



MISO-PJM Coordinated Transaction Scheduling Update  
**ITEM 8 (POSTING ONLY)**



# Overview

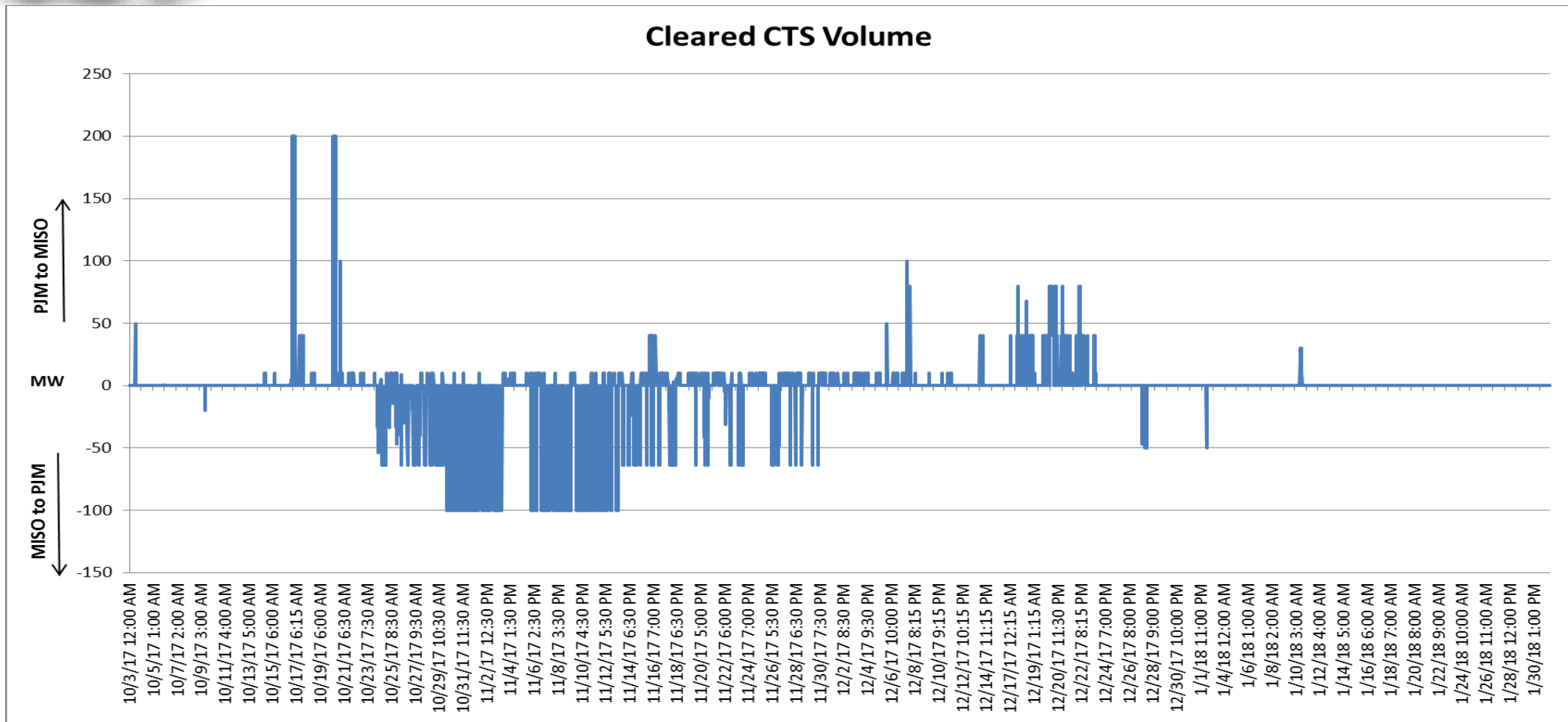
Coordinated Transaction Scheduling (CTS) provides a mechanism to better align RTO interchange with economics

- It allows Market Participants the opportunity to submit financial bids for real time interchange transactions between MISO and PJM
- This is an additional, optional mechanism over the existing scheduling process
- CTS is designed to...
  - Enhance Net Scheduled Interchange predictability
  - Enhance MISO-PJM price convergence
  - Lower production cost in both markets

## Key Takeaways

- CTS went live on October 3, 2017
- Review of CTS activity from October - January shows...
  - CTS bids and cleared volumes peaked in November
  - Cleared CTS MWs are currently an insignificant part of overall NSI between the RTOs
  - CTS forecasts are typically within 5% of LMP but this still leads to significant volatility in the forecast and realized price spread between the RTOs
  - Transaction fees for uncleared intervals may erode incentives to trade CTS

# Cleared CTS Volumes Since Implementation



- CTS MWs have cleared in ~15% of intervals

# Cleared CTS Volumes and Directions

Month	Unique Bidders	CTS Bids MWh (Total)	CTS Bids MWh (Average)	Cleared CTS MWh (Total)	PJM->MISO MWh	MISO->PJM MWh	% of Bid MW Volume Cleared
Oct-17	11	27,131	39.0	5,447.3	1,973.8	3,473.5	20%
Nov-17	4	58,342	80.9	13,464.3	1,283.0	12,181.3	23%
Dec-17	6	22,444	30.2	3,319.3	3,107.5	211.8	15%
Jan-18	3	918	1.3	102.5	77.5	25.0	11%

- 14 unique bidders have submitted CTS transactions
- Bids and cleared CTS MWs peaked in November with primary flow from MISO->PJM
- Average bid size and % of bid volume cleared also peaked in November
- Bid and cleared CTS MWs are down significantly since November

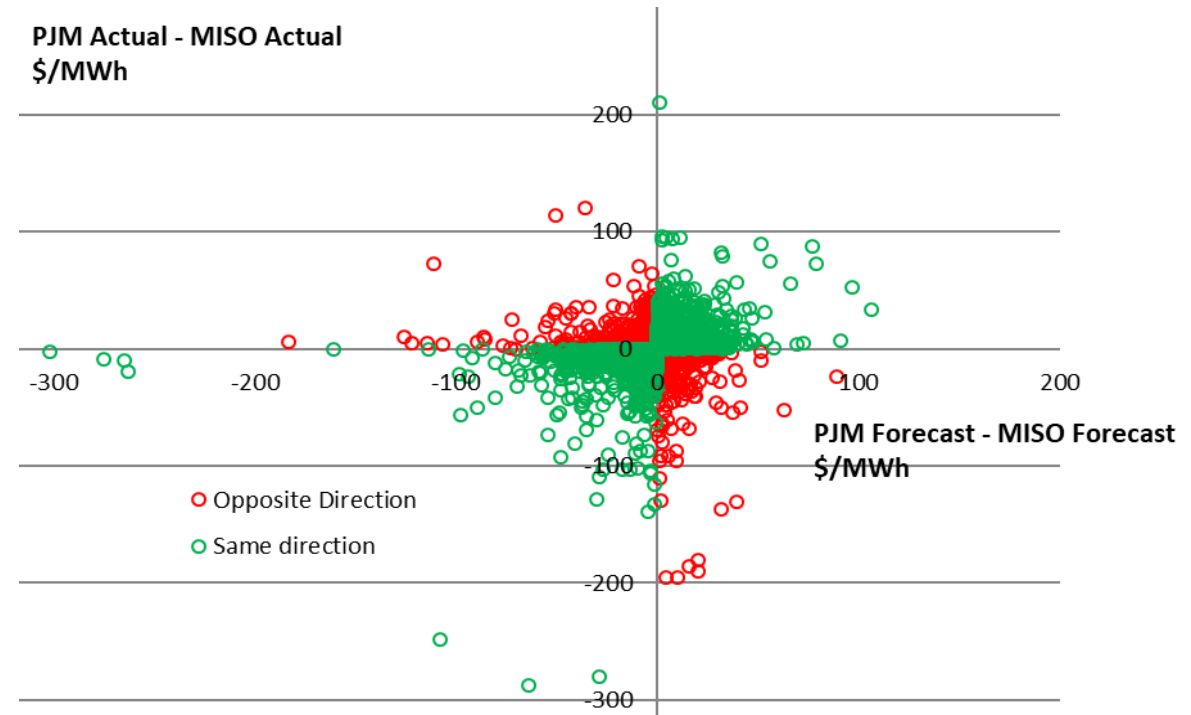
# Comparison of Average Forecast Price Spreads to Actual by Month

<u>Month</u>	Average of PJM Forecast minus MISO Forecast	Average of PJM Actual minus MISO Actual	Forecast Error as % of \$25 LMP
October 2017	-\$0.13	-\$1.44	5%
November 2017	\$0.09	-\$0.16	1%
December 2017	-\$2.20	-\$0.18	-8%
January 2018	-\$3.38	\$1.23	-18%
<b>Total</b>	-\$1.40	-\$0.13	-5%

- PJM forecast is PJM's forecast for the interface definition with MISO ~30 minutes before the operating interval
- MISO forecast is MISO's forecast for the interface definition with PJM ~30 minutes before the operating interval
- The difference between the forecasts creates the forecast spread that is used to clear CTS bids
- PJM and MISO actual are the LMPs used to settle interchange and CTS at the interface
- CTS forecasts have been off in both directions but in aggregate the forecast error of ~\$1 has been ~5% of the median ~\$25 interface price at the RTOs during this period
  - Forecast error is the forecast spread minus the actual spread divided by the median LMP of ~\$25

# Forecast Accuracy

- Forecast and actual interface price spreads are grouped around \$0 but there are significant differentials
- Given the typically proximity to \$0 the sign of the forecast and actual spread differ in ~35% of intervals (red dots in chart to the right)
- CTS forecasts have predicted the economic direction of flow in 65% of intervals. However, CTS MWs are more likely to clear when the forecasted spread moves away from \$0.
- As a result, the table below shows that 70-80% of the intervals that clear CTS MWs are flowing in the economic direction



Month	Intervals with Cleared CTS MWs	Intervals where Forecast is in the Uneconomic Direction	% Forecast Direction Accurate
Oct-17	481	154	68%
Nov-17	1,030	284	72%
Dec-17	504	81	84%
Jan-18	16	4	75%

\* We are working on analysis to determine how profitable is the economic flow CTS when comparing the bid spread with actual LMP spread

# CTS Revenue and Volume by Flow Direction

PJM->MISO Direction	Oct	Nov	Dec	Jan	Grand Total	MWh
Total Spread Revenue	\$5,020	\$9,150	\$7,444	-\$124	\$21,490	
Total Cleared MWs	6,985	4,826	12,290	310	24,411	6,103
Total Revenue/MW	\$0.72	\$1.90	\$0.61	-\$0.40	\$0.88	\$0.22

MISO->PJM Direction	Oct	Nov	Dec	Jan	Grand Total	MWh
Total Spread Revenue	\$31,928	\$87,979	\$4,087	\$2,210	\$126,203	
Total Cleared MWs	13,890	48,116	547	100	62,653	15,663
Total Revenue/MW	\$2.30	\$1.83	\$7.47	\$22.10	\$2.01	\$0.50

- In general, CTS activity has successfully arbitrated price spreads but it is not clear the revenues cover transmission reservation and other transaction fees
- The majority of activity flowed from MISO to PJM in November averaging ~\$2/MW of arbitrage revenues
- MISO has reached out to CTS traders regarding their experience with this new product

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