



Market Efficiency Update

Nick Dumitriu

PJM Market Simulation

Transmission Expansion Advisory Committee

February 6, 2024

Conclusion of 2022/23 Market Efficiency Cycle

- In January 2024, PJM posted the 2022/23 ME Base Case, (modeled year 2028):
 - Included the reliability upgrades from the 2022 Window 3.
 - Case was posted on the [ME secure page](#).
- An updated 2022/2023 ME Base Case that includes models for years 2030 and 2033 will be posted in the following weeks.
- Congestion analysis found no suitable drivers to be included at this time in the 2022/23 ME Window.

- Topology based on the 2028 powerflow posted for the reliability window 2023W1
 - Updated with the 2022W3 solution approved at the December 2023 Board meeting.
- Updated Summer/Winter reactive interface limits.
- Updated PROMOD Summer/Winter seasonal definitions to closer match the markets:
 - Summer season (May-Oct); Winter season (Nov-Apr).
- Generator Status updated as of November 8, 2023.
- The rest of the assumptions as in the [July TEAC ME whitepaper](#):
 - PJM Load forecast (January 2023 vintage).
 - Fuel/Emissions forecasts provided by Hitachi (Spring 2023 vintage).

- 2030 and 2033 models include NJSAA offshore wind generation and transmission upgrades.
- The increase of Dominion data center load in 2030 and 2033 are modeled at selected 500 kV buses in Dominion.
- 2023 Load Forecast Dominion Zonal Peak shown below.

2028 Peak (MW)	2030 Peak (MW)	2033 Peak (MW)
28,705	31,633	35,789



Market Efficiency Simulations - Congestion Starting 2028

Constraint ¹⁾	Area	Type	2028 Annual Congestion ME Base Case <u>After</u> 2022 Window 3 Upgrades	2030 Annual Congestion ME Base Case <u>After</u> 2022 Window 3 Upgrades	2033 Annual Congestion ME Base Case <u>After</u> 2022 Window 3 Upgrades
Clifford-Boxwood 138 kV	AEP	Line	\$ 48,494,165	\$ 101,032,950	\$ 279,914,514
Bremo-Scottsville 138 kV	DOM-AEP	Line	\$ 11,372,270	\$ 22,614,988	\$ 65,462,928
Bremo-Fork Union 115 kV	DOM	Line	\$ 4,411,072	\$ 5,651,795	\$ 16,367,670
AEP-DOM	PJM	Interface	\$ 2,801,883	\$ 8,829,729	\$ 15,897,199
Morgan-Cherry Run 138 kV	APS	Line	\$ 2,126,902	\$ 2,958,846	\$ 5,760,168
AP South	PJM	Interface	\$ 1,785,468	\$ 39,585,365	\$ 360,442,971
Westvaco-Mt Zion 138 kV	APS	Line	\$ 1,704,211	\$ 5,821,576	\$ 51,245,108
Chesterfield-Basin 230 kV	DOM	Line	\$ 1,845,737	\$ 5,402,214	\$ 13,558,667
Bremo 230/115 kV	DOM	Line	\$ 1,655,259	\$ 1,172,469	\$ 872,196
Charlottesville-Proffit Rd 230 kV	DOM	Line	\$ 1,196,533	\$ 7,402,184	\$ 61,105,123
Thrasher-Fentress 230 kV	DOM	Line	\$ 1,152,383	\$ 529,463	\$ 2,119,253

¹⁾ Table includes constraints that bind >\$1M annual congestion in 2028 production cost simulation.

Note: Simulations used the load forecast from the 2023 PJM Load Forecast Report.

These constraints are electrically close to reliability violations addressed in the 2022 Window 3. The magnitude of congestion in later years may be indicative of new reliability violations. More comprehensive analysis, including reliability is required.



Market Efficiency Simulations - Congestion Starting 2028

Constraint ¹⁾	Area	Type	2028 Annual Congestion ME Base Case <u>After</u> 2022 Window 3 Upgrades	2030 Annual Congestion ME Base Case <u>After</u> 2022 Window 3 Upgrades	2033 Annual Congestion ME Base Case <u>After</u> 2022 Window 3 Upgrades
Enbridge-DeKalb-Waterman 138 kV ²⁾	COMED	Line	\$ 7,513,761	\$ 7,945,695	\$ 8,661,300
Haumesser Rd-W De Kalb 138 kV ²⁾	COMED	Line	\$ 6,582,203	\$ 8,171,729	\$ 8,637,701
Ashtabula-Sanborn 138 kV ³⁾	FE-ATSI	Line	\$ 5,930,137	\$ 3,138,970	\$ 2,668,906

¹⁾Table includes constraints that bind >\$1M annual congestion in the 2028 production cost simulation.

²⁾This constraint will be addressed by the 2023 RTEP Window 1, Cluster 3 solution.

³⁾Constraint shows declining congestion between 2028 and 2033.

Note: Simulations used the load forecast from the 2023 PJM Load Forecast Report.



Market Efficiency Simulations - M2M Congestion

Constraint ¹⁾	Area	Type	2028 Annual Congestion ME Base Case After 2022 Window 3 Upgrades	2030 Annual Congestion ME Base Case After 2022 Window 3 Upgrades	2033 Annual Congestion ME Base Case After 2022 Window 3 Upgrades
Crescent Ridge-Corbin 138 kV	COMED-AMIL	Line	\$ 7,277,187	\$ 7,631,730	\$ 9,491,458
Green Acres-Olive 345 kV	COMED-AEP	Line	\$ 4,769,215	\$ 9,603,915	\$ 6,122,284
Mittal Steel-Putnam 138 kV	AMIL	Line	\$ 3,729,240	\$ 3,835,885	\$ 4,664,374
Stillwell 345/138 kV	NIPSCO	XFMR	\$ 1,766,364	\$ 1,954,327	\$ 4,268,758
Munster-Lake George 345 kV	NIPSCO	Line	\$ 954,185	\$ 399,629	\$ 2,460,135
Dune Acre-Michigan City 138 kV	NIPSCO	Line	\$ 650,747	\$ 1,096,110	\$ 2,417,109
Lallendorf-Monroe 345 kV	ATSI-DECO	Line	\$ 568,112	\$ 915,976	\$ 1,345,800
Kokomo-Tipton 230 kV	DUK-IN	Line	\$ 424,891	\$ 553,819	\$ 1,165,293
Gibson-Francisco 345 kV	DUK-IN	Line	\$ 162,664	\$ 14,052	\$ 1,291,980
Rock Creek-Quad City 345 kV	ALTW-COMED	Line	\$ 113,823	\$ 218,100	\$ 1,403,917

¹Table includes M2M constraints that bind >\$1M annual congestion in the 2028, 2030, or 2033 production cost simulations.

Note: Simulations used the load forecast from the 2023 PJM Load Forecast Report.

M2M constraints may be considered for a coordinated system planning study with MISO.



Market Efficiency Simulations - Congestion Starting 2030

Constraint ¹⁾	Congested Area	Type	2028 Annual Congestion ME Base Case <u>After</u> 2022 Window 3 Upgrades	2030 Annual Congestion ME Base Case <u>After</u> 2022 Window 3 Upgrades	2033 Annual Congestion ME Base Case <u>After</u> 2022 Window 3 Upgrades
Red Lion-Keeney 230 kV	DPL	Line		\$ 6,546,527	\$ 15,371,255
Hope Creek-Red Lion 500 kV	PSEG-DPL	Line		\$ 4,543,298	\$ 12,007,344
Boonetown Road-S. Reading 230 kV	METED	Line	\$ 124,156	\$ 3,722,941	\$ 9,018,730
Black Oak-Bedington	PJM	Interface		\$ 2,240,849	\$ 1,958,857
Fork Union-Cunningham 230 kV	DOM	Line	\$ 515,502	\$ 1,999,059	\$ 9,018,730

¹⁾Table includes constraints starting to bind >\$1M annual congestion in the 2030 production cost simulation, beyond the RTEP year.

Note: Simulations used the load forecast from the 2023 PJM Load Forecast Report.

The magnitude of congestion in later years may be indicative of new reliability violations. More comprehensive analysis, including reliability is required.



Market Efficiency Simulations - Congestion Starting 2033

Constraint ¹⁾	Congested Area ²⁾	Type	2028 Annual Congestion ME Base Case <u>After</u> 2022 Window 3 Upgrades	2030 Annual Congestion ME Base Case <u>After</u> 2022 Window 3 Upgrades	2033 Annual Congestion* ME Base Case <u>After</u> 2022 Window 3 Upgrades
Aspen-Brambleton 500 kV	DOM	Line		\$ 633,482	\$ 257,948,497
Spotsylvania-Morrisville 500 kV	DOM	Line		\$ 12,276	\$ 74,407,902
Front Royal-Morrisville 500 kV	DOM	Line		\$ 15	\$ 40,431,129
North Anna-Spotsylvania 500 kV	DOM	Line			\$ 23,120,070
Sandy Ridge-High Ridge 2314 230 kV	BGE	Line		\$ 353,252	\$ 16,862,048
Sandy Ridge-High Ridge 2334 230 kV	BGE	Line		\$ 209,110	\$ 7,581,533
Person-Sedge Hill 230 kV	CPL-DEM	Line	\$ 40,350	\$ 256,968	\$ 7,124,022
Safe Harbor-Graceton 230 kV	PPL-BGE	Line		\$ 596,923	\$ 3,899,387
North Philadelphia-Master 230 kV	PECO	Line		\$ 610,397	\$ 1,961,342
Hampshire-Ridgeley 138 kV	APS	Line		\$ 289,981	\$ 1,368,144
Farmville-Buckingham 230 kV	DOM	Line	\$ 80,165	\$ 104,829	\$ 1,135,690
Bremo-Bremodist 230 kV	DOM	Line	\$ 654,661	\$ 919,560	\$ 2,190,792
Chesterfield-Iron Bridge 230 kV	DOM	Line	\$ 263,962	\$ 248,662	\$ 1,865,043

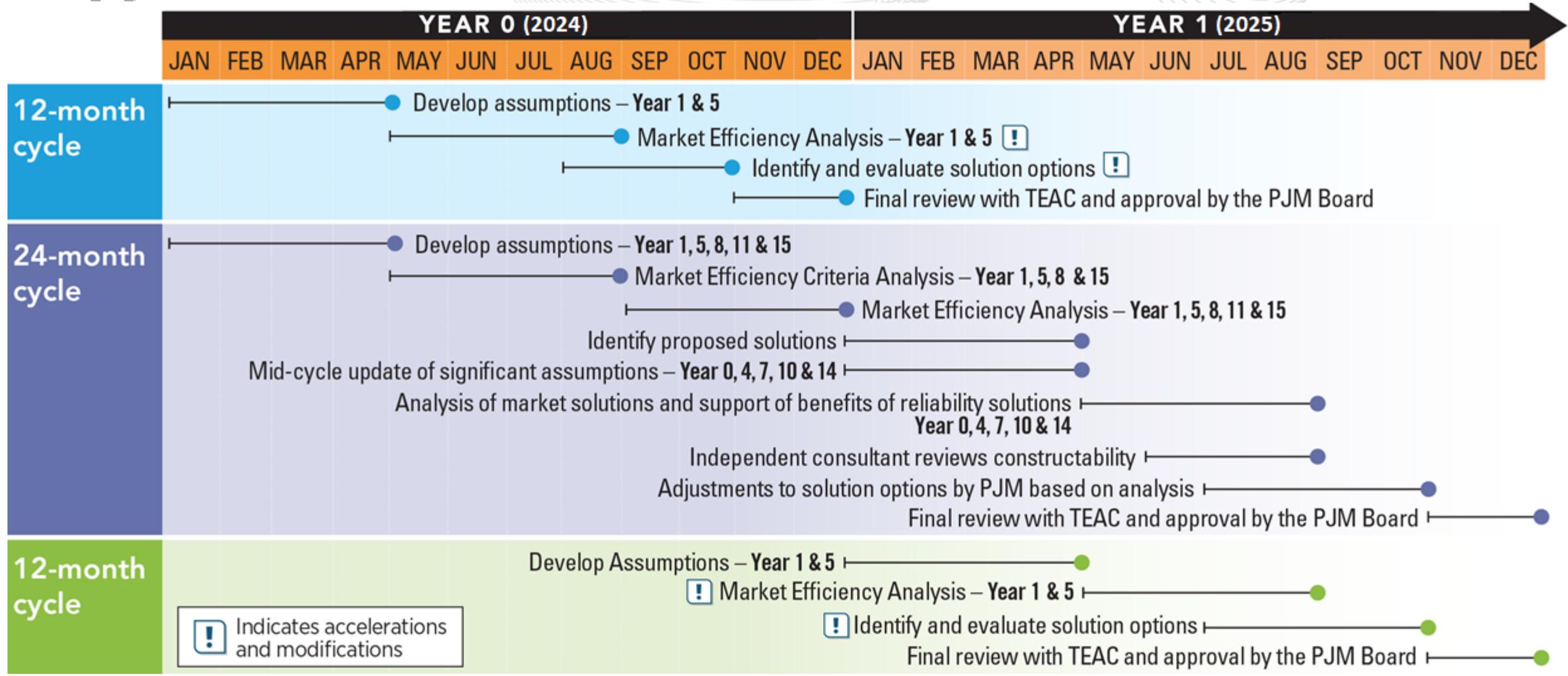
¹⁾Table includes constraints starting to bind >\$1M annual congestion in the 2033 production cost simulation.

²⁾Dominion 500 kV constraints are correlated with the market efficiency assumptions regarding Dominion future load locations.

The magnitude of congestion in later years may be indicative of new reliability violations. More comprehensive analysis, including reliability is required.

- Congestion analysis found no suitable drivers to be included at this time in the 2022/23 ME Window:
 - More comprehensive analysis, including reliability, is required
 - Some potential congestion drivers were already identified as reliability violations in 2023W1 and 2023W2 reliability windows.
 - Other facilities show very high congestion in simulations for years 2030 and beyond, which may be indicative of reliability violations.
 - Other potential congestion drivers show declining congestion between 2028 and 2033.
- PJM will continue to analyze the congestion patterns as part of the 2024/25 Market Efficiency cycle.
 - All congested facilities included in the previous slides will continued to be evaluated as potential drivers to be included in the 2024/25 Market Efficiency Window anticipated to open January 2025.
- M2M constraints may be considered for a coordinated system planning study with MISO.

2024/25 Market Efficiency Cycle



- Hitachi Energy PROMOD Database – Spring 2024.
- Powerflow consistent with the final 2028 RTEP powerflow.
 - Includes transmission upgrades and expansions approved at the February Board meeting.
- Load Forecast and Demand Response based on PJM 2024 Load Forecast Report.
- Updated Generation Expansion.
- Fuel/Emissions Price forecasts provided by Hitachi Energy (Spring 2024 vintage).
- Financial parameters, Discount Rate and Carrying Charge, based on the latest Transmission Cost Information Center spreadsheet.

Step	Tentative Target Date
Develop Base Case Assumptions	May 2024
Post Preliminary Base Case	July 2024
Stakeholders Feedback	September 2024
Identify Congestion Drivers	September – November 2024
Post Final Base Case and Target Congestion Drivers	January 2025
Long Term Proposal Window	January - May 2025
Analysis of Proposed Solutions	May – September 2025
TEAC Reviews and Board Approval	October - December 2025

Facilitator:
McGlynn, Paul
Paul.McGlynn@pjm.com

Secretary:
Tarik Bensala,
Tarik.Bensala@pjm.com

SME/Presenter:
Nicolae Dumitriu,
Nicolae.Dumitriu@pjm.com

Market Efficiency Update



Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

- V1 – 2/1/2024 – Original slides posted

**PROTECT THE
POWER GRID
THINK BEFORE
YOU CLICK!**



Be alert to
malicious
phishing emails.

Report suspicious email activity to PJM.
(610) 666-2244 / it_ops_ctr_shift@pjm.com

