Market Efficiency Update

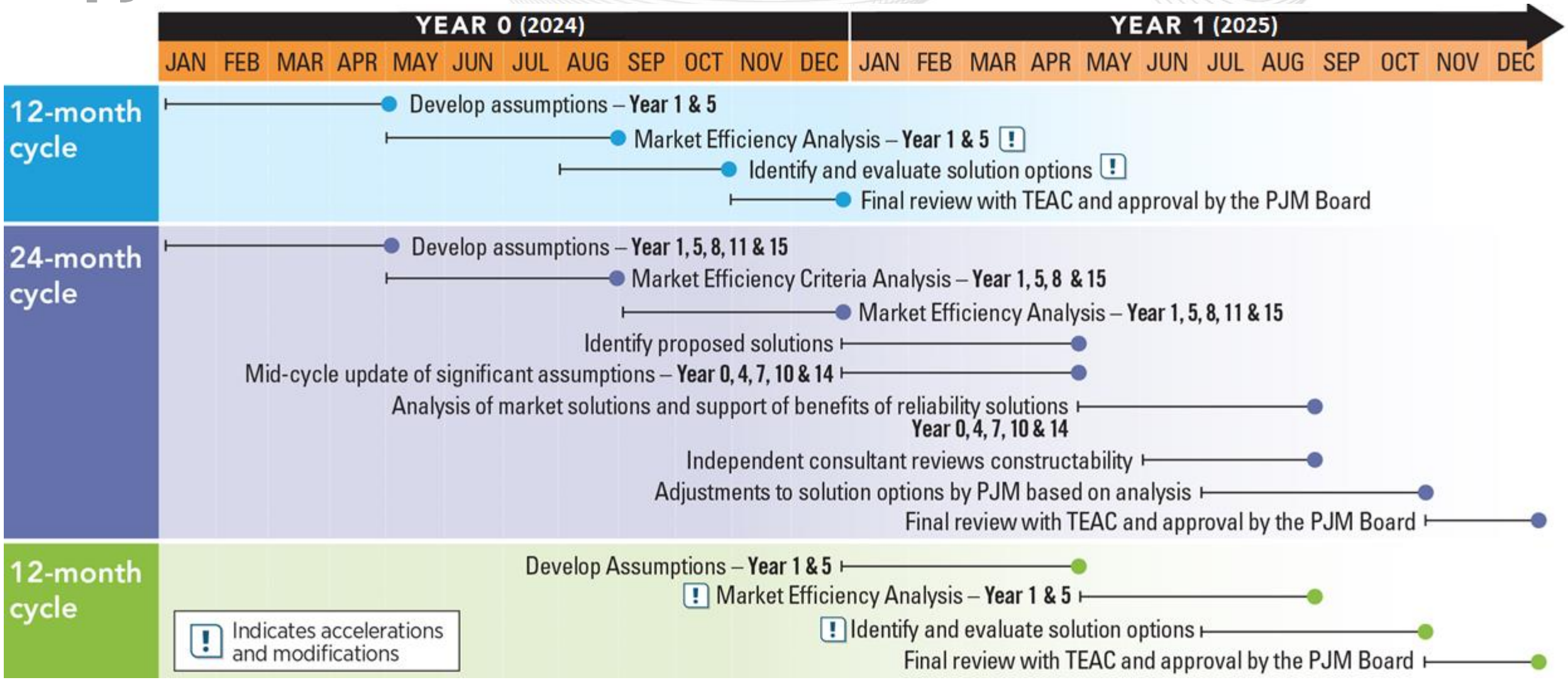
Market Simulation

Transmission Expansion Advisory Committee

February 6, 2025

2024/25 Long-Term Market Efficiency Cycle

2024/25 Market Efficiency Timeline



2024/25 Long Term Window
Market Efficiency Input Assumptions
Mid-cycle Update

2024/2025 ME Base Case: Mid-Cycle Update

- Topology based on the 2029 powerflow posted for the reliability window 2024W1
  - Updated with the 2024W1 proposed solutions to be approved at the February 2025 Board meeting.
- Updated PJM Load Forecast consistent with 2029 powerflow posted for the reliability window 2024W1 (see slide 6).
- Generator Status updated as of November 8, 2024 (see slide 12).
- Updated Financial Parameters (see slide 13).
- Updated Summer/Winter reactive interface definitions and limits (see slide 14).
- The rest of the assumptions as in the July TEAC ME whitepaper:
  - Fuel/Emissions forecasts provided by Hitachi (Spring 2024 vintage).
  - Demand response from 2024 PJM Load Forecast report (February 2024).

2024 PJM Peak Demand/Energy Adjusted Forecast

PJM Peak Load and Energy Forecast

Load	2025	2029	2032	2035	2039
Peak (MW)	154,333	167,389	173,817	181,330	192,460
Energy (GWh)	832,674	943,741	1,001,807	1,051,812	1,131,523

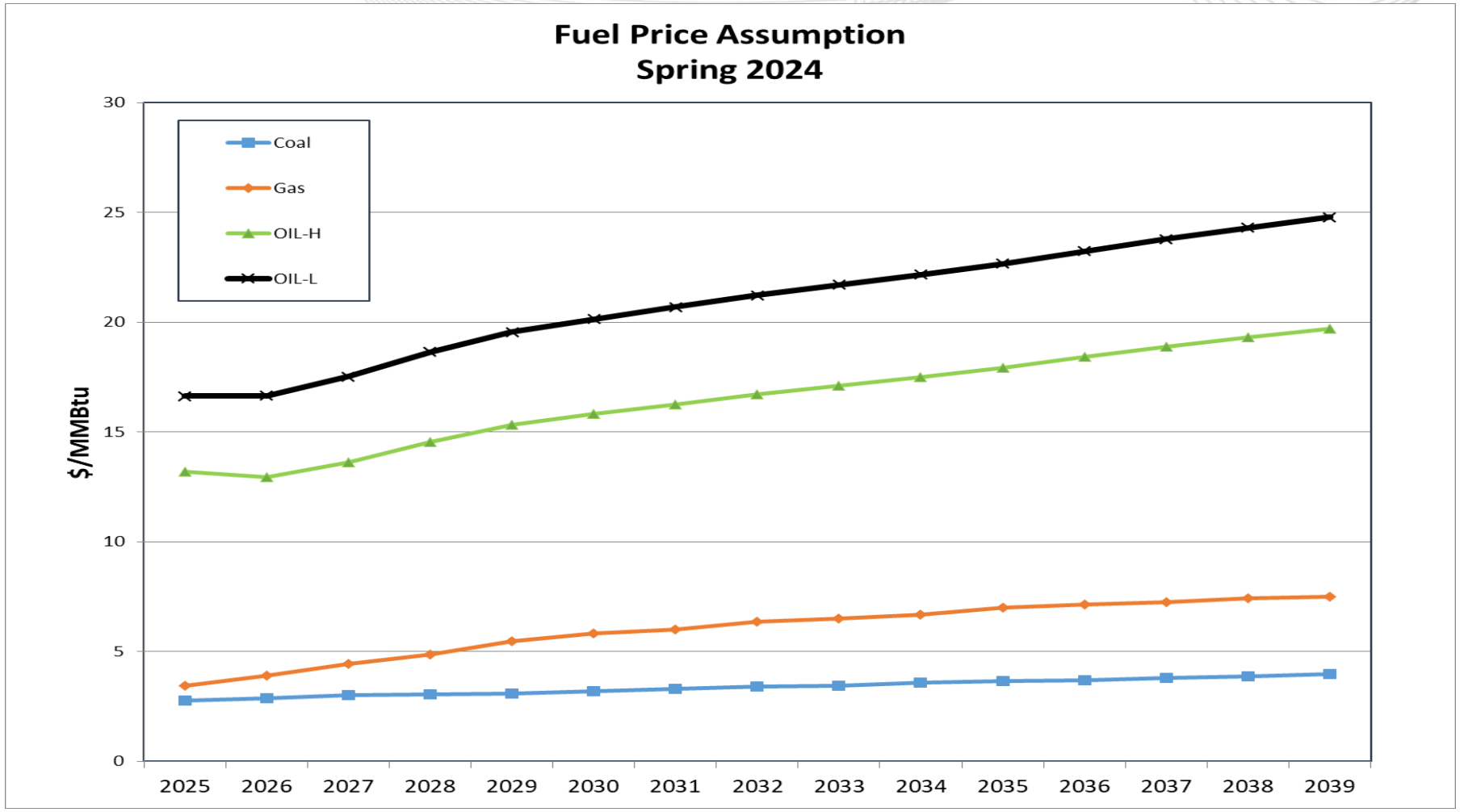
Notes: 1.) Peak and energy values from the February 2024 PJM Load Forecast Report Table B-1 and Table E-1 adjusted for additional non-conforming loads (consistent with 2029 powerflow posted for the reliability window 2024W1).
2.) Adjustments include Dominion load supported by State Queue generation & PPL, ME, PN, and APS non-conforming load.
3.) Model inputs are at the zonal level. To the extent zonal load shapes create different diversity, modeled PJM peak load may vary.

PJM Demand Resource Forecast

	2025	2029	2032	2035	2039
Demand Resource (MW)	7,814	8,265	8,500	8,772	9,210

Note: 1.) Values from the February 2024 PJM Load Forecast Report Table B-7.

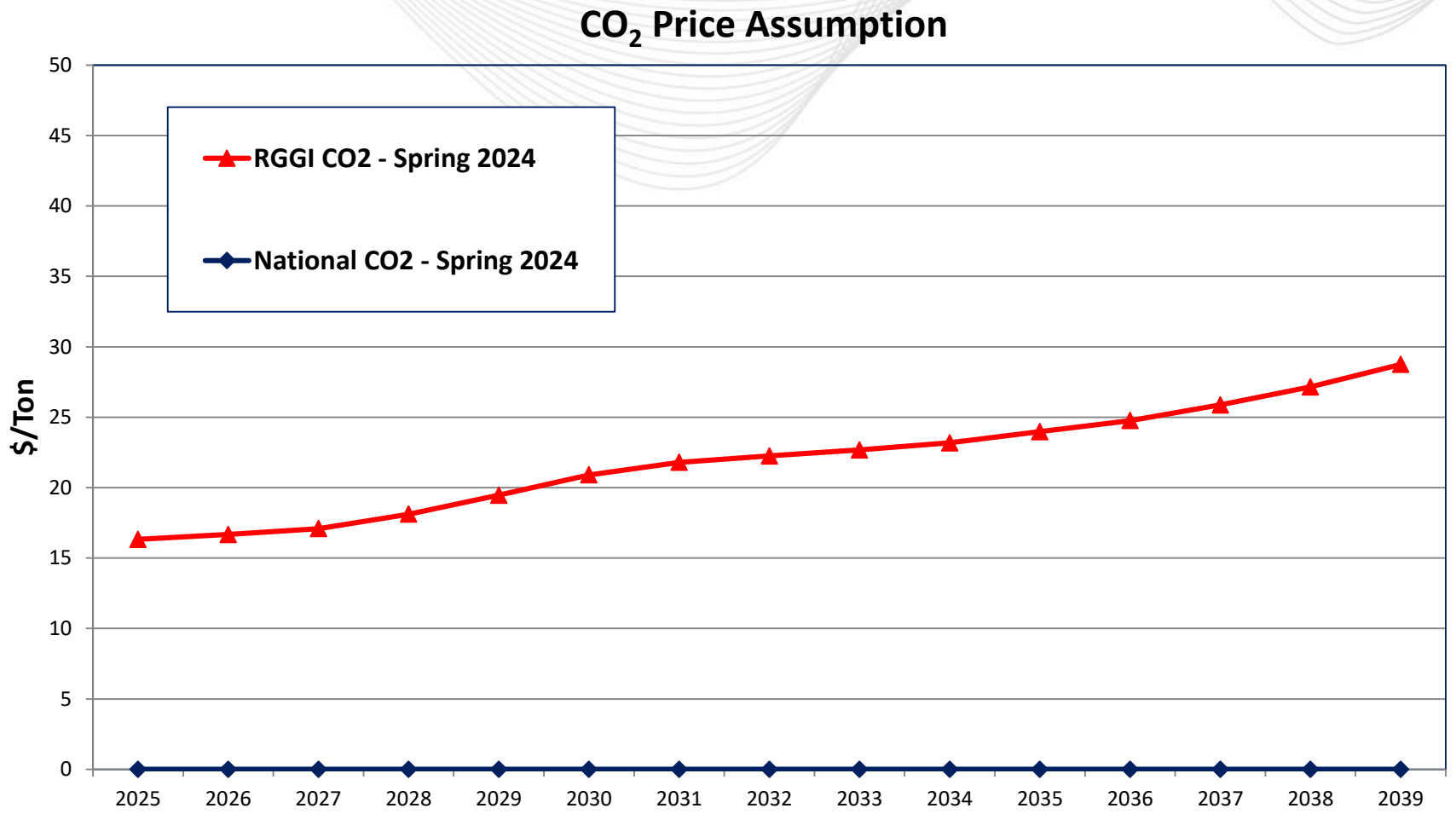
ME Assumptions
Fuel Price Forecast *



Notes:
Coal – Annual average of PJM unit burner-tip prices
Gas – Annual average Henry Hub price
Oil-H, Oil-L – Annual average prices

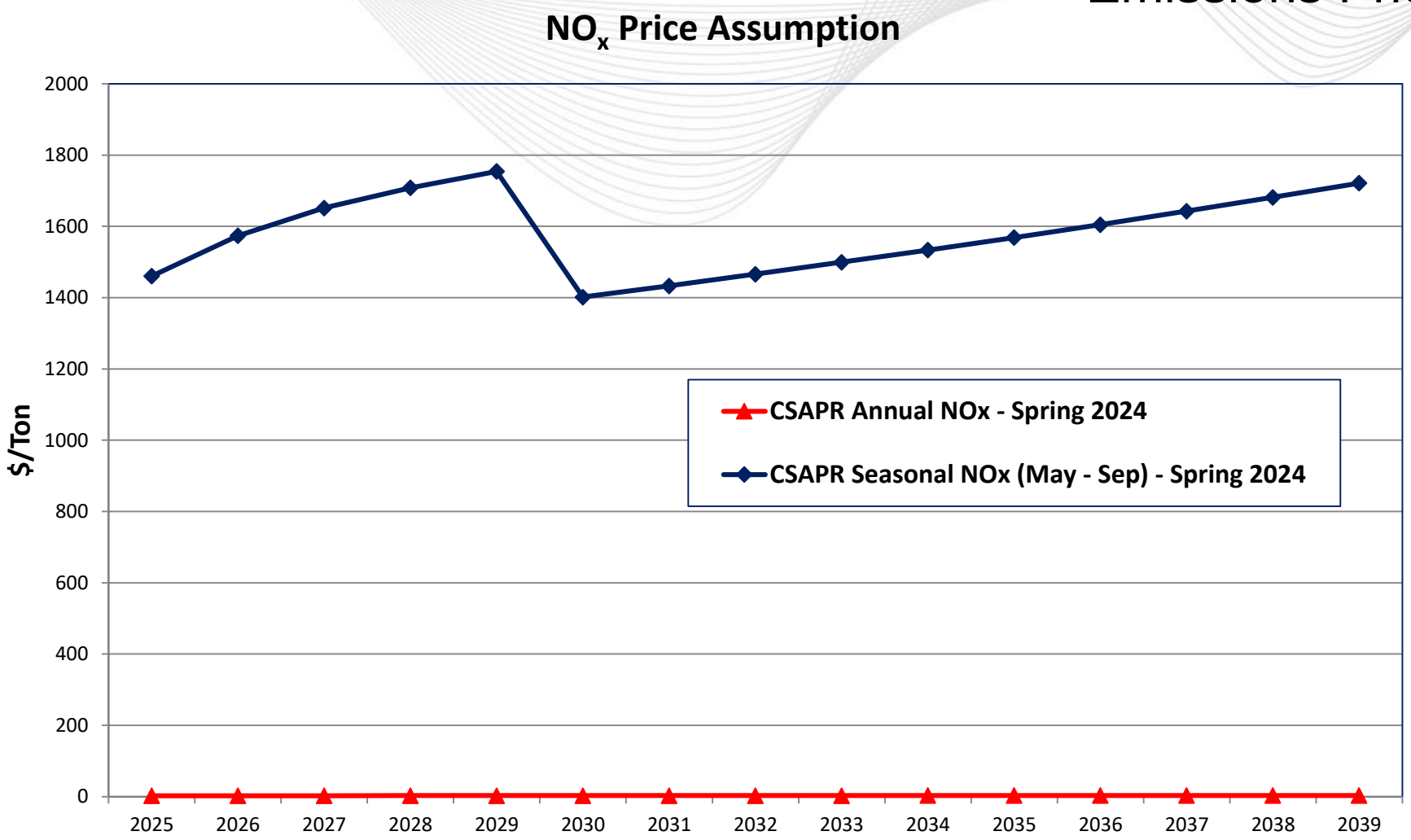
* Provided by Hitachi Energy – May 2024

ME Assumptions
Emissions Price Forecast *



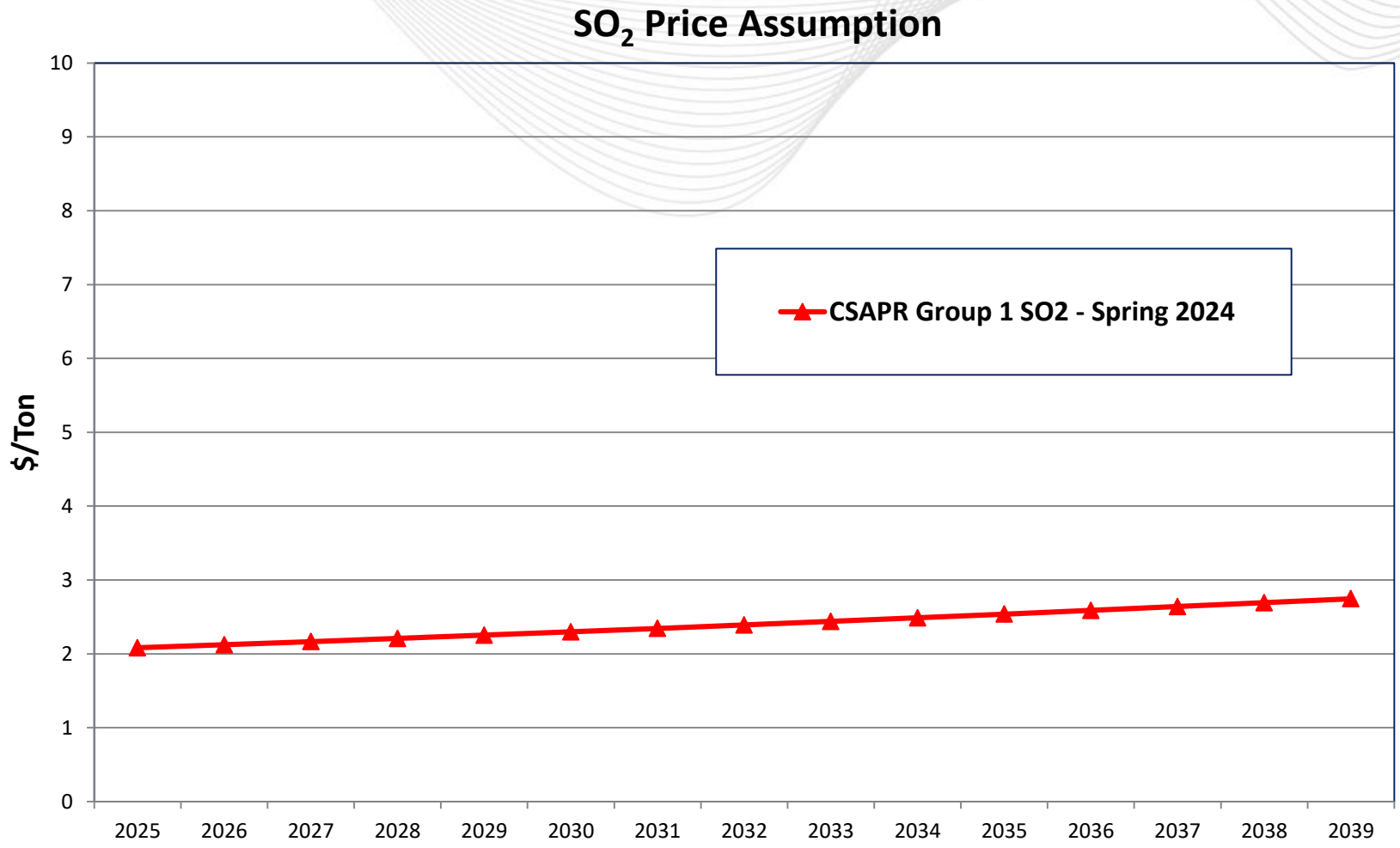
* Provided by Hitachi Energy – May 2024

ME Assumptions
Emissions Price Forecast *



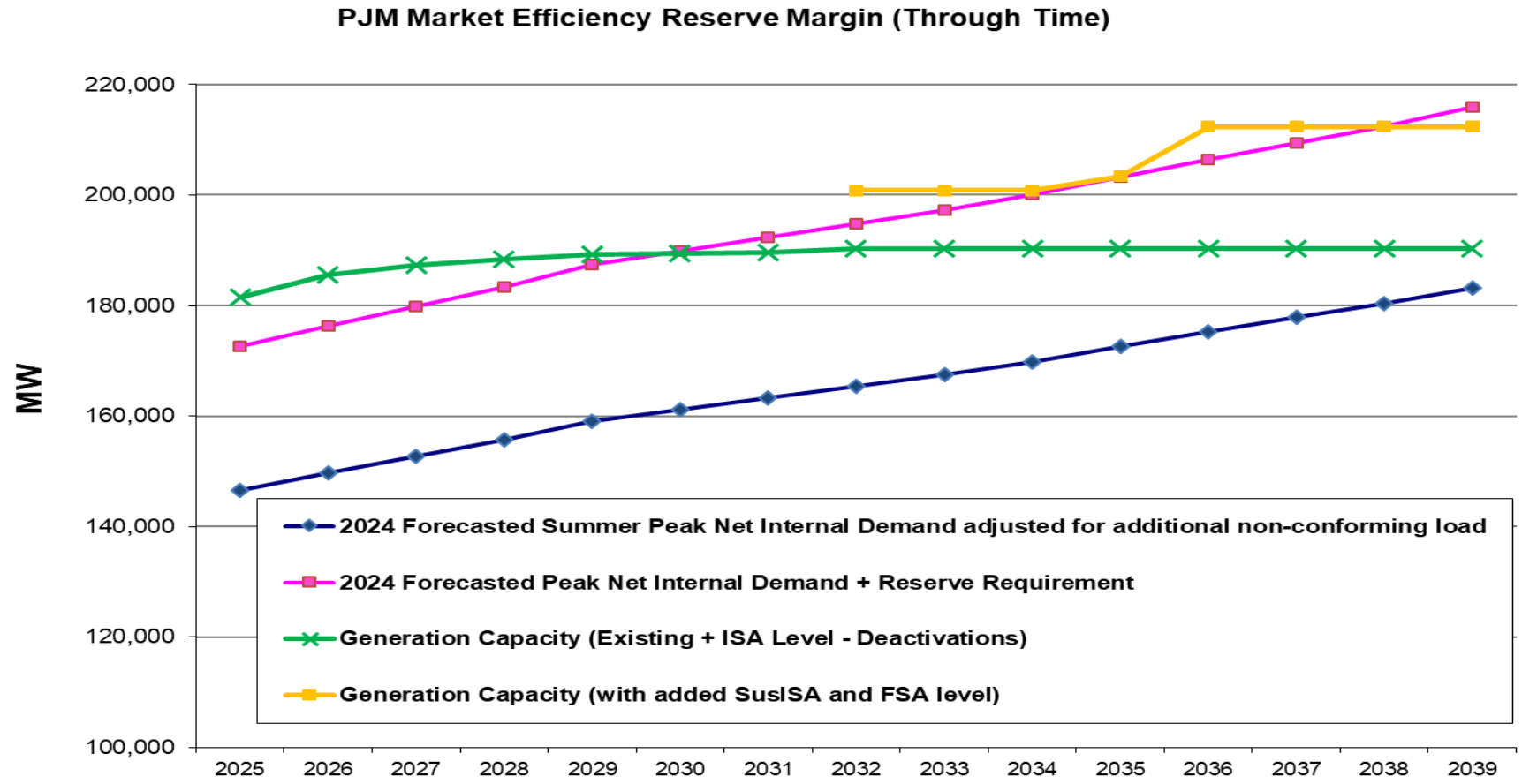
* Provided by Hitachi Energy – May 2024

ME Assumptions
Emissions Price Forecast *



* Provided by Hitachi Energy – May 2024

ME Assumptions
Generation Expansion Plan



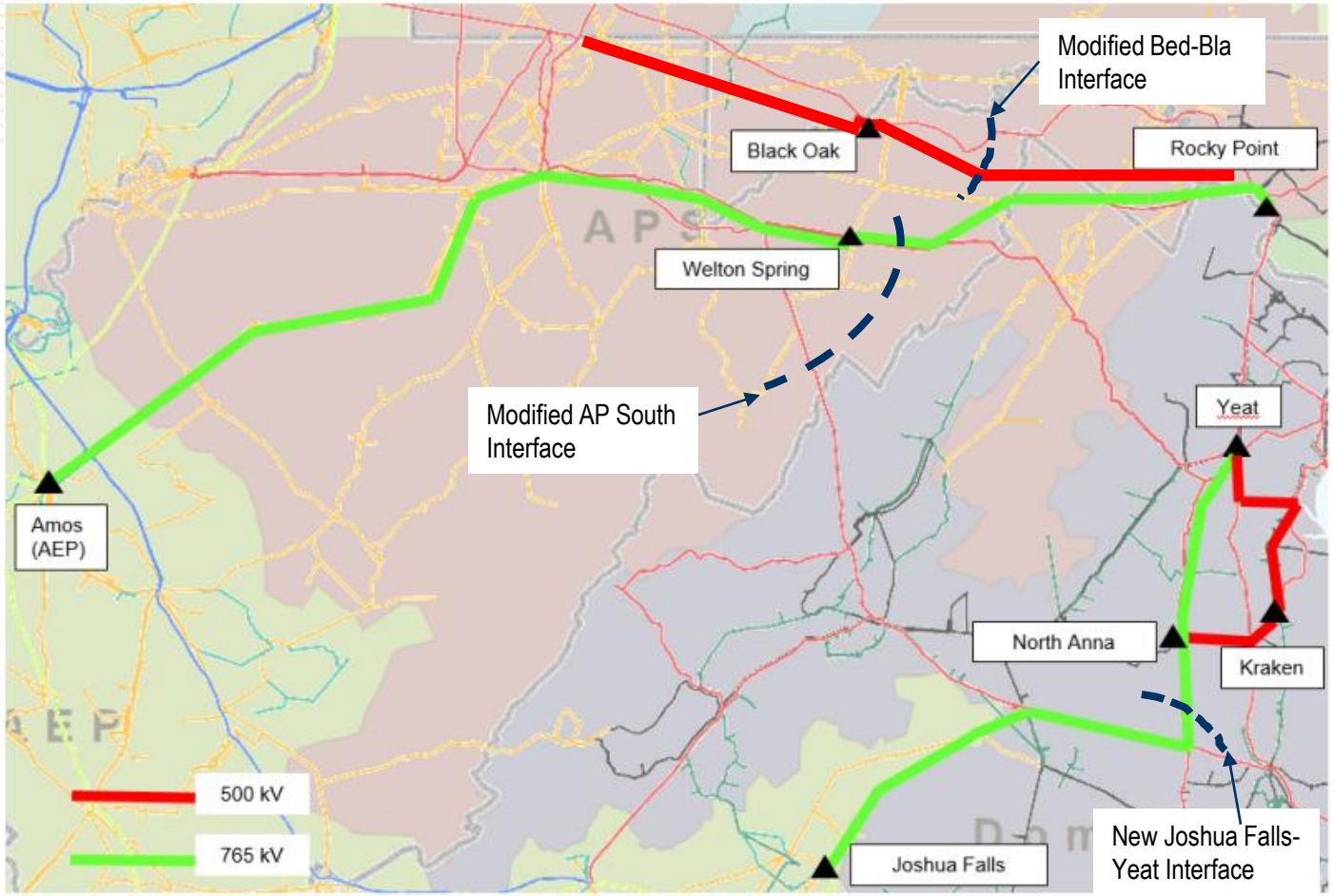
Notes: Generation includes existing and projected PJM internal capacity resources (assumed Installed Reserve Margin = 17.8%)
Unit level solar and wind resource capacity at 38% and 13% of maximum capability, respectively.
Model informed by the 2029 RTEP Powerflow, announced deactivations and the Generation Interconnection Queue as of 11/08/24.

- Financial parameters based on the Transmission Cost Planner (1/15/2025 version)
  - Discount Rate: 7.20%
  - Levelized Annual Carrying Charge Rate: 12.09%

2024/25 ME Base Case - Reactive Interface Model (2029 RTEP Topology with 2024W1 updates)

- The Market Efficiency reactive interface model was updated to consider the 2029 RTEP topology changes near existing reactive interfaces:
  - Add the new Amos-Welton Spring 765 kV to the existing AP South interface.
  - Add the new Black Oak-Woodside 500 kV to the existing Bed-Bla interface.
  - Create the new Joshua Falls-Yeat interface.

- The modification of existing reactive interfaces and creation of new interfaces are for Market Efficiency model purposes only.



2024/25 ME Base Case Status

- Upgraded to PROMOD IV user interface version 11.5. (PROMOD IV Engine I).
  - Also posted associated PROMOD CFG file on Market Efficiency secure page.
- Applied the 2024W1 proposed solutions.
  - Completed preliminary analysis of reactive interface limits.
- Mid-cycle update of 2029 and 2032 modeled years to be posted on Market Efficiency secure page once upgrades are approved by PJM Board at February meeting.
  - (XML files compatible with PROMOD 11.5).
- Updated ME Assumptions Whitepaper to be posted with February TEAC materials.

2024/25 ME Base Case Results

- The addition of the 2024W1 proposed solutions addresses the significant reliability issues previously present in the 2029 ME simulation.
  - The PROMOD case now solves without any overloads.

2029 ME Base Case	Hours with Constraint Overloads	Reactive Interface Analysis
Without 2024W1 proposed solutions	13	Unable to calculate interface limits due to voltage violations
With 2024W1 proposed solutions	0	Able to calculate interface limits

2024/25 ME Base Case Results (continue)

- As expected, after the addition of the 2024W1 proposed solutions, constraints near/overlapping with reliability violations no longer bind in the 2029 ME Base Case.

Constraint	Area	Type
Clifford-Boxwood 138 kV	AEP	Line
Roberts-Kenny 138 kV	AEP	Line
Mt Zion-Westvaco 138 kV	APS	Line
Frostburg-Ridgeley 138 kV	APS	Line
Spotsylvania-Morrisville 500 kV	DOM	Line
Northern Neck-Sanders D.P 230 kV	DOM	Line
Westmoreland-Oak Grove 230 kV	DOM	Line
St John-Four Rivers 230 kV	DOM	Line
Wilton-AD1-100 Tap 345 kV	COMED	Line

*Includes constraints that shown simulated congestion > $10M before the addition of 2024W1 proposed solutions.

2024/25 ME Base Case
2029 Simulated Congestion (Preliminary)

Constraint*	Area	Type	2029 Simulation Annual Congestion ($Million)	2029 Simulation Hours Binding (Hrs.)	Comment
Haviland-East Lima 138 kV	AEP	Line	23.16	734	Significant historical congestion
Museville-Smith Mountain 138 kV	AEP	Line	9.00	264	Nearby pump storage unit
AE1-250 Tap-Bearskin 138 kV	AEP	Line	3.29	109	
Edanville-Banister 138 kV	AEP	Line	2.87	49	
Leroy Center-Spruce 138 kV	ATSI	Line	1.28	123	
Chesterfield-Basin 230 kV	DOM	Line	60.72	1708	Nearby Interim ISA at Chesterfield
Turkey Run-Walnut Creek 115 kV	DOM	Line	2.75	264	
West Point-Lanexa 115 kV	DOM	Line	2.05	211	
Boonetown-South Reading 230 kV	METED	Line	1.60	208	Significant historical congestion
Lenox-Macnew Tap 115 kV	PENELEC	Line	4.54	1730	Significant historical congestion in area
Garrett-Garrett Tap 115 kV	PENELEC-APS	Line	1.84	246	
AP South Interface	PJM	Interface	37.94	383	Significant historical congestion
Bushkill-Kittatinny 230 kV	PPL-JCPL	Line	1.53	28	

*Includes constraints with annual simulated congestion greater than $1Million.

2024/25 ME Base Case
2029 Simulated Congestion (Preliminary)

Constraint*	Area	Type	2029 Simulation Annual Congestion ($Million)	2029 Simulation Hours Binding (Hrs.)	Comment
Wolfs Crossing TR 81 345/138 kV	COMED	TR	77.54	643	Existing RAS (see M03)
Kewanee-Putnam 138 kV	COMED-MISO	Line	18.71	466	M2M
Cherry Valley-Silver Lake 345 kV	COMED	Line	16.76	198	M2M, significant historical congestion
Nelson-Electric Junction 345 V	COMED	Line	15.73	165	M2M
Haumesser-W Dekalb 138 kV	COMED	Line	12.24	566	Significant historical congestion
Crescent Ridge-Corbin 138 kV	COMED-MISO	Line	8.94	418	M2M
Kewanee B1Z1 138 KV	COMED	CB	8.74	1001	Significant historical congestion
Kincaid-AD2-100 Tap 345 kV	COMED	Line	6.49	114	M2M
Quad Cities-MEC Cordova 138 kV	COMED-MISO	Line	5.00	58	M2M
Mazon-AD2-066 Tap 138 kV	COMED	Line	3.68	196	M2M, significant historical congestion
McGirr Rd-ESS H447 138 kV	COMED	Line	2.16	346	
Quad Cities-ESS H471 345 kV	COMED	Line	1.30	31	M2M
Streator-AC1-168 Tap 138 kV	COMED	Line	1.18	152	

*Includes constraints with annual simulated congestion greater than $1Million.

2024/25 ME Base Case
2029 Simulated Congestion (Preliminary)

Constraint*	Area	Type	2029 Simulation Annual Congestion ($Million)	2029 Simulation Hours Binding (Hrs.)	Comment
Green Acre-P9701 West 345 kV	MISO	Line	164.00	815	M2M
Douglas-Francisco 345 kV	MISO	Line	107.10	1970	M2M
Whitestown-Guion 345 kV	MISO	Line	84.10	2423	M2M
P9701 West-Olive 345 kV	MISO-AEP	Line	52.46	475	M2M
Hubbell-Batesville 138 kV	MISO	Line	49.20	816	M2M
Chicago Ave-Praxair 138 kV	MISO	Line	3.05	628	M2M
Hubbell-Weisburg 138 kV	MISO	Line	2.80	76	M2M
Elkhorn-North Lake Geneva 138 kV	MISO	Line	1.80	171	M2M
Mittal-Putnam 138 kV	MISO	Line	1.44	84	M2M

*Includes constraints with annual simulated congestion greater than $1Million.

2024/25 ME Base Case Next Steps

- Finalize modeling of all four simulated years (2025, 2029, 2032, 2035).
- Create load, fuel, and generation sensitivity scenarios.
- 2024/25 Long-Term Market Efficiency Window anticipated to open at the end of Q1 2025.
  - Once the congestion drivers are finalized and shared with TEAC.
  - The final Market Efficiency Base Case to be posted before the start of the window.

2025 Market Efficiency Tentative Timeline

Step	Tentative Target Date
Preliminary Congestion Report	February 2025
Finalize Target Congestion Drivers	March 2025
Post Final Base Case and Target Congestion Drivers (after Board approval of 2024W1 solution)	End of March 2025
Long Term ME Proposal Window (120 Days)	April - July 2025
Analysis of Proposed Solutions	July – September 2025
TEAC Reviews and Board Approval	October - December 2025

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Market Efficiency Update

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Revision History

- V1 – 1/30/2025 – Original slides posted.
- V2 – 2/03/2025 – Added slides 18-20 with 2029 Simulated Congestion (Preliminary).

  On slide 22, corrected first line in the table to match the step description with the title of slide 18.

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