On Standard Market Design

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Outline

- Structure and Scope of RTOs
- Evolution of RTOs
- Elements of Standard Market Design
Evolution of RTOs

- Order 888
- Order 2000
  - Outlined RTO characteristics and functions at a high level
- Standard Market Design (SMD)
  - Eliminate Seams
  - Adopt best practices
  - Address RTO functions in greater detail
  - To be released by FERC on Jul 31, 2002
Standard Market Design

- FERC’s proposal mirrors the PJM and NY ISO market designs
- Key elements of SMD
  - LMP based congestion management
  - Financial Transmission Rights
  - Financially binding day-ahead energy markets
  - Real time balancing markets
  - Capacity markets (initial reluctance, gradual acceptance)
  - Market power mitigation
Congestion Management

- Experiences with high uplift costs in California, ERCOT and New England
- Uplifts are difficult to hedge
- Zone redefinition creates uncertainties
- General acceptance of LMP and nodal pricing (albeit with appropriate hub definition)
  - *(Bill Hogan was right after all!)*

Source: ISO-NE
LMP components (NYISO LBMPs June 5, 2002)

LBMP decomposition depends on choice of reference bus

NYC

Source: NYISO
Financially Binding Day-ahead Markets

- Not required in Order 2000 but a key element of SMD
- Shifts risk of generator non-performance from loads to generators
- Encourages price signals for demand response
- Enhances reliability through day-ahead commitments
- Currently used in PJM and New York, New England implementation in Dec 02, missing in ERCOT

Design choices
- Centralized unit commitment with multi-part bids (PJM, NY)
- Decentralized self-commitment with single part portfolio bids (CalPX)
- General willingness to accept a NY (or PJM) style design despite complexity of centralized optimization
No Balanced Schedules

- **The thinking then**
  - Minimize RTO’s role by separating Power Exchange (PX)
  - RTO requires balanced schedule, PX allows participants to balance their schedules

- **The thinking now**
  - Little success with independent power exchanges
  - Too many coordination problems in congestion management
  - RTO required to operate day-ahead energy market
  - No balanced schedules necessary
Real-Time Markets

- Fundamental balancing function for an RTO
- General acceptance of ex-post pricing that reflects actual dispatch
- Prices that reflect actual dispatch do not need to use penalties for uninstructed deviations
- However, FERC straw proposal allows penalties when necessary
Transmission Rights

- Emerging consensus on financial rights over physical rights (although FERC straw proposal on SMD does not use the term “financial rights”)

- “At the start of Network Access Service, the transmission provider must offer source-to-sink obligations”

- “Upon the request of market participants, the transmission provider must also offer source-to-sink options and flowgate rights as soon as it is technically feasible”

- Should historical customers get initial Transmission Rights?
  - Option 1: Existing customers receive rights based on historical usage
  - Option 2: All customers receive a share

- If existing customers receive rights, should they be auctioned or allocated?
  - Option 1: Allocation
  - Option 2: Auction
  - Option 3: Partial allocation
  - Option 4: Regional variation
RTO Congestion Costs

CAISO data excludes intra-zonal congestion
New England data represents uplift costs

Source: Market monitor reports
PJM FTRs and Revenue Adequacy

PJM FTR Payout

Source: PJM
ERCOT FTR Auctions

ERCOT TCR Auctions

$ (millions)

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<th>G to P</th>
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$ p = H' \mu$

$p= $ LMPs
$\mu=$ Shadow prices
$H'=$ Shift factor matrix

Source: ERCOT
Capacity Markets

- Three distinct approaches
  - Energy only markets
    - Price caps that disallow scarcity rents make this approach difficult in the current political climate
  - Capacity payments
    - Difficult to guess “correct capacity price”
  - Capacity obligations for Load Serving Entities (LSE)
    - RTO sets reserve margin and quantity obligation for each LSE based on peak demand
    - Capacity price is determined by market
    - Markets must be forward looking (2- years) and long-term (e.g, annual/seasonal) to make them meaningful

- Other recent proposals
  - Call options (combines generation adequacy and price insurance)
Market Power Mitigation

- Market power mitigation, not price management
  - Encourage structural solutions, including divestiture
  - Should minimize refunds and ex-post price revisions
  - Damage control price caps a reality until a reasonable demand response is available
  - Damage control price cap should be sufficiently high to allow recovery of scarcity rents and elicit a demand response
  - Load pockets handled through RMR contracts
  - Parameters in price screens need to be selected carefully
    - Check for two conditions (1) *impact test*: prices jump suddenly by predefined tolerance (2) *conduct test*: bidding behavior changes suddenly (e.g., offer price exceeds 90 day-average by X% or Y$)
    - If both conditions are true, mitigate offer price
    - Does not apply to small portfolios, hydro resources and if prices fall below predefined threshold
RTO Consolidation

- RTO consolidation motivated by desire to eliminate seams between markets for increased efficiency and stable markets
- Ultimate goal to create around five RTOs that cover the United States
- Recent cost-benefit studies (PJM, Mirant, LECG, ICF) indicate clear benefits to customers from a common market in the Northeast and Midwest
- Some regions will see lower prices (e.g. New York) while others may see some increase in prices

- NERTO common market
  - Common power market for ISO-NE and NYISO (Peak load 56,141 MW)
  - Possible participation by Canadian provinces
- MISO-PJM-SPP common market (expected 2005)
  - More than 5000 generators
  - Will test the limits of large scale computation
    - Largest unit commitment tests to date have used around 3000 generators
RTO Structures

- For-profit ITCs operating under a non-profit RTO can address independence concerns
- Is it possible to allow ITC to perform some RTO functions without compromising efficiency?
- What happens to ITC value proposition if RTO performs all functions?
- How should PBRs be established under an LMP regime?
Existing and Emerging RTOs

Standard Market Design (SMD) based largely on PJM, New York ISO

PJM, NYISO, ISO-NE, CAISO & ERCOT, & MISO currently “operational” with varying elements of SMD
Power Market Liquidity

MW Daily volumes (non RTO hubs)

MW Daily volumes (RTO markets)

Source: MW Daily