



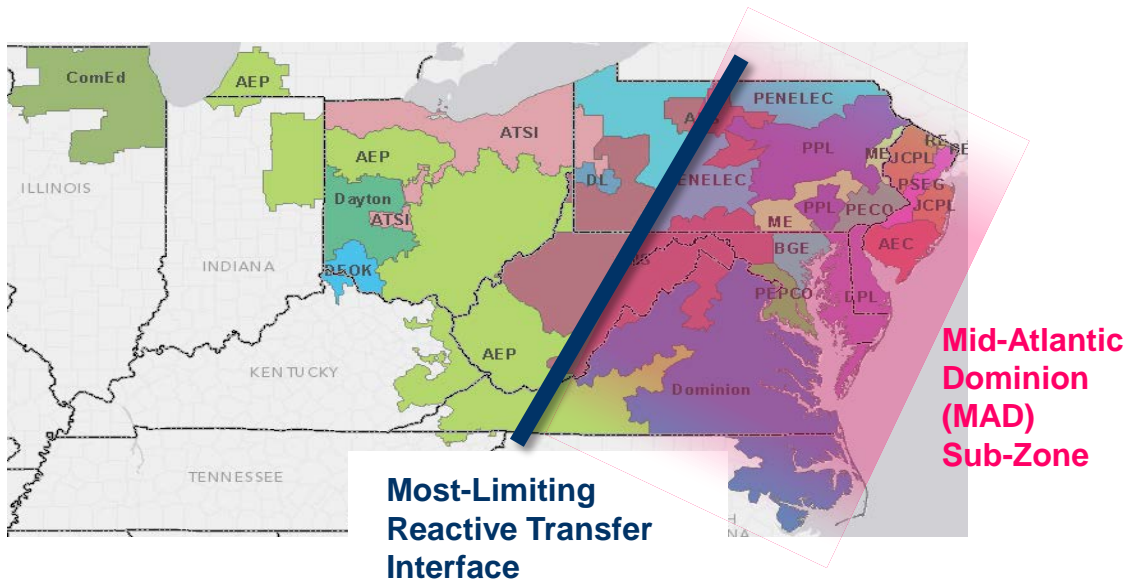
Locational Reserve Modeling

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June 8, 2018

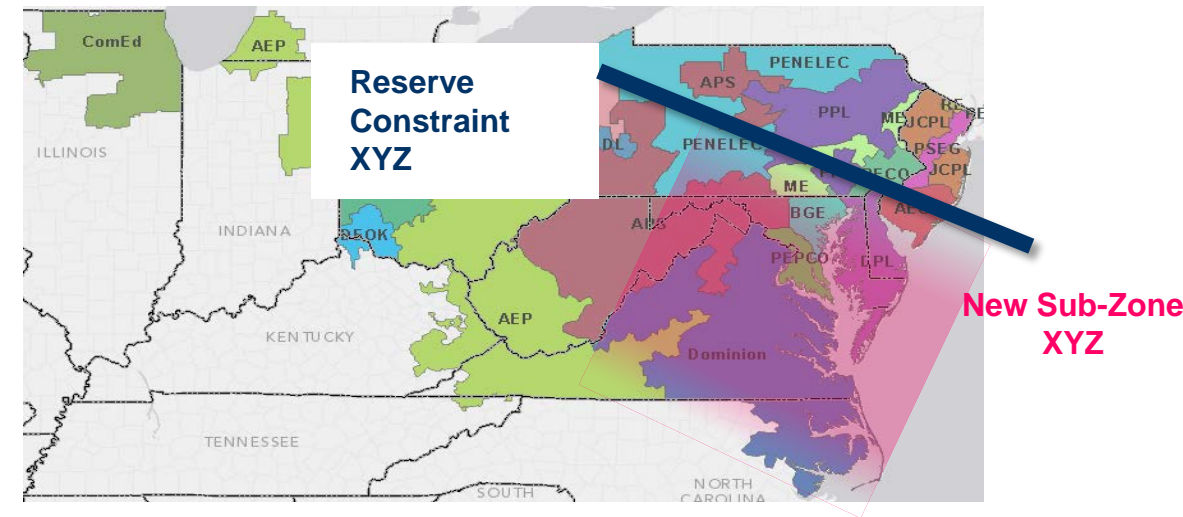
- The current, static reserve zone modeling approach (RTO reserve zone with MAD sub-zone) does not always accurately reflect the constraints dispatch is most concerned with overloading
 - Leads to reserve prices that may be misaligned with the reliability value of those locational reserves

- Nodal Reserve Pricing
 - Model a single RTO-wide reserve demand curve
 - No locational demand curves necessary
 - Monitor one or more transmission constraints for overload if reserves are deployed
 - Assign reserves to resources that will not result in constraint overloads
 - Capture cost of redispatch in nodal reserve congestion component
 - Yields nodal reserve clearing prices
 - *Preferred approach, but requires additional investigation to confirm feasibility*

- More Flexible Reserve Sub-Zone Modeling
 - Keep existing RTO reserve zone with closed loop sub-zone structure, but allow flexibility to change the location of the sub-zone
 - Define several reserve sub-zones, of which only one will be used at a time



OR



- Continue investigating feasibility of implementing nodal reserve pricing
 - Bring additional detail to the EPFSTF as soon as feasible
- Continue building detail around flexible sub-zone approach in case nodal reserve pricing is not feasible
 - Gather stakeholder feedback on the flexible sub-zone approach to date

- Define several reserve sub-zones, of which only one will be used at a time
- New reserve sub-zones may be defined for constraints in these three categories:
 - Reactive transfer interfaces (AP South, BED-BLA, etc.)
 - 345kV or above actual overload constraint (i.e. Conastone-Peach Bottom 500kV actual overload)
 - Contingency overload exceeding the load dump limit on a 345kV or above facility
- New reserve sub-zones will be defined as far in advance as possible
 - Model process after guidelines for notifying participants of new closed loop interfaces
 - Notification to PJM stakeholders of any new reserve sub-zone should be made as far in advance as possible, but no later than X days prior to use
- New reserve sub-zones will not be created on a same-day basis

- Sub-zones will be defined as all buses that have a 3% or greater distribution factor on the associated transmission constraint
 - Definitions will be posted on pjm.com
 - Reserve sub-zone definitions will be re-evaluated and published quarterly in advance of the network model builds

- Each reserve sub-zone will have its own ORDC for each product (SR or PR)
- Methodology for defining the sub-zone curve will be consistent with that of the RTO reserve zone curve.
 - Maximum price will be consistent with the maximum price on the RTO demand curve (\$850)
 - Minimum Reserve Requirement will be equal to the real-time output of the largest single contingency in the reserve sub-zone
 - Downward sloping section will be set by Probability of falling Below the Minimum Reserve Requirement (PBMRR) times the Max Price
 - Curve will be adjusted for operator actions, consistent with practices applied to RTO demand curve

Flexible Sub-zone Approach Details: Changing the location of the sub-zone

- Keep existing RTO reserve zone with closed loop sub-zone structure, but allow flexibility to change the location of the sub-zone

- The reserve sub-zone to be used for a given operating day will be determined on a day-ahead basis and will apply for the entire operating day.
 - Will be the reserve sub-zone associated with the most limiting of the defined reserve constraints, as determined by day-ahead or other forward reliability studies
 - Notification of changes to the reserve sub-zone to be used will be made as far in advance as possible, but no later than prior to the close of the day-ahead market (notification method TBD).

- Changes to the reserve sub-zone in use can be made after the close of the day-ahead market (including intraday) on an exception basis.
 - Stakeholders will be notified of all switches in the modeled reserve sub-zone as soon as possible (notification method TBD).

- Enhancements to spin event notifications / instructions will be necessary if the sub-zone in use can change
 - Send spin event notification to units within the impacted sub-zone via ICCP
 - Investigate adding requested spin event response MW to energy basepoint instruction sent via ICCP