



# PJM Scarcity Pricing Changes

HEPG – October 1, 2009

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- Scarcity Pricing is triggered in regions defined by transmission constraints.
  - Regions must be at least 2 entire contiguous transmission zones.
  - Defining constraints must be 500kV or greater.
  - Includes all pricing nodes with greater than 5% raise help dfax.
- Currently there are 6 regions defined including the PJM RTO as a whole.

The following dispatch actions initiate a scarcity pricing event:

- Begin to dispatch on-line generators which are partially designated as Maximum Emergency (MaxE) into emergency output levels.
- Begin to dispatch on-line generators which are designated entirely as MaxE, above their designated minimum load points, if they are currently on-line and operating at their minimum load points because of restrictive operating parameters associated with the generators.
- Begin to dispatch any offline generators that are designated entirely as MaxE and that have start times less than or equal to 30 minutes.
- Voltage reduction
- Emergency energy purchases
- Manual load dump

- All offer caps are lifted within the local scarcity pricing region
- LMPs are set at the highest market-based offer operating at PJM's direction in the scarcity pricing region
- Resources called on for the scarcity condition are not offer capped
- The only offer caps are the \$1000/MWh energy offer cap in the Tariff

1. Improve reliability by reducing demand and increasing generation during periods of operating reserve (OR) shortage.
2. Make it more worthwhile to invest in demand response.
3. Encourage existing resources to continue to be relied on during OR shortages.
4. Encourage entry of new generation and demand response.
5. Comparable treatment of all resources.
6. Ensure market power is mitigated.

- Methodology that employs an operating reserve constraint penalty factor curve method and the joint, simultaneous co-optimization of energy and reserves
  - “Scarcity” is determined by a “shortage of reserves”
  - There is a price (penalty factor price) associated with allowing reserves to go into shortage in order to maintain energy balance
  - An example of how this works is presented in Appendix 2 of this presentation.
  - An example of how this works across locations in RTO implementations to date can be found <http://www.pjm.com/committees-and-groups/working-groups/~media/committees-groups/working-groups/spwg/20090903/20090903-item-04-locational-example.ashx>
- Market power screening through the use of the Three Pivotal Supplier Test and market power mitigation to cost-based offers will remain in place at all times
  - Prices increase as a result of entering a reserve shortage and are driven by the penalty factor prices associated with allowing reserve to go into shortage

- 10-Minute Non-synchronized and Synchronized Reserve Products
  - Used to meet Synchronized and Primary Reserve requirements
  - 30-Minute product was discussed but decided against for initial implementation
  - Further discussion on this will be deferred till after initial implementation
- PJM Operations proposed reserve regions
  - RTO reserve region
  - Mid-Atlantic + DOM reserve region delineated by APSOUTH as is done today for Synchronized Reserve
  - 5-minute co-optimized energy and A/S prices and possibly some assignments
- One reserve constraint penalty factor curve for each product and region
  - 4 separate curves
  - Recognizes shortage may not occur in Primary Reserve first, but could happen with Synchronized first.

- Emergency resource inclusion and handling of emergency procedures
- Non-convexities in reserve commitments and price setting
- Shape and magnitude of the penalty factor curve
- Locational price additivity and the VOLL