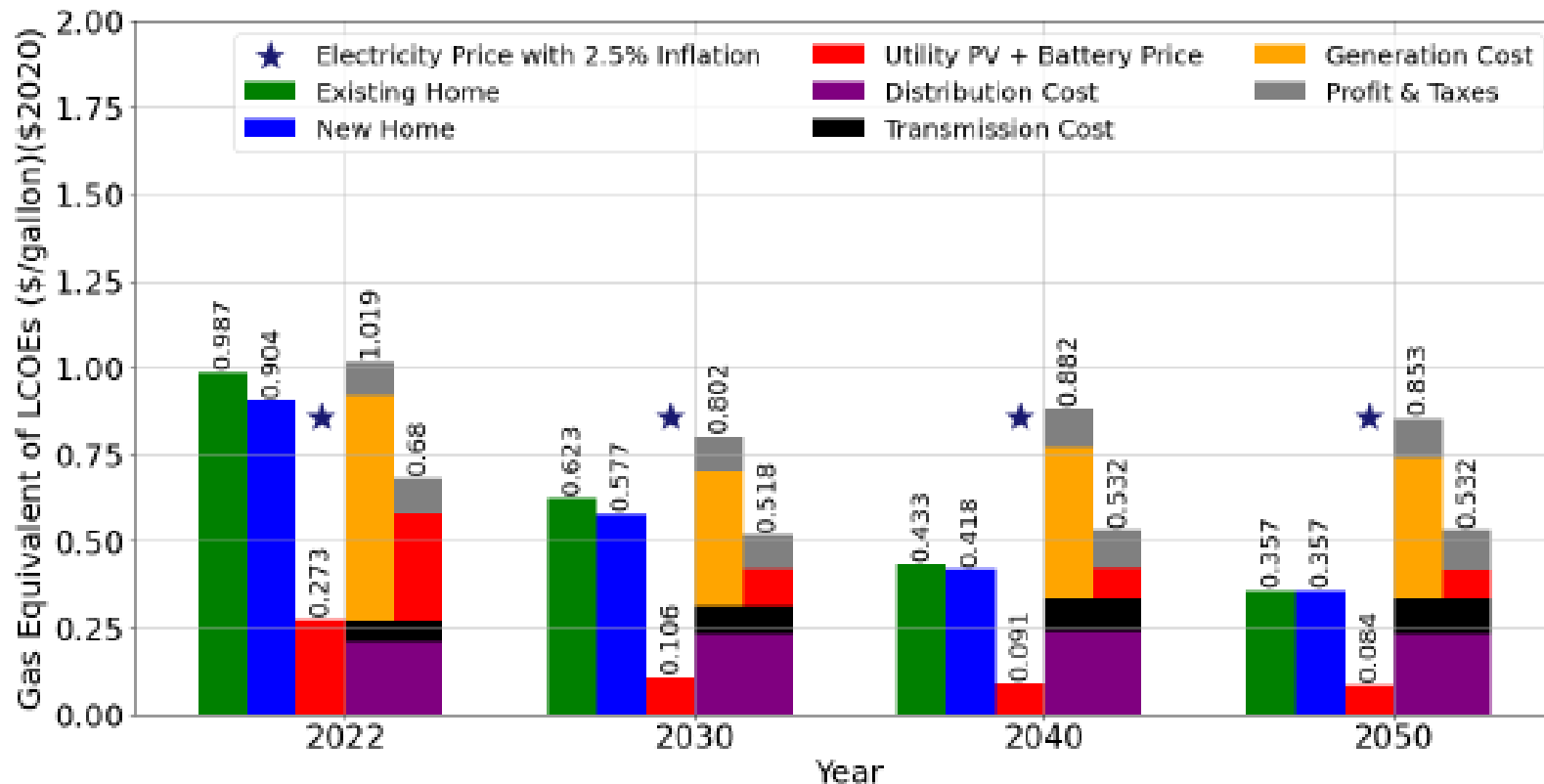
Gas Equivalent of LCOEs (\$/gallon) for PV Only Scenario with 30% PV ITC. EV range 220 miles, 68.7 kWh battery capacity (3.2 miles/kWh). Gasoline car 24.2 mpg.

Residential and Utility, Solar + Battery – Florida Electricity



Utility PV + Battery (4-hour) "out of the wall" Cost of Electricity, with the 30% Federal ITC for PV and Battery.

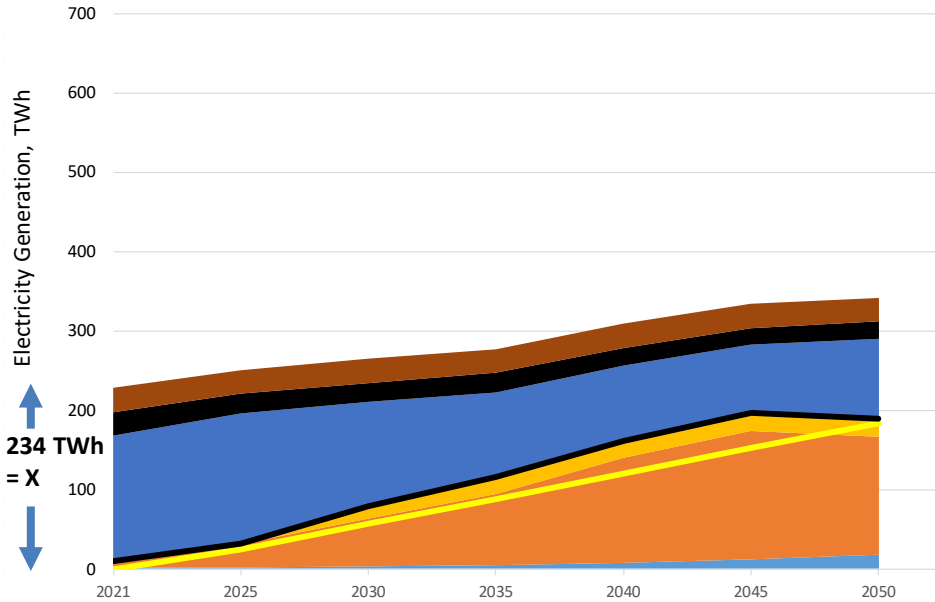
Residential and Utility, Solar + Battery – Florida Gasoline Equivalent



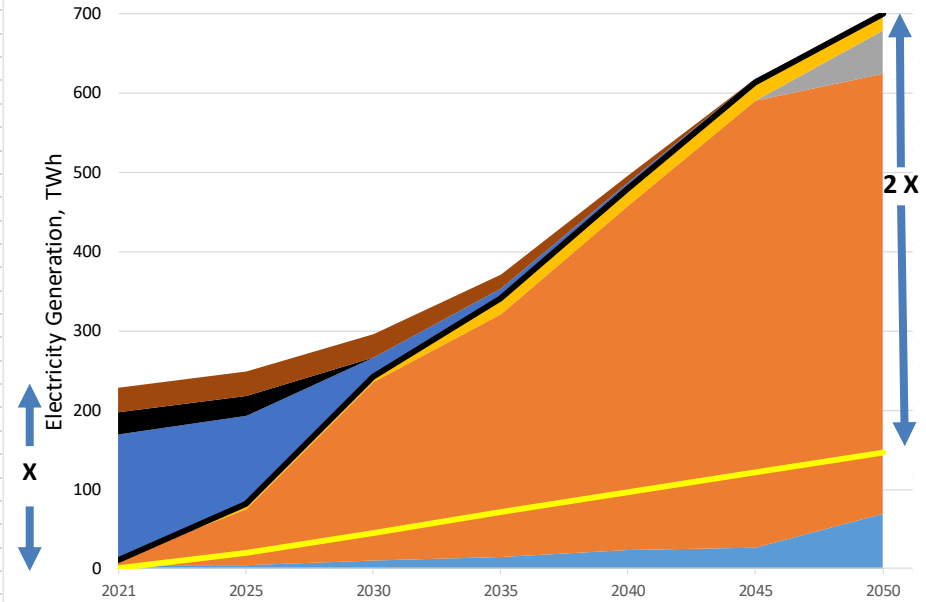
Gasoline Equivalent of LCOEs (\$/gallon) for PV+Battery Scenario with 30% PV and Battery ITC.

Florida Electricity Generation

Florida Baseline Electricity Generation



Florida 100% Renewable Electricity Generation



Customer-sited Solar

Transmission-sited Solar

Offshore Wind

Onshore Wind

Gas

Coal

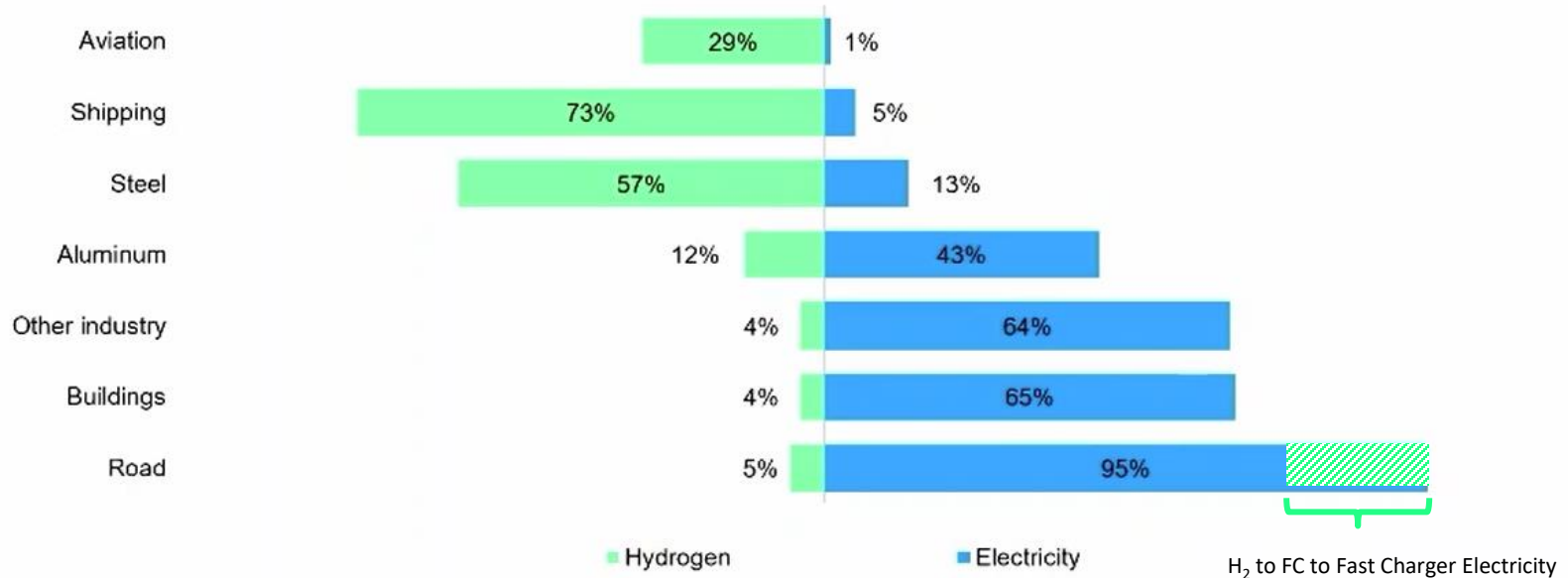
Nuclear

Possible 100% solar residential electricity by 2050

Total Solar and Wind Electricity Generation

Renewable Hydrogen and Electricity will generally not compete

2050 final energy demand by sector, Net Zero Scenario



Source: BloombergNEF New Energy Outlook 2022