

INTRODUCTION TO SUBSTATION DESIGN

March 3-4, 2020
Hilton Garden Inn Charlotte Uptown
Charlotte, NC

RELATED EVENT:

**SUBSTATIONS FOR
NON-ENGINEERS**

March 2-3, 2020 | Charlotte, NC

“

“This course was a perfect next step for an electrical engineer working in the utility sector. Learning about substation design methodology and terminology has provided a baseline and logical next step in building my professional skillset.”

Electrical Engineer II, City of Boulder



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1.2 CEUs for the
course

OVERVIEW

Transmission to distribution substation designs vary in complexity, proportional to their rating (MVA) and application. A variety of engineering disciplines are involved including civil, mechanical, electrical power and communications. Design philosophies are influenced by a utility's contingency strategy, space limitations, aesthetic requirements, work rules, maintenance practices, and other factors.

This course will provide an overview of design methods with given specifications and a one-line diagram for a typical T to D substation. Discussion concerning substation device options provide attendees with the information to make intelligent choices regarding design features. The class creates a forum for comparing best practices for substation design, maintenance, and the operation of these facilities.

LEARNING OUTCOMES

A comprehensive introduction to the following substation components will be discussed:

- Review the various types of substations
- List substation reliability/redundancy considerations
- Review substation specifications and one-line diagrams
- Review site selection criteria and components
- Determine the keys to initial substation layouts
- Get an overview on civil engineering considerations including: concrete foundations, steel structures, and liquid containment
- Review substation components and ratings including: power transformers, voltage regulators, voltage regulating controls, overcurrent protective devices of fuses and circuit breakers, overvoltage protection
- List the purposes, uses for and types of protection & control
- Get introduced to metal enclosed substations
- Get introduced to modular substations

WHO SHOULD ATTEND

- New or moderately experienced substation engineers
- New power distribution engineers
- Substation design managers and supervisors



“EUCI set you up with an extensive framework and encourages all participants to dive deeper in to individual topics for further personal development and understanding.”

Engineer, Prairie Land Electric Cooperative

REGISTER TODAY! CALL 303-770-8800 OR VISIT WWW.EUCI.COM

AGENDA

TUESDAY, MARCH 3, 2020

12:30 – 1:00 pm

Registration

1:00 – 5:00 pm

Course Timing

Course Overview - Welcome, Introductions & Course Scope

- Types of Substations
 - o Course focus on transmission to distribution open frame bus work substations
- Substation Reliability/Redundancy Considerations
 - o Alternative power source for served load
 - Robustness of distribution feeders
 - Redundancy within the substation
- Review of Substation Specifications
 - o One line diagram

Site Selection

- Meets the Estimated Required Area
- Access to Transmission Line
- Access to Transportation
 - o Roads, railroad, barge, etc.
- Elevation – Proximity to Floodplain
- Proximity to Ocean (Salt Water)
- Soil Conditions

Initial Substation Layout

- Determine Entry (Primary) and Exits (Secondary)
 - o Handling power line congestion
 - Overhead vs. underground
- Required Clearances Within Substations
 - o Per NESC 2017 Sections 10 -19
- Space Requirements (Vertical/Horizontal)
 - o Substation devices (transformers, breakers, etc.)
 - o Operation of heavy lifting equipment

Civil Engineering Considerations

- Concrete Foundations for Substation Devices
- Steel Structures Supporting:
 - o Bus work
 - o Miscellaneous devices (PTs, CTs, Disconnect Switches, Surge Arresters, etc.)
- Liquid Containment



“It gave me an insight of what we are using at our present company and what other technology is on the market and the benefits. It was very informative.”

Trainee Engineer, Belize Electricity Ltd.

AGENDA

WEDNESDAY, MARCH 4, 2020

7:30 – 8:00 am **Continental Breakfast**

8:00 am – 5:00 pm **Course Timing**

12:00 – 1:00 pm **Group Luncheon**

Substation Components and Rating

- Power Transformer (3) Design Considerations
 - o Rating (ONAN, ONAF.....)
 - o With/without load tap changer
 - o Winding configurations
 - o Dielectric fluids
- Voltage Regulators
 - o Bus vs. discreet feeder regulation
 - o Voltage regulator ratings
- Voltage Regulating Controls for LTC & VRs
 - o Settings & features
- Overcurrent Protective Devices
 - o Fuses
 - Power fuses
 - Current limiting fuses
 - o Power circuit breakers
 - Design considerations:
 - Interrupting medium
 - o Oil, air, SF₆, vacuum
 - Dielectric medium
 - o Oil, air, SF₆, solid dielectric
 - Driving mechanisms
 - o Hydraulic
 - o Motor operators
 - o Magnetic actuators
 - Maintenance requirements
 - o Automatic circuit reclosers
 - o Ratings
- Overvoltage Protection
 - o Coordination of arresters w/equipment insulation ratings
 - o Station & heavy-duty class arresters



“Be ready to laugh with Jerry’s ‘Dad’ jokes that helps to keep the class engaged with material that at often times can be very technical.”

Interconnection Engineer, SPower



“Great overall view of substation applications.”

Engineer Trainee (Electrical), Western Area Power Administration

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AGENDA

WEDNESDAY, MARCH 4, 2020 (CONTINUED)

Protection & Control

- Station Power
 - o Aux power
 - Station batteries vs. control cabinet batteries
- Sensors
 - o PTs and CTs
- Metering
 - o Protective relay
 - Overcurrent protection (phase & ground)
 - o Differential relaying
 - Transformer
 - Substation
- Remote/Supervisory Control
 - o Communication protocols within intelligent devices
 - o Gateway computers
- Control Houses

Introduction to Metal Enclosed Substation

- Where Space is at a Premium
 - o No exposed bus work
 - o Rack out breakers

Introduction to Modular Substations

- Small KVA Requirements
- Delivered as a Complete Unit

INSTRUCTORS

Anthony Centore, PE

Director of Engineering Services, Pike Engineering

Tony holds a BS in Electrical Engineering from the University of Pittsburgh School of Engineering, a BS in Physics from California University of Pennsylvania, an MBA from Robert Morris College, and is a registered professional engineer in multiple states. His 30 year career spans the power space that includes large power transformer design and manufacturing, heavy industry, large melting furnaces controls and power systems to include static var compensation, utility generation station power systems and controls, and utility substation and transmission design.

Jerry Josken

Senior Consultant, Pike Engineering

Jerry holds a BS in Electrical Engineering Technology from the Milwaukee School of Engineering and a MBA from North Central College. During his 30+ year career with Eaton's Cooper Power Systems Jerry served in a variety of engineering capacities. Past leadership positions include Chair of IEEE Rural Electric Power Conference (2012) and GLEMS Distribution Equipment /Controls (2013-2014). Presently, Jerry coordinates Pike Engineering Professional Development Programs.

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REQUIREMENTS FOR SUCCESSFUL COMPLETION OF PROGRAM

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

INSTRUCTIONAL METHODS

Case studies, PowerPoint presentations, and group discussion will be used in this event.

EVENT LOCATION

A room block has been reserved at the **Hilton Garden Inn Charlotte Uptown**, 508 E M.L.K. Jr Blvd, Charlotte, NC 28202, for the nights of March 1-3, 2020. Room rates are \$209 plus applicable tax. Call **1-704-373-0917** for reservations and mention the **EUCI group code**. The cutoff date to receive the group rate is February 14, 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.**

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 ANSI/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 ANSI/IACET Standard.

EUCI is authorized by IACET to offer 1.2 CEUs for the course.

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.

REGISTER TODAY! CALL 303-770-8800 OR VISIT WWW.EUCI.COM

REGISTRATION INFORMATION EVENT LOCATION

Mail Directly To:

EUCI
4601 DTC Blvd., Ste. 800
Denver, CO 80237
OR, scan and email to: conferences@euci.com

WWW.EUCI.COM
p: 303-770-8800
f: 303-741-0849

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PLEASE REGISTER

BOTH SUBSTATIONS FOR NON-ENGINEERS AND INTRODUCTION TO SUBSTATION DESIGN COURSES:
MARCH 2-4, 2020: US \$2395
EARLY BIRD on or before FEBRUARY 14, 2020: US \$2195

INTRODUCTION TO SUBSTATION DESIGN COURSE ONLY: MARCH 3-4, 2020: US \$1395
EARLY BIRD on or before FEBRUARY 14, 2020: US \$1195

ENERGIZE WEEKLY

EUCI's Energize Weekly e-mail newsletter compiles and reports on the latest news and trends in the energy industry. Newsletter recipients also receive a different, complimentary course presentation every week on a relevant industry topic. The presentations are selected from a massive library of more than 1,000 current presentations that EUCI has gathered during its 31 years organizing courses.

Sign me up for Energize Weekly

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

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CREDIT CARD INFORMATION

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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 January 31, 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 at 303-770-8800. EUCI reserves the right to alter this program without prior notice.

