PJM - MISO
Achieving a Virtual RTO
Through A Joint Operating Agreement

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• Purpose - provide a process to allow coordinated management of transmission constraints that are significantly impact by generation dispatch in both markets

• Benefits
  – Most efficient and least costly management of transmission constraints near market boundaries
  – Coordinated pricing at market boundaries
  – Increased alternatives to manage security constraints in a reliable manner
Market Seams Issues

- Limitations in managing transmission congestion near borders
- Loop Flow Impacts
- Interregional Power Interchange
- Granularity issues and inefficiency in the Transmission Loading Relief (TLR) procedures
Management of Constraint Through TLR Process

Congestion on Line A causes RTO 2 to Declare TLR
Since RTO 1 dispatch does not monitor Line A,
RTO 1 lowers Gen B in response to TLR
Result is reduced effectiveness of TLR in managing Line A flow
Congestion on Line A causes RTO 2 to initiate redispatch protocol
RTO 1 enters Line A into security-constrained dispatch
Result is RTO 1 lowers Gen A and congestion is reduced
Identification of Jointly Managed Transmission Constraints

• The list of transmission constraints that are jointly coordinated will be pre-identified and posted.
• Limited to those constraints for which at least one generator in the adjacent (non-monitoring) RTO has a significant power distribution factor (i.e. 5 percent).
• Flow entitlements will be quantified for all transmission constraints that are designated to be coordinated.
Interregional Coordination in Various Market Timeframes

• Real-time Market
  – Least-cost management of transmission constraints through joint, iterative security-constrained economic dispatch

• Day-ahead Market
  – Day-ahead market will recognize flow entitlements of adjacent RTO
  – provides Day-ahead congestion relief upon request

• Reliability Scheduling
  – Transmission security analysis will recognize flow entitlements of adjacent RTO

• FTR Allocations and Auctions
  – will recognize flow entitlements of adjacent RTO
• When any of the pre-identified transmission constraints becomes binding in the monitoring RTO security-constrained dispatch, it is also entered in the non-monitoring RTO security-constrained dispatch.
• Monitoring RTO will manage constraint based on actual limit
• Non-monitoring RTO will manage constraint based on flow entitlement and based on the requested MW relief amount.
• RTOs will share constraint shadow price information to determine least-costly dispatch alternatives
Real-time Market Settlements

- Compare powerflow contribution from non-monitoring RTO dispatch to flow entitlement

  - If flow > flow entitlement
    - Non-monitoring RTO payment to monitoring RTO is calculated as follows:
      - payment = (flow - flow entitlement) * Transmission Constraint shadow price in monitoring RTO

  - If flow < flow entitlement
    - Monitoring RTO payment to non-monitoring RTO is calculated as follows:
      - payment = (flow entitlement - flow) * Transmission Constraint shadow price in non-monitoring RTO
Day-ahead Market

- If either RTO identifies need to coordinate flow on a Day-ahead basis then it will notify the other RTO and a joint Day-ahead scheduling protocol will be implemented.
- Provides capability for RTOs to adjust the flow entitlements that are used in the Day-ahead Markets as necessary to coordinate pre-identified transmission congestion.
- If Day-ahead coordination is performed, then the corresponding flow entitlement adjustments are made in the applicable hours in the Real-time market.
- Settlements protocols are similar to Real-time but will used Day-ahead quantities and prices.
FTR Auctions and Allocations

• The FTR simultaneous feasibility analysis in both RTOs will recognize the flow entitlements that exist flow the adjacent RTO.

• Technical models for FTR analysis, Day-ahead market and Real-time market will contain similar levels of detail to ensure consistency and revenue adequacy.
Benefits of Coordinated Dispatch

- Consistency of Locational Price signals at the market borders
- Utilizes existing technology
- Reduced transmission congestion costs
- Increase in dispatch alternatives make operations more reliable
- Loop Flow effects are internalized through coordination
- Increased efficiency in interregional power interchange
- Coordinated FTR allocation provides protect from congestion for Native Load and Firm customers