SAFETY IN BATTERY STORAGE

October 25, 2019
EUCI Office Building Conference Center
Denver, CO

EUCI is authorized by IACET to offer 0.7 CEUs for the course
OVERVIEW

Utilities across the country are rapidly deploying energy storage technologies. Battery energy storage systems (BESS) can be used for a variety of applications, including frequency regulation, demand response, transmission and distribution infrastructure deferral, integration of renewable energy, and microgrids. This storage technology is vital, as it turns power generated by non-dispatchable energy sources — such as wind and solar — into dispatchable ones, thereby improving grid reliability and allowing the integration of even more renewable capacity.

As storage emerges into the utility and power system mainstream, gaps in safety practices for energy storage technologies are coming to light. Concerns regarding large-scale energy storage facilities, especially those using lithium-ion batteries, are driving the requirements for improved knowledge of safety hazards and updating long-established standards to ensure the storage industry’s integrity and future growth.

This course will provide an in-depth overview of the hazards and operating risks associated with battery storage. In addition, it will provide a brief review of the different battery types, new standards that help with safety, how to design and operate for safety, and testing standards. Finally, it will also address the decommissioning removal and disposal protocols for batteries.

LEARNING OUTCOMES

- Review the different types of battery storage
- Identify the different types of safety hazards for batteries
- Review the hazards associated with each type of battery
- Discuss the testing standards and certifications for safety
- Discuss how to design for safety and operating safely
- Examine installation measures for batteries
- Discuss decommissioning & removal practices

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.

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.
AGENDA

FRIDAY, OCTOBER 25, 2019

7:30 – 8:00 am  Registration and Continental Breakfast

8:00 am – 3:45 pm  Course Timing

12:00 – 1:00 pm  Group Luncheon

1. Quick Review of Battery Types
   a. Lead-Acid
   b. Lithium-Ion
   c. Other Non-flow chemistries that are commercial
   d. Redox Flow batteries
   e. Organic Flow batteries
   f. Plating Flow batteries

2. Battery Safety Hazards
   a. Leakage and spills
   b. Stray voltage
   c. Off-gassing
   d. Thermal run away
   e. Toxic fumes
   f. Hazardous waste
   g. Power quality
   h. Other

3. Battery Type vs. Hazard
   a. Which battery types have which hazards
   b. Variations in a chemical family (e.g. Li-Ion)

4. Standards That Apply to Safety
   a. NFPA 855
   b. NFPA (NEC) 70
   c. IEEE 1625
   d. IEEE 1725
   e. ISO/IEC 17025
   f. UN/DOT 38.3
   g. Other safety standards

5. Testing Standards and Certifications
   a. UL 1642 Lithium Cell
   b. UL 2054 Safety Requirements for Household and Commercial Batteries
   c. UL 2580
   d. UL 1989 Standby Batteries
   e. UL/CSA/IEC 60950 (may be evaluated in conjunction with UL 2054)
AGENDA

FRIDAY, OCTOBER 25, 2019 (CONTINUED)

6. Designing for Safety
   a. Which standards apply to your project
   b. Which chemistry best fits your use case(s)
   c. Optimizing non-flow batteries deployment
      i. Siting considerations
      ii. Containment measures
   d. Civil and electrical infrastructure limits/issues/concerns
   e. Housing and other occupied structures around your site
   f. What comes "out of the box" from the battery manufacturer
   g. ALL hazards associated with specific chemistry chosen

7. General Installation Measures
   a. Fire suppression system
   b. The right firewalls/construction type
   c. Enough room to get emergency vehicles into the site
   d. Sources of water for emergency use
   e. Secondary containment
   f. Proper grounding
   g. Arc flash prevention/safe distances
   h. Automated protection system(s) — electrical fire, off-gassing -etc.
      i. Proper sensors for any hazard
   j. Etc.

8. Operating Safety
   a. Use case and the battery limits
   b. Maintenance
   c. Limits to operation

9. Decommissioning & Removal
   a. Batteries life and variations
   b. Design that incorporates decommissioning

*Throughout the discussion, to illustrate points, compare and contrast safety concerns, design issues, etc.,
two battery deployment examples will be used — a 1 MW/4 MWH Li-Ion battery setup and a 5MW/40 MWH flow battery
EVENT LOCATION

EUCI Conference Center
4601 DTC Blvd., B-100
Denver, CO 80237

NEARBY HOTELS

<table>
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<tr>
<th>Hotel</th>
<th>Address</th>
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<td>Hyatt Regency Denver Tech Center</td>
<td>7800 E. Tufts Ave, Denver, CO 80237</td>
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<td>Hilton Garden Inn Denver Tech Center</td>
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<td>Hyatt Place Denver Tech Center</td>
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INSTRUCTIONAL METHODS

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

REQUIREMENTS FOR SUCCESSFUL COMPLETION

Participants must sign in/out each day and be in attendance for a minimum of four hours to be eligible for any continuing education credit.
PLEASE REGISTER

- SPECIAL BUNDLE PRICE: ADVANCED BATTERY STORAGE, SAFETY IN BATTERY STORAGE AND PRE-COURSE WORKSHOP
  OCTOBER 23-25, 2019: US $2795
  EARLY BIRD on or before OCTOBER 4, 2019: US $2595

- ADVANCED BATTERY STORAGE AND SAFETY IN BATTERY STORAGE COURSES: OCTOBER 23-25, 2019: US $2395
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- SAFETY IN BATTERY STORAGE COURSE ONLY
  October 25, 2019: US $1195
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How did you hear about this event? (direct e-mail, colleague, speaker(s), etc.)

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Job Title

Company

What name do you prefer on your name badge?

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List any dietary or accessibility needs here

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Account Number

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OR Enclosed is a check for $ to cover registrations.

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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 September 20, 2019 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 at 303-770-8800. EUCI reserves the right to alter this program without prior notice.