



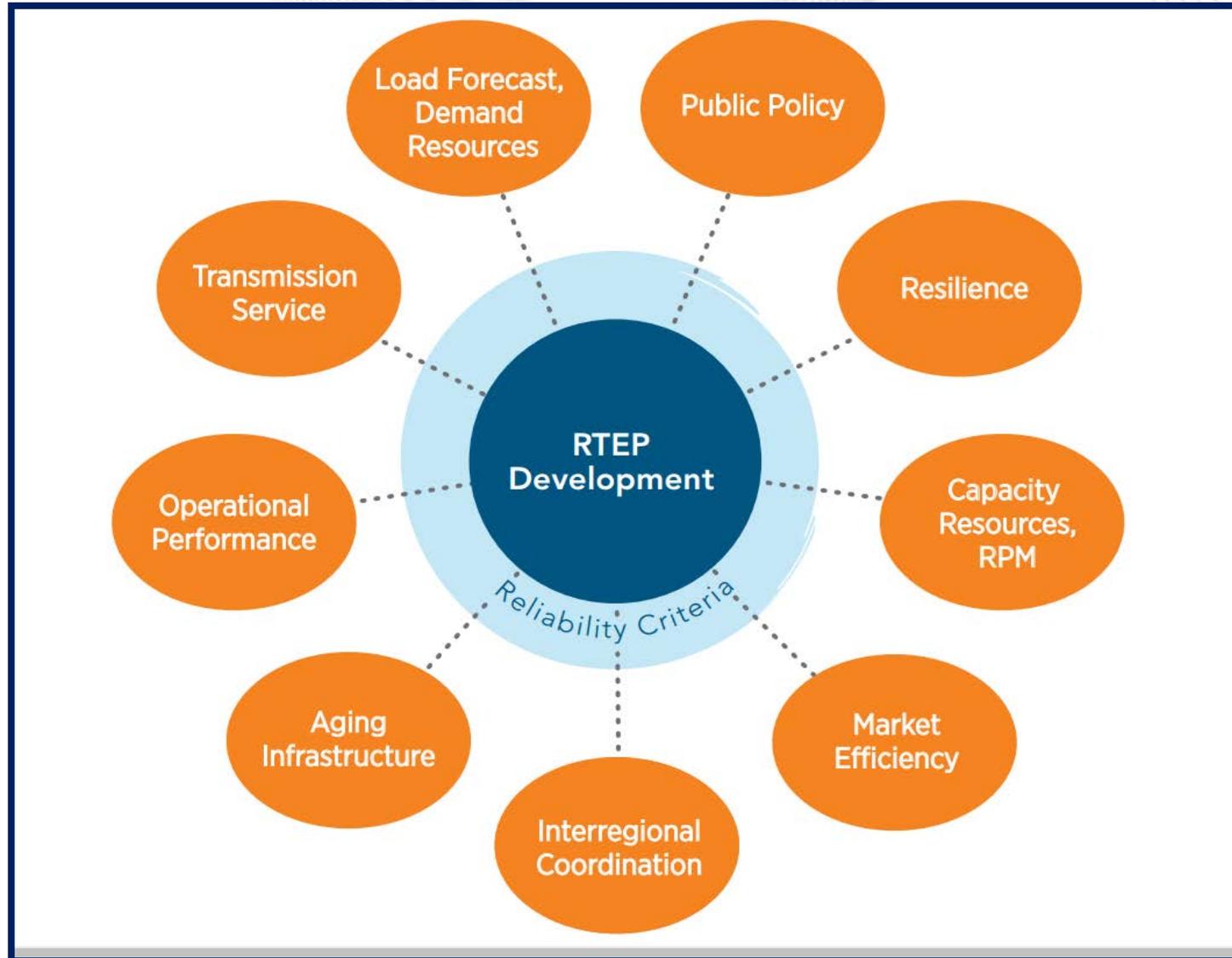
# PJM Regional Transmission Expansion Planning (RTEP) Process

IPSAC

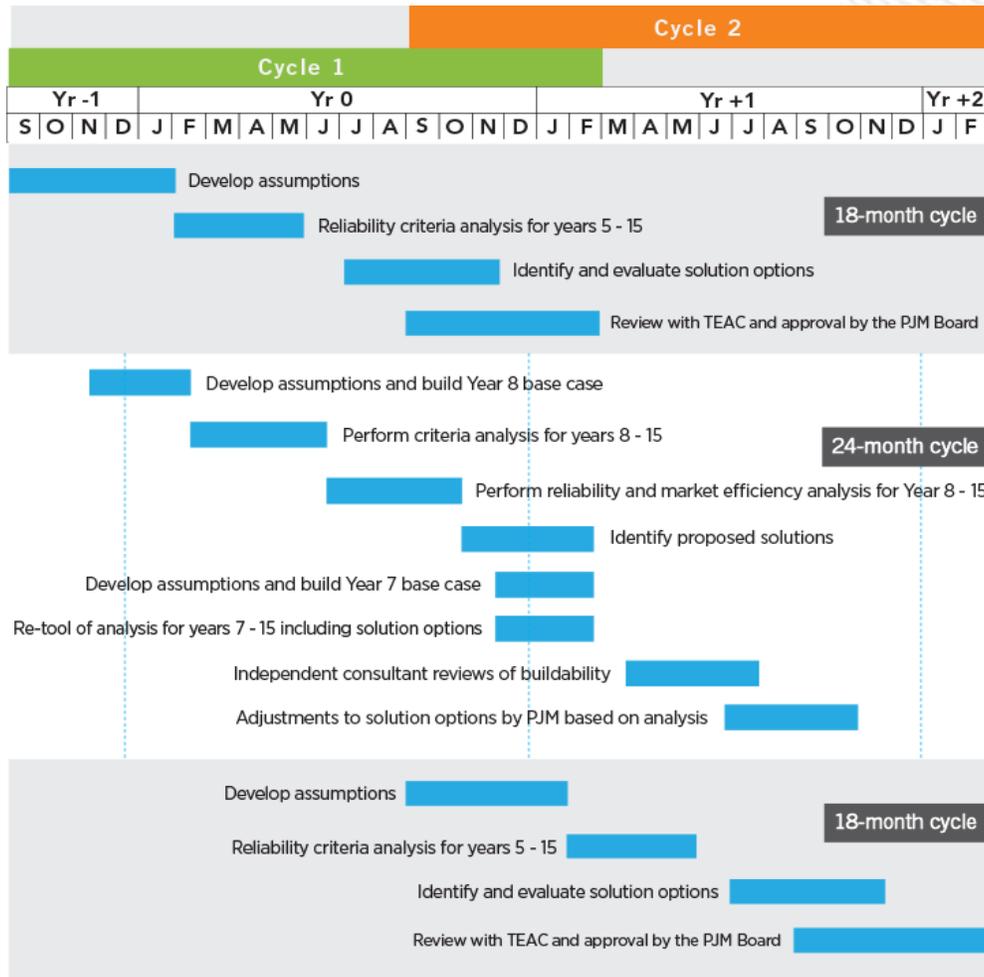
December 14, 2020

- Planning Committee (PC)
  - <http://www.pjm.com/committees-and-groups/committees/pc.aspx>
- Transmission Expansion Advisory Committee (TEAC)
  - <http://www.pjm.com/committees-and-groups/committees/teac.aspx>
- Interregional Planning
  - <http://www.pjm.com/planning/interregional-planning.aspx>
- Services and Requests
  - <http://www.pjm.com/planning/services-requests.aspx>
- RTEP Development
  - <http://www.pjm.com/planning/rtep-development.aspx>
- Manual 14B
  - <http://www.pjm.com/-/media/documents/manuals/m14b.ashx>

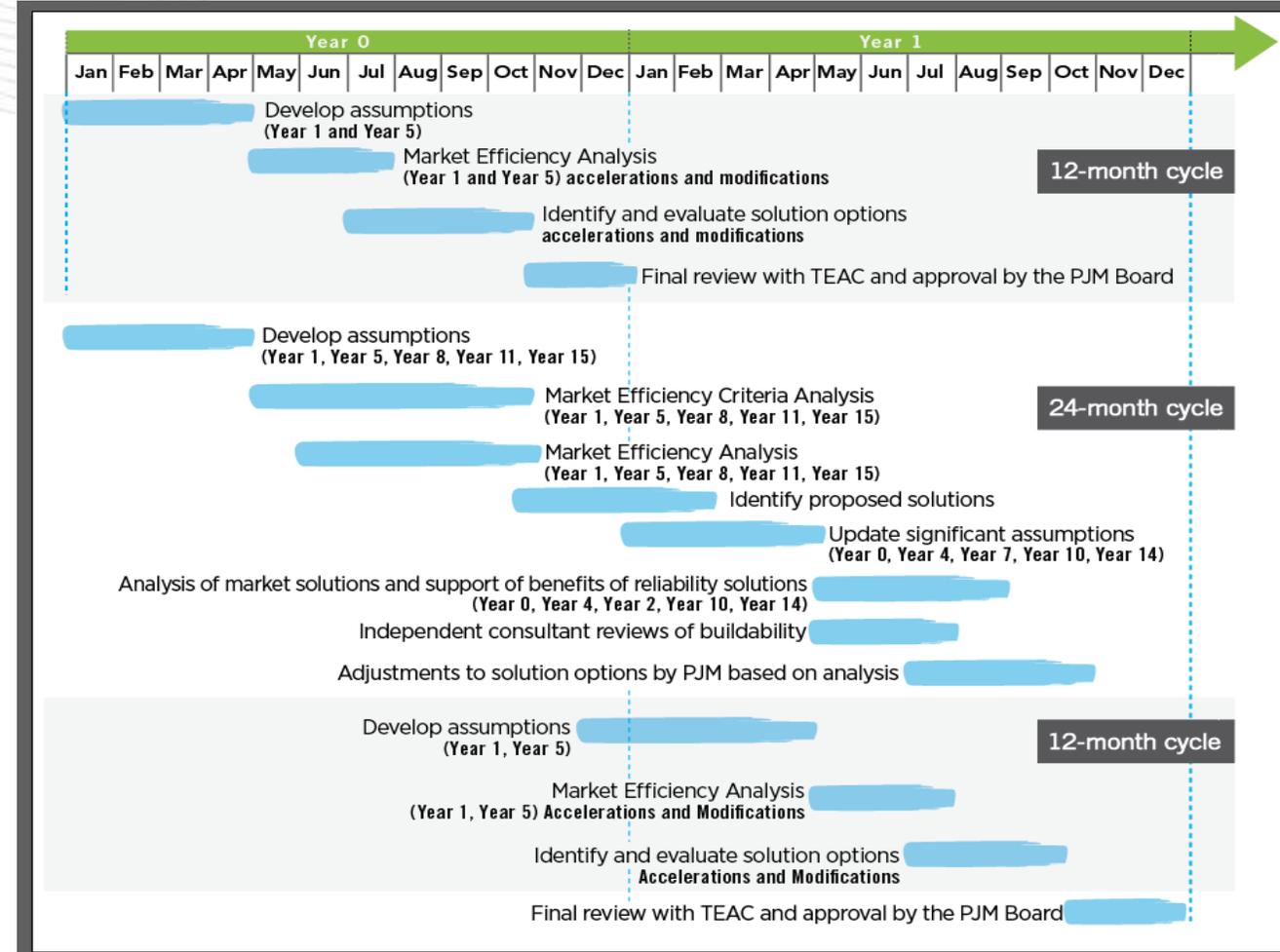
# PJM RTEP Drivers and Planning Cycles



## PJM's 2-year Reliability



## PJM's 2-year Market Efficiency





# PJM 2020 RTEP Update

- The 2020 RTEP Assumptions were presented at the May IPSAC meeting. Refer to <https://www.pjm.com/-/media/committees-groups/stakeholder-meetings/ipsac/2020/20200515/20200515-ipsac-pjm-regional-transmission-expansion-planning-process.ashx>
- Baseline Projects –Projects that are driven by reliability criteria violations, operational performance issues, and congestion constraints.
- Supplemental Projects – Projects that are not required to address system reliability, Operational performance or economic criteria. Supplemental projects are planed according to the Tariff Attachment M-3 process.

- Per the PJM Operating Agreement, a proposal window was conducted for all reliability needs that were not Immediate Need reliability upgrades or were otherwise ineligible to go through the window process.
- PJM opened 3 windows as part of the 2020 study year
  - Proposal Window No.1 - 60 days window
  - Proposal Window No.2 - 30 days window
  - Proposal Window No.3 – 30 days window

# 2020 RTEP Window 1 Update

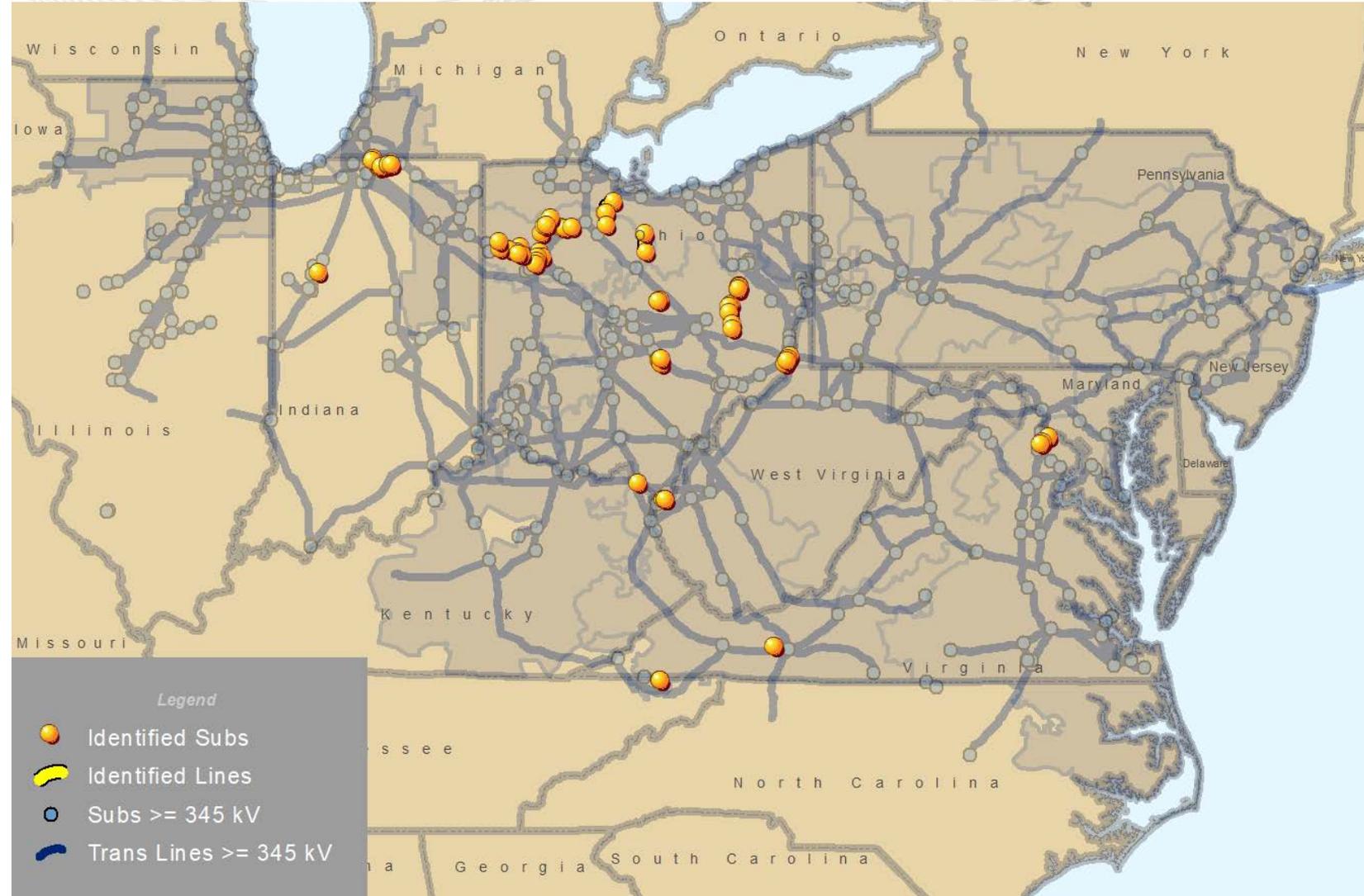
- PJM as part of the annual Regional Transmission Expansion Plan conducted studies and originally identified 3228 flowgates. 207 of those flowgates were eligible for competition, where 3021 of the flowgates were excluded from the competition for various reasons.
  - Window 1 Opened: July 1, 2020
  - Window 1 Closed: August 31, 2020

## Overview of 2025 Results

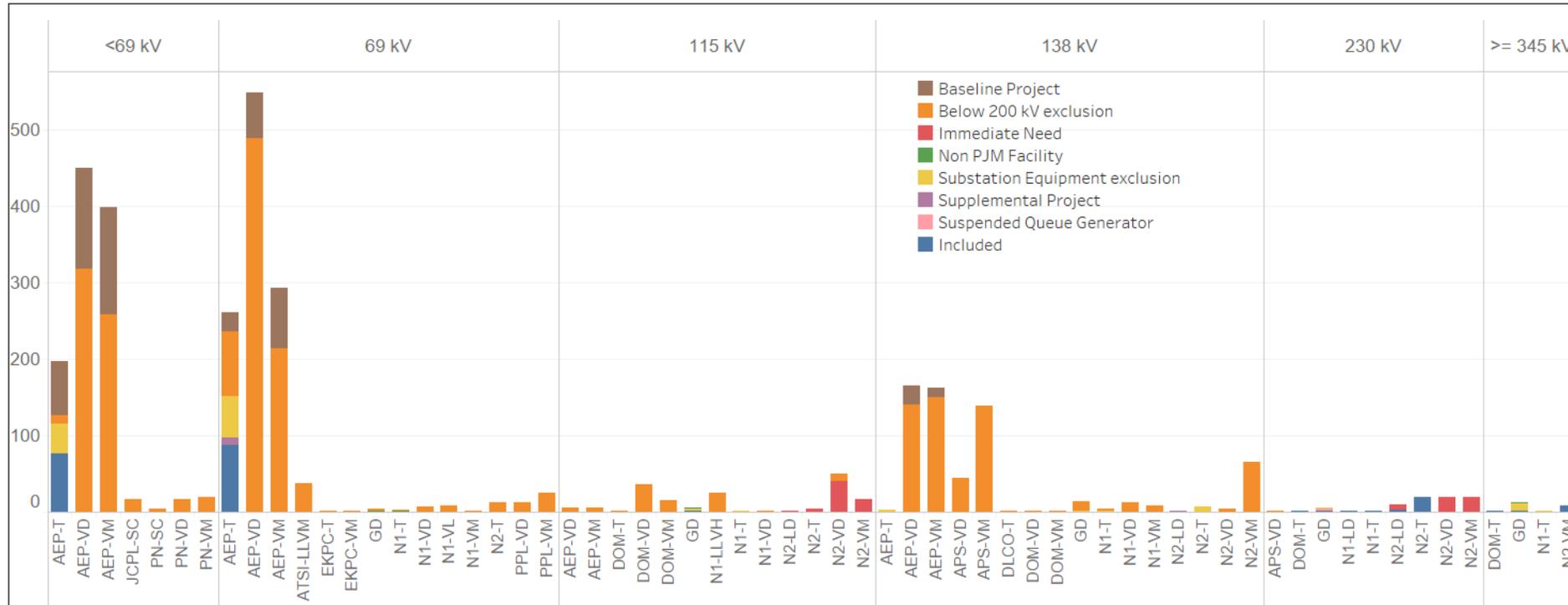
Total of 3228 flowgates identified

- 207 flowgates are eligible
  - 165 in the PJM West Region
  - 31 in the PJM South Region
  - 11 in PJM Mid-Atlantic Region
- 3021 flowgates excluded
  - 2226 due to the below 200 kV exclusion
  - 122 due to the substation equipment exclusion
  - 545 fixed by existing baseline
  - 108 Dominion Immediate Need
  - 11 fixed by supplemental project already in service due to customer needs or required as part of the customer service due to do no harm studies
  - 6 Non PJM Facility
  - 3 suspended queue generator

Note: PJM made several updates/corrections after the window was initially opened which resulted in a reduction in the number of violations identified in the 2020 RTEP



Voltage	Window Excluded							Window Included	Total
	Baseline Project	Below 200 kV exclusion	Immediate Need	Non PJM Facility	Substation Equipment exclusion	Supplemental Project	Suspended Queue Generator		
<69 kV	345	642			40			76	1,103
69 kV	163	898		4	55	10		87	1,217
115 kV		99	61	1	3			2	166
138 kV	37	585			12	1			635
230 kV		2	47		1		3	30	83
345 kV				1	10			11	22
500 kV								1	1
765 kV					1				1
<b>Total</b>	<b>545</b>	<b>2,226</b>	<b>108</b>	<b>6</b>	<b>122</b>	<b>11</b>	<b>3</b>	<b>207</b>	<b>3,228</b>



- 47 proposals received from 8 entities to address the flowgates eligible for competition
    - 12 proposals include greenfield construction
  - PJM so far have received 52 proposals to address the flowgates excluded from the competition.
    - 5 proposals include greenfield construction
- Proposals evaluation in progress

# 2020 RTEP Window 2 Update

Violation was identified for Dominion's FERC 715 Planning Criteria (End of Life Criteria)

- Proposal Window No.2 Opened: July 1, 2020
  - Proposal Window No.2 Closed: July 31, 2020
- 1 proposal was received from 1 entity
- Proposal is from an incumbent entity
    - Rebuild 500kV Line #514 (Doubs(FE) - Goose Creek(DEV) 500kV transmission). (Baseline upgrade # B3247)

# 2020 RTEP Window 3 Update

- Proposal Window No.3 Opened: September 18, 2020
- Proposal Window No.3 Closed: October 19, 2020

This window includes 24 Thermal AEP FERC 715 Violations, primarily on 69kV facilities resulting from contingency correction:

- 8 flowgates are from the 2020 RTEP Window 1 violations
- 16 flowgates are new violations for 2020 RTEP Window 3

3 proposals received from 2 entities

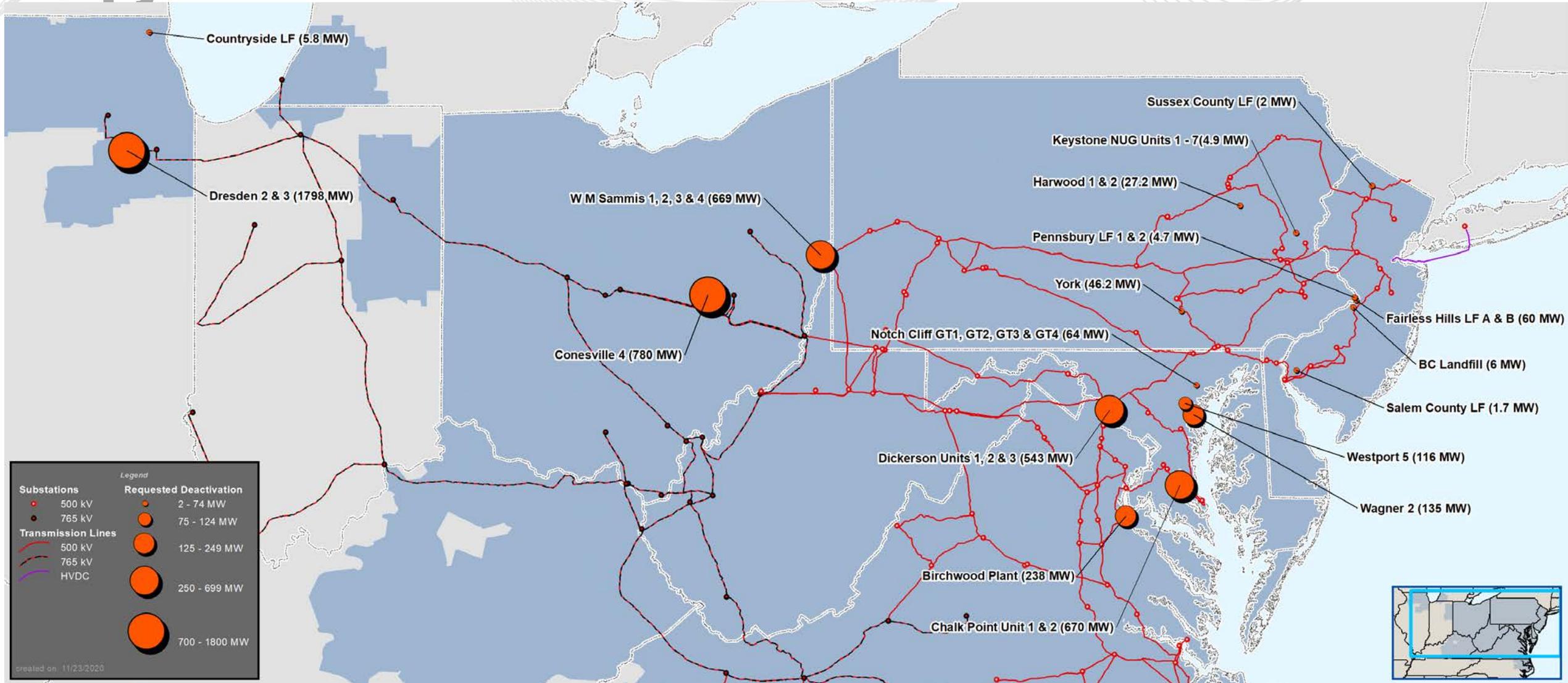
➤ Proposals evaluation in progress

# 2020 RTEP M-3 Process

- Development of Supplemental Projects:
  - PJM coordinated the Supplemental projects planning as described in the Tariff, Attachment M-3.
    - PJM received/presented 310 Supplemental Needs from 1/1/2020 to 11/30/2020
    - Solutions were proposed for 185 of the 310 projects
    - 116 projects completed all necessary reviews and the projects will be integrated into the 2021 Regional Transmission Expansion Plan.



# Generation Deactivation Notification Update (Between 4/1/2020 and 11/1/2020)



Unit(s)	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Chalk Point Unit 1 and 2 (670 MW)	PEPCO	6/1/2021	Reliability analysis complete. No violation identified
Dresden 2 and 3 (1798 MW)	ComEd	11/1/2021	Reliability analysis complete. No violation identified
Birchwood Plant (238 MW)	Dominion	3/1/2021	Reliability analysis complete. No violation identified
York Generation Facility (46.2 MW)	MetEd	5/31/2022	Reliability analysis Underway.
Harwood 1 and 2 (27.2 MW)	PPL	5/31/2021	Reliability analysis Underway
Countryside Landfill (5.8 MW)	ComEd	1/27/2021	Reliability analysis Underway.

Unit(s)	Transmission Zone	Actual Deactivation Date	PJM Reliability Status
Westport 5 (116 MW)	BGE	6/1/2020	Reliability analysis complete. No impacts identified.
Wagner 2 (135 MW)	BGE	6/1/2020	Reliability analysis complete. No impacts identified
W M Sammis 1, 2, 3 and 4 (669 MW)	ATSI	6/1/2020	Reliability analysis complete and upgrades expected to be completed in time for unit to deactivate as scheduled.
Sussex County LF (2 MW)	JCPL	6/1/2020	Reliability analysis complete. No impacts identified.
Salem County LF (1.7 MW)	AEC	6/1/2020	Reliability analysis complete. No impacts identified.

Unit(s)	Transmission Zone	Actual Deactivation Date	PJM Reliability Status
Pennsbury Generator Landfill 1 and 2 (4.7 MW)	PECO	6/1/2020	Reliability analysis complete. No impacts identified.
Notch Cliff GT1, GT2, GT3 and GT4 (64 MW)	BGE	6/1/2020	Reliability analysis complete. No impacts identified
Keystone Recovery Units 1 - 7 (4.9 MW)	PPL	6/1/2020	Reliability analysis complete. No impacts identified
Fairless Hills Landfill A and B (60 MW)	PECO	6/1/2020	Reliability analysis complete. No impacts identified.

Unit(s)	Transmission Zone	Actual Deactivation Date	PJM Reliability Status
Conesville 4 (780 MW)	AEP	6/1/2020	Reliability analysis complete; upgrades expected to be completed in future, but interim operating measures identified and unit can deactivate as scheduled
BC Landfill (6 MW)	PSEG	6/1/2020	Reliability analysis complete. No impacts identified.
Dickerson Unit 1, 2 and 3 (543 MW)	PEPCO	8/13/2020	Reliability analysis complete. No impacts identified



# RTEP Projects Electrically Near the PJM-NYISO Interface Between March and December 2020

**Process Stage:** Second Review

**Criteria:** Winter Baseline

**Assumption Reference:** 2025 RTEP assumption

**Model Used for Analysis:** 2025 RTEP Winter case

**Proposal Window Exclusion:** Below 200 kV

**Problem Statement:** Post contingency voltage drop violation on the Williams 115 kV substation. The Williams 115 kV bus has a voltage drop issue for a line fault stuck breaker contingency loss of the Williams – Tiffany – Laurel lake – Westover 115 kV circuit.

Violations were posted as part of the 2020 Window 1: FG# N1-WVD1

**Existing Facility Rating:** N/A

**Proposed Facility Rating:** N/A

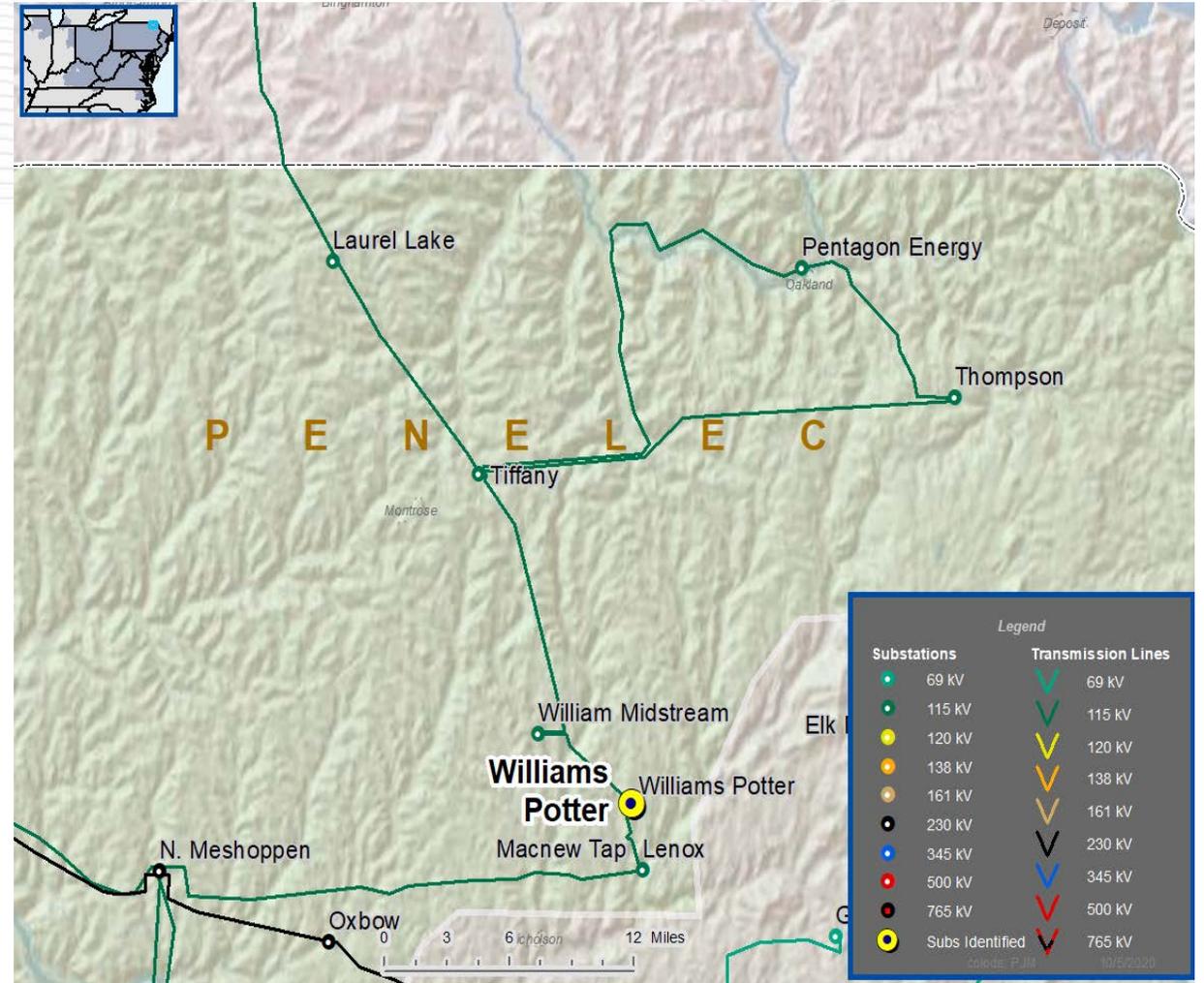
**Recommended Solution:**

Construct a new breaker-and-a-half 115 kV (Warriner Pond) substation near Tiffany substation. All transmission assets and lines will be relocated from Tiffany to the new substation. The two distribution transformers will be fed via two dedication 115 kV feeds to the existing Tiffany substation. (b3245)

**Estimated Cost:** \$23.2 M

**Alternatives:** Convert Tiffany Substation to a ring bus configuration (Not feasible).

**Required In-Service:** 6/1/2025



Need Number: PN-2020-002

Process Stage: Solution Meeting 07/07/2020

Previously Presented:

Need Meeting 5/12/2020

Project Driver:

*Equipment Material Condition, Performance and Risk*

Specific Assumption Reference:

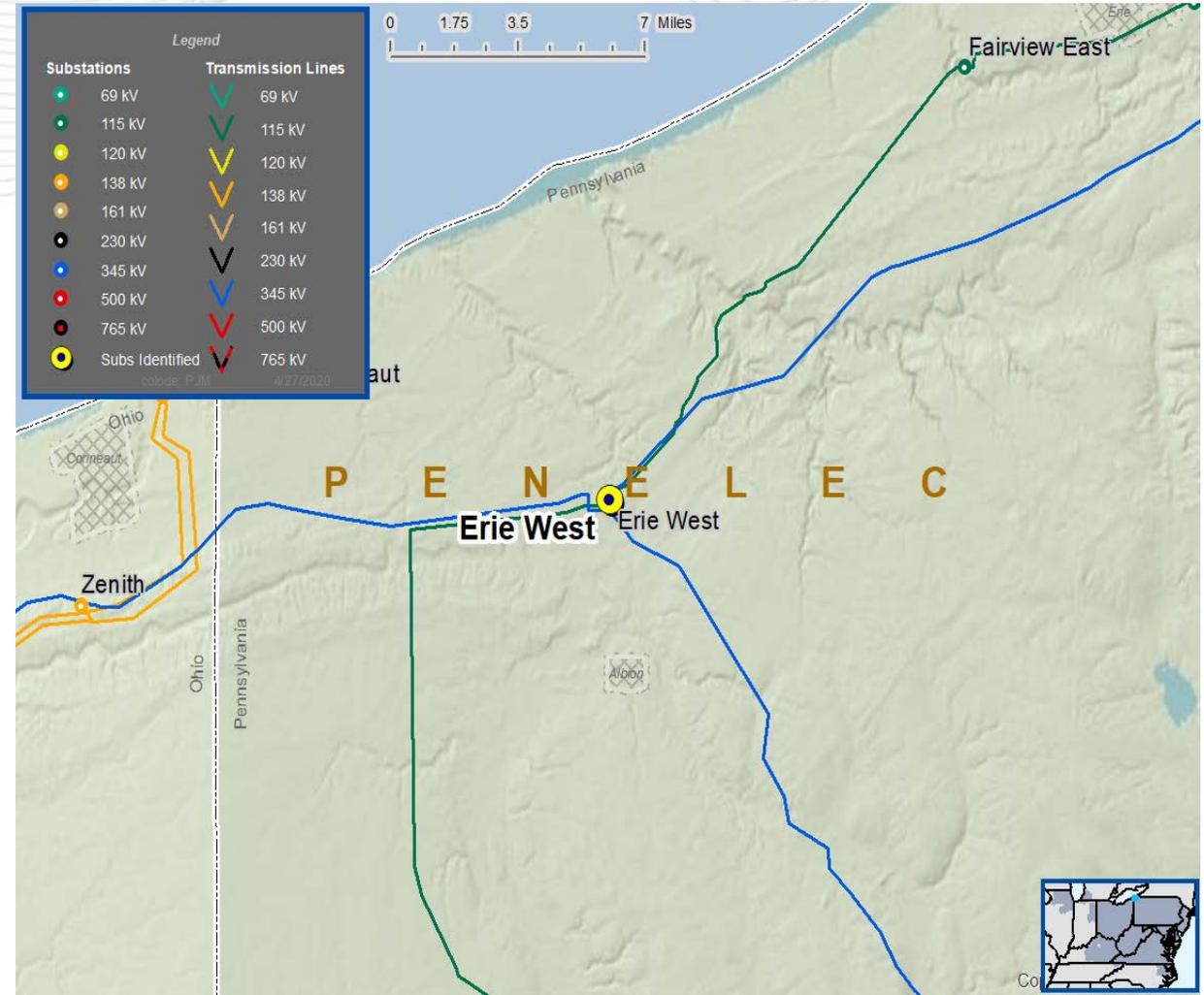
Substation Condition Rebuild/Replacement

Problem Statement:

Erie West #1 345/115 kV Transformer

- Transformer has increased failure probability due to:
  - Transformer is 47 years old.
  - High level heating gases and moisture
  - HV bushings have significant deterioration
  - Obsolete parts
  - Nitrogen and oil leaks

Transformer circuit rating is the existing transformer rating of 266/333 MVA (SN/SE).



**Need Number:** PN-2020-002

**Process Stage:** Solutions Meeting 07/07/2020

**Proposed Solution:**

*Replace Erie West #1 345/115 kV Transformer*

- Replace the #1 345/115 kV transformer and associated equipment with a 168/224 MVA transformer

**Transformer Rating:**

Erie West #1 345/115 kV Transformer

- Before Proposed Solution: 266 / 333 MVA (SN/SE)
- After Proposed Solution (anticipated): 280 / 341 MVA (SN/SE)

**Alternatives Considered:**

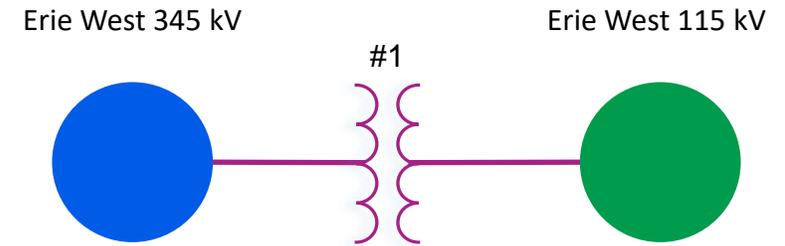
- Maintain existing condition

**Estimated Cost:** \$3.3M

**Projected In-Service:** 12/31/2021

**Project Status:** Conceptual

**Model:** 2020 Series 2025 Summer RTEP 50/50



Legend	
500 kV	
345 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
34.5 kV	
23 kV	
New	

**Process Stage:** Second Review

**Criteria:** Summer and Winter N-1-1

**Assumption Reference:** 2025 RTEP assumption

**Model Used for Analysis:** 2025 RTEP Summer and Winter cases

**Proposal Window Exclusion:** None

**Problem Statement:** Post contingency high voltage violation on the Pierce Brook 345kV substation. The Pierce Brook 345kV bus has high voltage issue for N-1-1 contingency loss of the Pierce Brook – Five Mile 345 kV circuit plus Pierce Brook shunt reactor, and Pierce Brook – Five Mile 345 kV circuit plus Lewis Run - Pierce Brook 230 kV circuits in both summer and winter analysis results.

Violations were posted as part of the 2020 Window 1: FG# N2-SVM52 to N2-SVM55 and N2-WVM15 to N2-WVM19

**Existing Facility Rating:** N/A

**Proposed Facility Rating:** N/A

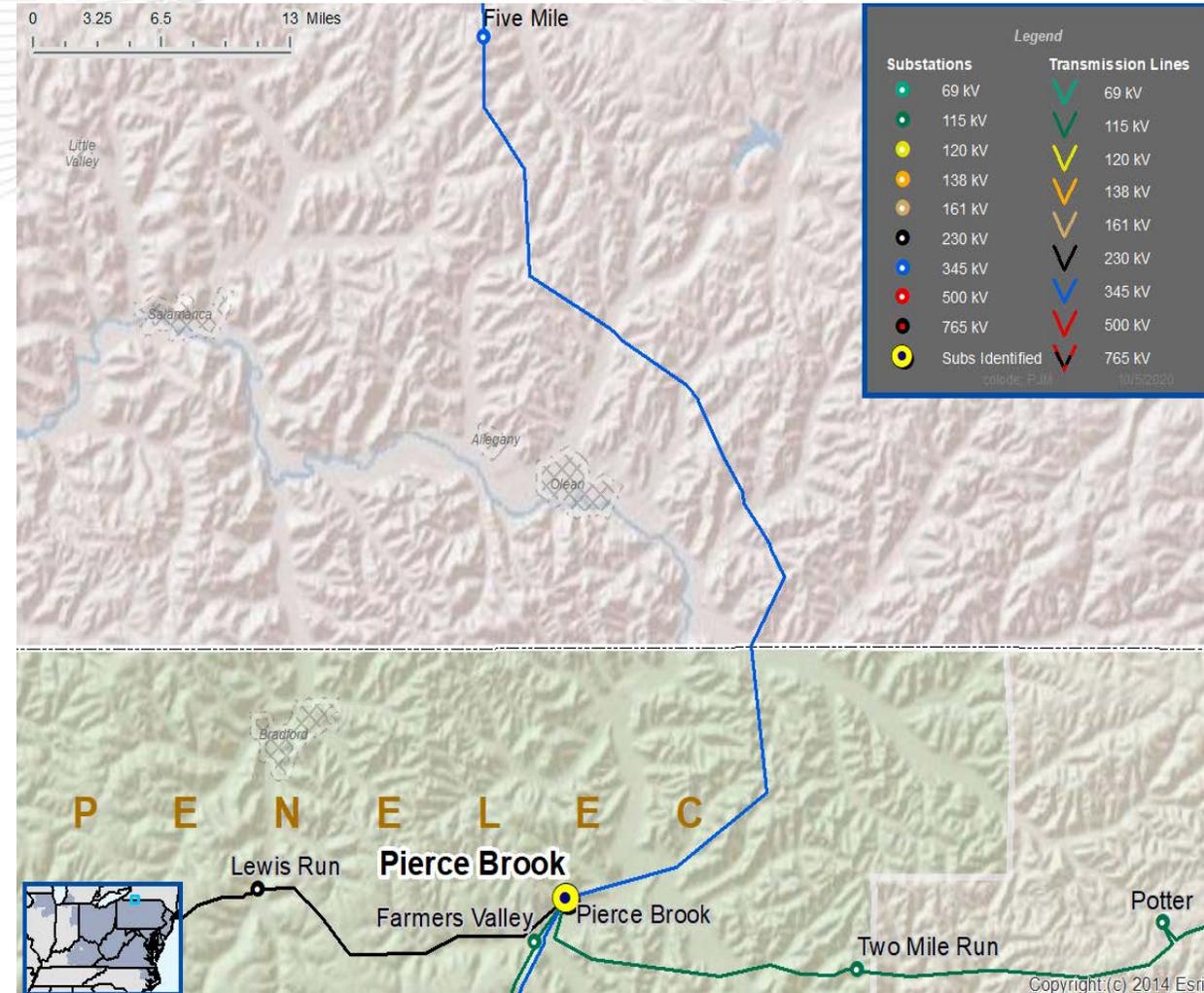
**Recommended Solution:**

Install a second 125 MVAR 345 kV shunt reactor and associated equipment at Pierce Brook Substation. Install a 345 kV breaker on the high side of the #1 345/230 kV transformer. (B3306)

**Estimated Cost:** \$8.08 M

**Alternatives:** N/A

**Required In-Service:** 6/1/2025



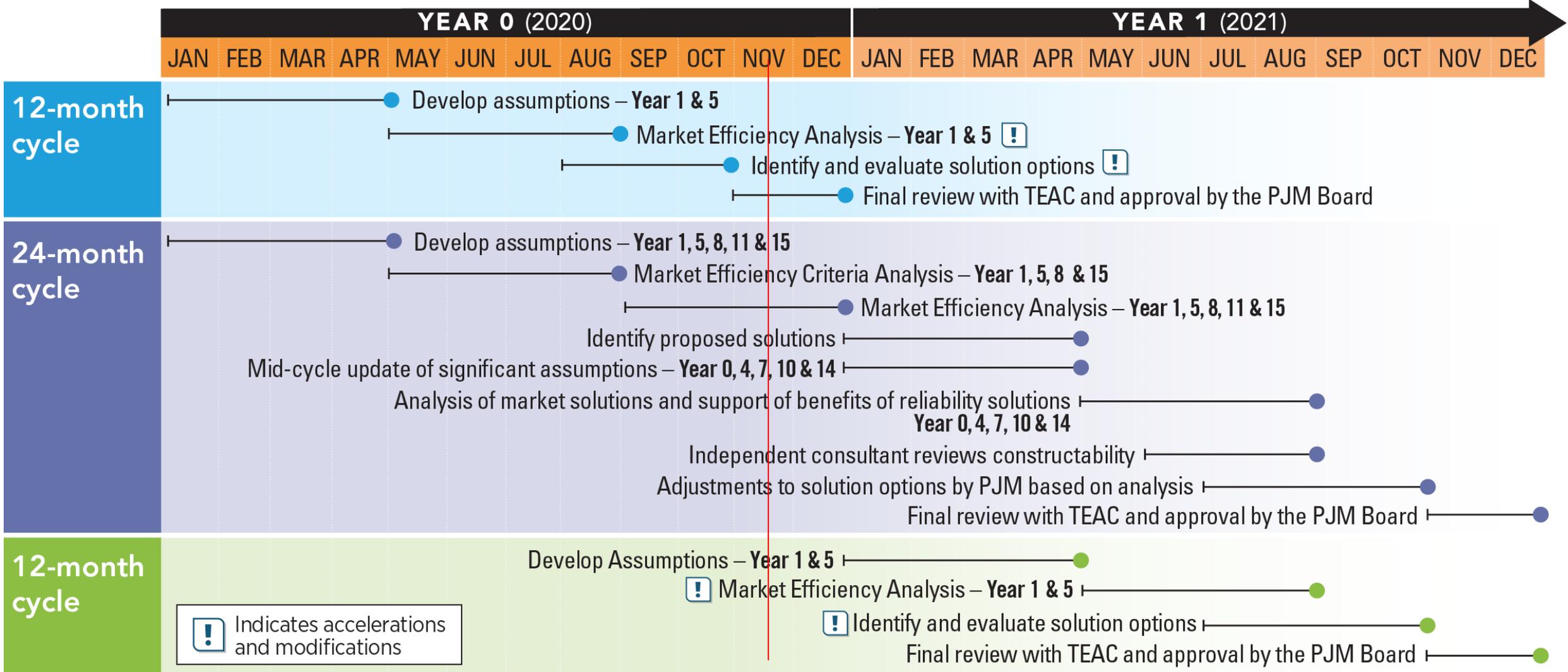


# PJM Market Efficiency Update

Nick Dumitriu

Sr. Lead Engineer, PJM Market Simulation

# 2020/2021 Long-Term Window



- Market Efficiency Input Assumptions presented at TEAC meetings June through August
  - 20/21 Market Efficiency Analysis Assumptions [whitepaper](#) was shared with the PJM board for consideration at the September Board meeting and posted with the October TEAC materials
- Market Efficiency Training, available [here](#) completed October 20<sup>th</sup>
- Long-Term Window Materials Posting Schedule
  - Retooled PROMOD model to be posted during the month of November (XML format)
    - XML files compatible with PROMOD 11.3
  - ME Window Congestion Drivers, ME Window Base Case, and Sensitivity scenarios to be posted in December, before start of 20/21 Long-Term Window

- Retooled model includes (to-be posted during November)
  - MISO data update
  - Updated PJM Generation Expansion (ISA/FSA status, retirements)
  - Updated topology using the retooled 2025 powerflow from Transmission Planning
    - Also updated PJM line ratings and contingency definitions
  - ABB-Hitachi PROMOD data updates (heat rates, generator outages)
  - Updated PROMOD setup
- Final sensitivity cases to-be posted during November



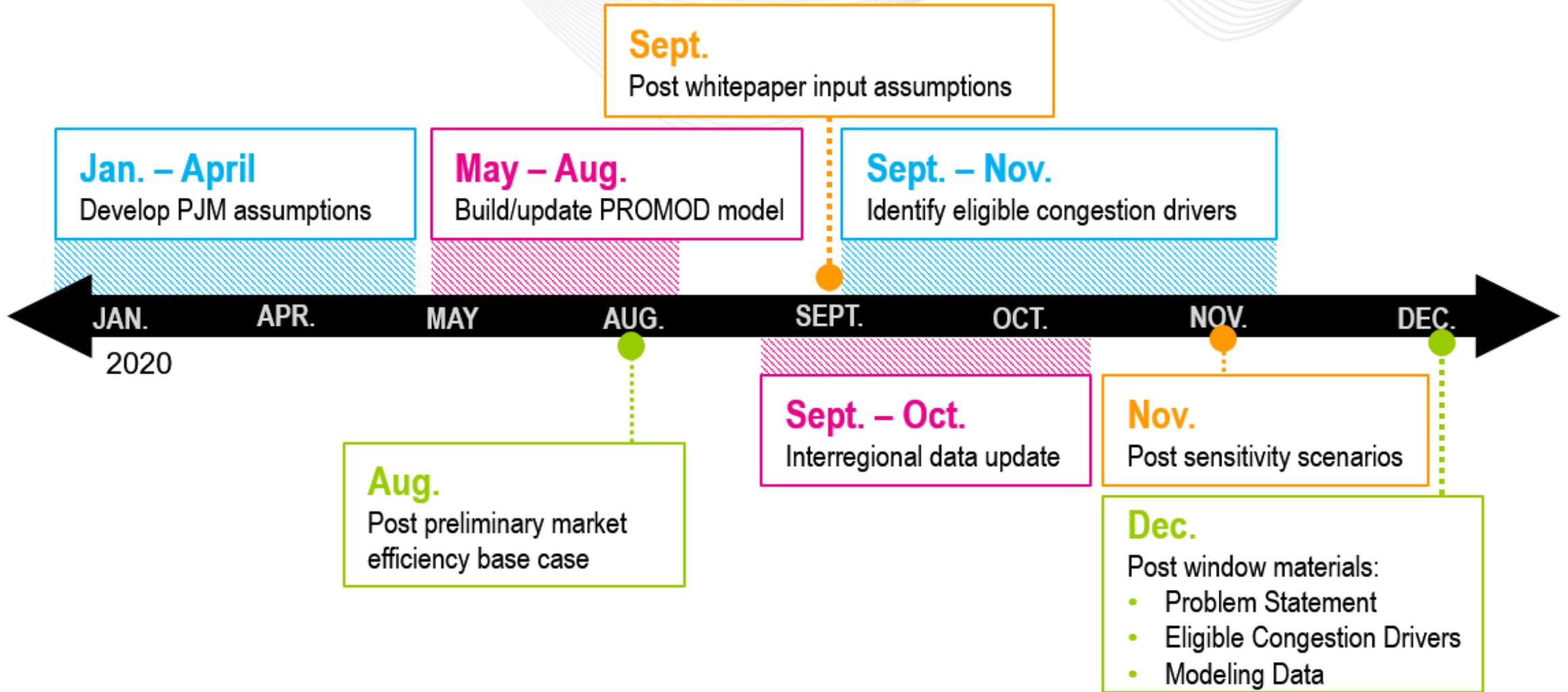
# PJM Base Case Updated Preliminary Results - 2025 Simulated Congestion\*

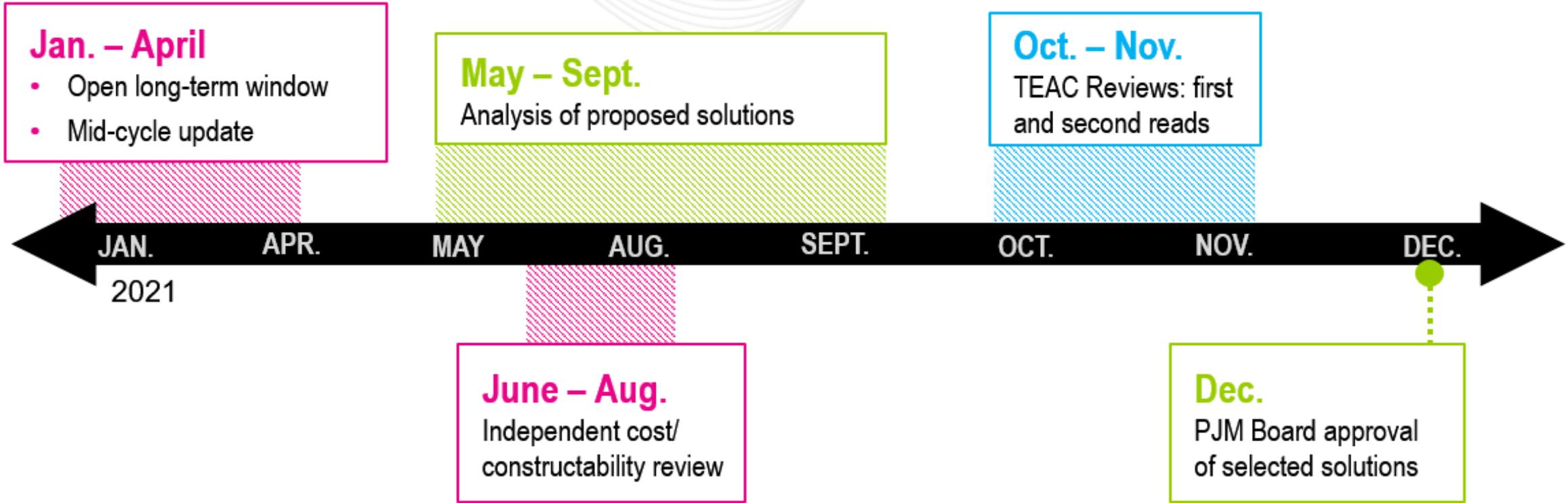
Group**	Correlated Historical Constraints***	Congested Area	Type	Historical 2019 Day Ahead Congestion	Historical 2020 Day Ahead Congestion	Simulated 2025 Area Congestion*
1	Harwood to Susquehanna #1 230 kV	PPL	Line	\$ 4,587,972	\$ 16,157,914	Yes
1	Harwood to Susquehanna #2 230 kV	(Susq. Group)	Line	\$ 1,466,849	\$ 3,290,309	
2	Cumberland to Juniata 230 kV	PPL (Juniata group)	Line	\$ 3,516,896	\$ 6,368,984	Yes
2	Dauphin to Juniata 230 kV		Line	\$ -	\$ 472,479	
2	Juniata #1 500/230 kV		XFRM	\$ -	\$ 46,886	
2	Juniata #2 500/230 kV		XFRM	\$ -	\$ 2,836,659	
3	Plymouth Meeting to Whitpain #3 230 kV	PECO	Line	\$ 1,572,531	\$ 3,104,181	Yes
3	Plymouth Meeting to Whitpain #4 230 kV		Line	\$ 938,713	\$ 654,931	
4	Cherry Run to Morgan 138 kV	APS	Line	\$ 883,588	\$ -	Yes
4	Jct. to French's Mill 138 kV		Line	\$ 116,952	\$ 345,506	
4	Gore to Stonewall 138 kV		Line	\$ 818,902	\$ 177,599	
4	Messick Road to Morgan 138 kV		Line	\$ 263,290	\$ -	
4	Messick Road to Ridgeley 138 kV		Line	\$ 1,704,272	\$ 462,027	
5	Kammer North (Bus 1 & 3) to Natrium 138 kV	AEP	Line	\$ 178,984	\$ 36,523	Yes
6	Quad Cities to Rock Creek 345 kV	CE-ALTW	M2M	\$ 896,048	\$ 427,688	Yes
7	Muskingum River to Beverly 345 kV	AEP	Line	\$ -	\$ -	Yes
8	Muskingum River to Waterford 345 kV	AEP	Line	\$ -	\$ -	Yes

\*Preliminary results, not final congestion drivers. List of constraints and congested areas may change in the final base case.

\*\*Table identifies correlated historical constraints with 2025 PROMOD simulated congestion in the same area/group.

# 2020/21 Long-Term Window Schedule (Year 2020)





# Questions?

