



WHITE PAPER

MISO's 2016/2017 Capacity Auction: What Happened and What is Ahead?

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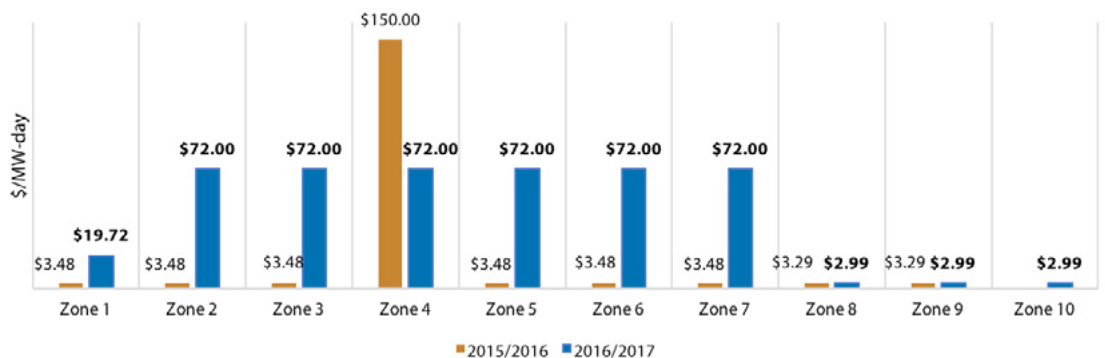
The Bottom Line

1. Although prices increased 20-fold in many Northern MISO zones, 2016/2017 capacity prices were still well below other ISOs and less than the going-forward costs of merchant generators.
2. Because of the vertical demand and steep supply curves, the supply/demand balance in MISO is very sensitive. While prices for Zones 2-7 cleared at \$72/MW-day, a change of approximately plus or minus 250 MW in supply or demand would have shifted prices by plus or minus \$40/MW-day.
3. With Zone 4's capacity import limit nearly doubled, the Zone, which had previously cleared at \$150/MW-day, did not separate in this auction and saw prices cut in half.
4. MISO is proposing a market re-design that would implement a three-year forward-market with sloped demand curves for zones relying on competitive retail load, such as Zone 4.

2016/2017 Auction Results

While MISO historically had some of the lowest capacity prices in the U.S., in the 2016/2018 auction, Zones 2-7 saw prices increase to \$72/MW-day price, significantly higher than the clearing prices in the 2015/2016 auction. This price is even higher than the PJM RTO capacity price for the same capability period, which cleared at \$59.37/MW-day. PJM, however, saw significant uplift to \$134/MW-day with the implementation of capacity performance in the transition auction. Zone 1 and Zones 8-10 had binding export constraints and cleared at \$19.72/MW-day and \$2.99/MW-day respectively. Exhibit 1 illustrates the 2016/2017 capacity auction clearing prices across MISO.

Exhibit 1: 2016/2017 Auction Results



Source: MISO and ICF



How We Got Here: MISO Capacity Market Structure

Of the four main U.S. RTO-operated capacity markets, MISO was the last to be established and has consistently had the lowest prices. MISO is currently divided into 10 Local Resource Zones (LRZ) as seen in Exhibit 1. Zone 10 was separated from Zone 9 in July 2015. Low prices have been fairly ubiquitous geographically, even in the zones contiguous to PJM (Zones 1-7) and in spite of FERC Orders that direct significant and recurring congestion, as evidenced by price differentials,¹ be eliminated via new transmission.²

MISO's Resource Adequacy Construct aims to improve the reliability of the MISO electricity grid by ensuring locational resource adequacy requirements are met. The capacity auction is prompt rather than forward-looking like the ISO-NE and PJM markets, meaning that capacity for the June-May annual planning period is procured in April of that same year. Participants bid into the auction for one year obligations. The bids are cleared through a single, sealed-bid clearing price auction against a vertical demand curve, unlike PJM and ISO-NE where bids are cleared against sloping demand curves. The Resource Adequacy Construct began with the 2013/2014 auction period. Prior to this, MISO conducted a voluntary capacity market with significantly low capacity prices and no incentives for localization. The clearing price for each Zone for the four resource adequacy auctions is outlined in Exhibit 2. As evidence by clearing prices that are significantly lower than the northeastern capacity markets, MISO's market design acts to balance capacity procured through local or state planning processes, rather than incentivize new builds or clear at a competitive market price.

Exhibit 2: MISO Historical Capacity Prices (\$/MW-Day)

Zones	1	2	3	4	5	6	7	8	9	10
13/14	1.05	1.05	1.05	1.05	1.05	1.05	1.05	NA	NA	NA
14/15	3.29	16.75	16.75	16.75	16.75	16.75	16.75	16.44	16.44	NA
15/16	3.48	3.48	3.48	150	3.48	3.48	3.48	3.29	3.29	NA
16/17	19.72	72.00	72.00	72.00	72.00	72.00	72.00	2.99	2.99	2.99
Average	6.89	23.32	23.32	59.95	23.32	23.32	23.32	7.57	7.57	2.99

Source: MISO

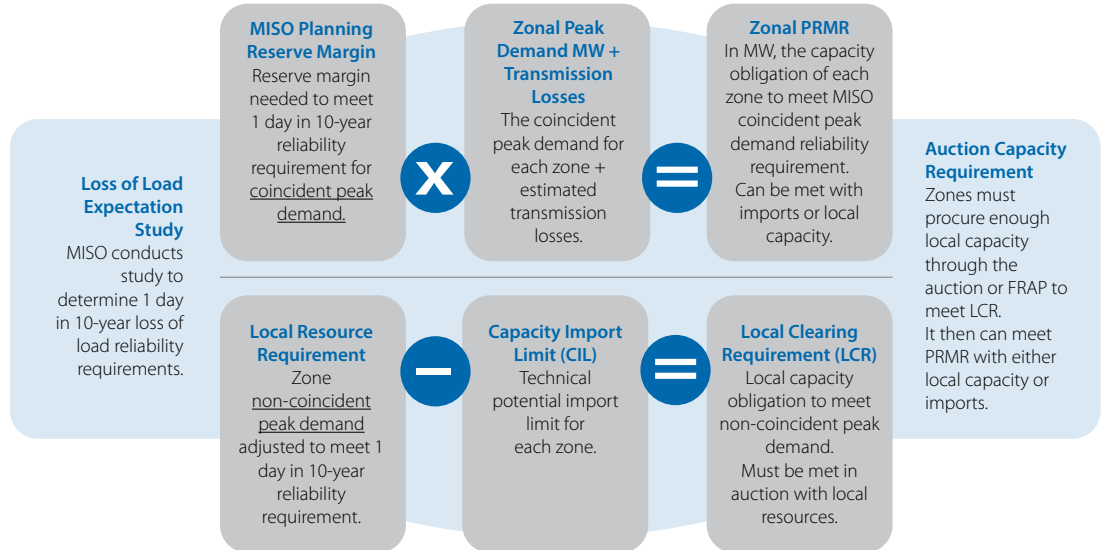
There are two reserve requirements that load serving entities (LSE) and utilities must meet in the RA auctions: the planning reserve margin requirement (PRMR) and the local clearing requirement (LCR). This locational and reserve requirement structure is similar to other capacity markets. [Exhibit 3](#) outlines how these requirements are determined and met in the auction. The LCR is the amount of capacity a zone must procure internally in order to meet its own peak demand requirements. The PRMR is the amount of capacity a zone must procure—including imports—to fulfill its obligation to meet MISO's peak demand reliability requirements. Resources to meet these requirements include both merchant resources that offer competitive bids in the auction and resources either contracted or developed by utilities. LSEs can also procure some or all of their requirements via a fixed resource adequacy plan (FRAP) instead of RA auctions. The amount of resources under a FRAP in a given Zone can either be removed from the overall requirements or can be assumed to be available in auctions at zero price.

¹ Commonwealth Edison's capacity price (Chicago area part of PJM), separated last PJM capacity auction at well above \$200/MW day. Zones 2,3, 6, and 7 have cleared over the same period at close to one tenth this level on average over the last three years. Zone 4 has averaged approximately \$75/MW Day over the last three auctions.

² See FERC Orders 890 and 1000. FERC is the regulator of RTOs, and transmission planning.



Exhibit 3: MISO Capacity Obligations



Source: ICF

MISO has generally had lax bid mitigation rules compared to the other capacity markets concerning buy-side market power. MISO capacity market bids are not subject to a minimum offer price rule (MOPR). (FERC considered and rejected this idea in 2012.) With the dominance of utilities, and their preference for self-supply combined with the lack of MOPR rules, MISO capacity auctions have had a large portion of their capacity bid at zero price. This outcome, in combination with using a vertical demand curve, has led the MISO capacity market to place little value on merchant generation.

How We Got Here: 2015/2016 Auction Results and What Has Happened Since

The 2015/2016 auction results stunned the industry when Zone 4 prices spiked to \$150/MW-day, with the other Zones clearing at less than \$3.5/MW-day. This was largely due to the concentration of independent power producers (IPP) and more retail load relying on the auction instead of bi-lateral contracts leading to prices clearing at a similar level as PJM and ISO-NE.

Zone 4 prices in 2015/2016 cleared close to the level at which units must justify their bids to the market monitor. In MISO, unit's bids are subject to a conduct threshold and reference price. In the previous MISO auctions, generators were allowed to bid up to the conduct threshold (Reference Price + 10 percent of Net Cost of New Entry (CONE)). The reference price, reflected the opportunity cost of exporting power to the neighboring regions such as PJM and was set at \$155.79/MW-day for the 2015/2016 auction period. In other words, the reference price was set to solve the anomalous situation that contiguous regions have persistent price differentials. However, FERC found it unjustifiable to set a reference level based on PJM capacity prices due to limited transmission to PJM and recent changes in the PJM capacity auction, which have generally increased the barriers to entry for external resources into the PJM markets. Thus, FERC directed the reference price to be set at \$0/MW-day for the 2016/2017 auction. With the reference price at \$0/MW-day, any generator that bids higher than 10 percent of Net Cone (approximately \$25/MW-day) will have to justify its bid to the market monitor. Going forward, FERC directed that technology specific reference levels should be created in order to reduce the burden on the Market Monitor.



Since the 2015/2016 auction, FERC also ruled that methodology used for computing the capacity import limits (CIL) understates the import capability of a zone. This is primarily because the methodology does not account for increased import capability resulting from counter-flows from capacity exports committed to neighboring regions. The market monitor has recommended, and FERC has approved, the proposal to add back the amount of capacity exported from a zone into its CIL to account for the approximate impact of counter flows. This greatly increased the CIL for Zone 4 going into the 2016/2017 auction. Key auction parameter changes between the 2015/2016 and 2016/2017 auction are highlighted in Exhibit 4.

Exhibit 4: 15/16 to 16/17 Auction Parameter Comparison

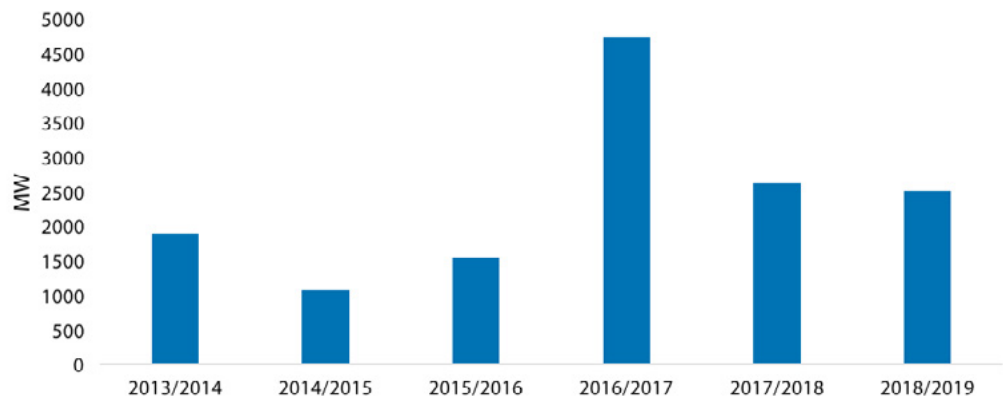
		Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10
15/16	PRMR	18.3	13.6	9.8	10.4	8.9	19.4	22.7	8.1	25.2	NA
	LCR	16.0	12.3	8.7	8.9	6.5	14.7	21.4	7.9	23.6	NA
	CIL	3.7	2.9	2.0	3.1	3.9	5.6	3.8	2.1	3.3	NA
16/17	PRMR	18.2	13.6	9.9	10.4	8.5	18.8	22.4	8.2	20.7	4.9
	LCR	15.9	13.0	8.7	5.5	5.0	13.7	20.9	6.3	17.5	4.0
	CIL	3.4	1.6	1.9	6.3	4.8	5.6	3.5	3.5	4.5	2.7
Delta	PRMR	-0.1	0.0	0.1	0.0	-0.4	-0.7	-0.3	0.1	-4.5	4.9
	LCR	-0.1	0.7	0.0	-3.4	-1.5	-1.0	-0.6	-1.6	-6.1	4.0
	CIL	-0.3	-1.3	-0.1	3.2	0.9	0.0	-0.3	1.5	1.2	2.7

Source: MISO

Key Takeaways From the 2016/2017 Auction

- 4.3 GW lower supply from retirements and exports to PJM** – A lower level of offered capacity significantly impacted the \$72/MW-day clearing price in Zones 2-7. MISO saw a 4.3 GW decrease in offered capacity in this auction, driven by both retirements and increased exports to PJM with some offsetting impact from new capacity additions. There was just under 3 GW of retirements; of these, 2 GW related to coal units that retired in April 2016 and had previously received a one year extension for Mercury Air Toxics Standards (MATS) compliance. Additionally, as illustrated in Exhibit 5, exports to PJM increased by approximately 3.2 GW. The Covert combined-cycle plant, previously of Zone 7 and now interconnecting with PJM, accounts for approximately 1.2 GW of this capacity loss. Approximately 2 GW of this capacity is expected to return to MISO for 2017/2018.

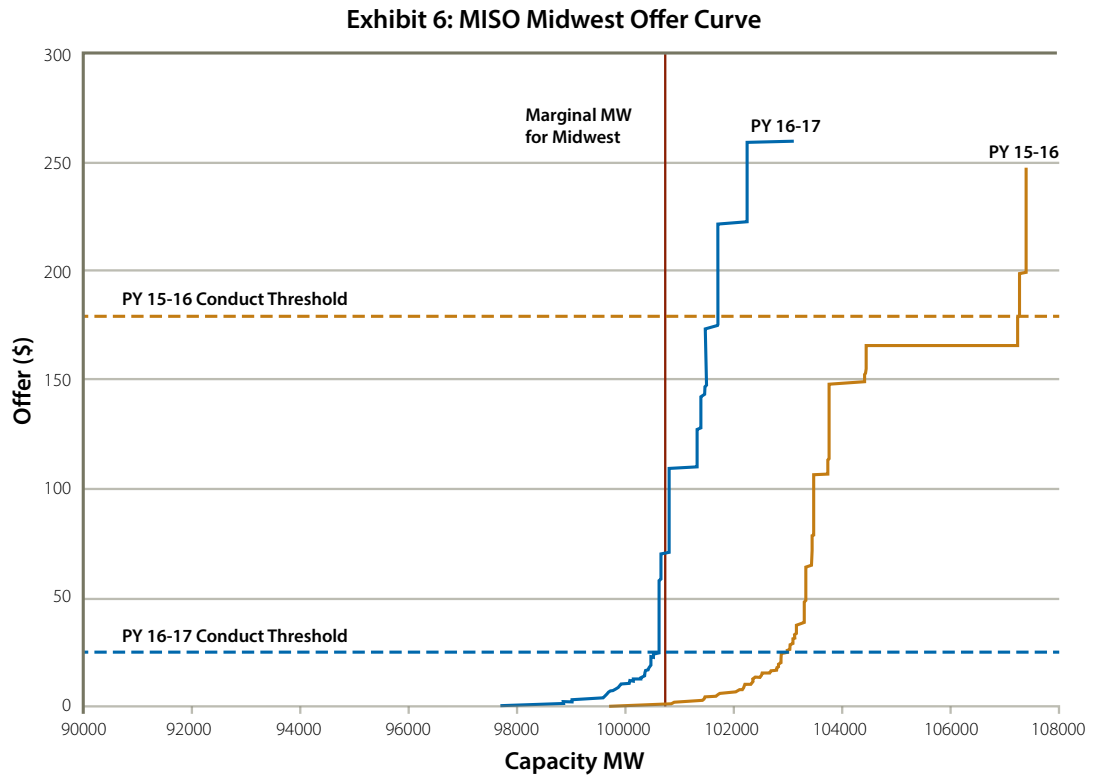
Exhibit 5: MISO Exports to PJM



Source: PJM



- Price sensitivity from shape of supply and demand curve** - As seen in Exhibit 6, this decrease in capacity had a substantial impact on prices. If this capacity had participated in the market, i.e. supply curve like planning year 15/16, the clearing price would have been close to \$0/MW-day instead of \$72. This price volatility is driven by both the vertical demand and steep slope of the supply curve. A marginal change in supply or demand, even less than 250 MW, would have led to prices to clear at either approximately \$25 or \$110/MW-day.

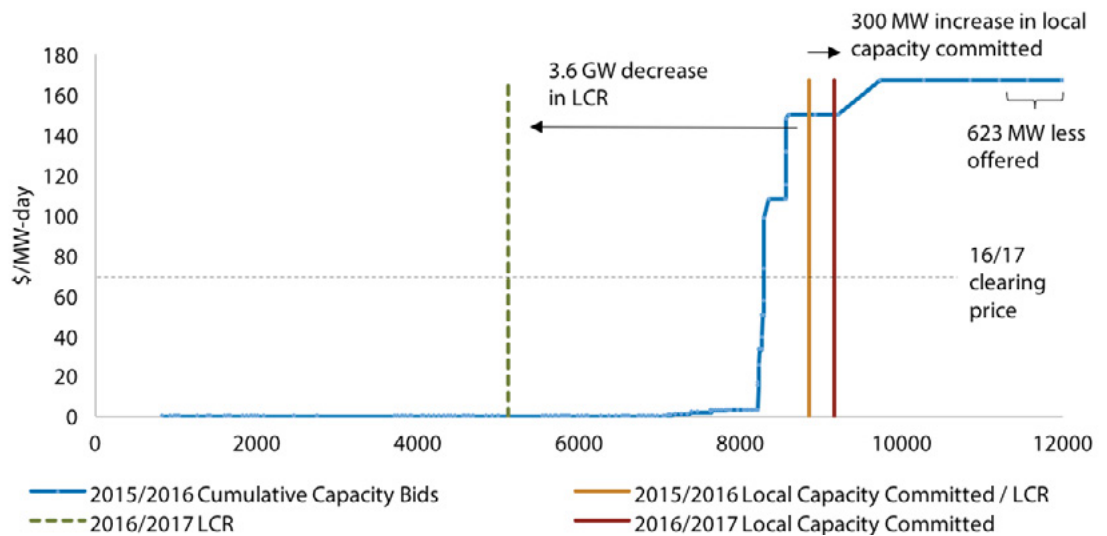


Source: MISO

- No price separation in Zone 4** – While other MISO North Zones saw increased pricing in this auction, Zone 4, which had previously separated and cleared at \$150/MW-day, saw lower prices in this auction and cleared at the same price as Zones 2-7. Zone 4 saw the largest change in CIL from the recent FERC ruling. There were approximately 1.9 GW of counter flows (exports) that had to be accounted for in the CIL, increasing the limit to 6.3 GW and thereby decreasing the local capacity requirement. As illustrated in Exhibit 7, using the 2015/2016 Zone 4 supply curve, capacity offered at the level of the 2016/2017 local clearing requirement was priced at \$0/MW-day. However, this new CIL was not binding and Zone 4 was able to clear more local capacity in this auction.



Exhibit 7: Illustrative Zone 4 Offer Curve



Source: MISO, ICF

- MISO South export limit binding** – There was price separation between the northern and southern MISO Zones because the 876 MW export limit was binding. This limit was lower than the binding limit of 1 GW in the 2015/2016 auction. Since the 2015/2016 auction, MISO reached a settlement with SPP over the use of the transmission lines connecting the northern and southern zones of the ISO, which increased the transfer limit from 1 GW to 2.5 GW. However, prior to the auction, 1.6 GW of this capability was sold through firm reservations, leaving only 0.8 GW left for the auction.

Market Redesign Ahead

MISO has released a proposal for a substantial redesign in the way it operates its capacity market that will make it more like the PJM and ISO-NE markets. This came after an October 2015 issue statement in which MISO recognized that its current market design and price signals were inadequate to support competitive entry in the capacity market. These issues are largely related to the use of a vertical demand curve and the prompt timing of the auctions. While the design changes improve the market, they do not directly address the key issue in the market: the absence of an existing unit minimum bid price based on energy and capacity markets³ and not out-of-market payments. This problem is especially acute in MISO because most of MISO is composed of traditional utility-regulated power plants with an incentive to bid low, clear, demonstrate to their regulators the plants are used and useful, and then recover their costs and return of and return on capital based on their regulated arrangements. Furthermore, the decision as to which RTO is the area's RTO rests solely with the transmission provider and there is limited export capability even from MISO zones like Zone 4 which are contiguous with PJM.

³The PJM's Market Monitor has pointed out that low bidding could also be an exercise of buy side market power by existing units. FERC has noted this in its June 9 2015 Capacity Performance Order, but declined to rule since the issue was not ripe – there was no formal proposal to rule on. Thus, this issue of a lack of protection against excessively low bids is not limited to MISO, but rather is more prevalent. Also, MISO allows utilities to bid some of their capacity as available for the market as opposed to bilaterally determined. However, there is no rules regarding what portion of this is consistent with out of market payments.



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Why is it Needed?

In an October 2015 issue statement, MISO recognized that its current market design and price signals were inadequate to support competitive entry in the capacity market. The two primary market features that create this inefficiency are the:

- 1. Vertical Demand Curve** – The current MISO market employs a vertical demand curve set at the target reserve margin. Vertical demand curves present two issues: they are more prone to volatility than sloped demand curves, and they do not value capacity in excess of the target reserve margin. This volatility was seen in the 2015/2016 auction when Zone 4 prices spiked to \$150/MW-day.
- 2. Prompt Auction Timing** – With capacity actions occurring just two months ahead of the capability period, pricing signals do not occur with enough lead time to catalyze new builds. In forward auctions, new units that are not yet under construction can bid in the market and move forward with development if they receive adequate price signals i.e. clear the market. With the prompt auction structure, merchant developers can respond to current price signals but have no guarantee of the economics of a potential plant under development.

Because of the price volatility, no value for excess capacity, and inefficient auction timing, there is insufficient incentive for merchant retailers to enter or stay in the system. While this is not an issue in states with a large presence of vertically-integrated utilities, competitive markets, like Zone 4, rely on merchant generation to meet their reserve requirements. As noted, while these are the problems MISO has chosen to address, there are other issues such as inadequate protection against low bids below competitive market levels.

What has Been Proposed?

To address these market design issues, MISO has proposed the competitive retail solution (CRS). This proposal will create a new capacity market, the forward location requirements auction (FLRA) for Zones such as Zone 4 that rely on the capacity market for resource adequacy. The new market would incorporate some of the design features of ISO-NE and PJM's capacity market, including implementing a sloped demand curve and holding the auctions on a three-year forward basis. However, no minimum offer price rule (MOPR) or other changes to the market mitigation measures would be implemented. Regulated utilities located in a Zone using the FLRA would be able to participate in the FLRA, so the new design still contains buy-side market power issues. Critically, this auction will only be used to procure a Zone's LCR. The remainder of the Zone's requirements will be procured during the prompt capacity auction. The redesign will potentially be implemented over the next year and a half. The first auction with the new design would be held in 2018 for the 2019/2020, 2020/2021, and 2021/2022 auction periods. Further details on the implementation and design of this market restructuring are expected in a forthcoming filing with FERC slated for July 2016.

Without the implementation of a MOPR or limits on participation of regulated utilities, there is the possibility that generation from regulated utilities, with costs subsidized by consumers, will continue to satisfy retail load at discounted costs. Without the implementation of new mitigation measures, the new market structure is not likely to catalyze higher clearing prices or those closer to merchant costs of new entry.

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