EUCI ONLINE COURSE

BASICS OF THE ELECTRIC POWER GRID – RELIABILITY, RESILIENCY AND BUSINESS CONCEPTS FOR BEGINNERS

August 13-14, 2020
Online | Central Time

EUCI is pleased to offer this course on our online interactive platform. Enjoy a valuable learning experience with a smaller impact on your time and at reduced cost. You will gain new knowledge, skills, and hands-on experience from the comfort of your remote location.

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EUCI is authorized by IACET to offer 1.3 CEUs for the course
OVERVIEW

By attending EUCI’s new Basics of Electric Power Grid – Reliability, Resiliency and Business Concepts for Beginners course, attendees will take a technical dive into the types of utilities and how they are organized, regulated, and financed. The instructor will dissect the types of generation resources, substations, transmission, distribution, and utilization along with the essential reliability and resiliency aspects of the power grid.

The Basics of Electric Power Grid course will cover the technical concepts of power systems in simple, easily understood vernacular, such as how utilities plan, design, construct and operate different components of power system and operate the system in an integrated manner. The instructor will provide details about how power systems are planned, designed, and operated in organized market and non-organized wholesale market environments. Also, this course will introduce the type of organized markets, such as energy, capacity, and ancillary services offered by RTOs/ISOs, forward price curve, locational marginal price and wholesale real time and day ahead market settlement.

is the course is intended to increase participant’s understanding of the electric grid and how it functions technically in the electric power system. Attendees do not need to have engineering or technical backgrounds. Participants completing the seminar will be able to return to their organizations with a broad understanding of the make-up and functions of the electrical system. The seminar will also include power flow demonstrations, videos, and class discussion/review questions.

In addition, the course will explore how revenue is generated for power providers, how the customers are charged, and regulatory oversight of power systems, such as FERC, NERC, and State Public Utility/Service Commissions. The instructor will review the basics of utility business and financing models, revenue requirements and rate design.

LEARNING OUTCOMES

- Describe various types of utilities and compare similarities and distinct differences of each
- Discuss business organizations and characteristics of utilities
- Analyse utility business regulatory control mechanisms
- Describe basic functions of utility financial statements
- Explain the concepts of Return on Equity (ROE)
- Discuss the concepts of Cost of Service and Ratemaking processes and principals
- Identify common components of customer billing systems
- Discuss how utilities operate under Regional Transmission Organizations (RTOs) from the business point of view
- Describe basic electricity concepts, including voltage, current, power, types of electric current – alternating current (AC) vs. direct current (DC)--, three-phase power, and energy
- Explain components of the power system and how they fit and work together
- Discuss design and operation of electric utility systems
- Identify drivers of system planning, design, and operation
- Describe types of power generation sources including renewables such as wind, solar, geothermal, and hydros, their status, and future role
- Identify various voltage capacities of AC and DC transmission lines, and explain how DC transmission is integrated into an AC transmission network
- Review the purpose of station equipment, such as transformers and circuit breakers
- Recognize the components of a distribution system
- Review right-of-way requirements for transmission and distribution lines
- Describe Types of energy markets, ancillary service markets and capacity markets, market prices, and wholesale price volatility
- Describe RTOs/ISOs
- Describe ancillary services and markets
- Recognize the need for grid modernization and smart grid and status
AGENDA

THURSDAY, AUGUST 13, 2020 - CENTRAL TIME

8:30 – 9:00 am  Login and Welcome

9:00 am – 4:00 pm  Course Timing

12:00 – 12:30 pm  Lunch Break

Electric Utility Types in the U. S.
• Investor Owned Utility (IOU)
  o Electric utilities with transmission, distribution, and bundled or un-bundled generation assets
  o Independent transmission companies
  o Independent Power Producers (not price-regulated)
• Cooperatives (Co-op)
• Municipal utilities
• Regulated versus non-regulated

Typical Utility Business Organization
• Corporate departments (executive, finance, operations, training)
• Finance
• Logistics
• Information technology
• Customer service and interface

Characteristics of utility business models
• User necessity
• Reliability
• Utilization rates
• Scalability
• Service exclusivity

Business Regulatory Control and Oversight
• Federal Trade Commission (FTC)
• Securities and Exchange Commission
• Anti-trust law and natural monopolies
• Sarbanes – Oxley 2002
• Energy Policy Act 2005
• Regulatory considerations
  o FERC requirements
  o Grid access
  o NERC requirements
  o Reliability compliance
  o Cyber security compliance
  o Public utility commissions/service commissions
AGENDA

THURSDAY, AUGUST 13, 2020 - CENTRAL TIME (CONTINUED)

Billing and Finance Introduction
- How utilities compute charges
  - Capital expense
  - Energy usage
  - Taxes, fees, and riders
  - Fuel costs
  - Optional services (participation in services/products/programs)
- Rate schedules
- Customer billing
- Return on equity (ROE)

Cost of Service
- Cost allocation methodologies

Concepts of Cost of Services and Ratemaking Process
- General ratemaking and regulation
- Fixed and Variable Costs
- Rates classifications
- Electricity pricing
- Traditional rate design
- Time-based rates and demand
- Marginal cost pricing

Power Systems – Technical Aspects, Part I
- Electricity basics
  - Voltage and Current (AC vs. DC), Power, Energy, Frequency, Three-phase power, Reactive
    Power – VARs, Power triangle – Relationship between real power, reactive power, and total
    power
  - Measuring power & energy
    - Volts, Amps, Watts, Reactive Power, Frequency, and Losses
- Load
  - Types of loads and characteristics
  - Determining load and usage
  - Load forecasting, power factor, load factors, system peaks
  - Demand response
- Planning and designing the power system
  - Beginning the process - T & D planning
    - Utility planning vs. regional planning
    - FERC Order 1000
- Generation
  - Fossil fuel power plants and their future
    - Coal, Natural gas simple and combined cycle
  - Renewable energy - status and future
    - Solar, wind, hydro, geothermal, other
  - Nuclear energy
  - Distributed generation resources
  - Energy storage – Role, current status and future
AGENDA

FRIDAY, AUGUST 14, 2020 - CENTRAL TIME

8:30 – 9:00 am  Login and Welcome

9:00 am – 4:00 pm  Course Timing

12:00 – 12:30 pm  Lunch Break

Power Systems – Technical Aspects, Part II

• Power system transmission network
  o Types of transmission lines
    - AC vs. DC
    - Overhead vs. Underground
  o Functions of transmission lines
  o Voltages and purpose
  o Role of transmission lines in the interconnected environment and organized markets
  o Components of transmission towers/poles and conductors
  o Right-of-way considerations
  o What determines power flow, Loop flows, and Losses

• Substations
  o Purpose
  o Components at a typical substation
    - Transformers, circuit breakers, series and shunt reactors
    - Series and shunt capacitors
    - Switches, lightning arresters, protection equipment

• Distribution system
  o Purpose – then and now
  o Voltage class
  o Modernization of distribution systems and integration of renewables such as rooftop solar, net metering
  o Types of microgrids and integration

• Power system operation in the interconnected environment
  o Single contingency, N-1, N-2
  o Functions of balancing area operators and reliability coordinators
  o Ensuring reliability
  o Monitoring the system
  o Impact of organized markets on system operation
  o Frequency and time error corrections

• Ancillary services
  o The need for ancillary services and compliance requirements
  o Types of ancillary services
  o Whose responsibilities? Who are the providers? How to procure?
  o Ancillary service markets in RTOs/ISOs

• System reliability and resiliency
  o Interconnected network effects
  o Causes and impacts of generation and transmission outages
  o Balancing authorities (control areas)
  o Transmission congestion, contract paths, flow gates
FRIDAY, AUGUST 14, 2020 - CENTRAL TIME (CONTINUED)

Role of FERC/NERC in Maintaining Reliability and Resiliency
- NERC and FERC's regulatory oversight
  - Concepts of reliability (adequacy and security) and resiliency
  - Functions of NERC and Regional Reliability Entities
  - Mandatory reliability and cyber security compliance standards, audits, and penalties
  - Examples of reliability and cyber security standards

Introduction of Regional Transmission Organizations (RTOs)/Independent System Operators (ISOs)

Wholesale Energy Markets
- Regulated vertically integrated utilities
- Deregulated markets
- Financial energy markets
- Introduction to RTOs/ISOs – Purpose, functions, regulatory oversight
- Physical real time (sport) markets, Day Ahead Markets
- Wholesale energy prices
  - Energy price volatile
  - Locational market price (LMP)
- Energy, ancillary, and capacity markets offered by RTOs/ISOs
- Renewable integration and real time operational issues
- Power purchase agreements (PPAs) and bilateral contracts

Grid Modernization and Smart Grid
- Need for modernization
- Resiliency improvement to maintain reliability during and after major events
- Risk mitigations
- Infrastructure improvements, and modernization of operational practices with technological innovations and tools
COURSE INSTRUCTOR

Raj Rana, PE, MBA, CEM, PMP
President, Rana Energy Consulting

At present, Mr. Rana provides consulting services in the electric utility industry in the areas of NERC compliance, energy markets, power system planning and operation, resources integrations, and project management.

Previously, while serving as Director – RTO Policy and NERC Compliance at American Electrical Power, Mr. Rana was responsible for coordination of energy, transmission, market structure, finance, and governance related RTO policy issues among the AEP business units, development of corporate positions/policies, and advocacy of such positions at regulatory agencies as well as at stakeholder forums in PJM, SPP, and ERCOT RTOs. He was also responsible for the development and coordination of strategic direction of AEP's power system reliability compliance program among all business units as well as coordination and facilitation of compliance plans, policies and procedures within the company to ensure timely and successful compliance of NERC and regional reliability standards.

Mr. Rana also worked in AEP's System Planning department in various positions. His experience at AEP includes planning and operation of the bulk transmission network, generation interconnections, tariff and regulatory/legislative issues, system integration, asset management, mergers and acquisitions, as well as planning and engineering studies for international transmission and generation projects. Mr. Rana holds a BSEE degree from M. S. University (India), an MSEE degree from West Virginia University, and an MBA degree from University of Dayton. Mr. Rana also completed the AEP Management Development Program at the Fisher Business College of the Ohio State University. He is a life-senior member of IEEE and holds Ohio State PE license. Mr. Rana is also a certified energy manager and a project management professional.
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.

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ONLINE COURSE DELIVERY & PARTICIPATION DETAILS

We will be using Microsoft Teams to facilitate your participation in the upcoming event. You do not need to have an existing Teams account in order to participate in the broadcast – the course will play in your browser and you will have the option of using a microphone to speak with the room and ask questions, or type any questions in via the chat window and our on-site representative will relay your question to the instructor.

- You will need to join the appropriate meeting at the appropriate time.
- You will receive a meeting invitation will include a link to join the meeting.
- Separate meeting invitations will be sent for the morning and afternoon sessions of the course.
  - You will need to join the appropriate meeting at the appropriate time.
- If you are using a microphone, please ensure that it is muted until such time as you need to ask a question.
- The remote meeting connection will be open approximately 30 minutes before the start of the course. We encourage you to connect as early as possible in case you experience any unforeseen problems.

REQUIREMENTS FOR SUCCESSFUL COMPLETION

You must be logged in for the entire presentation and send in the evaluation after the online course is completed.

INSTRUCTIONAL METHODS

PowerPoint presentations, open discussion, examples and explanation of fuses materials
BASICS OF THE ELECTRIC POWER GRID – RELIABILITY, RESILIENCY AND BUSINESS CONCEPTS FOR BEGINNERS ONLINE COURSE
AUGUST 13-14, 2020: US $1295 (Single Connection)

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* All other discounts do not apply to license packs

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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 July 10, 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.

EUCI reserves the right to alter this program without prior notice.