

PJM Shortage Pricing Proposal Matrix

Component:	Proposal:	Details:
General Methodology	<ul style="list-style-type: none"> • Real-time joint optimization of energy and reserves • Integration of operating reserve demand curve for all market-based reserve products 	<ul style="list-style-type: none"> • Inflexible reserve resources including synchronous condensers and demand resources will be committed for reserves on an hourly basis and locked in during the operating hour • Online generators following dispatch will be dispatched for energy and reserves in real-time as system conditions dictate • Transparent energy and ancillary service price calculations that include the impacts of lost opportunity and product substitution costs
Reserve Products	<ul style="list-style-type: none"> • 10-minute Synchronized Reserves • 10-minute Non-Synchronized Reserves 	<ul style="list-style-type: none"> • Synchronized plus Non-Synchronized Reserves equal Primary Reserves
Reserve Requirements	<ul style="list-style-type: none"> • Primary Reserves = 150% of the largest system contingency • Synchronized Reserves = 100% of the largest system contingency 	<ul style="list-style-type: none"> • Synchronized Reserve requirement is nested within the Primary Reserve requirement • These requirements will be enforced in each reserve area/region.
Reserve Regions	<ul style="list-style-type: none"> • For both Primary and Synchronized Reserves <ul style="list-style-type: none"> ○ RTO Reserve Area ○ Mid-Atlantic plus Dominion Reserve Region 	<ul style="list-style-type: none"> • Locational nesting of the Mid-Atlantic plus Dominion Reserve Region within the RTO Reserve Area • A minimum quantity (currently 418 MW) of Non-Synchronized Reserves must be located within Dominion Zone.
Regulation Commitment/Deployment	<ul style="list-style-type: none"> • Regulation commitment and deployment will largely remain unchanged 	<ul style="list-style-type: none"> • Regulating resources will be committed by 30 minutes prior to the operating hour and will be locked for the entire hour.

Market Pricing Periodicity	<ul style="list-style-type: none"> 5-minute marginal prices for energy, reserves and regulation calculated simultaneously 	<ul style="list-style-type: none"> 5-minute prices will be averaged over the course of an hour for settlement purposes
Penalty Factors and Shortage Prices and Transition Plan	<ul style="list-style-type: none"> \$850/MWh enforced for both Primary and Synchronized Reserves in all modeled regions. \$850/MWh penalty factors with a \$1,000/MWh offer cap will result in \$2,700/MWh shortage prices (+/- losses and congestion). PJM transition proposal that would work up to \$850/MWh penalty factors over 3 year period 	<ul style="list-style-type: none"> \$850/MWh allows full utilization of all assets within PJM to meet energy and reserves needs and is consistent with empirical and historic analysis. In proposed transition to arrive at \$850/MWh penalty factors, PJM has proposed the following <ul style="list-style-type: none"> Year 1, \$250/MWh penalty factors, \$1500/MWh maximum energy price Year 2, \$400/MWh penalty factors, \$1800/MWh maximum energy price Year 3, \$550/MWh penalty factors, \$2100/MWh maximum energy price Year 4, full \$850 penalty factors, \$2700/MWh maximum energy price Transition mechanism was put in place to allow PJM and stakeholders to gather operating experience with the new dispatch and pricing mechanisms without having the full pricing implications.
Emergency Procedures and Pricing	<ul style="list-style-type: none"> PJM has proposed that emergency procedures impact prices. 	<ul style="list-style-type: none"> Emergency generating capacity, demand response and purchases from external areas should be eligible to set price. Emergency procedures like a voltage reduction or manual load dump will result in prices consistent with a shortage of all reserve products in the reserve region where the emergency action was initiated.
Emergency DR Deployment	<ul style="list-style-type: none"> In general no change from the status quo deployment by zone and lead time. Measures implemented to avoid frequent 	<ul style="list-style-type: none"> Once a zone has been deployed, it will move to the bottom of the list for deployment during the next event. However, if system conditions require it, a single zone may be called multiple times in a row.

	deployment of a single zone.	
Emergency DR Data Reporting	<ul style="list-style-type: none"> • CSPs will submit aggregated zonal level information for all of their resources by lead time in each zone. 	<ul style="list-style-type: none"> • CSPs will submit the following information: <ul style="list-style-type: none"> ○ Total load available to be curtailed ○ Total load already being curtailed ○ Total load remaining that can be curtailed (should be the difference between the two above) • This information will be submitted in the following frequency: <ul style="list-style-type: none"> ○ Once per month for non-summer months ○ Once per day during summer months ○ Once per hour once an emergency alert has been issued.
Day Ahead Hedging	<ul style="list-style-type: none"> • PJM has proposed to allow offer caps commensurate with the annual maximum shortage price for virtual bids and non-capacity demand response resources to allow Day Ahead prices to match real-time. • In separate options PJM has proposed to change the definition of fixed demand bids globally and under certain conditions to protect load customers. 	<ul style="list-style-type: none"> • Option 1: <ul style="list-style-type: none"> ○ Raise offer caps for virtual bids and non-capacity demand response. ○ No changes to fixed demand bids. • Option 2: <ul style="list-style-type: none"> ○ Raise offer caps for virtual bids and non-capacity demand response and treat fixed demand bids as price-sensitive at \$1,000/MWh all of the time. ○ This would require explicit submission of a price sensitive demand bid at prices above \$1,000/MWh to ensure hedging when the Day Ahead price exceeds \$1,000/MWh.

		<ul style="list-style-type: none"> • Option 3: <ul style="list-style-type: none"> ○ Raise offer caps for virtual bids and non-capacity demand response and treat fixed demand bids as price-sensitive at \$1,000/MWh only during shortages of Day Ahead Scheduling Reserves. ○ This would require explicit submission of a price sensitive demand bid at prices above \$1,000/MWh to ensure hedging when the Day Ahead price exceeds \$1,000/MWh when Day Ahead Scheduling Reserves are short.
Revenue Offset Mechanism in RPM	<ul style="list-style-type: none"> • Maintain today's existing mechanism. 	<ul style="list-style-type: none"> • 3-year historic average offset for the calculation of Net CONE • 3-year historic average market revenues used to calculate Market Seller Offer Caps
Regulation Prices	<ul style="list-style-type: none"> • PJM has proposed the removal of the shoulder hour lost opportunity cost from the regulation clearing price calculation only 	<ul style="list-style-type: none"> • The nature of a 5 minute marginal prices for regulation will make it impossible to incorporate this into the clearing price. The shoulder hour opportunity cost will remain as part of regulation but for after-the-fact opportunity cost purposes only.