

# FUNDAMENTALS OF ELECTRICITY TRANSMISSION COURSE

**December 11-12, 2017**  
**Andaz Scottsdale**  
**6114 N. Scottsdale Road**  
**Scottsdale, AZ**

## RELATED EVENT

**COST ESTIMATING METHODOLOGIES FOR  
SUBSTATIONS AND TRANSMISSION PROJECTS**  
December 12-13, 2017 | Scottsdale, AZ

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EUCI is authorized  
by IACET to offer  
1.0 CEUs for the  
course

## OVERVIEW

New electricity transmission, transmission expansion, and transmission upgrades are being proposed in every region of the US and Canada. Electricity transmission, and the need for more of it, is the key to many of North America's energy goals, including: increased reliability and security, the integration of more renewable energy, more competitive markets, and the construction and implementation of a smart grid. In addition, new transmission market mechanisms are being applied in many US regions. This course is designed to provide a practical overview of electricity transmission and the transmission system for non-engineers or those who are new to the industry. The course will cover how new transmission is designed and planned and how the transmission system is regulated. Important topics such as markets and new technologies will also be discussed.

## LEARNING OUTCOMES

- Define and describe the major concepts of electricity transmission
- Explain considerations that impact transmission planning and design
- Analyze the importance of transmission reliability and the factors that can affect it
- Examine the purpose, role, and impact of NERC
- Identify the main drivers for new transmission and discuss the many challenges of transmission expansion
- Review the history and trajectory of FERC regulations for transmission planning and cost allocation
- Examine the structure of major transmission markets in the US and comprehend how the market system operates

## WHO SHOULD ATTEND

- Engineering staff new to transmission
- Executives, attorneys, accountants, managers and other professionals from investor-owned utilities; federal, state, and municipal utilities; and electric cooperatives
- Renewable energy product developers
- Regulatory agency staff
- Consultants, attorneys, and engineering firms that work within the electricity transmission sector



*"A helpful and beneficial course for individuals that do not have an energy background. I can go back to work feeling prepared for new and current projects."*

Associate Counsel, NERC



*"For someone with a very basic level of knowledge in the transmission industry, this course provided excellent examples and definitions to make it easy to understand."*

Corporate Communications Specialist, ATC

# AGENDA

MONDAY, DECEMBER 11, 2017

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

**8:30 am – 5:00 pm**      **Course Timing**

**12:00 – 1:00 pm**      **Group Luncheon**

- Basic Electricity Concepts
  - o Terms and definitions
  - o Relationship of voltage, current, resistance and power
  - o Alternating current and voltage
- Load
  - o Sectors and characteristics
  - o Drive costs
- Generation
  - o Electricity generation basics
  - o Typical power system components
- Transmission
  - o Primary functions
  - o Major components
  - o High voltage DC transmission (HVDC)
- FERC and State Regulation
  - o FERC regulatory authority
  - o State regulation
- Reliability and Compliance
  - o ERO (NERC) compliance process overview
  - o Bulk electric system reliability
- Transmission Line Losses
- System Integration and Grid Operation
  - o System operations terminology
  - o Control area / balancing area
  - o Ancillary services
- Power System Protection Basics
- Transmission Planning Concepts
- Design & Planning
  - o ROW considerations
  - o Configurations
  - o NECS
  - o Survey
  - o Types of structures
  - o NERC compliance



“A great course for learning the basics of the electricity industry and increasing general industry knowledge.”

Compliance Assistant,  
NERC

# AGENDA

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TUESDAY, DECEMBER 12, 2017,

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

**8:30 am – 12:00 pm**    **Course Timing**

- Energy
- Wholesale Power Markets
- RTO's/ISO's
  - o RTO advantages and disadvantages
  - o FERC authority over RTOs/ISOs
- Regional Organized Markets
  - o The players
- Locational Marginal Prices (LMP)
  - o Components of LMP
  - o Three bus examples for LMP
- Transmission Congestion and Risk Management
  - o Financial Transmission Rights (FTRs)
- Emerging Issues: Challenges and Opportunities



*“Perfect class for analysts, or those of that nature. Provides a great base of knowledge for the overall electrical system.”*

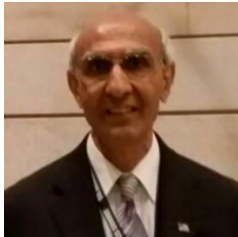
Project Analyst, SCE



*“Any utility employee or contractor would benefit from this class as a high level overview of the transmission interconnection system across the US.”*

Project Manager, The Morse Group

# INSTRUCTORS



**Raj Rana, PE, MBA, CEM, PMP, NERC Cert.**  
**President at Rana Energy Consulting, LLC.**

Raj Rana is engaged in providing consulting services in the areas of transmission planning and operation, NERC reliability compliance, energy efficiency, wholesale energy markets, transmission access as well as project management.

He worked for American Electric Power (AEP) for many years primarily in the areas covering transmission planning and operation, transmission access, NERC reliability compliance, regulatory and RTO policy, and RTO.

He has a BSEE degree from M. S. University (India), MSEE degree from West Virginia University, and MBA degree from University of Dayton. He also completed the AEP Management Development Program at the Fisher Business College of the Ohio State University. He holds the Ohio State PE license. He is a Certified Energy Manager (CEM), and Project Management Professional (PMP), and NERC certified reliability coordinator. He is a Life Senior Member of IEEE. He is also a member of the Association of Energy Engineers (AEE) and the Project Management Institute (PMI).



**Ed Weber**  
**Senior Transmission Planning Advisor, HDR Engineering Inc.**

Ed Weber is a senior electrical engineer with 30 years of experience in power system analysis and planning throughout the upper Midwest region. He has extensive experience in power system reliability and modeling; power flow and stability analysis; transmission tariff process and generator interconnections. He has served on several national and regional work groups associated with the Mid-Continent Area Power Pool, Midwest Reliability Organization, the North American Reliability Corp, and the Western Electric Coordinating Council.

Ed's experience includes over 20 years of management of large power facility projects requiring coordination of project planning, design, and environmental activities; coordination of consultant activities; coordination of regulatory and contractual activities; interfacing with the developers and transmission owners and operators; and preparation of reports.

During his 30 year career at Western Area Power Administration (WAPA), he supervised a diverse staff of professional engineers and was responsible for all facets of power system planning and operational support. Ed directed the initial NERC Standards and Compliance program for WAPA, Upper Great Plains Region; as well as coordinating the tariff revisions necessary to comply with FERC Order 890 - Large Generator Interconnection. Since coming to HDR Engineering, Ed has worked on several large renewable energy projects along with numerous planning studies.

**Keil Backer**  
**Project Engineer, HDR, Inc.**

Keil is a transmission line engineer with over five years of experience with HDR in transmission line design for both government and public utilities ranging from 69kV to 500kV projects. He has worked on renovations and upgrades of existing transmission lines and new design of wood, steel multi-pole, and lattice tower projects. Other experience includes the analysis of existing transmission projects for NERC compliance and accompanying remediation design. Keil has been involved with other aspects of the design process including environmental and permitting coordination, estimating costs, material lists, property acquisition support, and public outreach. In addition to design work in the office, he has spent time in the field acquiring survey for projects, staking structures for construction, and observing construction progress. Keil graduated from Montana State University in 2009 with a Bachelor's of Science in Mechanical Engineering.

## IACET CREDITS

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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 1.0 CEUs for the course.**

## REQUIREMENTS FOR SUCCESSFUL COMPLETION OF PROGRAM

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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

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

## PROCEEDINGS

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The proceedings of the course will be published, and one copy will be distributed to each registrant at the course.

## EVENT LOCATION

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The event is located at the Andaz Scottsdale, 6114 N. Scottsdale Road, Scottsdale, AZ 85253. A room block has been reserved for the nights of December 10-12, 2017. Room rates are US \$229. Call **1-480-368-1234** for reservations and mention the EUCI event to get the group rate. The cutoff date to receive the group rate is November 10, 2017 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

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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.

Please make checks payable to: "PMA"

**REGISTRATION**  
*to register [CLICK HERE](#) or*

**Call: 201 871 0474**  
**fax: 253 663 7224**  
**email: [register@pmaconference.com](mailto:register@pmaconference.com)**  
**web: <http://pmaconference.com/>**  
**Mail: POB 2303 Falls Church Va 22042**

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## PLEASE REGISTER

**BOTH FUNDAMENTALS OF ELECTRICITY TRANSMISSION AND COST ESTIMATING METHODOLOGIES FOR SUBSTATIONS AND TRANSMISSION PROJECTS COURSES:**  
 DECEMBER 11-13, 2017: US \$2195  
 EARLY BIRD on or before NOVEMBER 22, 2017: US \$1995

**FUNDAMENTALS OF ELECTRICITY TRANSMISSION COURSE**  
**ONLY:** DECEMBER 11-12, 2017: US \$1395  
 EARLY BIRD on or before NOVEMBER 22, 2017: US \$1195

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

Print Name

Job Title

Company

What name do you prefer on your name badge?

Address

City

State/Province

Zip/Postal Code

Country

Phone

Email

List any dietary or accessibility needs here

### CREDIT CARD INFORMATION

Name on Card

Account Number

Billing Address

Billing City

Billing State

Billing Zip Code/Postal Code

Exp. Date

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

**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 November 10, 2017 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 (201) 871-0474.