PJM Energy Market Overview

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PJM and PJM West Control Areas

PJM West

PJM RTO

PJM RTO with PJM West

- Generating Units: 594
- Generation Capacity: 66,100 MW
- Peak Load: 62,443 MW
- Annual Energy: 298,011 MW
- Transmission Miles: 13,000
- Area (Square Miles): 79,000
- Customers: 11 Million
- Population Served: 25.1 Million
- States (+ D.C.): 8

PJM - Full Service RTO
- Control Area Operator
- Transmission Provider
- Market Administrator
- Regional Transmission Planner
- NERC Security Coordinator
**NETWORK MARKET MODEL**

- **Market Participants**
- **Common Market Interface**
  - RTO Functions (Transmission Reservation, Energy Market, Settlements & Billing)
  - RTO Portals
  - RTO Data Repository
    - Planning
    - Scheduling
    - Operations
    - Settlements & Billing
  - Internet or VPN Access
- **Regional Entity**
  - Control Area
  - ITC

- **RTO Specific**
- **ITC Regional Entity**

The diagram illustrates the integration of various components within the network market model, emphasizing the roles and data transport mechanisms between different entities and functions.
Overview of Regional Market

PJM Regional Market
Single Economic Dispatch
Single Constraint Control

PJM West
Separate Regulation
Spinning Reserves

PJM
Separate Regulation
Spinning Reserves

Dynamically set tie schedule

Scheduled Tie Lines

FE
NY
AEP
VA
Spot & Ancillary Markets

- Market Flexibility
  - Support bilateral transactions
  - Self scheduling of supply
  - Spot Market access
- Market Information
  - Internet posting system
- Market Incentives
- Market Adaptation
PJM Energy Market

Options for energy supply

Load Serving Entities obtain energy to serve customers

- Self-schedule their own resources
- Bilateral Transactions

PJM Spot Market

CUSTOMERS
- Industrial
- Commercial
- Residential
What is the Day-ahead Market?

A Day-ahead hourly forward market for electric energy. It provides the option to ‘lock in’:

- scheduled quantities at day-ahead prices
- scheduled energy deliveries at day-ahead congestion price
- Fully financial, allows virtual demand and supply bids
The PJM Market uses Locational Marginal Pricing (Nodal Pricing) to manage transmission congestion.

The PJM Market also includes overlying trading hubs and zones to provide standard energy products for the commercial markets.

The PJM Market includes FTRs (Financial Transmission Rights) to allow participants to manage congestion risk.
Voluntary Bid Based Market
- Unit Specific (start-up, no-load and energy bids)
- Slice of System (energy only)
- Bids “locked in” by noon day before

Energy Pricing based on Locational Marginal Pricing (Nodal Pricing) with overlying zones and trading hubs

Central Unit Commitment (voluntary) and Security Constrained Dispatch (voluntary)

Network customers are not required to schedule expected use (free flowing ties); must bid in designated resources

Non-Network Customers must schedule expected use of spot market (voluntary)

Day-ahead forward market and Real-time spot market
Efficient Real-time Markets

- LMP pricing, pricing based on actual system operating conditions
- State estimator updated continuously
- Same model for day-ahead market, system scheduling, dispatch, and settlements
- Cost causation for pricing to market participants
- Consistency results in market confidence
Efficient Real-time Markets

- The price of energy at each location is calculated and posted on the PJM website at five minute intervals.
- Settlements are performed based on hourly integrated LMPs
- Self-scheduled generation and transaction are price-takers
- Generator and transaction status can change in real-time with 20 minute notice
Ancillary Service Markets

- Energy and energy transportation (transmission service) are the commodities that RTO customers need in the RTO market.
- Ancillary Services (regulation, reserves, etc.) are services that the RTO needs to ensure reliable system under RTO market operations.
- Since Energy is the desired commodity, Ancillary Services should not dominate or distort the market.
- The market design should provide an efficient mechanism to acquire Ancillary Services without distorting the energy market.
Locational Marginal Pricing Model

1. **Real-Time Data**
   - **State Estimator**
     - System Economic Dispatch Rates
   - **LPA Preprocessor**
     - Generator Bids

2. **Flexible Generating units and bids**
   - **LPA**
     - LMP’s for all locations

3. **PJM Dispatcher Input**
   - **LPA Contingency Processor**
     - Binding Transmission Constraints
   - **LPA**