

ADVANCED BATTERY STORAGE

May 13-14, 2020
Marriott Kansas City Downtown
Kansas City, MO



*"This course is very informative
and thanks for organizing it."*

Senior Director, Envision Energy



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by IACET to offer
1.4 CEUs for the
course.

OVERVIEW

A radical energy transformation is under way today, one that we will likely fully appreciate only in hindsight. Utility regulators and operators are beginning to rebuild the bulk power system to make it more resilient and better able to accommodate higher penetration levels of variable renewable generation. With more wind and solar coming onto the grid, long duration storage is the holy grail in energy. One of the prime movers in this energy transformation is the rapid advancement of battery storage technologies.

There are different application characteristics, which underscore the need for different batteries and battery technologies. Some chemistries or technologies are better suited for short-duration power applications, whereas others are better suited for long duration energy applications so no one battery is the ideal tool for all applications.

This course will provide an in-depth overview of the various types of long duration batteries. In addition, it will address things to consider such as battery characteristics, projected life, performance and costs. It will look at battery storage applications, utility scale implementations, use cases and system resiliency. The program will address storage design, safety, long duration batteries, use cases, design considerations and the future of battery storage.

LEARNING OUTCOMES

- Review battery storage and other types of storage
- Identify the various types of long duration batteries
- Discuss different battery chemistry characteristics and matching the chemistry to the application
- Discuss navigating the safety hazards for batteries including fire suppression systems
- Identify the major components in a Battery Energy Storage System (BESS)
- Review the different battery storage applications including frequency regulation
- Discuss various battery storage use cases
- Discuss constraints and systems for utility scale implementations
- Examine AC/DC coupled systems, what they do and advantages/disadvantages
- Identify and mitigate energy storage design
- Discuss the future of energy storage



“Useful content for those looking to better understand the role batteries might play in a power supply portfolio. Recommend attending before issuing an RFP.”

Director of Operations, OMPA



“Worthwhile course for those needing an overview on BESS.”

National Director of Business Development, BAE Batteries USA

AGENDA

WEDNESDAY, MAY 13, 2020

8:00 – 8:30 am **Registration and Continental Breakfast**

8:30 am – 4:45 pm **Course Timing**

12:00 – 1:00 pm **Group Luncheon**

- Storage
 - o Process, non-battery energy storage, batteries
- Long duration batteries
 - o Battery chemistry
 - Matching the chemistry to the application
 - Characteristics
 - Charge rates
 - * Max charge
 - * Discharge
 - o Diversity of chemistry – 200 + and counting (periodic table illustration)
 - How it works
 - Potential failure mechanisms
 - o Lithium-ion BESS
 - How they work
 - Family of chemistries – all with different characteristics
 - o Flow batteries
 - Redux
 - Plating
 - Organic and Others
 - o Other choices in batteries
 - Advanced lead-based batteries
 - Sodium, fluorine, etc.
 - o Things to know and think about
 - Characteristics to think about
 - Projected life
 - Performance
 - o Safety
 - NEC 700-705 and 855
 - * Fire suppression systems
 - * Battery scorecards
 - IEEE 1547 and UL 1741
 - Fire protection systems
 - Navigating the safety standard
 - o Major components in a BESS
 - A visual walk thru a typical BESS
 - * Physical batteries (e.g. Li-ion)
 - * Flow battery
 - Batteries
 - Environmental systems (HVAC, etc.)
 - Inverters
 - Controllers
 - Housings
 - Battery management system
 - Storage management system/Energy management systems
 - Market participation systems

AGENDA

WEDNESDAY, MAY 13, 2020 (CONTINUED)

- o Major components in a BESS (continued)
 - Forecasting and analytics
 - Secondary containment
 - Substation
 - Fire suppression
 - Augmentation plan
 - Replacement plan
- o Battery storage use cases
 - Top 10 use cases (what they require from a battery)
 - Wholesale energy market
 - Distribution energy market
 - Utility operations
 - Renewable locations (e.g. Solar+Storage)
 - Residential
 - EV charging
 - Critical facilities
 - Other

4:45 pm **Program Adjourns for Day**

THURSDAY, MAY 14, 2020

8:00 – 8:30 am **Continental Breakfast**

8:30 am – 4:30 pm **Course Timing**

12:00 – 1:00 pm **Group Luncheon**

- Building a business case
 - o Typical benefit categories
 - o Regional differences
 - PJM
 - ERCOT
 - CAISO
 - Other regions
 - o Costs
 - Initial capital costs
 - Soft costs of initial placement (e.g. design, permits, etc.)
 - Interconnection
 - * Typical timeline
 - * Steps in the process
 - * Studies to perform prior to considering an ESS
 - Operations
 - * Schedules
 - * Bidding
 - * Key issues
 - Augmentation and replacement
 - Other costs

AGENDA

THURSDAY, MAY 14, 2020 (CONTINUED)

- Utility scale implementation
 - o Lessons learned
 - Dealing with startups
 - Hidden factors
 - Fire protection
 - Public perception
 - Construction issues
 - o Addressing local constraints and systems
 - o How to avoid impacting end users
- System resiliency
- AC/DC coupled systems
 - o Difference in efficiency
 - Lower losses
 - DC coupled to generation
 - DC coupled to DC loads
 - Issues with arc flash
 - o Components involved
 - Battery banks
 - * Convertors
 - * Controllers
 - * Transformers
 - o What they do
- Design considerations
 - o Li-Ion and other “square” batteries
 - o Flow batteries
- Implementation
 - o Typical work plan at a high level
 - o Typical timelines
 - o Case studies
- Operational risks
- Conducting inspections and maintenance
- Assisting with refurbishing and/or decommissioning
 - o Environmental considerations
 - o Recycling
- Integrators
- The future of battery storage
 - o What’s next
 - o Ideal energy user profiles



“Great course to get a broad view of technical aspects of energy storage projects.”

Senior Engineer, MEPPi

COURSE INSTRUCTORS



Doug Houseman
Utility Modernization Lead, Burns & McDonnell

Doug Houseman is a long-time industry veteran who is a member of the Gridwise Architecture Council (GWAC), chair of the IEEE Power & Energy Society (PES) Intelligent Grid and Emerging Technology Coordinating Committee, and a NIST Resiliency Fellow. He has been working on storage issues since 1980, when he was involved with several DOD projects.



Chris Ruckman, P.E.
Energy Storage Director, Burns & McDonnell

Chris Ruckman is the Energy Storage Director for Burns and McDonnell's Energy Division where he oversees the development of solutions to meet growing challenges for the electrical grid. An electrical engineer with more than 24 years of experience, Mr. Ruckman combines a passion for sustainable solutions with his deep technical understanding of the utility industry to develop safe, reliable, and cost-effective energy storage solutions. His experience includes electrical system design and analysis, protective relaying, and detailed design for new and retrofit power generation projects, microgrids, and black start. He is a senior member of the IEEE PES Power System Relaying Committee and currently serves as the Chairman of the Black Start Generator Plant Protection Issues working group. He holds a B.A. in Physics from William Jewell College and a B.S. in Electrical Engineering from The University of Kansas. He is a registered engineer in California, Iowa, Kansas, Kentucky, Minnesota, Nebraska, Ohio, Oklahoma, Texas and Wisconsin.



Jason Barmann
Staff Electrical Engineer, Burns & McDonnell

Mr. Barmann is presently assigned to the electrical group of the Energy Division. His responsibilities include utility-scale battery energy storage system (BESS) design, electrical system design, electrical equipment procurement, load flow and short-circuit analysis, protective relay settings and configuration, and preparing electrical schematics for control and protection.



Katlyn Meggers
Utility Planning Specialist, Burns & McDonnell

Katlyn Meggers is a Utility Planning Specialist at Burns & McDonnell, specializing in energy storage technology, power generation benchmarking insights, capital asset planning solutions (CAPS), power plant decommissioning, and due diligence studies. She earned her Bachelor of Science in Chemical Engineering from the University of Kansas.



"Speakers were quite knowledgeable!"

Sr. Projects Engineer, Xcel Energy

IACET CREDITS



EUCI has been accredited as an Authorized Provider by the International Association for Continuing Education and Training (IACET). In obtaining this accreditation, EUCI has demonstrated that it complies with the AN-SI/IACET Standard which is recognized internationally as a standard of good practice. As a result of their Authorized Provider status, EUCI is authorized to offer IACET CEUs for its programs that qualify under the AN-SI/IACET Standard.

EUCI is authorized by IACET to offer 1.4 CEUs for the course.

REQUIREMENTS FOR SUCCESSFUL COMPLETION

Participants must sign in/out each day and be in attendance for the entirety of the course to be eligible for continuing education credit.

INSTRUCTIONAL METHODS

Case studies and PowerPoint presentations will be used in this program.

EVENT LOCATION

A room block has been reserved at **Marriott Kansas City Downtown**, 200 W 12th St, Kansas City, MO 64105, for the nights of May 12-13, 2020. Room rates are US \$217 plus applicable tax. Call **1-816-421-6800** for reservations and mention the EUCI event to get the group rate. The cutoff date to receive the group rate is April 12, 2020 but as there are a limited number of rooms available at this rate, the room block may close sooner. ***Please make your reservations early.***

REGISTER 3, SEND THE 4TH FREE

Any organization wishing to send multiple attendees to this course may send 1 FREE for every 3 delegates registered. **Please note that all registrations must be made at the same time to qualify.**

To Register Click Here, or

Mail Directly To:
PMA Conference Management
PO Box 2303
Falls Church VA 22042
201 871 0474
Fax 253 663 7224
register@pmaconference.com

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PLEASE REGISTER

ADVANCED BATTERY STORAGE COURSE
MAY 18-19, 2020: US \$1595
EARLY BIRD ON OR BEFORE APRIL 24, 2020:
US \$1395

ENERGIZE WEEKLY

Energize Weekly is EUCI's free weekly newsletter, delivered to your inbox every Wednesday. We provide you with the latest industry news as well as in-depth analysis from our own team of experts. Subscribers also receive free downloadable presentations from our past events

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How did you hear about this event? (direct e-mail, colleague, speaker(s), etc.)

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What name do you prefer on your name badge?

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Email

List any dietary or accessibility needs here

CREDIT CARD INFORMATION

Name on Card

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Account Number

Billing City

Billing State

Exp. Date

Security Code (last 3 digits on the back of Visa and MC or 4 digits on front of AmEx)

Billing Zip Code/Postal Code

OR Enclosed is a check for \$ _____ to cover _____ registrations.

Substitutions & Cancellations

Your registration may be transferred to a member of your organization up to 24 hours in advance of the event. Cancellations must be received on or before April 10, 2020 in order to be refunded and will be subject to a US \$195.00 processing fee per registrant. No refunds will be made after this date. Cancellations received after this date will create a credit of the tuition (less processing fee) good toward any other EUCI event. This credit will be good for six months from the cancellation date. In the event of non-attendance, all registration fees will be forfeited. In case of course cancellation, EUCI's liability is limited to refund of the event registration fee only. For more information regarding administrative policies, such as complaints and refunds, please contact our offices. EUCI reserves the right to alter this program without prior notice.