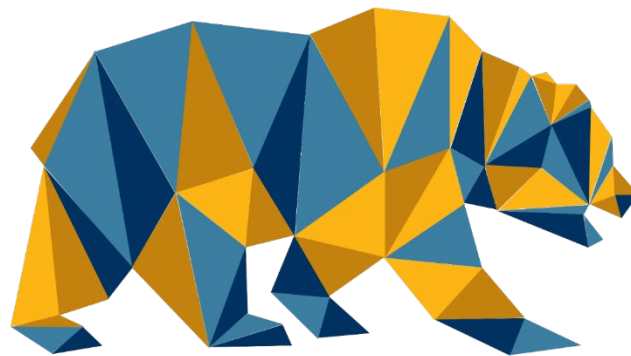


# Berkeley Power and Energy Center

## Annual Research Review Meeting



# BPEC

Wednesday, April 24, 2024

Clark Kerr Campus

University of California, Berkeley



**08:00 AM – 08:30 AM**

**Breakfast and Registration**

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**08:30 AM – 08:45 AM**

**Welcome Address**

Dean Tsu-Jae King Liu, Prof. Robert Pilawa

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**08:45 AM – 09:15 AM**

**BPEC Faculty Presentations**

Prof. Robert Pilawa, Prof. Jessica Boles, Prof. Duncan Callaway

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**09:15 AM – 10:15 AM**

**Lecture Session #1:  
Data Center Power Delivery**  
Session Chair: Dr. Nathan Ellis

**09:15 AM – 09:35 AM**

**Intermediate Bus Converters for Data Center Applications**  
Rose Abramson

**09:35 AM – 09:55 AM**

**Active Tuning of Resonant Switched-Capacitor Converters for 48 V Step Down Applications**  
Haifah Sambo

**09:55 AM – 10:15 AM**

**The Switching Bus Converter: Toward 48-V-to-1-V Single-Stage Vertical Power Delivery for Data Center Applications**  
Yicheng Zhu

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**10:15 AM – 10:45 AM**

**Coffee Break and Group Photo**

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**10:45 AM – 11:45 AM**

**Lecture Session #2: Electric Transportation**  
Session Chair: Rahul Iyer

**10:45 AM – 11:05 AM**

**An EMI-Compliant and Automotive-Rated 48 V to Point-of-Load Dickson-Based Hybrid Switched-Capacitor DC-DC Converter**  
Sahana Krishnan

**11:05 AM – 11:25 AM**

**A 14-level FCML Inverter for Electric Vehicles with Optimal Capacitors Achieving 175 kW/kg and 380 kW/L Power Density**  
Logan Horowitz

**11:25 AM – 11:45 AM**

**Ultra Light-Weight DC-DC Converters for Electric Aircraft**  
Dr. Nathan Ellis

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**11:45 AM – 12:00 PM**

**BPEC Educational Activities**

Prof. Jessica Boles, Prof. Robert Pilawa

**12:00 PM – 01:00 PM**

**Lunch**

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**Start of Private Sessions and Events (BPEC Member Companies)**

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**01:00 PM – 02:00 PM**

**\* Poster Session**

\* Poster titles listed on page 4.

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**02:00 PM – 03:00 PM**

**Lecture Session #3: Components and Devices**

**Session Chair: Tahmid Mahbub**

**02:00 PM – 02:20 PM**

**A Piezoelectric-Resonator-Based Virtual Inductor**  
Tucker Skinner

**02:20 PM – 02:40 PM**

**High-Efficiency Piezoelectric Transformers for Power Conversion**  
Sourav Naval

**02:40 PM – 03:00 PM**

**Overtone Piezoelectric Resonators for Power Conversion**  
Wentao Xu

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**03:00 PM – 03:15 PM**

**Coffee Break**

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**03:15 PM – 04:15 PM**

**Lecture Session #4: Grid Integration**

**Session Chair: Francesca Gardine**

**03:15 PM – 03:35 PM**

**Small-Signal Stability in Inverter-Dominated Grids: Exploring the Role of Gains, Line Dynamics, and Operating Conditions**  
Ruth Kravis

**03:35 PM – 03:55 PM**

**Distributed Battery Dispatch for Uncertainty Mitigation in Renewable Microgrids**  
Sunash Sharma

**03:55 PM – 04:15 PM**

**A Combined Power Factor Correcting and Active Voltage Balancing Control Technique for Buck-Type AC/DC Grid-Tied Flying Capacitor Multilevel Converters**  
Rod Bayliss III

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**04:15 PM – 04:25 PM**

**Concluding Remarks**

Prof. Robert Pilawa

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**04:30 PM**

**Departure for Campus Lab Tour**

## Poster Session - Details

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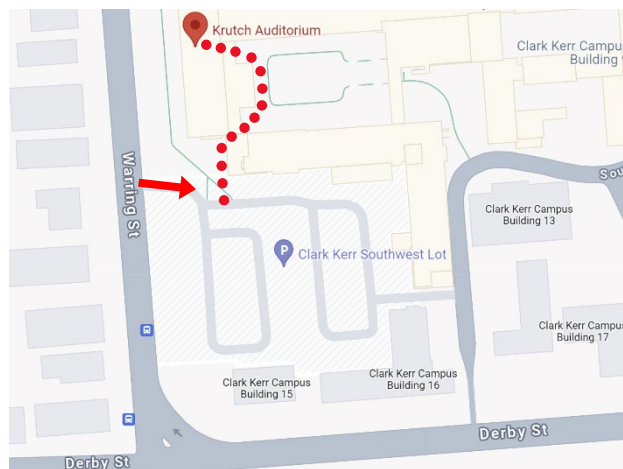
- **An 840-V-to-120-V Radiation Tolerant Flying Capacitor Multilevel Converter for Space Robotics**  
Elisa Krause
- **A 48-V-to-12-V Regulated Hybrid Switched-Capacitor DC-DC Converter with Bi-Directional Power Transfer for Automotive Applications**  
Nagesh Patle
- **A Segmented Electric Aircraft Drivetrain Employing 10-Level Flying Capacitor Multi-Level Dual- Interleaved Power Modules**  
Rod Bayliss III
- **Modeling and Control of the Flying Capacitor Multilevel Converter**  
Rahul Iyer
- **Comparative Performance Analysis of Regulated Hybrid Switched-Capacitor Topologies for Direct 48 V to Point-of-Load Conversion**  
Yicheng Zhu
- **An Active Split-Phase Control Technique for Hybrid Switched-Capacitor Converters Using Capacitor Voltage Discontinuity Detection**  
Rose Abramson
- **A Gallium Nitride-based 48-V-to-1-V Point-of-Load Converter for Aerospace Telecommunications and Computing Applications**  
Dr. Nathan Ellis
- **A Variable Switching Frequency Control Technique for DC-AC Flying Capacitor Multilevel Converters to Improve Efficiency and Inductor Utilization**  
Francesca Gardine
- **The Flying Capacitor LLC Converter: A Hybrid Switched Capacitor Converter with Galvanic Isolation for Large Step-Down Applications**  
Logan Horowitz
- **Simplified Closed-Loop Control for Piezoelectric-Resonator-Based DC-DC Converters**  
Dr. Mustapha Touhami
- **Steady-State Analysis of Series-Capacitor Buck Converters in Discontinuous Capacitor Voltage Mode**  
Nathan Biesterfeld
- **A Modular Multi-Phase High-Power Resistive Load Bank with Zero-Current Switching Functionality**  
Ben Liao
- **A Merged ZCS/ZVS Control Technique for Resonant Switched-Capacitor Converters**  
Haifah Sambo
- **Thermal Test Vehicle Design for Datacenter Cooling Applications**  
Tahmid Mahbub
- **On the Size and Weight of Passive Components: Scaling Trends for High-Density Power Converter Designs**  
Jiarui Zou
- **Transmission Line Dynamics on Inverter Dominated Grids: Analysis and Simulations**  
Gabriel Colon-Reyes
- **Advanced Dielectric Coatings for Improved Liquid Cooling of Power Converters**  
Joseph Schaadt

## Parking and Location - Details

### Clark Kerr Campus (Sessions and Presentations)

Parking Lot: Southwest Lot, Venue: Krutch Auditorium

- Upon arrival at Clark Kerr Campus, please park in the Southwest Lot (marked by the indigo “P” pin).
- Enter the Southwest Lot via Warring St as shown by the red arrow.
- The Southwest Lot is located near the Krutch Auditorium (marked by the red pin) where registration and events will take place.
- At registration, you will be provided with a parking pass for the Southwest Lot, which you will place inside your vehicle.
- To access the Krutch Auditorium from the Southwest Lot, follow the dotted red line.



### UC Berkeley Main Campus (Lab Tour)

Parking Lot: Upper Hearst Structure, Venue: Cory Hall

- Upon arrival at the main campus, please park in the Upper Hearst Structure (marked by the indigo “P” pin). The parking pass provided at registration is valid for the Upper Hearst Structure.
- Enter the Upper Hearst Structure via La Loma Ave as shown by the red arrow.
- The Upper Hearst Structure is located across the street from Cory Hall (marked by the red pin) where the lab tour will take place.
- BPEC students will meet you by the Hearst Ave entrance to Cory Hall
- To access Cory Hall from the Upper Hearst Structure, follow the dotted red line.

