

RUTGERS

Edward J. Bloustein School
of Planning and Public Policy

October 24-25, 2017
Rutgers University-New Brunswick
New Brunswick, NJ

In-Depth Introduction to Electricity Markets

A Two Day Professional Short Course

Presented by
Frank A. Felder, Ph.D.

**POST-CONFERENCE
WORKSHOP**
Renewable Energy and Markets

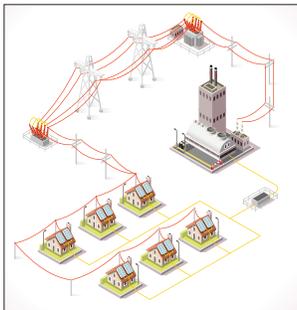
October 26, 2017





Overview

This comprehensive introductory course provides an in-person overview of the industry, focusing on the linkages among power system engineering, markets, regulatory policy, and business strategies. Specific examples and actual market data are used to illustrate basic principles and ideas. The course covers electricity markets in the United States (New England, New York, PJM, Texas, Midwest, California, the West and the South) and Ontario and Alberta's electricity markets in Canada.



The instructor employs several approaches to elicit participation from attendees, including group exercises and an electricity market simulation in which participants bid a portfolio of generation resources over the course of the seminar under various market rules and conditions. Participants will have plenty of opportunities to ask questions and discuss issues of special interest to them. Extensive and comprehensive course notes will also be provided. Continental breakfast and lunch are included.

This course has been previously presented over 75 times in the last 15 years to over 1,500 students in the U.S., Africa, Asia, Canada, and Europe.

This course has been approved for 13 Continuing Legal Education Credits for Planners and has applied for the same for both attorneys and professional engineers in New Jersey.

Areas Covered

Attendees will obtain the answers to the following questions:

1. What are the major components of a power grid?
2. What is meant by loop flow or parallel flow?
3. What is dispatch and unit commitment?
4. What ancillary services are needed to operate the grid?
5. In reliability analysis, what is the difference between adequacy and security?
6. Why is locational marginal pricing necessary?
7. Why are prices based upon marginal costs not average costs?
8. What is meant by uniform clearing prices and why are they used?
9. Why are both day-ahead and real-time markets necessary?
10. How is congestion risk managed?
11. How are markets for emissions, renewable resources and capacity related?
12. How do retail electricity markets work?
13. What role has economies of scale played in the structure of the electric power industry?
14. What portions of the industry remain economically regulated and why?
15. What is RTO/ISO governance?
16. What are the roles of the federal and state governments in the power sector?
17. Why is transmission planning necessary and what are the major issues?
18. What are the different types of forecasting techniques?
19. Why is risk management so important in electricity markets?
20. What does the statement mean that natural gas is typically the marginal fuel for electricity production and what is its implication for electricity prices?
21. What are different business strategies pursued in each portion of the electric power supply chain (generation, traders, transmission and distribution, retail marketers and aggregators)?
22. How does cost-of-service regulation result in rates?

Agenda

TUESDAY, OCTOBER 24, 2017

8:30 – 8:50 am Registration and Continental Breakfast

8:50 – 9:00 am Welcome and Opening Remarks

SESSION I: POWER SYSTEMS

9:00 – 10:30 am Generation, Transmission, Distribution and Load

Power system components, types of organizations and businesses involved with the grid, power system supply chain, generation dispatch and unit commitment, power flows, ancillary services, and reliability analysis.

10:30 – 10:45 am Networking Break

10:45 – 12:00 pm Business Analysis of Power System Operations and Investments

Integration of business analysis with power system engineering including the generation investment decision, calculating the cost of electricity, and the economics of generation dispatch, unit commitment and ancillary services.

12:00 – 1:00 pm Group Luncheon

SESSION II: ELECTRICITY MARKETS

1:00 – 2:30 pm Electricity Markets: Energy, Capacity and Ancillary Services

Review of real-time, day-ahead, capacity and ancillary services markets, locational marginal prices, transmission congestion, transmission congestion contracts, and congestion risk management.

2:30 – 2:45 pm Networking Break

2:45 – 4:00 pm Electricity Markets: Bilateral, Renewable and Air Emission Markets and Market Power and Mitigation

Renewable energy markets, emission allowance markets, settlement, arbitrage/speculation between markets, bilateral contracts, retail vs. wholesale markets, opportunity cost pricing, exercising market power, and market power monitoring and mitigation.

4:00 – 5:00 pm Team-based Generation Bidding Simulation

Seminar participants are divided up into teams representing different Independent Power Producers that submit their energy bids into an electricity markets. This simulation continues throughout the second day and results and bidding strategies under different market conditions and rules are discussed and analyzed.



WEDNESDAY, OCTOBER 25, 2017

8:30 – 9:00 am **Continental Breakfast**

SESSION III: REGULATORY POLICY

9:00 – 10:30 am **U.S. Federal Legislation and Regulations**

Industry restructuring, federal legislation and regulations, role of economies of scale in regulatory policy, unbundling of electricity services, and open transmission access/FERC Order 888/889. Round 2 of Generation Bidding Simulation.

10:30 – 10:45 am **Networking Break**

10:45 – 12:00 pm **State Regulation and Policies**

Emerging federal and state policies, transmission expansion and cost allocation/FERC Order 1000, role of states in retail electricity markets, governance of Regional Transmission Organizations and Independent System Operators. Round 3 of Generation Bidding Simulation

12:00 – 1:00 pm **Group Luncheon**

1:00 – 2:30 pm **Business Strategies and Analysis I**

Technical and fundamental forecasting techniques, risk management instruments including swaps and options, pricing trends in electricity and natural gas, and causes of electricity price volatility. Round 4 of Generation Bidding Simulation.

2:30 – 4:00 pm **Business Strategies and Analysis II**

Business strategies (generation, transmission and retail), rate cases, cost-of-service regulation, revenue requirements, weighted average cost of capital, smart grid, course wrap up and evaluation.

Questions, comments and discussion are encouraged throughout the course, and participants are free to contact the instructor at any time during and after the completion of the course regarding course materials, trends in the industry, employment issues, etc.

Instructors

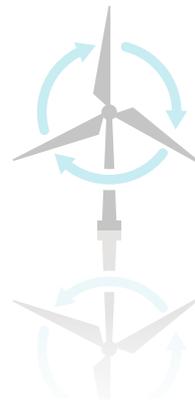
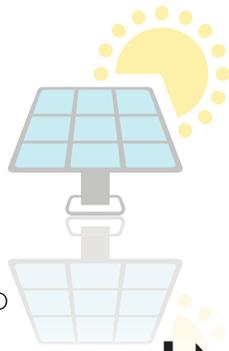


Frank Felder Ph.D. is an expert on the economics and reliability of restructured electric power systems. Frank is an Associate Research Professor at the Edward J. Bloustein School of Planning and Public Policy, Rutgers University, where he conducts research in electricity markets with the Center for Energy, Economic and Environmental Policy. He also consults a wide range of clients in the industry, advising them on market design,

market power, electricity price forecasting, risk management, and retail electricity markets. He has testified before the Federal Energy Regulatory Commission and several state public utility commissions. Frank has conducted numerous seminars and lectures and has widespread experience explaining complex—and sometimes arcane—material in an intuitive, humorous, and accessible manner.

Frank holds a Ph.D. in technology, management, and policy from the Massachusetts Institute of Technology, where his studies focused on the economics and reliability of restructured electric power systems.

Howard Haas (Guest Speaker), has been the Deputy Market Monitor at PJM Interconnection since 2004, where he has been responsible for directing analysis and monitoring of PJM markets. Prior to joining PJM, Dr. Haas served as a senior economist in the energy policy section of the Illinois Commerce Commission. Prior to that, Dr. Haas was a visiting professor at Michigan State University, an economic analyst with the Michigan State Department of Resource Development and an independent consultant. Dr. Haas has a PhD in Economics from Michigan State University.



Post-Conference Workshop

Renewable Energy and Markets

This workshop explores renewable energy technologies, including their technical capabilities and limitations, cost structure, and how they participate in energy, capacity, renewable and environmental markets. Specific renewable resources that will be examined include solar, wind, hydroelectric, geothermal, as well as emerging technologies. Participants will be provided with extensive and detailed course notes and supporting materials.

Learning Outcomes

- Learn the different renewable energy technologies and their technical characteristics
- Understand the cost structure of renewable technologies and how to calculate the levelized cost of electricity using variable, maintenance, and fixed costs
- Compare the performance and costs of renewable technologies to conventional generation options
- Examine how renewable energy technologies earn revenue in wholesale and retail electricity markets such as energy, capacity, renewable energy credits, and net metering
- Investigate the operational issues associated with intermittent resources and how these technologies can be complemented with energy storage and demand response

Course Outline

October 26, 2017, 9 am to 12 noon – Fundamentals of Renewables

- Public policy motivation for expanding the use of renewable energy technologies
- Types of renewable technologies and their technical characteristics
- Cost structure of renewable technologies
- Status and forecasts of renewables in the U.S. and worldwide
- Financial analysis of renewable resources including tax implications
- Cost-benefit analysis of renewable resources



October 26, 2017, 1 pm to 5 pm

- Wholesale market revenues for renewables: energy and capacity
- Retail market revenues for renewables: renewable energy credits and net metering
- Role of storage and demand response in complementing renewables
- How renewables earn revenues under cap-and-trade policies
- Renewable case study: analysis of offshore wind
- Renewable case study: behind the meter solar with storage

Registration

TO REGISTER CLICK HERE *or*

Call: (201) 871-0474

Email: register@pmaconference.com

Mail: PMA Conference Management
POB 2303
Falls Church VA 22042

PLEASE SELECT

- In-Depth Introduction to Electricity Markets (Oct.24-25) AND WORKSHOP (Oct.26):** US \$1600
EARLY BIRD before Sept.22: \$1400
- In-Depth Introduction to Electricity Markets ONLY (Oct.24-25) :** US \$1150
EARLY BIRD before Sept.22: \$950
- WORKSHOP ONLY (Oct.26) :** US \$790
EARLY BIRD before Sept.22: \$690

LOCATION

Address

Rutgers University Inn and Conference Center
178 Ryders Lane
New Brunswick, NJ 08901

<http://inn.rutgers.edu/>

The Rutgers Inn & Conference Center is accessible by car, bus or train. We are located off Route 18, less than two miles from Route 1 and Exit 9 of the New Jersey Turnpike. The New Brunswick train station, with New Jersey Transit and Amtrak service, is located downtown, and is across from the Suburban Transit station, with commuter bus service to NYC.

For directions and information about parking, visit <http://inn.rutgers.edu/getting-here>

Hotels

Visit inn.rutgers.edu/accommodations for more information about staying at the Rutgers University Inn and Conference Center. In addition, the Heldrich Hotel, www.theheldrich.com, (732) 729-4670 and the Hyatt Regency-New Brunswick, newbrunswick.regency.hyatt.com, (732) 873-1234 are a short drive. A listing of additional hotels in the area may be found at bit.ly/ceeep-hotels.

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15% discount for 3 participants, 25% discount for 4 or more.
Please call (201) 871 0474 or email register@pmaconference.com for group registration.

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 October 23, 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. In the event of non-attendance, all registration fees will be forfeited. In case of conference cancellation, Rutgers University's liability is limited to refund of event registration fee only.

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Edward J. Bloustein School
of Planning and Public Policy

Center for Energy, Economic and Environmental Policy
Rutgers, The State University of New Jersey
Civic Square Building, 33 Livingston Avenue
New Brunswick, N.J. 08901

848-932-2750

ceeep.rutgers.edu