

RUTGERS

Edward J. Bloustein School
of Planning and Public Policy

March 13-14, 2018
Rutgers University-New Brunswick
New Brunswick, NJ

In-Depth Introduction to Electricity Markets

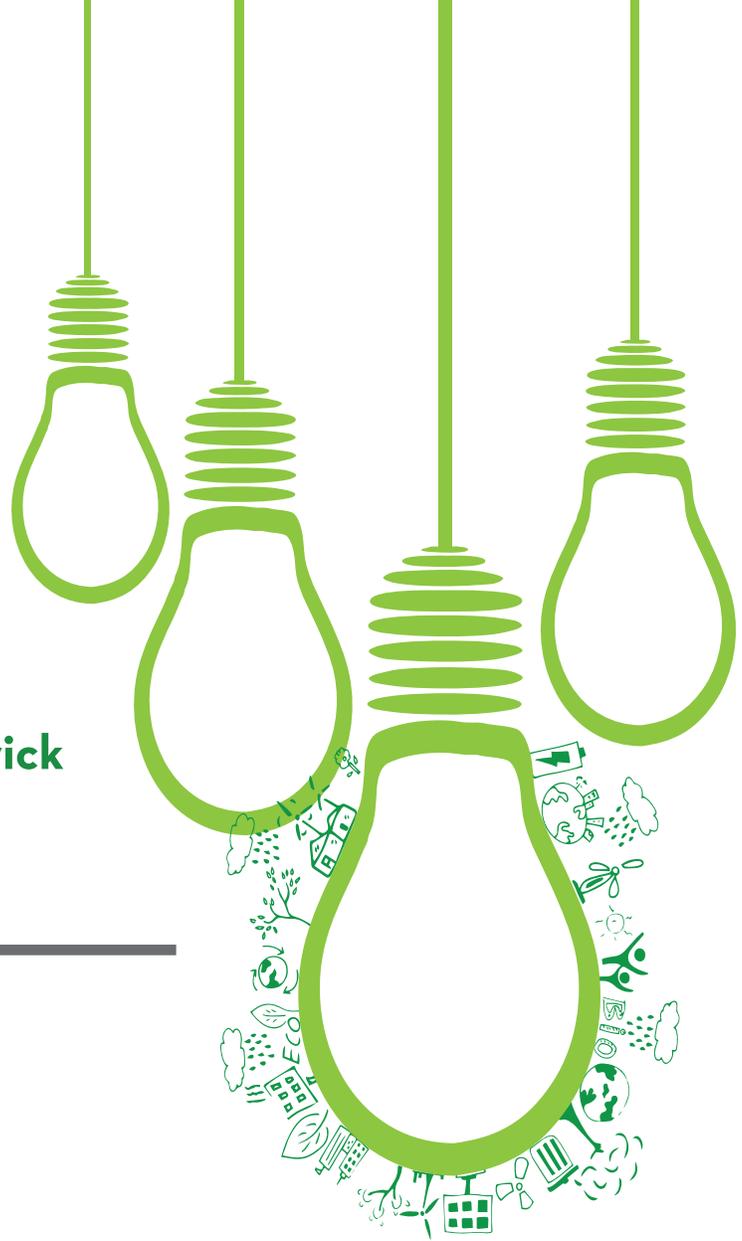
A Two Day Professional Short Course

Presented by
Frank A. Felder, Ph.D.

**POST-CONFERENCE
WORKSHOP**

**Energy Efficiency and
Renewable Energy**

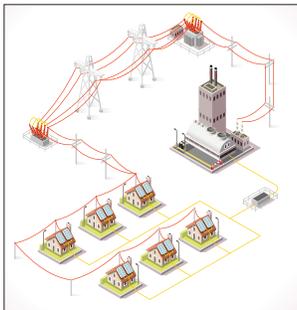
March 15, 2018





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 Education Credits for planners. Attorneys and professional engineers requiring Continuing Education Credits should contact the instructor so that appropriate arrangements can be made.

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, MARCH 13, 2018

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.

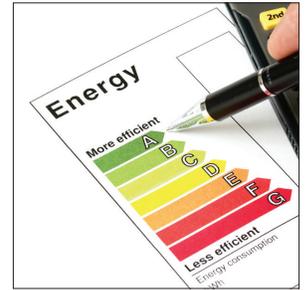
2:30 – 2:45 pm Networking Break

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, MARCH 14, 2018

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

11:00 – 12:00 pm Discussion Topics in PJM

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.

Instructor



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.

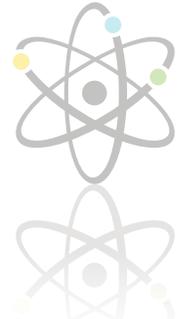
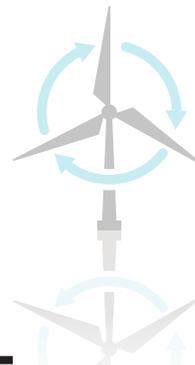
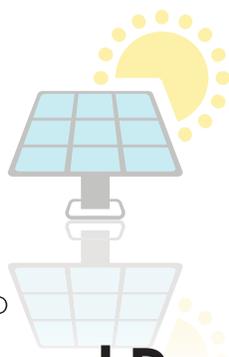
Frank can be contacted at (848) 932-2750 or at ffelder@ejb.rutgers.edu.



Adam J. Keech (guest speaker) has worked at PJM for over 14 years in both Market Operations and System Operations. He is currently responsible for the efficient design and operation of PJM's electricity markets including the Day-ahead and Real-time Energy and Ancillary Service Markets, Financial Transmission Rights auctions and the capacity market. During his time in System Operations, he was the director of Dispatch Operations and was responsible for oversight of the PJM control room.

Adam graduated from Rutgers University in 2002 with a bachelor's degree in Electrical Engineering. He earned a master's degree in Applied Statistics from West Chester University in 2013.

PJM Interconnection, founded in 1927, ensures the reliability of the high-voltage electric power system serving 61 million people in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM coordinates and directs the operation of the region's transmission grid, which includes 62,556 miles of transmission lines; administers a competitive wholesale electricity market; and plans regional transmission expansion improvements to maintain grid reliability and relieve congestion.



Post-Conference Workshop

Energy Efficiency and Renewable Energy

This workshop explores energy efficiency and renewable energy technologies, including their technical capabilities and limitations, cost structure, and how they participate in energy, capacity, renewable and environmental markets. Demand response, energy efficiency, combined heat and power, storage, and other demand side technologies will be discussed. 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 energy efficiency and renewable energy technologies and their technical characteristics
- Understand the cost structure of energy efficiency and renewable technologies and how to calculate the levelized cost electricity using variable, maintenance, and fixed costs of generation resources
- Compare the performance and costs of energy efficiency and renewable technologies to conventional generation options
- Examine how energy efficiency and 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

March 15, 2018, 9 am to 12 noon – Fundamentals of Renewables

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

March 15, 2018, 1 pm to 5 pm

- Wholesale market revenues for clean energy: energy and capacity
- Retail market revenues for renewables: renewable energy credits and net metering
- Role of storage and demand response in complementing renewables
- How energy efficiency and renewables earn revenues under cap-and-trade policies
- Energy efficiency case study: combined heat and power
- 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
fax: 253 663 7224
email: register@pmaconference.com
web: <http://pmaconference.com/>
Mail: POB 2303 Falls Church Va 22042

LOCATION

Address
Edward J. Bloustein School of Planning and Public Policy
Rutgers, The State University of New Jersey
33 Livingston Avenue
New Brunswick, NJ 08901

The front of the Bloustein School building faces Livingston Avenue. As you enter the main doors of the building, the Bloustein School is on the left. Go through the double doors to access the elevators.

The Bloustein School is a five-minute walk from the New Brunswick Train Station (NBK), which has NJ TRANSIT and Amtrak connections on the Northeast Corridor. The station is approximately one hour from Newark Airport, New York City and Philadelphia.

For directions and information about parking, visit bloustein.rutgers.edu/location

Hotels
The Heldrich Hotel, www.theheldrich.com, (732) 729-4670 and the Hyatt Regency-New Brunswick, newbrunswick.regency.hyatt.com, (732) 873-1234 are both within walking distance of the Bloustein School. A listing of additional hotels in the area may be found at bit.ly/ceeep-hotels.

PLEASE SELECT

In-Depth Introduction to Electricity Markets (March 13-14) AND WORKSHOP (March 15): US \$1600
EARLY BIRD before Feb. 23: \$1400

In-Depth Introduction to Electricity Markets ONLY (March 13-14) : US \$1150
EARLY BIRD before Feb. 23: \$950

WORKSHOP ONLY (March 15) : US \$790
EARLY BIRD before Feb. 23: \$690

How did you hear about this event? (direct email, colleague, speaker(s)) _____

Print Name _____ Job Title _____

Company _____

What name should appear on your name badge? _____

Address _____

City _____ State/Province _____ Zip/Postal Code _____ Country _____

Phone _____ Email _____

List any dietary/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 back of Visa/MC or 4 digits on front of AmEx) _____

OR Enclosed is a check for \$ _____ to cover _____ registrations.

15% discount for 3 participants, 25% discount for 4 or more.
Please call (201) 871-0474 or email register@pmaconference.com prior to 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 March 12, 2018 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.