HSIM Update

Risk Management Committee

March 21, 2023

BACKGROUND

Historical Simulation Initial Margin (HSIM) Model effective on Aug. 3, 2022.

Six FTR monthly auctions and four long-term auctions have occurred since go live.

FTR Off-Peak Class Hours

- Class type change became effective on Sept. 1, 2022, introducing DailyOffPeak (7x8) and WkndOnPeak (2x16).

- Starting with March auction (Feb. 10, 2023), HSIM day-ahead price history for these new class types is calculated from actual settled day-ahead prices for the respective hours replacing history generated from ratio to off-peak.

HSIM Back Testing

- PJM performs regular back testing to assess the performance of HSIM model and robustness of PJM total FTR Credit Requirement.

- PJM has performed four back tests since go live.

MEMBER LEVEL

HSIM IM at T0 vs. Gain & Loss (Settled + MTA_T2 - MTA_T0)

Back Test Month:	Sept.	Oct.	Nov.	Dec.
BOPP (Monthly) Market Change: MTA_T0 and MTA_T2 Calculation Dates	AUCTION SEPT. → NOV. — Aug. 25 → Oct. 25	OCT. → DEC. — Sept. 21 → Nov. 22	NOV. → JAN. — Oct. 25 → Dec. 22	DEC. → FEB. — Nov. 22 → Jan. 25
Long-Term Market Change: MTA_T0 and MTA_T2 Calculation Dates	2023/26 Long-Term Auction Round 2 → Round 4 — Aug. 10 → Dec. 12	2023/26 Long-Term Auction Round 2 → Round 4 — Aug.10 → Dec. 12	2023/26 Long-Term Auction Round 3 → Round 4* — Oct. 12 → Dec. 12	2023/26 Long-Term Auction Round 3 → Round 4* — Oct. 12 → Dec. 12
Total Shortfall ($M)	**$74**	**$34**	**$1**	**$22**
Generation Owners	$4	$7	$0	$2
Electric Distributors	$19	$27	$1	$1
Transmission Owners				$5
Others	$51		$0	$14
Total # of Members Participating	163	160	164	170
Total # of Members With Shortfall	**12**	**7**	**4**	**11**
< 1 ($ Million)	6	3	4	8
1–5 ($ Million)	3	3	0	2
5–10 ($ Million)	1	0	0	0
10 - 20 ($ Million)	1	0	0	1
> 20 ($ Million)	1	1	0	0
Failure Rate	**7%**	**4%**	**2%**	**6%**

- Model back test compares Initial Margin value in the test month (T0) to portfolio losses within two auction periods.

- Records a failure if loss between the two auction periods exceeded Initial Margin calculated in the test month (T0)

- Analysis of results shows higher failure rates are mainly driven by price movements not previously captured in the price history.

- Model cumulatively incorporates new price movements.

*Using Round 4 Long-Term Auction as Round 5 still pending at time of this report

Back Testing Results

HSIM Total Requirement vs. Settled + MTA_T2

MEMBER LEVEL

Back Test Month:	Sept.	Oct.	Nov.	Dec.
BOPP (Monthly) Market Change: MTA_T0 and MTA_T2 Calculation Dates	**AUCTION** SEPT. ➔ NOV.	OCT. ➔ DEC.	NOV. ➔ JAN.	DEC. ➔ FEB.
	Aug. 25 ➔ Oct. 25	Sept. 21 ➔ Nov. 22	Oct. 25 ➔ Dec. 22	Nov. 22 ➔ Jan. 25
Long-Term Market Change: MTA_T0 and MTA_T2 Calculation Dates	2023/26 Long-Term Auction Round 2 ➔ Round 4	2023/26 Long-Term Auction Round 2 ➔ Round 4	2023/26 Long-Term Auction Round 3 ➔ Round 4	2023/26 Long-Term Auction Round 3 ➔ Round 4
	Aug. 10 ➔ Dec. 12	Aug .10 ➔ Dec. 12	Oct. 12 ➔ Dec. 12	Oct. 12 ➔ Dec. 12
Total Shortfall ($M)	**$0**	**$1**	**$1**	**$17**
Generation Owners	$0	$1	$0	$2
Electric Distributors	$0	$0	$1	$1
Transmission Owners	$0	$0	$0	$0
Others	$0	$0	$0	$14
Total # of Members Participating	**163**	**160**	**164**	**170**
Total # of Members With Shortfall	**2**	**2**	**2**	**7**
< 1 ($ Million)	2	2	2	5
1–5 ($ Million)				1
5–10 ($ Million)				
10–20 ($ Million)				1
> 20 ($ Million)				
Failure Rate	**1%**	**1%**	**1%**	**4%**

- Total requirements back test incorporates other FTR collateral components; MTA, ARR credits and $0.10/MWh minimum, calculated in back test month.
- Compares total collateral held in T0 to the portfolio value two auction periods later
- Records a fail if total collateral requirement in T0 **is not** enough to cover a negative portfolio value at T2
- Results show a lower failure rate compared to the Initial-Margin-only test as it considers other components.

HSIM Model working as expected based on these early back tests.

PJM will continue to back test after each auction and determine need for future calibration, enhancements and improvements to the model.

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HSIM Update

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Appendix

1. **Back Test month:** Back test assumes a member default occurs on the first day of this month.

2. **BOPP:** Balance of planning period

3. **Margin Period of Risk (MPOR)** is two auction periods; assumed time it takes to liquidate a defaulted portfolio

4. **MTA_T0:** Is the Mark to Auction value of a portfolio at the time Initial Margin is calculated

5. **MTA_T2:** Is the Mark to Auction value of a portfolio two periods later; assumed to be the liquidation value of open positions

6. **T0:** Time Zero; the HSIM calculation month for the back test assessment

7. **Failure rate:** Percentage of members whose portfolio value declines between the two auction periods exceeded the Initial Margin value in T0

8. **Shortfall:** The aggregate dollar amount of loss not covered by the Initial Margin

9. **Settled:** Refers to the value of transactions that have settled in the two months MPOR between T0 and T2