

Brief Remarks on Electricity Markets

by

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Key Requirements of Competitive Electricity Markets

- Efficiency
- Reliability (keeping the lights on)
- Competition
- Authority (clear mandates)
- Coordination (clear lines of communication)
- Independence
- Geographical scope (large footprint)



Main Functions of an ISO/TSO/RTO

- Control over operation within its jurisdiction
- Nondiscriminative transmission service
- Implement market mechanisms for transmission pricing and congestion management
- Serve as supplier of last resort for all ancillary services (reactive power; frequency; reserves)
- Short-term reliability
- OASIS (open-access same-time information system)
 - TTC; ATC
- Coordination with neighboring control areas
- Planning and expansion of transmission facilities
- Monitor markets for design flaws and market power



Some Problems Have Been Identified

- New usage of transmission systems
 - growth in volume of trading
 - unexpected amounts and directions of power flows
- Planning and expansion of transmission grid is not keeping up with increasing bulk power trading (Cal.)
- Coordination between generation and transmission planning is diminishing
- Coordination between ISO and generation maintenance (Cal.)
- Market dominated by few generators ; Gaming (Cal.)
- Reduced liquidity
- Centrally forecast estimate of demand limits its involvement (Cal.)
- Several reliability near misses; Blackouts (lights off!) in U.S., Italy



Path to Standard Market Design: key features

- Energy market (day-ahead; real-time balancing)
 - SCED (security-constrained economic dispatch) and LMP based
- AS (ancillary services) market
- TR (transmission rights) market
 - congestion charges
 - FTR's, FGTR's
- Market power monitoring and mitigation
 - over-concentration
 - strategic location
 - strategic behavior; collusion



Differences in Market Design

- Centralized/Bilateral? (Spain; PJM; NETA)
- LMP/ZMP/UMP? (PJM; NordPool, CAISO; Spain)
 - congestion; market liquidity; price volatility
- Congestion Management;
 - LMP/ZMP(market splitting)
 - TLR; buy-back (NordPool/CAISO)
- Financial/Physical rights?
- AS market coordinated with energy market?
 - independent/sequential/joint?
- Loss allocation
- Unit commitment? (PJM; NETA)
- Reliability/Operational



Market Design: unsolved issues

- Generator sitting left to market forces? What about transmission?
 - economics/reliability intertwined
- Who pays for new transmission additions?
 - economic signals (not LMP)
 - loop flow
- Transactions across several jurisdictions (Europe)
 - pancaked tariffs
 - loop flow
- Imbalance exposure of wind farms/combined heat & power
- Extreme system conditions
 - scarcity of reserves & failure to clear the spot market



