



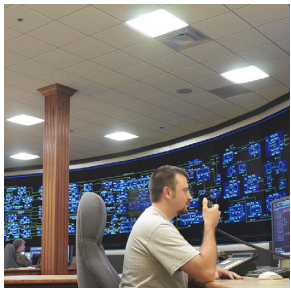
Course length: Two days

Prerequisites: Electric Industry Basics (live seminar), Electric Industry Overview (online course), *Understanding Today's Electricity Business* (book), or a fundamental understanding of the electric business

CPE credits: 16

An in-depth look at how power markets work

The importance of wholesale power markets continues to grow. For those who work for or provide services to an organization involved in electric markets an understanding of how these markets function is critical to success. Key areas include which services are traded, how bilateral and Independent System Operator (ISO) transactions are completed, how ISO markets operate, how bilateral and locational marginal prices (LMP) are determined, how risk is managed through physical and financial products, and how markets continue to evolve with the growth of renewable and distributed resources. Wholesale Power Markets: Trading, ISOs, Pricing, and Products explores each of these key principles in depth and can be customized to a specific ISO.



WHO WILL BENEFIT FROM THIS SEMINAR?

- Previous participants in Enerdynamics' Electric Industry Basics who are ready to take their knowledge of markets to the next level
- Finance, accounting, legal, sales, and regulatory professionals interacting with ISOs, traders, procurement groups, merchant generators, transmission owners, and retail marketers
- Employees in utility or retail marketing procurement needing a deeper understanding of wholesale markets
- Generation and transmission planners and project developers for utilities, merchant generators, and renewable energy companies
- System operators wanting a deeper understanding of the needs of market participants
- Utility account representatives and department managers working for a company in a region with competitive wholesale markets

WHAT PARTICIPANTS WILL LEARN

- Basic market concepts including demand, supply, and factors driving price
- Who market participants are and what roles they play
- The various electric market structures in North America including regulated and competitive wholesale and retail markets
- Details on bilateral, electronic exchange, ISO, and regulated markets as well as the option of self-provision
- Details on each of the services traded in markets including capacity, energy, ancillary services, transmission rights, renewable energy credits, emission allowances, and financial services
- How each of the various markets sets prices
- Concepts used to measure value, risk, and opportunity
- Techniques used to manage risk
- Market strategies used by generation, wholesale, and retail market participants to achieve success
- How wholesale markets are likely to evolve in the future

COURSE AGENDA

Introduction

- What electric markets are and why we have them
- Vertically integrated vs. competitive markets
- The need for the ISO in competitive markets
- Where vertically integrated and competitive markets exist
- Physical properties of electricity that impact how markets can be structured

Market Concepts – Consumers and Load Curves

- Weekly load curves by hour
- Typical daily load curves in different seasons
- How consumer behavior contributes to curve shapes
- Key factors that drive demand
- How weather impacts are measured
- Impacts of price
- Impacts of Distributed Energy Resources (DER)

Market Concepts – Running an Electric System

- The physical grid
- System planning and operations (five years to five minutes)
- Long-term resource planning
- Seasonal planning
- Day-ahead scheduling
- Real-time operations
- Using markets to clear longs and shorts in each time frame

Market Concepts – Market Participants

- Generators
- Wholesale traders
- Independent system operators (ISOs) and power pools
- Load-serving entities (LSEs)
- Transmission owners (TO)





- Distribution utilities
- Vertically integrated utilities
- Needs of various participants

Market Concepts – Generators and Dispatch Curves

- The concept of the dispatch curve
- Generation types and their physical characteristics
- Variable and fixed costs of various generation types
- Impacts of heat rate, fuel cost, and emissions compliance
- Demand response, distributed generation, and storage as supply resources
- Regional generation mixes and dispatch curves
- The impacts of increasing renewable supply
- The increasing importance of generation flexibility
- Key factors that drive supply availability and dispatch curves

Market Concepts – Price

- How demand curves and dispatch stacks drive price
- Typical hourly price movements
- Concepts of price volatility
- Day-ahead versus real-time prices
- Impacts of fuel prices and price-responsive loads
- Forward price curves
- Using forward prices to lessen volatility

Electric Market Details – Market Structures

- Definition of market structure
- The factors that define market structure
- Bilateral wheeling markets versus ISO organized markets
- Market structures and the roles of market participants

Electric Market Details – Products and Services

- Electric services and features
- Details on each type of service (definition, how services

are typically structured, which markets they are bought and sold in, time frames)

- Forward capacity
- Forward energy
- Day-ahead energy
- Real-time energy
- Ancillary services
- Transmission rights
- Renewable Energy Credits (RECs)
- Emissions allowances and offsets
- Financial services

Electric Market Details – Trading Arrangements

- What are trading arrangements?
- Channels – how parties transact
- Bilateral channels (direct, brokers, exchanges, RFPs)
- Procurement auctions
- Organized ISO markets
- Standard contracts
- Credit arrangements

Electric Market Details – ISO Market Details

- The relationship between bilateral forward markets and ISO markets
- The process for scheduling energy, ancillary services, and transmission
- Optimized scheduling models
- Day-ahead offers
- Locational marginal pricing (the concept, how LMP is calculated, examples, contour maps)
- Transmission congestion costs
- Financial transmission rights (FTRs)
- How real-time energy is dispatched and priced
- Energy imbalance markets

Market Strategies to Manage Risk

- Key terms
- Risk vs. opportunity
- Volatility
- Portfolio theory
- Definition of value
- Mark-to-market (MTM)
- Valuing complex assets (scenario modeling, Black-Scholes, stochastic modeling)
- What risk management is
- Risk exposures that must be recognized
- Risk management strategies
- Measuring risk using Value at risk (VaR)
- Stress testing
- Other risk measurement tools
- Hedging vs. speculation
- How a risk management program is designed and implemented

The Future of Electric Markets

- What makes electric markets complex and varied
- The growth of renewables and distributed resources
- Electric vehicles
- Creating transactional markets at the retail level
- The difficulty of predicting market behavior

