

# GRIDED

The Center for Grid Engineering Education

## **Energy Storage Technologies, Applications and Integration**

### Course Description

This course is part of a series of courses developed and offered by GridEd to address several evolving forces that will alter the fundamental operating characteristics of the electric grid, transforming it from a one-way central supply structure to one that has bidirectional, flexible power flows resulting from the integration of energy storage systems. This course focuses on energy storage technologies and applications for transmission and distribution connected systems. Students will learn about the policy, cost, and technical challenges facing the wider use of energy storage and what can be done to address those challenges. Additionally, considerations for energy storage project development and deployment will be discussed.

### Who Should Attend

The course is intended for anyone interested in the energy storage technology landscape and understanding how energy storage can be used as an asset to maintain or improve grid reliability and operations. Students will include utility engineers and technicians, procurement officers, regulatory compliance staff, legal staff, and possibly regulators. Previous technical training is helpful but not necessary.

### Registration Information

Registration at: <http://grided.epri.com/courses.html>

Dates: Monday, November 13th, 2017  
Tuesday, November 14th, 2017  
Day 1: 8:00-5:00  
Day 2: 8:00-12:00

Location: Kelvin Smith Library/CWRU  
Room-LL06 (lower level)  
11055 Euclid Avenue  
Cleveland, OH 44106

PDH Available: 12 hours

Registration Fee:

- \$1,200 per person
  - 20% discount for organizations with three or more attendees
  - 25% discount for government employees (non-utility)
  - 25% discount for university professors\*
  - 75% discount for graduate students\*
- \*University IDs required to qualify for professor or graduate student discounts.

*Students need to bring: laptops or tablets to access online resources and to follow class notes. Wi-Fi access is provided. Lecture slides will be provided electronically in PDF format.*

### For More Information

Amy Feser, [afeser@epri.com](mailto:afeser@epri.com), (865) 218-5909

### Course Instructors

Erin Minear, [eminear@epri.com](mailto:eminear@epri.com), (650) 855-8706

Ben Kaun, [bkaun@epri.com](mailto:bkaun@epri.com), (650) 855-2208

## Meet the Instructors



**Ben Kaun** has over 10 years experience in electric power RD&D. He currently manages research efforts pertaining to energy storage, distributed energy resources (DER), and microgrids. He manages EPRI's Energy Storage Integration Council (ESIC), a deployment-oriented public, technical forum with a mission to advance integration of safe, reliable, cost-effective energy storage systems. Ben works collaboratively with industry to develop analytical tools and methods to understand the value of energy storage and DER, including the Storage Value Estimation Tool (StorageVET). He serves on the board of the Energy Storage Association. Prior to EPRI, Ben worked with Tesla Motors and other early stage companies to develop novel technology, test, and commercialize advanced batteries for vehicle electrification. Ben earned a BS in Systems Engineering from the University of Illinois and an MS in Management Science & Engineering from Stanford University.



**Erin Minear** is an Engineer Scientist for the Energy Storage Program at the Electric Power Research Institute (EPRI), managing projects related to integrating energy storage assets into the utility grid. Erin has previous experience in developing commercial behind-the-meter and utility distribution-connected energy storage systems for an engineering, procurement, construction (EPC) firm. She also has 7 years of experience as a power systems engineer implementing projects to drive reliability and efficiency improvements, including transmission and distribution upgrades, microgrids, renewable energy, and energy storage. Erin is a registered Professional Engineer in the state of California and has a BS and MS in Electrical Engineering from California Polytechnic State University, San Luis Obispo.

## Course Outline

### Day 1 Energy Storage Technology and Application Overview

- **Introduction to Energy Storage**
  - Drivers
  - Introduction to Value and Uses
  - Remaining Challenges
- **Energy Storage Technologies**
  - Technical Overview of Storage Technologies
  - Battery Energy Storage System Components
  - Moving from Technology to Deployment
- **Value Analysis for Energy Storage**
  - Cost and Value Metrics
  - Bulk Storage Applications
  - Utility Distribution Applications for Energy Storage
  - Customer-Sited Applications for Energy Storage
  - Basic Training for Value Analysis of Storage
- **Regulatory and Policy Considerations**
  - Utility business structures
  - Federal Policy – Legislation and Regulation
  - State Policy
  - Public Utility Commissions rulings

### Day 2 Energy Storage Deployment Considerations

- **Overview of Energy Storage Project Life Cycle**
  - Planning
  - Procurement
  - Deployment and Integration
  - Operations and Maintenance
  - Decommissioning and End-of-Life
- **Safety**
- **Lessons Learned and Resources for Further Learning**

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### Electric Power Research Institute

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