

INTRODUCTION TO WHOLESALE ELECTRICITY MARKETS: RTOs AND ISOs

December 7-8, 2017
Hyatt Regency Mission Bay and Resort
San Diego, CA



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OVERVIEW

This course is designed to introduce basics of wholesale electricity markets operating in the U.S., Canada and Mexico. The purpose is enhancing attendees' understanding of types of wholesale electricity markets and the platforms that offer such markets. The focus will be on the functions of RTOs / ISOs and their role in providing platforms for real-time and day-ahead energy markets, ancillary service markets and in some cases capacity markets. Participants will also gain a high-level understanding of current issues affecting electricity markets and will receive detailed explanation of how the electricity markets operate.

Major topics covered in this course include:

Basics of Electric Power Systems

- Fundamentals of electricity, definitions and measuring units
- Generation, transmission, distribution, and loads
- Types of generation resources including intermittent resources, costs, and capabilities
- Load duration curves, system load factors, load growth and customer classes
- Ancillary services
- Power system losses
- Power system load flow simulation

Regulatory Oversight – Role of FERC and State Regulatory Agencies

Regional Transmission Originations (RTOs) and Independent System Operators (ISOs)

- RTOs/ISOs in U.S. and Canada
- Regulatory structure of RTOs/ISOs
- RTO functions and characteristics
- Advantages and disadvantages of RTO participation
- Role of FERC, state regulatory agencies, and market monitor

Regional Wholesale Electricity Markets Fundamentals

- Wholesale electricity prices trend and volatility
- Locational marginal price (LMP) and its components
- Review of supply and demand relationship, spot versus bilateral electricity markets
- Economic merit order selection and unit commitment including responsibilities and obligations
- Security constrained economic dispatch and scheduling
- Two settlement system: Day ahead and real-time settlement
- Cost of transmission congestion
- Financial transmission rights (FTRs) for hedging against transmission congestion
- Wholesale Demand response
- Capacity market
- Ancillary services market
- Virtual trading
- Comparison of energy, capacity, and ancillary service markets offered by RTOs/ISOs in the U.S.
- LMP simulation
- Forward pricing curve
- Generator bidding strategies and constraints
 - o Variable cost and its components, marginal cost, incremental cost
 - o cost-based vs. market-based rate
- Scarcity pricing and load pockets
- Energy price forecasting overview
- Brief overview of risk management
- RTO/ISO Financial settlement



“Great class! Opened my eyes to the deep details of the market place.”

Managing Partner, Apis Energy Group

LEARNING OUTCOMES

Participants with little or no prior electric utility industry background or experience will be able to benefit from this course.

Participants should be able to:

- Describe major components of a power system and types of wholesale electricity markets
- Describe platforms for real-time and forward wholesale electricity markets
- Explain locational marginal price (LMP) and its components
- Describe, at high level, types of risks inherent in the wholesale energy markets and financial tools to manage such risks
- Describe the role of generators, transmission, and load in a power system
- Define and provide examples of ancillary services
- State the role of FERC and state regulatory agencies
- Describe ISO/RTO functions
- Describe role of transmission in the regional wholesale electricity markets
- Explain bilateral and real-time energy markets
- Discuss RTO/ISO financial settlement and credit issues

WHO SHOULD ATTEND

- Employees new to the industry or with limited industry experience
- Energy attorneys and regulatory personnel new to the industry
- Energy traders and power marketers new to their job
- Customer service representatives
- Support staff of electric utilities and RTOs/ISOs - Accounting, IT personnel, and support personnel
- Power generator and transmission project owners/developers
- Energy finance professionals

“

“Broad enough for a good range of attendees; deep enough for all to learn.”

Regulatory Compliance
Administrator,
Central Iowa Power
Cooperative

“

“If you are looking for a comprehensive course that covers the basics of RTOs and ISOs, this is the course for you.”

Settlements Analyst, City Utilities of Springfield,
MO

“

“Beneficial introduction to markets. Gives good insight into interactions and strategies to be a participant.”

ATC/AIC Specialist, TVA

AGENDA

THURSDAY, DECEMBER 7, 2017

- 7:30 – 8:00 am** **Registration and Continental Breakfast**
- 8:00 – 10:30 am** **Power System Basics, Types of Generation Resources and Loads, and Regulatory Oversight**
- Fundamentals of electricity, definitions, and units
 - Overview of source to socket components - Generation, transmission, distribution, and loads
 - Power flow demonstration
 - Types of generation resources, heat rate, capacity factor, and installation costs
 - Load characteristics - Load duration curves, load factor, and customer classes
 - Demand response
 - Power system losses
 - Regulatory oversight – Role of FERC, State regulatory agencies, and market monitor
 - Review questions
- 10:30 – 10:45 am** **Morning Break**
- 10:45 am – 12:00 pm** **Types of Energy Markets, Regional Transmission Originations (RTOs) and Independent System Operators (ISOs)**
- Wholesale electricity prices and volatility
 - Review of supply and demand relationship
 - Types of electricity markets – real-time (spot) versus bilateral markets
 - RTOs/ISOs in U.S. and Canada
 - RTO functions and characteristics
 - RTO drivers
 - Advantages and disadvantages of RTO /ISO participation
 - Regulatory framework and role of FERC and state regulatory agencies
 - RTO stakeholders
 - Review questions
- 12:00 – 1:00 pm** **Group Luncheon**
- 1:00 – 3:00 pm** **Locational Marginal Price (LMP)**
- LMP concept
 - Components of LMP and examples
 - Nodal, Hub, and Zonal LMP
 - LMP demonstration, review questions, and class exercise
- 3:00 – 3:15 pm** **Afternoon Break**
- 3:15 – 5:00 pm** **RTO/ISO Wholesale Electricity Markets**
- Economic merit order and unit commitment
 - Security constrained economic dispatch
 - Cost of transmission congestion and losses
 - Financial transmission rights (FTRs) for transmission congestion hedging
 - Day ahead and real-time market, scheduling and dispatch
 - Capacity market
 - Ancillary services – whose responsibilities?
 - Ancillary services market
 - Comparison of markets offered by RTOs/ISOs in the U.S.
 - Review questions

AGENDA

FRIDAY, DECEMBER 8, 2017

- 7:30 – 8:00 am** **Continental Breakfast**
- 8:00 – 8:15 am** **Review of Previous Day; Opportunities for Questions and Discussion on Previous Day's Material**
- 8:15 – 10:00 am** **Regional Wholesale Electricity Market Basics - Continued**
- Overview of generator/load offer/bidding considerations, bid and offer curves, three-part bid
 - Generator capacity dispatch range, variable cost components, start-up cost, no load cost, ramp rate concepts
 - Overview of RTO/ISO financial settlement
 - Review questions
- 10:00 – 10:15 am** **Morning Break**
- 10:15 – 11:45 am** **Risk Management and Credit Requirements**
- Potential risks
 - Overview of risk hedging tools for real-time and bilateral markets: FTRs, Virtual trading, options, futures, and SWAPs
 - Credit requirements
 - Review questions

INSTRUCTOR

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

While serving as the director of RTO Policy and NERC Compliance at American Electrical Power, Raj 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, 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.

Previously, Mr. Rana 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 the Ohio State PE license. Mr. Rana is also a certified energy manager and project management professional.

REQUIREMENTS FOR SUCCESSFUL COMPLETION OF PROGRAM

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

This course will use slide presentation, group discussions, as well as active participation. Attendees will have sample opportunities to actively participate in review questions/answers sessions, group breakout sessions, and simulations/demonstrations offered as part of this course.

PROCEEDINGS

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

EVENT LOCATION

A room block has been reserved at the Hyatt Regency Mission Bay and Resort, 1441 Quivira Rd, San Diego, CA 92109 for the nights of December 6-7, 2017. Room rate is \$159 plus \$10 resort fee and applicable tax. Call **1-619-224-1234** for reservations and mention the EUCI event to get the group rate. The cutoff date to receive the group rate is November 6, 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.***

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 1.0 CEUs for the course.

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Upon successful completion of this event, program participants interested in receiving CPE credits will receive a certificate of completion. **EUCI is authorized by CPE to offer 12 credits for this course.** There is no prerequisite for this course.

Program Level 1: Intermediate, **Delivery Method:** Group-Live, **Advanced Preparation:** None

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.

REGISTRATION
to register [CLICK HERE](#) or

Call: 201 871 0474
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Please make checks payable to: "PMA"

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PLEASE REGISTER

○ INTRODUCTION TO REGIONAL WHOLESALE ELECTRICITY MARKETS- RTOS AND ISOS COURSE

December 7-8, 2017: US \$1395,
 Early bird on or before November 17, 2017: US \$1195

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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Account Number Billing City Billing State

Exp. Date Security Code (last 3 digits on the back of Visa and MC or 4 digits on front of AmEx) Billing Zip Code/Postal Code

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 3, 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.