<table>
<thead>
<tr>
<th>Time</th>
<th>Agenda Item</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 a.m.</td>
<td>Welcome and Introductions</td>
<td>Dave Winslow, Chair</td>
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<tr>
<td>10:10 a.m.</td>
<td>Approval of March 3, 2017 Meeting Minutes</td>
<td>Dave Winslow, Chair</td>
</tr>
<tr>
<td>10:15 a.m.</td>
<td>Status of FSEC Programs</td>
<td>Jim Fenton</td>
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<tr>
<td>10:30 a.m.</td>
<td>Publix’s Energy Response During Hurricane IRMA Report of Florida Energy Office</td>
<td>Mike Faas, Tony Morgan</td>
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<tr>
<td>11:00 a.m.</td>
<td>US DOE’s PV Regional Test Center (RTC) Program Opportunities for Partnership</td>
<td>Laurie Burnham, RTC Program Dir., Sandia Nat’l Labs</td>
</tr>
<tr>
<td>11:30 a.m.</td>
<td>Florida Power &amp; Light Battery Technologies Showcase and Opportunities for Partnership</td>
<td>Cory Ramsel, Sr. Director FPL Development</td>
</tr>
<tr>
<td>12:00 p.m.</td>
<td>UF Solar Gators Formula Sun Grand Prix</td>
<td>Chris Komarav, Student UF</td>
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<tr>
<td>12:15 p.m.</td>
<td>Lunch (Buffet) UF Solar Gators Formula Sun Grand Prix (show and Tell)</td>
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<tr>
<td>1:05 p.m.</td>
<td>UCF Energy Update</td>
<td>Dave Norvell</td>
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<tr>
<td>1:15 p.m.</td>
<td>City of Orlando Energy Update</td>
<td>Chris Castro</td>
</tr>
<tr>
<td>1:25 p.m.</td>
<td>Development of Working Groups Update Utility and Commercial Consumers</td>
<td>Jennifer Szaro, Jim Fenton</td>
</tr>
<tr>
<td>1:50 p.m.</td>
<td>Board Business</td>
<td>Dave Winslow, Jim Fenton</td>
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<tr>
<td>1:50 p.m.</td>
<td>Date and Agenda for Next PAB Meeting</td>
<td></td>
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<tr>
<td>2:00 p.m.</td>
<td>Adjournment</td>
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Federally Funded Industrial Collaborative Partnerships

PV, EVs, Energy Efficient Buildings, Load Management, Batteries, Alternative Fuels, Hydrogen, Fuel Cells, Smart Grid Electronics, V2X, Training & Education
Education and Training Opportunities

• UCF energy focus encompasses FSEC, Facilities, two Faculty Clusters, Engineering and Science departments
• Mission of research and responsibility
• Exploring new degree and certificate offerings
• Corporate and Workforce Training
• Professional Development for Educators
Community Engagement

• STEM Enrichment
• State and Regional Expos
• Federal Funding through AEOP
• Seeking Sponsors
PV Manufacturing Research

- **P.I.:** Kris Davis
- **Funding:** $1.58 million, DOE SunShot, PVRD 2
- **Project Focus:** Development of new measurement techniques to detect and reduce contact degradation in PV modules
- **Partners:** Arizona State University, Rochester Institute of Technology, and BrightSpot Automation

https://today.ucf.edu/ucf-energy-researchers-receive-3-1-million-make-solar-affordable/
PV System Research Impacting LCOE

- **P.I.:** Joe Walters
- **Funding:** $1.6 million, DOE SunShot, PVRD 2
- **Project Focus:**
  High resolution monitoring system, Algorithm development and validation, Diagnostic and Prognostic capability, LCOE model development
- **Partners:**
  Sandia National Laboratories (PV system monitoring), NextEra Energy (parent to FPL), OSISoft (performance monitoring software), Pordis (hardware, string level monitoring), FSEC (PV system monitoring, module characterization)

https://today.ucf.edu/ucf-energy-researchers-receive-3-1-million-make-solar-affordable/
Two PVRD2 Subcontracts

• **Case Western University** Lead
  Reliability and Power Degradation Rates of PERC Models Using Differentiated Packaging Strategies and Characterization Tools

• **Brightspot Automation, LLC** Lead
  Improving Solar Panel Durability through Novel Panel Designs, Advanced Manufacturing Equipment, and Field Retrofits to Existing Systems
Unlocking the High Efficiency Potential of Bifacial Silicon Solar Cells by Advanced but Simplified Techniques

- Develop bifacial silicon solar cells with simplified but innovative manufacturing techniques targeting high conversion efficiency (>23%)
- Fast-track technology transfer through partnership with industry players:
- Exploit economic benefits in the state of Florida by creating jobs, improving energy efficiency and attracting investments.

<table>
<thead>
<tr>
<th>Source of Funding (2 Year Project)</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agency Funding</strong></td>
<td></td>
</tr>
<tr>
<td>REET, Florida Department of Agriculture and Consumer Services</td>
<td>$400,000</td>
</tr>
<tr>
<td><strong>Cost Share</strong></td>
<td></td>
</tr>
<tr>
<td>Oxford Instruments</td>
<td>$110,700</td>
</tr>
<tr>
<td>Florida Solar Energy Center (FSEC) / UCF</td>
<td>$151,981</td>
</tr>
<tr>
<td>BRIDG / ICAMR</td>
<td>$100,000</td>
</tr>
<tr>
<td><strong>Total Project Cost</strong></td>
<td>$762,681</td>
</tr>
</tbody>
</table>

**Team**
- Dr. Ngwe Zin (PI)
- Prof. Winston Schoenfeld (co-PI)
- Prof. Kris Davis (co-PI)
- Dr. Hubert Seigneur (team member)
- Ms. Sara Bakhshi (graduate student)
Baseline Indoor Air Quality Field Study in Occupied New US Homes: Hot Humid and Mixed Humid Climates

Summary: 32 homes in each of two climate regions (64 homes total) with varying house and ventilation characteristics, about half meeting ASHRAE 62.2 mechanical ventilation requirements.

Impact: Targeting the warm-humid region of the Southeastern US enables a dataset where the influence of outdoor moisture can be a focus for investigation.

Project Goals:
- Measure time-integrated and temporal profiles of humidity and contaminants of concern; monitor the use of ventilation equipment; and track activities impacting pollutant emissions.
- Characterize the prevalence, type, and installed performance of mechanical ventilation equipment in new homes; explore regional variations in system designs and performance.
- Investigate associations of indoor humidity and contaminant levels with the presence of control measures including ASHRAE 62.2 compliant mechanical ventilation.

Key Takeaway: Data for researchers to use to determine the relationships among air flows in homes indoor air quality, and indoor moisture in the hot humid and mixed humid climates.
# Integrated HVAC Control Methods for Supplemental High Efficiency Mini-Split Heat Pumps in Existing Homes

<table>
<thead>
<tr>
<th>Prime Recipient</th>
<th>EERE funds: $283.5K</th>
<th>Cost share: $31.5K (10%)</th>
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<tbody>
<tr>
<td>University of Central Florida, Florida Solar Energy Center</td>
<td>PI’s: Eric Martin, Karen Fenaughty, and Danny Parker</td>
<td>Partners: Mitsubishi and AirCycler</td>
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- **Summary:** Continue investigation of a low-cost space conditioning upgrade for existing homes using a supplemental mini-split. Enhance comfort and energy savings with integrated control strategies.
- **Impact:** Previous FSEC research documented 34% average heating/cooling savings in 10 Florida existing homes using supplemental mini-split.
- **Project Goals:**
  - Improve thermal distribution with automated fan cycling of existing central system.
  - Improve energy savings and comfort through integrated control device that controls both the existing central system and supplemental mini-split.
  - Evaluate existing central system end-of-life options through simulation and economic analysis.

**Key Takeaway:** Runtime of a low efficiency existing central system can be offset with a high efficiency supplemental system. Supplemental system provides redundancy if central system fails.
Test and Evaluation of Cryogenic Fluid Capacitor

- **PI:** Ali Raissi
- **Agency Funding:** $50k

The aim of this research is to evaluate the energy storage capacity of liquefied gases and the relative simplicity of high pressure gas bottles, while limiting the downfalls associated with both methods. By exploiting a unique attribute of nano-porous aerogel materials, many important industrial gases such as hydrogen, methane, etc. can be stored in a molecular surface adsorbed state at densities on par with liquid state, at low to moderate pressure, and then supplied as a gas, on-demand, to a point of interest. Laboratory-scale prototypes of the system have been developed at and tested by the NASA-KSC.

- **Project Partners:** NASA SSC
  MetaVista Inc.
Sub-Quality NG Treatment with Simultaneous Hydrogen Recovery

- **PI:** Ali Raissi
- **Co-PIs:** Paul Brooker, Nazim Muradov, Nan Qin
- **Phase 1 Funding:** $263k
- **Phase 2 Funding:** $1.75M
- **Focus:** Phase 1 of project will focus on the optimization of a UCF-FSEC licensed process (to GRT). This is a hybrid thermochemical & electrochemical sour gas cleanup technology with simultaneous hydrogen recovery and sulfur sequestration. Phase 2 project will design, build and commission an industrial scale SQNG treatment plant to be installed in one of the gulf states.
- **Funded by:** Green Recycling Technologies, LLC of Chicago, IL
Transition

• Driven by DOE solicitations to Industrial-Funded Collaborative Partnerships
  – Value-added research for utilities, diverse state and federal agencies, manufacturers of energy-saving technology and industries that process and consume energy
  – Working groups that cooperatively steer FSEC into carrying out collaborative research that provides funding for FSEC researchers and is beneficial to the members of the Working group [Win-Win]
  – Opportunities with EV/PV/Energy Storage RD&D
Industrial-Funded Collaborative Partnerships

FSEC Offers

- Holistic and integrated approach for new and emerging energy systems (PV, Storage, EVs and Buildings)
- Real world performance, analysis and durability

Benefits to Industry

- Response moves from reactive to proactive
- Provides deeper insight into field performance
- Improved LCOE of an energy system
- New market opportunities through integration of multiple energy systems
- Aids grid integration of new energy systems
Vision for FSEC and for NSF ERC
Integrated Smart Building Energy Storage

Create the tools and processes for Net-Zero Energy Communities through the integration of next-generation smart energy storage, solar energy production, electric vehicles and advanced high frequency and efficient power-electronics systems, for increased shared-energy efficiency of community buildings and transportation, and improved grid resiliency.
Integrated Smart Building Energy Storage (IS-BEST) NSF ERC Creating the tools and processes for Net-Zero Energy Communities

1. Building Energy Demands
   Energy efficiency retrofits, load management, thermal energy storage, vehicle loads

2. Electrochemical Energy Storage
   Batteries, Fuel Cells

3. Solar Energy Production
   Photovoltaics, Hydrogen Production

4. Vehicle-to-X
   Bidirectional, wireless charging

5. Smart Power Electronics and Communication
   Smart thermostats and sensors, high efficiency inverters

Cross Cutting Research Areas

- Wide-Band Gap Semiconductors
- Materials, Packaging and Durability
- Electrochemistry and Solid State Science
- Hardware in the Loop
- Grid Integration
- Engineering Education
- Education for non-STEM community
IS-BEST NSF ERC Team

- **Universities:** University of Central Florida [Lead], Case Western Reserve University, Georgia Tech University, New Mexico State University, Washington University St. Louis, Illinois Institute of Technology
- **National Laboratories:** National Renewable Energy Lab, Idaho National Lab and Argonne National Lab
- **Community Partners:** Orlando, Cleveland, Atlanta, Chicago, Denver, Indian Reservations
- **Industrial Consortium:** Modeled after: cSi-PVMC, FEEDER, Drive Electric Florida, SEMATECH, SEPA
- **Industry Partners:** Building Controls, ESCOs, PV w/ Power Electronics, Batteries, H₂ Electrolyzers, fuel cells, EVs, EV infrastructure, Large Building owners, Utilities
Questions?
Energy Consumer Partners
Utility Partners

- OUC The Reliable One
- Duke Energy
- FPL
- Gulf Power
- TECO Energy
- Florida Municipal Power Agency
- Smart Electric Power Alliance