

GRIDED

The Center for Grid Engineering Education

Electric Transportation – 10 PDH

Course Description

The electrification of transportation, including light duty passenger vehicles, heavy duty vehicles, and people and goods movement, is occurring at an increasing rate. The US alone has over 700,000 light duty plug-in electric passenger vehicles on the road today and has seen electrification of port equipment, goods movement, and delivery vehicles. Several major heavy duty truck manufacturers have announced plans to develop and sell battery electric heavy duty vehicles, dozens of pilots of battery electric buses are underway and electric forklifts are becoming common place.

Beginning with an overview of the electric transportation space, this course will cover the basics of transportation electrification opportunities, vehicle technologies, charging technologies, and the benefits of electrified transportation technologies. Course registrants will learn about integration of goods movement technologies and electric vehicles with the grid, reverse energy flow from electric vehicles and pertinent standards relative to the electric vehicle space. The course will introduce methods being used to manage electric vehicle charging and to mitigate high power loads that have very low duty factors. Laboratory testing and field demonstration results will be presented to highlight the impact of transportation electrification. Registrants will be introduced to relevant standards and recommended practices, including the latest developments in the National Electric Code, Society of Automotive Engineers documents, and other standards impacting the electrified transportation space.

Who Should Attend

Utility engineers interested in learning about transportation electrification opportunities, individuals involved in deployment of transportation technologies, fleet managers, and grid planners that will be required to deal with these new electrification activities would benefit from course attendance.

Registration Information

Date & Time:

Thursday, Sept. 20th, 2018

Friday, Sept. 21st, 2018

Day 1 – 8:00 am – 5:00 pm

Day 2 – 8:00 am – Noon

Location:

Georgia Power Company HQ

241 Ralph McGill Blvd

Conference Room 1

Atlanta, GA 30308

PDH's Available: 10 hours

Register: <http://grided.epri.com/courses.html>

Registration Fee:

- \$1200 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.
- *Contact afeser@epri.com for discount inquiries.

Registrants are encouraged 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, (865) 218-5909

Course Instructor:

John Halliwell, jhalliwell@epri.com

Course Agenda – Day 1

1. Transportation Electrification Overview

Each listed technology will be discussed at a high level with updates on current market status, deployment status and future trends.

- a. Light Duty Vehicles
- b. Heavy Duty Vehicles
- c. People and Goods Movement
- d. Benefits of Electrifying Transportation

2. Technologies Used in Electrification of Transportation

This section of the course will cover detailed elements of each of the key technologies used in vehicle electrification as follows:

- a. Batteries
 - i. Battery chemistries and basic properties
 - ii. Key battery materials issues
 - iii. Energy, weight and volume considerations
- b. Drive system technologies
 - i. Vehicle topologies from internal combustion to fully battery electric
 - ii. Motors
 - iii. Inverters
 - iv. Regenerative braking
- c. Vehicle types
 - i. Energy consumption by application
 - ii. Size and weight considerations
 - iii. Tradeoffs of battery electric versus plug-in hybrid electric technologies

d. People and goods movement technologies

- i. Energy consumption by application
- ii. Size and weight considerations

3. Charging Technology

This section of the course will provide detailed descriptions of each of the listed charging technologies as they apply to all types of electric transportation charging:

- a. Power/Time considerations for charging
- b. AC charging
 - i. Light duty vehicles
 - ii. Heavy duty vehicles
 - iii. Other electrified systems
- c. DC charging
 - i. Light duty vehicles
 - ii. Heavy duty vehicles
 - iii. Other electrified systems
- d. Wireless charging
 - i. Light duty vehicles
 - ii. Heavy duty vehicles
 - iii. Other electrified systems
- e. Catenary and other forms of charging
- f. Networking of Charging Stations

4. Vehicle/Grid Integration

This section of the course will focus on how transportation technologies impact the electricity grid and how those impacts can be managed.

- a. Grid impacts
- b. Intelligent Charging

Course Agenda – Day 2

5. Reverse Energy Flow - Vehicle to –

This section of the course will cover use of vehicles as energy sources in three key applications:

- a. Vehicle to Load
- b. Vehicle to Home
- c. Vehicle to Grid

6. Goods Movement Technology Overview

This section of the course will cover non-road goods movement technologies.

- a. Forklifts

- b. Planes, Trains and Cranes
- c. Other technologies

7. Electric Transportation Standards Overview

This section of the course will review standards for electric transportation technologies.

- a. Society of Automotive Engineers
- b. IEEE
- c. Underwriters Labs
- d. National Fire Protection Association
- e. NIST, NEMA, and others
- f. International

Meet the Instructor



John Halliwell is a team member in the Electric Transportation Group of EPRI where his focus is infrastructure development and smart charging for plug-in electric vehicles. He joined EPRI in 2007 and has been active in the electric transportation space since 2008. John has managed dozens of electric transportation projects in his tenure at EPRI including vehicle demonstrations, infrastructure installations and lab testing of electric vehicle supply equipment.

John is the current chair of the Society of Automotive Engineers J1772 “Electric Vehicle Conductive Charge Coupler Task Force”. His former employers include EG&G, Oak Ridge National Lab and Vacuum Technology, Inc. He has broad experience in design and application of electronic circuits and electronic systems. His favorite pastimes are hiking, building and repairing tube guitar amplifiers and amateur radio. Halliwell received Bachelor of Science and Master of Science Degrees in electrical engineering from the University of Tennessee, Knoxville.