Market Simulation Update

Market Simulation

Transmission Expansion Advisory Committee

November 4, 2025

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2025-2026
Stage 1A ARR 10 Year Analysis Update

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Background

- Purpose:
- Ensure the transmission system is capable to support the simultaneous feasibility of Stage 1A ARRs up to 60% of Network Service Peak Load inclusive of the projected ten-year load growth

- Annual ARR/FTR market model

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ARR Model Overview

- A zonal growth rate was applied to 60% of each zone's NSPL to develop the expected zonal load, years 2 to 10.
- The simultaneous feasibility analysis included all requested Stage 1A ARRs plus additional ARRs to account for the expected 10 years load growth.
- Source pnodes of additional ARRs were from Stage 1 generators which have a historical LMP lower than the historical zonal LMP.
  - Stage 1 generators up to the maximum MW capacity of the resource.
  - Stop scheduling additional ARRs either by the historical LMP of the next highest price resource exceeds the historical zonal LMP or until the expected zonal load was met.

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Results

- 2025/2026 Stage 1A 10-Year ARR analysis identified violations near Peach Bottom and DOM area.

- Upgrades are anticipated under the current RTEP process (see next slide).

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Results of 2025/26 Stage 1A ARR 10-year Analysis

Facility Name	Facility Type	First Year of Violation	Upgrade expected to fix infeasibility	Expected in-service date
COOPERPE230 KV COO-GRA I/o L500.Conastone-PeachBottom.5012	LN	1	2022 RTEP Reliability Window 3 for load growth and generation deactivation (b3780, b3800)	2027-2028
COOPERPE230 KV COO-PEA I/o L500.Conastone-PeachBottom.5012	LN	1	2022 RTEP Reliability Window 3 for load growth and generation deactivation (b3780, b3800)	2027-2028
NOTTINGH230 KV 1-3 I/o L500.Conastone-PeachBottom.5012	LN	1	2022 RTEP Reliability Window 3 for load growth and generation deactivation (b3780, b3800)	2027-2028
NOTTINGH230 KV 2-3 I/o L500.Conastone-PeachBottom.5012	LN	1	2022 RTEP Reliability Window 3 for load growth and generation deactivation (b3780, b3800)	2027-2028
NOTTINGH230 KV NOT-PEA I/o L500.Conastone-PeachBottom.5012	LN	1	2022 RTEP Reliability Window 3 for load growth and generation deactivation (b3780, b3800)	2027-2028
CONASTON500 KV CNS-PEA	LN	1	2022 RTEP Reliability Window 3 for load growth and generation deactivation (b3780, b3800)	2027-2028
COLORA 230 KV COL-CON2 I/o L230.Conowingo-Nottingham-220-03	LN	1	2022 RTEP Reliability Window 3 for load growth and generation deactivation (b3780, b3800)	2027-2028
HARWGATE115 KV 100J I/o L500.Carson-Midlothian.563	LN	1	Wreck and rebuild 5.4 miles of 115 kV line #100 Locks-Harrowgate to achieve a minimum summer emergency rating of 393 MVA.	6/1/2026

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2025 Annual Acceleration Analysis of RTEP Reliability Projects

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Acceleration Analysis Overview

- Scope: Determine which reliability upgrades, if any, have an economic benefit if accelerated or modified.

- Study Years: AS-IS and RTEP set of economic input assumptions used to study impacts of approved RTEP projects.

- Process:
  - Compare market congestion for AS-IS vs. RTEP topology.
  - Estimate economic impact of accelerating planned upgrades.

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Acceleration Analysis Status

- Completed production cost simulations:
  - 2025 study year with AS-IS and RTEP Topology.
  - 2029 study year with RTEP Topology.
- Identified reliability upgrades responsible for congestion reductions between the AS-IS and RTEP topology cases.
- Checked the feasibility of accelerating project schedules for the identified reliability upgrades.
- Results of analysis included on the following slide.

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Congestion Savings of RTEP Enhancements

Constraint [1]	Area	Type	Simulated 2025 [2] Annual Congestion Savings [3] ($M)	PJM RTEP Upgrade
AP South Interface	PJM	Interface	147	B4000: 2024W1 Regional Cluster
Straban-Lincoln 115 kV	METED	Line	88	B3800: Build new Hunterstown-Carroll 230 kV circuit
Messick Rd.-Ridgeley 138 kV	APS	Line	47	B3800: 2022W3 Western Cluster
Charlottesville-Proffit Rd Del Pt 230 kV	DOM	Line	44	B3800: Rebuild 230 kV line #2054
Haumesser Rd. (R)-W De Kalb Tap (R) 138 kV	CE	Line	28	B3811: Rebuild Haumesser Road to H-452 138 kV
Dumont-Stillwell 345 kV	AEP-NIPSO	Line	27	B3775: Dumont-Stillwell 345 kV sag study
Northwest-Conastone 230 kV	BGE	Line	25	B3771: Reconductor Northwest-Conastone 230 kV circuits
Safe Harbor-Graceton 230 kV	PPL-BGE	Line	24	B3800: 2022W3 Eastern Cluster
Gore-Stonewall 138 kV	APS	Line	16	B3800: 2022W3 Western Cluster
Roxbury-Aspen Road Solar 115 kV	PENELEC	Line	14	B3751, B3752: Rebuild Roxbury-Shade Gap 115 kV
Olive-Univ. Pk. N. 345 kV	AEP-CE	Line	12	B3775: Olive-University Park 345 kV sag study
Saint John-Crete 345 kV	NIPSCO-CE	Line	11	B3775: Reconductor/Rebuild Crete-St John 345 kV

1) Includes constraints with annual congestion decreases where responsible RTEP upgrades were identified.
2) 2025 Market Conditions comprise of load, generation expansion, fuel forecasts, and other fundamental assumptions at levels forecasted for year 2025.
3) Congestion Impact of RTEP Enhancements calculated by comparing market simulations with AS-IS vs. RTEP Topology.

- For additional congestion details see June TEAC Market Efficiency Update.

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Congestion Savings of RTEP Enhancements (cont.)

Constraint [1]	Area	Type	Simulated 2025 [2] Annual Congestion Savings [3] ($M)	PJM RTEP Upgrade
Nottingham Reactor 230 kV	PECO	Reactor	10	B3800: 2022W3 Eastern Cluster
Juniata TR 500/230 kV	PPL	XFMR	9	B3664: Replace station equipment at Juniata 230 kV
North Delphos-East Delphos 69 kV	AEP	Line	9	B3346: Rebuild North Delphos-East Delphos-Elida Road
Clifford-Colleen 138 kV	AEP	Line	8	B4000: 2024W1 Regional Cluster
Remington CT-Marsh Run 230 kV	DOM	Line	4	B4000: 2024W1 Regional Cluster
Fork Union-Bremo 115 kV	DOM	Line	3	B4000: 2024W1 Regional Cluster
Chesterfield 1-Hopewell 230 kV	DOM	Line	2	B3694: Reconductor Hopewell-Chesterfield 230 kV
Shade Gap-Aspen Road Solar 115 kV	PENELEC	Line	2	B3751, B3752: Rebuild Roxbury-Shade Gap 115 kV
Spartan-Stafford 230 kV	DOM	Line	1	B3694: Rebuild Cranes Corner-Stafford 230 kV

1) Includes constraints with annual congestion decreases where responsible RTEP upgrades were identified.
2) 2025 Market Conditions comprise of load, generation expansion, fuel forecasts, and other fundamental assumptions at levels forecasted for year 2025.
3) Congestion Impact of RTEP Enhancements calculated by comparing market simulations with AS-IS vs. RTEP Topology.

- For additional congestion details see June TEAC Market Efficiency Update.

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Acceleration Analysis Results

- The reliability projects on the previous slides were evaluated for acceleration potential.

- None of these projects will be accelerated for one or more of the following reasons:

  - Project has a near-term in-service date.

  - Project currently in the siting and permitting process and schedules not final.

  - Cost of acceleration is greater than the simulated Market Efficiency benefits.

  - For some projects, PJM and the Transmission Owners are working to coordinate the implementation of project work in order to meet the current expected in-service dates.

  - For some projects, analysis of outage schedule shows no ability to accelerate.

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2024/25 Market Efficiency Window 1 Update

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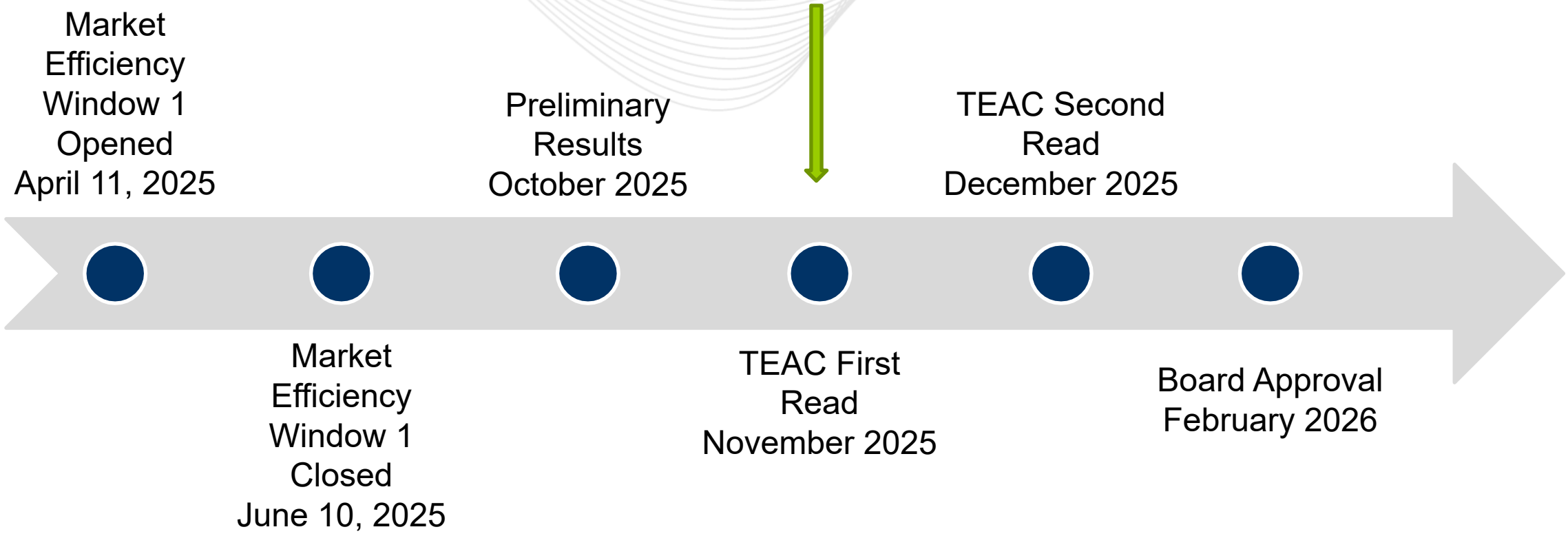
2025 Market Efficiency Timeline



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2024/25 ME Window 1 - Status

- 2024/25 Long-Term Market Efficiency Window 1 opened on 4/11/25 and closed 6/10/25.
  - Market Efficiency Base Case, Sensitivity Scenarios, and Congestion Drivers for the window posted on the Market Efficiency secure page.
  - Updated Event Files were posted on the Market Efficiency secure page at the beginning of October.
  - Updated congestion file posted on the Market Efficiency secure page.
- Received 14 proposals from 5 entities.
  - Redacted versions of proposals are posted on the Redacted Proposals page.
  - Proposal descriptions can be found in the Market Efficiency Update presented at August TEAC.
- Analysis completed and preliminary results presented during the Market Efficiency Update at the October TEAC.

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2024/25 ME Window 1 - Results

- Museville-Smith Mountain 138 kV (AEP)
  - Analysis completed: Proposal 733, reconductor one span of the Museville-Smith Mountain 138 kV line and replace disconnect switches at Smith Mountain station, selected as the preferred solution.

- West Point-Lanexa 115 kV (DOM)
  - Analysis completed: Proposal 525, 230/115 kV switching station at Goalders Creek, selected as the preferred solution.

- Garrett-Garrett Tap 115 kV (APS-PENELEC)
  - Garrett-Garrett Tap 115 kV congestion driver will be addressed in 2025W1 reliability window.
  - Proposed solution presented during the Reliability Analysis Update at the October TEAC.

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2024/25 Market Efficiency Window 1
1st Read

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Museville-Smith Mountain 138 kV (AEP)

- Completed comprehensive analysis considering economic benefits, reliability and operational impacts of the proposals.
- Proposal 733, rebuild one span of the Museville-Smith Mountain 138 kV line and replace disconnect switches at Smith Mountain station, selected as the preferred solution.
  - B/C Ratio: 136.55
  - In-Service Cost: $1.81 million
  - Addresses the target congestion
  - Passes all PROMOD sensitivity scenarios
  - Reliability analysis has been completed and no reliability violations identified
- PJM staff intends to submit Proposal 733 to be approved by the PJM Board for inclusion in the Regional Transmission Expansion Plan.

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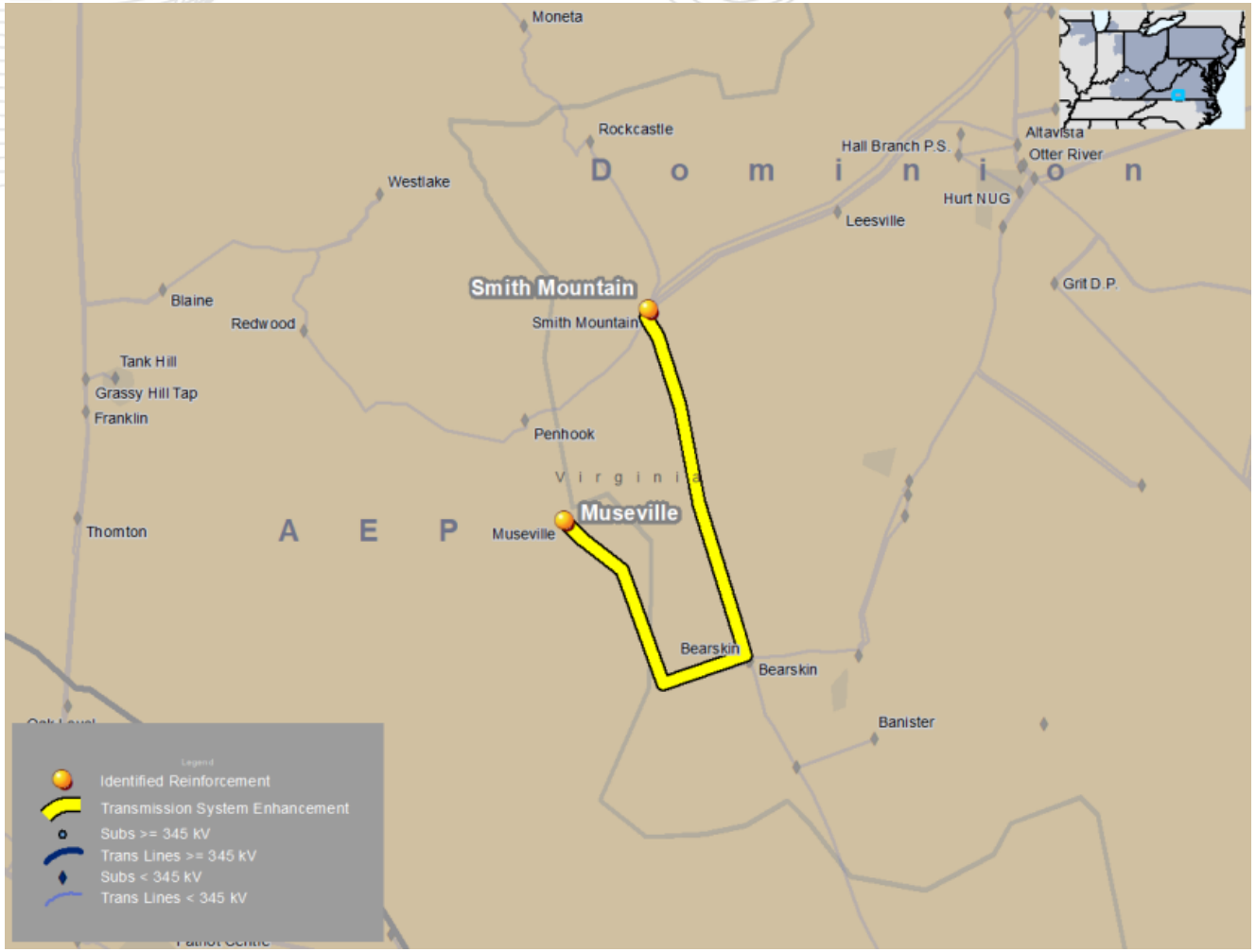
1st Read - Museville-Smith Mountain 138 kV (AEP)

Project ID: 2025-ME1-733
Proposed Solution: Rebuild one span of the Smith Mountain-Museville 138 kV line and replace disconnect switches at Smith Mountain station.
Preliminary Facility Rating (MVA): 409/409/517/517 (SN/SE/WN/WE)
Project Type: Upgrade
kV Level: 138 kV
In-Service Cost ($M): $1.81
In-Service Date: June 2027
B/C Ratio: 136.55
Target Zone: AEP
ME Constraints: Musevillle-Smith Mountain 138 kV
Cost Capping Provision: No



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West Point-Lanexa 115 kV (DOM)

- Completed comprehensive analysis considering economic benefits, reliability and operational impacts of the proposals.
  - Proposals 390 and 525 were identified as the most cost-effective solutions.
  - The 3-breaker ring bus design of proposal 525 is more reliable in terms of system protection and operational efficiency.
  - From a constructability viewpoint, proposal 525 has a lower Outage Coordination risk.
- Proposal 525, 230/115 kV switching station at Goalders Creek, selected as the preferred solution.
  - B/C Ratio: 2.71
  - In-Service Cost: $23.41 million
  - Addresses the target congestion
  - Passes majority of PROMOD sensitivity scenarios
  - Reliability analysis has been completed and no reliability violations identified
- PJM staff intends to submit Proposal 525 to be approved by the PJM Board for inclusion in the Regional Transmission Expansion Plan.

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1st Read - West Point-Lanexa 115 kV (DOM)

Project ID: 2025-ME1-733
Proposed Solution: Construct 230/115kV switching station at the future Goalders Creek 115kV substation and install a 299 MVA, 230/115kV transformer. Cut the existing Line #2016 from Lanexa to Harmony Village near the Goalders Creek substation. Install a three-breaker ring bus arrangement on the 230 kV side.
Project Type: Upgrade
kV Level: 230 kV & 115 kV
In-Service Cost ($M): $23.41
In-Service Date: January 2029
B/C Ratio: 2.71
Target Zone: DOM
ME Constraints: West Point-Lanexa 115 kV
Cost Capping Provision: No

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Appendix A
Informational Only – Sensitivity Results

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Museville-Smith Mountain 138 kV - B/C Ratios (Informational Only)

Proposal ID	332	385	717	733	991	993
Project Type	Upgrade	Upgrade	Greenfield	Upgrade	Greenfield	Greenfield
B/C Ratio Metric	Lower Voltage	Lower Voltage	Regional	Lower Voltage	Regional	Lower Voltage
In-Service Cost ($MM)*	$86.11	$131.64	$1,568.72	$1.81	$520.38	$270.09
Base Case B/C Ratio	20.55	13.44	2.97	136.55	2.68	6.45
High Load B/C Ratio	41.86	27.39	7.41	551.74	13.88	20.63
Low Load B/C Ratio	13.52	8.84	1.88	124.54	1.54	4.73
High Gas B/C Ratio	19.47	12.74	3.09	171.10	3.76	6.50
Low Gas B/C Ratio	14.10	9.24	2.71	118.38	2.54	4.85
Generator Sensitivity B/C Ratio	23.56	3.49	1.99	138.87	1.53	2.29

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West Point-Lanexa 115 kV - B/C Ratios (Informational Only)

Proposal ID	50	183	338	390	525	836	910
Project Type	Upgrade	Upgrade	Upgrade	Upgrade	Upgrade	Upgrade	Upgrade
B/C Ratio Metric	Lower Voltage	Lower Voltage	Lower Voltage	Lower Voltage	Lower Voltage	Lower Voltage	Lower Voltage
In-Service Cost ($MM)*	$83.92	$221.74	$28.11	$21.41	$23.41	$62.58	$90.89
Base Case B/C Ratio	0.26	0.30	0.97	3.05	2.71	0.13	0.55
High Load B/C Ratio	N/A	N/A	1.23	0.06	26.05	0.91	2.17
Low Load B/C Ratio	N/A	N/A	0.31	0.85	2.08	0.07	0.43
High Gas B/C Ratio	N/A	N/A	0.87	0.61	1.40	0.03	0.06
Low Gas B/C Ratio	N/A	N/A	0.38	0.04	0.00	0.11	0.00
Generator Sensitivity B/C Ratio	N/A	N/A	0.57	3.75	4.17	0.18	0.89

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Market Efficiency Update

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- V1 – 10/30/2025 – Original slides posted.

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