

PJM - MISO

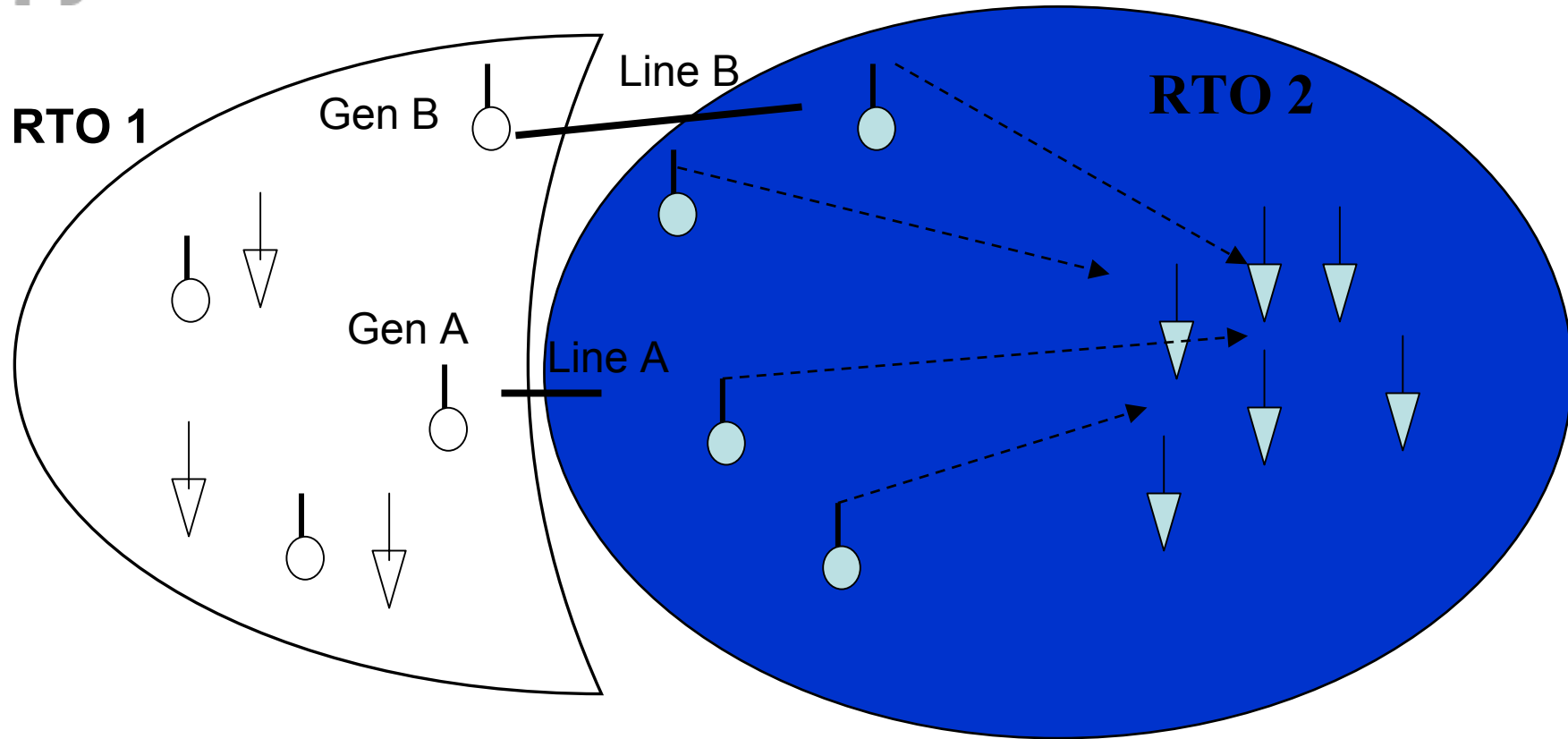
Achieving a Virtual RTO

Through A Joint Operating Agreement

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- Purpose - provide a process to allow coordinated management of transmission constraints that are significantly impacted 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

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

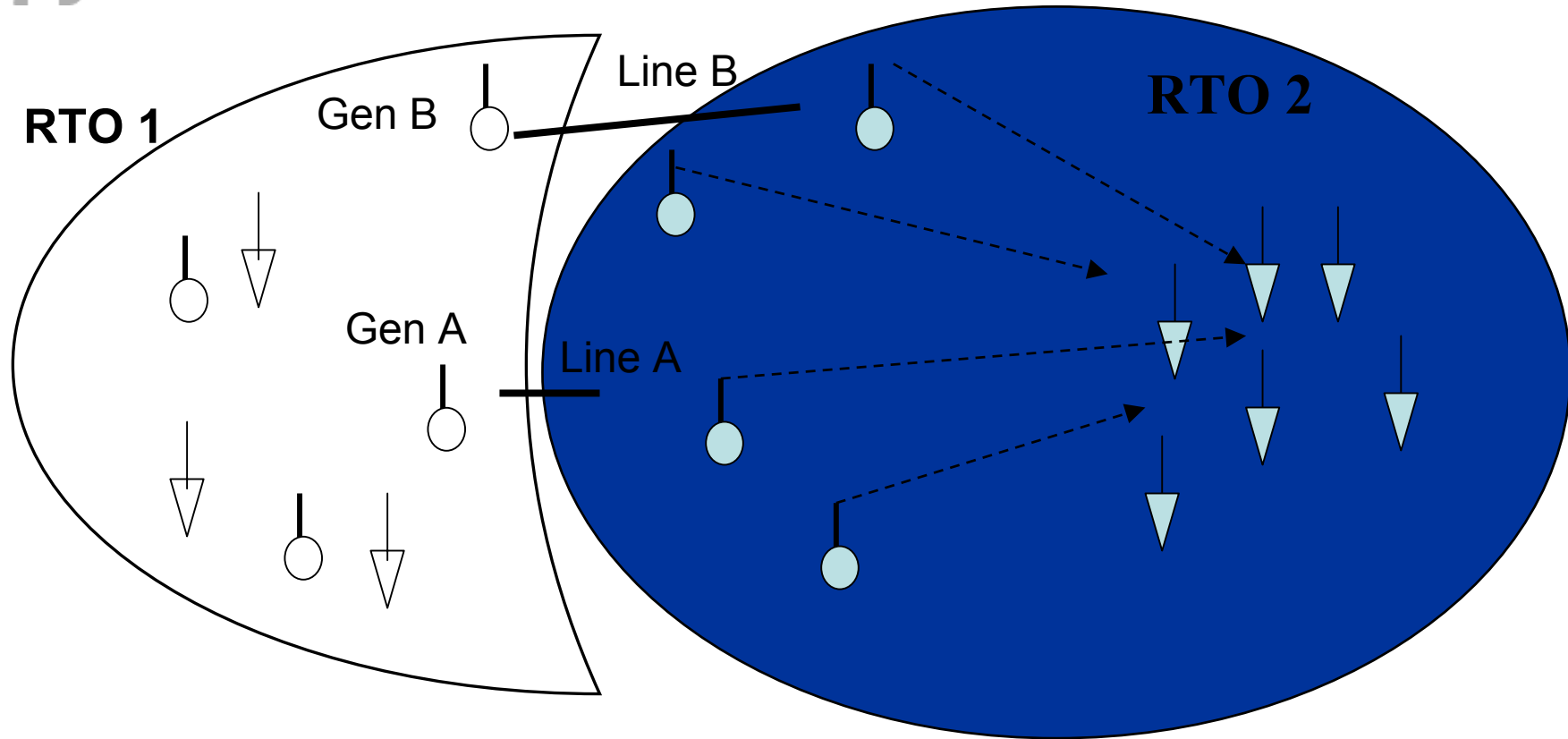


Congestion on Line A causes RTO 2 to Declare TLR

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

- 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.

- 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

- 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:
 - $\text{payment} = (\text{flow} - \text{flow entitlement}) * \text{Transmission Constraint shadow price in monitoring RTO}$
- If flow < flow entitlement
 - Monitoring RTO payment to non-monitoring RTO is calculated as follows:
 - $\text{payment} = (\text{flow entitlement} - \text{flow}) * \text{Transmission Constraint shadow price in non-monitoring RTO}$

- 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 use Day-ahead quantities and prices.

- 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.

- 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