



# FLORIDA SOLAR ENERGY CENTER®

*Creating Energy Independence*



***Dr. James Fenton, Director  
December 12, 2014***

A Research Institute of the University of Central Florida

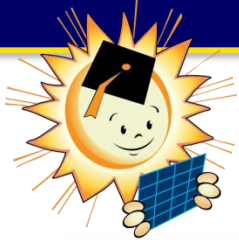


# UCF's FSEC Leads in Energy



**FEEDER** Foundations for Engineering Education  
for Distributed Energy Resources





# EnergyWhiz Olympics & Expos



**Hydrogen Challenge**



**Energy Innovations**



**Junior Solar Sprint**



**Bright House Solar Energy Cookoff**



**Critter Comfort Cottage**



**Electrathon**

FSEC Research



Curriculum Development, Professional Development  
Student Outreach

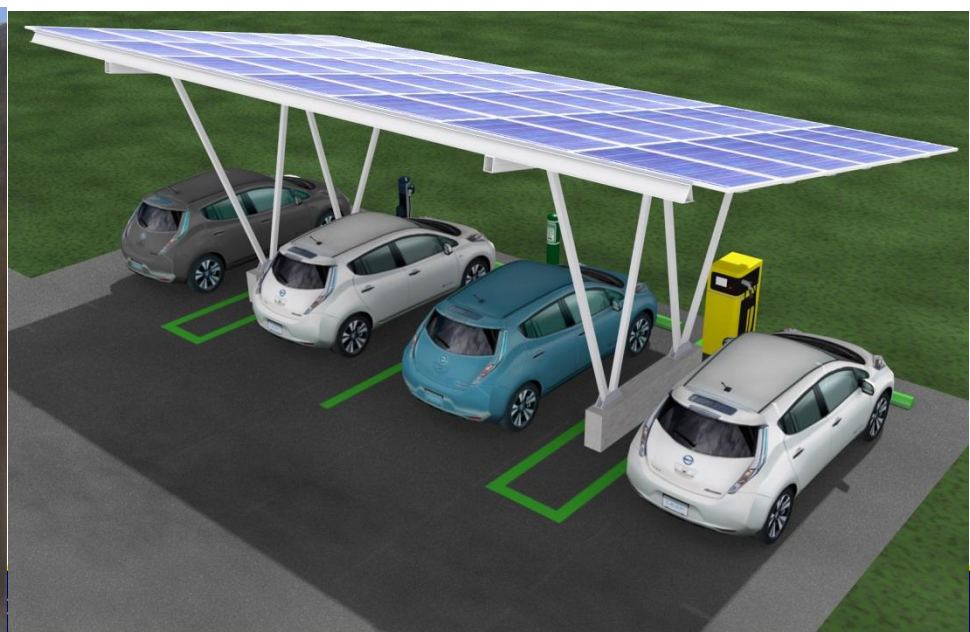
# Buildings – Code and Above Code Programs Changing Landscape



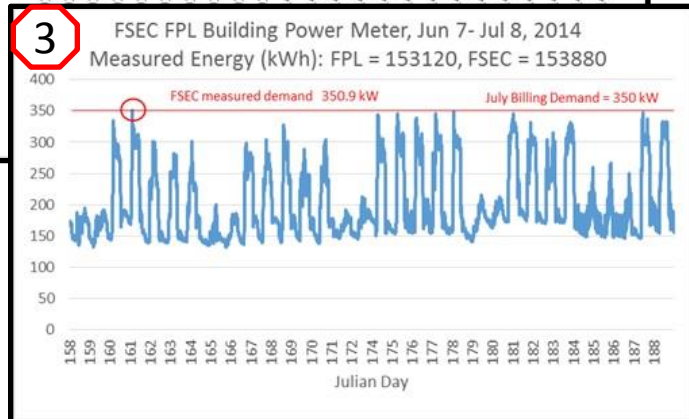
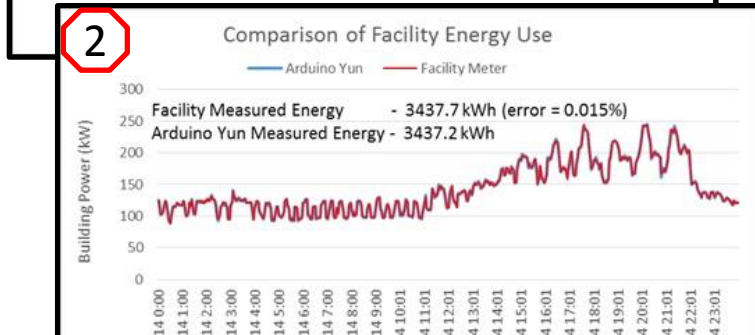
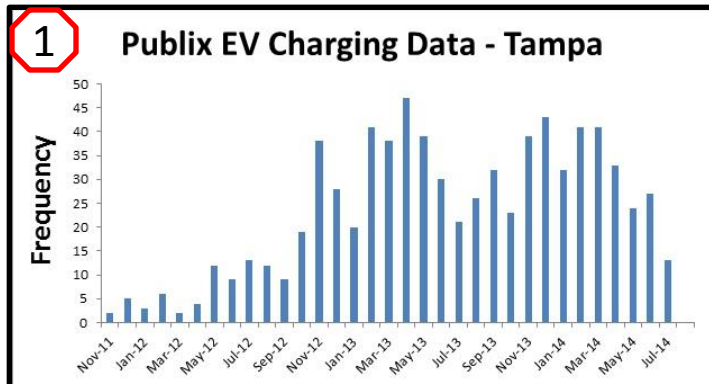
- New Codes and Programs Require Mechanical Ventilation Solutions
  - researching control mechanisms to reduce moisture and energy impacts
  - FSEC with Department of Building Regulation funding – starting project to determine issues and performance of residential systems installed during last ten years; also evaluating appropriate commercial code credit for ERVs
  - EnergyGauge Software – allowing more options for mechanical ventilation systems and controls in residences



1. EVTC Student Day at Tuskegee University on November 7, 2014.
2. Nissan Fast Charging Station installation at FSEC.
3. EVTC laboratory at FSEC - grid to load to vehicle communication.
4. Development of EV wireless laboratory. (w/ Utah State University).
5. Monitoring FSEC's office building power, EV charging & FSEC's PV.



# EVTC Data Collection, Reduction, and Analysis



1. Analysis of Publix EV Charger Data
2. Verification of Measured EMS Data
3. FPL Utility Meter Data Comparison
4. Historic Literature Review of FCV Data





# Unwind and Plug-in



## Why your next car should be an electric vehicle



### Put money back in your pocket

Electricity is cheaper than gasoline per mile. And fewer moving parts mean less maintenance and repairs, saving you money to spend on the things that matter most to you.



### Fuel up the American way

Help reduce foreign oil consumption by switching to vehicles fueled by electricity, which is made largely from domestic sources of energy.



### Help preserve Florida's natural beauty

Going electric helps preserve Florida's environment now and for the future.



### Enjoy the ultimate convenience

Fuel your car at the most convenient place of all—your home! This means more time spent doing what you enjoy



### Be an innovator

Lead the way, challenging the latest in electric vehicle

## New & Events

Florida's six **National Drive Electric Week** events in September reaped roughly 3,500 attendees, 200 plug-in vehicles (owners and dealers alike), and over 625 test drives!



Find a charging station near you.



Did you know?

Most people drive less than

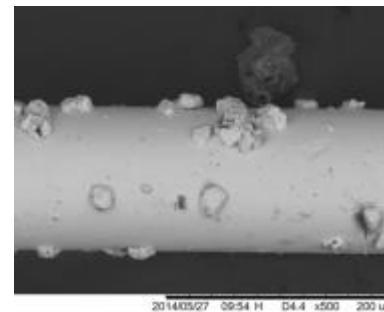
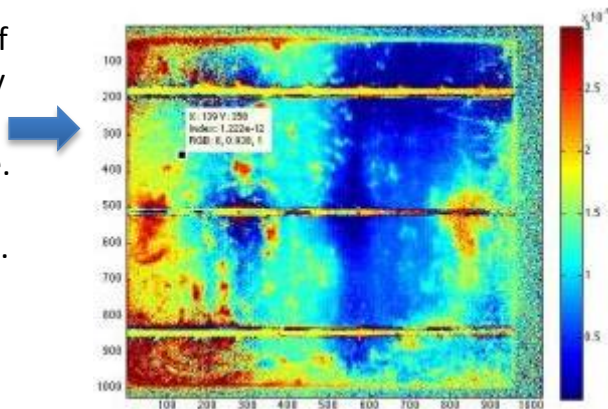
**40**

miles per day – well within the range of today's electric

# U.S. Photovoltaic Manufacturing Consortium (PVMC)

- PVMC – 6 year program out of the DOE’s SunShot program
  - Program goal is to promote U.S. manufacturing through industry-led collaborative R&D throughout the entire PV manufacturing supply chain
  - Currently end of year 3
- FSEC/UCF is leading the \$10M c-Si component of the PVMC
- c-Si PVMC Program Areas
  - Feedstock and Wafering: Si purification, crystal growth, slicing Si ingot/bricks into wafers
  - c-Si Metrology: Measurements anywhere in the manufacturing process (ingot to module) can be investigated to improve US manufacturing

Saturation current map of a c-Si solar cell created by UCF graduate student using photoluminescence. Red areas indicate high recombination (high loss).



Diamond wire for sawing silicon wafers. Diamond particles are plated onto a steel wire using nickel

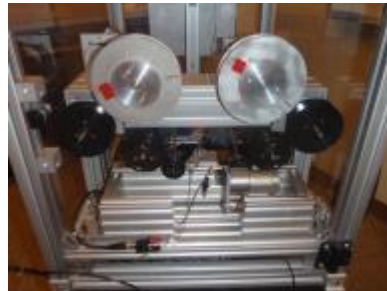




# c-Si PVMC Program Highlights

- Program activities expanding
  - 2014 had 4 projects planned and completed
  - 2015 has 14 projects planned and underway
- Information dissemination
  - >10 papers already published or submitted
  - Numerous presentations given at PV conferences
- Intellectual property (patents)
  - PVMC with Ultrasonic Technologies (Florida company) have submitted a provisional patent application for new wafering-based metrology method

All industry and university members are highly involved in collaborative projects



Prototype tool  
to test IP

- UCF/FSEC infrastructure improvement (next slide)
  - Solar simulator obtained and placed at FSEC for high efficiency technology
  - New metrology lab created for materials and device measurements



# Regional Test Centers

Supporting the DOE SunShot Initiative by helping accelerate technological evolution in the energy sector and increasing PV deployment



Crystalline Silicon Technologies

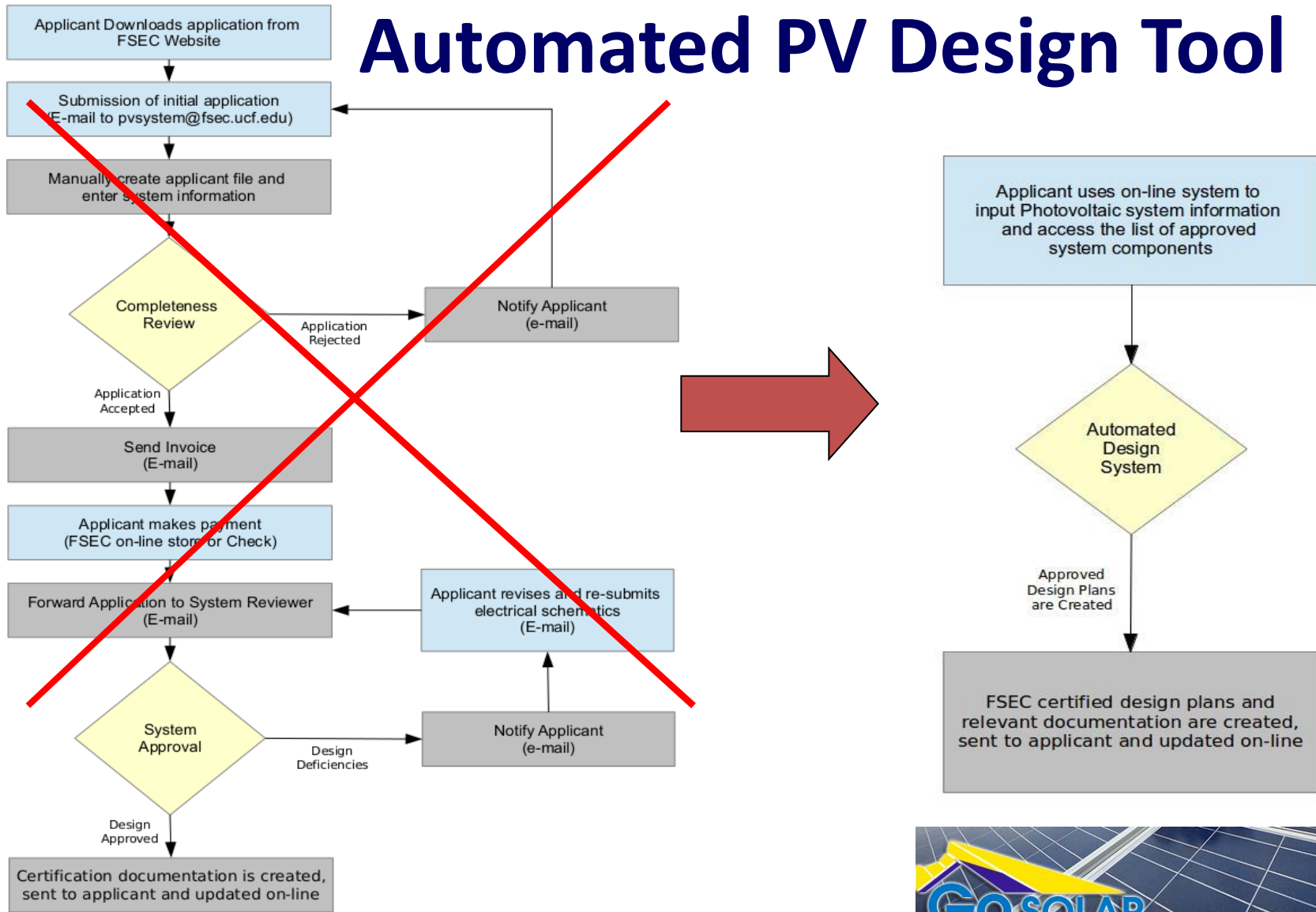


Thin Film Technologies



# Go SOLAR Florida

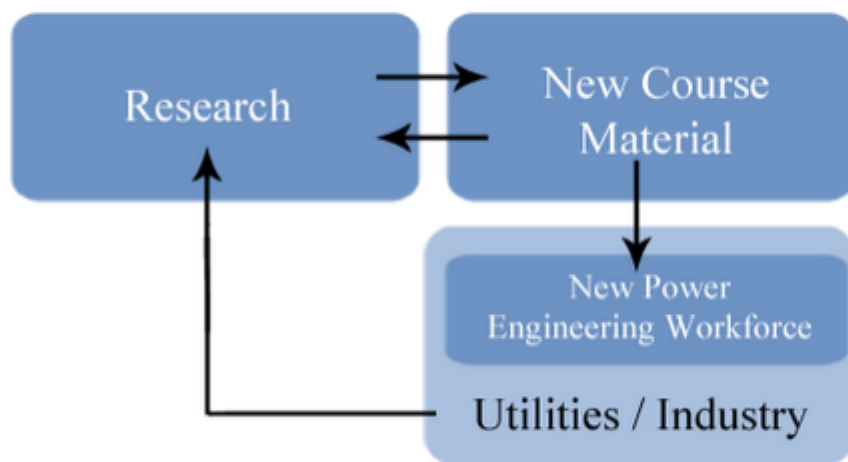
## Automated PV Design Tool



# FEEDER Foundations for Engineering Education for Distributed Energy Resources

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## EDUCATION & TRAINING



### ACTIVITIES AND OUTCOMES

FEEDER adopts several transformational approaches for power engineering education, including

- *Share delivery* of courses among multiple universities
- Use modern information and communications technology for *multiple delivery options*
- Provide students with *more program options and career pathways*
- Implement course, credit, and tuition exchange agreements
- Increase student throughput per course and per program
- Better match faculty expertise with course teaching assignments

## COURSES

[Summer Short Courses @ UCF](#)

[Training Courses @ FEEDER Institute](#)