



Transmission Expansion Advisory Committee (TEAC) Recommendations to the PJM Board

PJM Staff White Paper

PJM Interconnection
February 2022

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I. Executive Summary

On December 8, 2021, the PJM Board of Managers approved changes to the Regional Transmission Expansion Plan (RTEP), totaling a net increase of \$95.65 million for baseline projects, to resolve baseline reliability criteria violations and address changes to existing projects. The PJM Board of Managers also approved a net increase of \$39.14 million for network upgrades to address new projects with signed ISAs, project scope changes and project cancellations.

Since then, PJM has identified additional baseline reliability criteria violations, and the transmission system enhancements needed to solve them, at an estimated cost of \$519.37 million. Scope/cost changes to an existing project will result in a net increase of \$3.54 million, and cancellation to an existing project will result in a net decrease of \$7.5 million. This yields an overall RTEP net increase of \$515.41 million, for which PJM recommended Board approval. With these changes, RTEP projects will total approximately \$39,448.9 million since the first Board approvals in 2000.

PJM sought Reliability and Security Committee consideration and full Board approval of the RTEP baseline projects summarized in this white paper. On February 16, 2022, the Board approved the addition of RTEP baseline projects as well as other changes to the RTEP as summarized in this paper.

II. Baseline Project Recommendations

A key dimension of PJM's RTEP process is baseline reliability evaluation, which is necessary before subsequent interconnection requests can be analyzed. Baseline analysis identifies system violations to reliability criteria and standards, determines the potential to improve the market efficiency and operational performance of the system, and incorporates any public policy requirements. PJM then develops transmission system enhancements to solve identified violations and reviews them with stakeholders through the Transmission Expansion Advisory Committee (TEAC) and Subregional RTEP committees prior to submitting its recommendation to the Board. Baseline reliability transmission enhancement costs are allocated to PJM responsible customers.

III. Baseline Reliability Projects Summary

A summary of baseline projects with estimated costs equal to or greater than \$10 million, as well as one operational performance driven project, is provided below. A complete listing of all recommended projects and their associated cost allocations is included in Attachment A (allocations to a single zone) and Attachment B (allocations to multiple zones). Projects with estimated costs less than \$10 million typically include, by way of example, transformer replacements, line reconductoring, breaker replacements and upgrades to terminal equipment, including relay and wave trap replacements.

A. AEP Transmission Zone

- Baseline project b3353 – Allen 46 kV Station Rebuild Baseline Conversion: \$16 million
- Baseline project b3348 – Dehue Area Improvements: \$65.8 million
- Baseline project b3361 – Prestonsburg-Thelma 46 kV Rebuild: \$33.01 million

B. APS Transmission Zone

- Baseline project b3683 – Messick Road-Ridgeley 138 kV Upgrades: \$11.2 million

C. ComEd Transmission Zone

- Baseline project b3677 – LaSalle-Mazon 138 kV Rebuild: \$42.06 million

D. Dominion Transmission Zone

- Baseline project b3686 – Bremo-Columbia D.P. 115 kV Switching Station: \$16 million
- Baseline project b3687 – Bristers-Minnieville D.P. 115 kV Rebuild: \$30 million
- Baseline project b3684 – Earleys-Kelford 115 kV Rebuild: \$18.75 million
- Baseline project b3692 – Elmont-Chickahominy 500 kV Rebuild: \$58.16 million
- Baseline project b3694 – Fredericksburg/Carson/Hopewell Area Improvements: \$93.41 million
- Baseline project b3689 – Remington CT-Gainesville 230 kV Reconnector: \$30.68 million

PJM also recommended projects totaling \$79.53 million, which include a 115 kV and multiple 69 kV line rebuilds, 230 kV line reconnectoring, a 345/138 kV transformer installation, 138/69/46 kV and 138/69 kV transformer replacements, capacitor bank installations, a reactor installation, circuit breaker and disconnect switch installations/replacements, and other substation and terminal equipment upgrades/replacements, whose individual cost estimates are less than \$10 million.

A more detailed description of the larger-scope projects that PJM recommended to the Board is provided below.

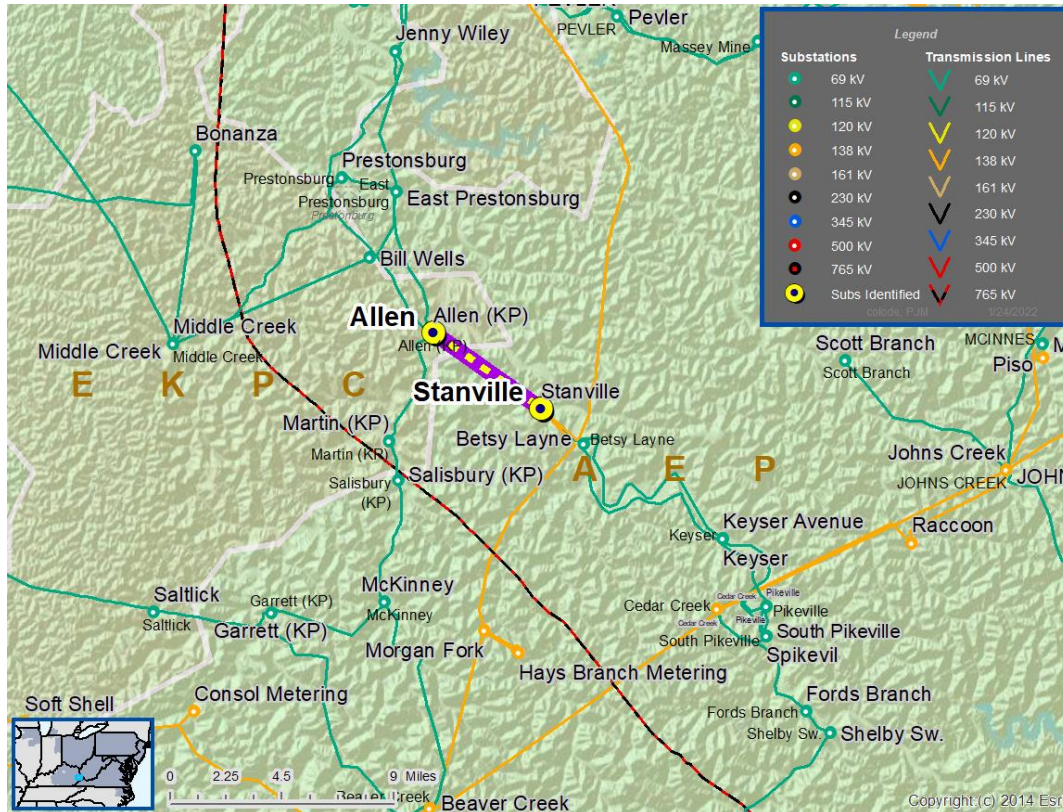
E. Baseline Reliability Project Details

Baseline Project b3353: Allen 46 kV Station Rebuild Baseline Conversion

AEP Transmission Zone

In the 2026 RTEP winter case, the Stanville-Allen 46 kV line section is overloaded for multiple N-1 outage combination.

Map 1. b3353: Allen 46 kV Area



The recommended solution, which was excluded from the competitive proposal process for the below 200 kV exclusion, is an existing supplemental project that has been converted to a baseline. The supplemental project scope, slated to be in service by the end of 2023, addresses the severe flooding issue and obsolete equipment at the existing Allen station. The supplemental project was converted to a baseline as it addresses both the supplemental needs identified through the M-3 process and the identified reliability needs in the 2026 RTEP winter case. The proposed conversion of the supplemental project to a baseline does not add any cost to the RTEP. The solution is to rebuild the Allen 46 kV station to the northwest of its current footprint utilizing a standard air-insulated substation with equipment raised by 7-foot concrete platforms and a control house raised by a 10-foot platform to mitigate flooding concerns. Five 69 kV 3000 A 40 kA circuit breakers in a ring bus (operated at 46 kV) configuration will be installed with a 13.2 MVAR capacitor bank. The existing Allen station will be retired. A 0.20 mile segment of the Allen-East Prestonsburg 46 kV line will be relocated to the new station. The new McKinney-Allen line extension will extend around the south and east sides of the existing Allen station to the new Allen station being built in the clear. A short segment of new single circuit 69 kV line and a short segment of new double circuit 69 kV line (both operated at 46 kV) will be added to the line to tie into the new Allen station bays. A segment of the Stanville-Allen line will also have to be relocated to the new station. A 0.25 mile segment of the existing Allen-Prestonsburg single circuit will be relocated, and the relocated line segment will require construction of one custom self-supporting double circuit dead-end structure and single circuit suspension structure. A short segment of new double circuit 69 kV line (energized at 46 kV) will be added to tie into the new Allen station bays, which will carry Allen-Prestonsburg and Allen-East Prestonsburg 46 kV lines. A temporary 0.15 mile section double circuit line will be constructed to

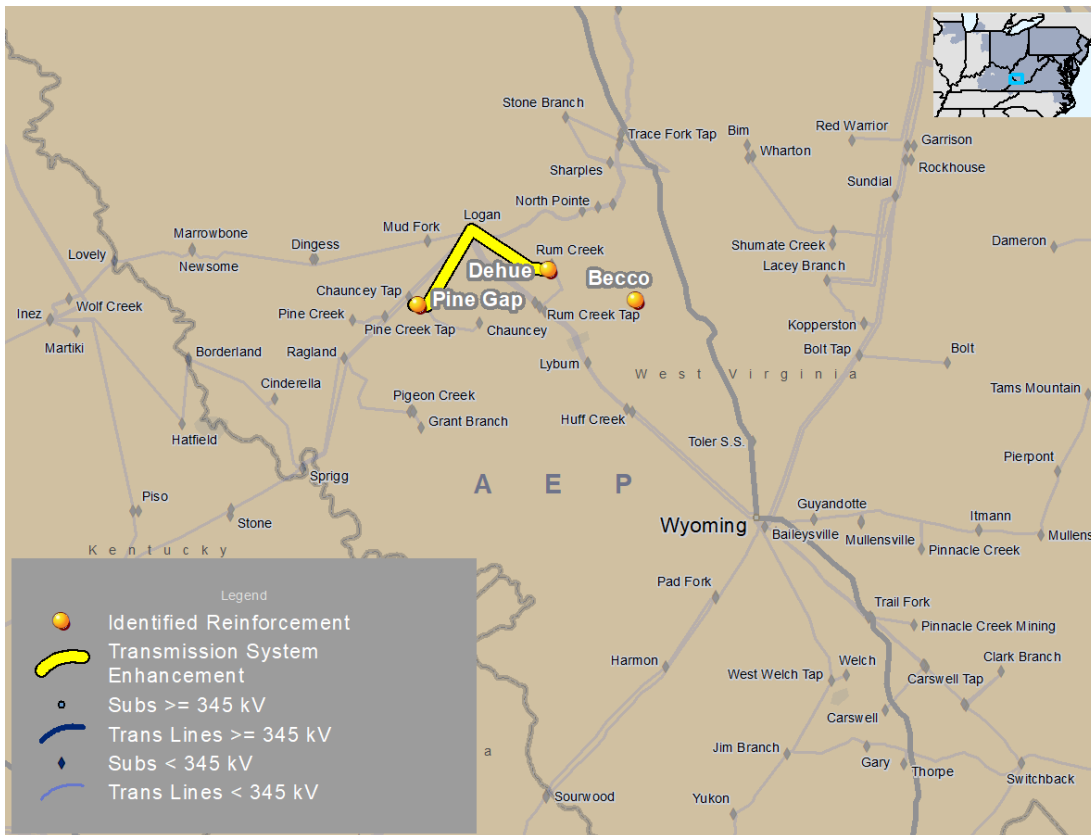
keep both lines energized during construction. Remote end work will also be required at Prestonsburg, Stanville and McKinney 46 kV stations. The estimated cost for this project is \$16 million, with a required in-service date of December 2026. The projected in-service date is December 2023, and the local transmission owner, AEP, will be designated to complete this work.

Baseline Project b3348: Dehue Area Improvements

AEP Transmission Zone

In the 2026 RTEP light load case, the Becco-Slagle, Dehue-Pine Gap and Dehue-Slagle 46 kV lines are overloaded for an N-1 outage combination. There are also low voltage and voltage drop violations at Three Fork, Toney Fork, Cyclone, Pardee, Crane, Latrobe, Becco, Slagle and Dehue 46 kV buses for an N-1 outage combination.

Map 2. b3348: Dehue Area



The recommended solution, solicited through the 2021 Window 1 competitive proposal process, is to construct a new 138 kV Tin Branch single bus station to replace Pine Gap station, consisting of a 138 kV box bay with a distribution transformer and 12 kV distribution bay. Two 138 kV lines will feed this station (from Logan and Sprigg stations), and distribution will have one 12 kV feed. The project installs two 138 kV circuit breakers on the line exits and a 138 kV circuit switcher for the new transformer. A new 138/46/12 kV Argyle station will be constructed to replace the Dehue station, with a 138 kV ring bus using a breaker-and-a-half configuration, an autotransformer (46 kV feed) and a distribution transformer (12 kV distribution bay). Two 138 kV lines will feed the Argyle station (from

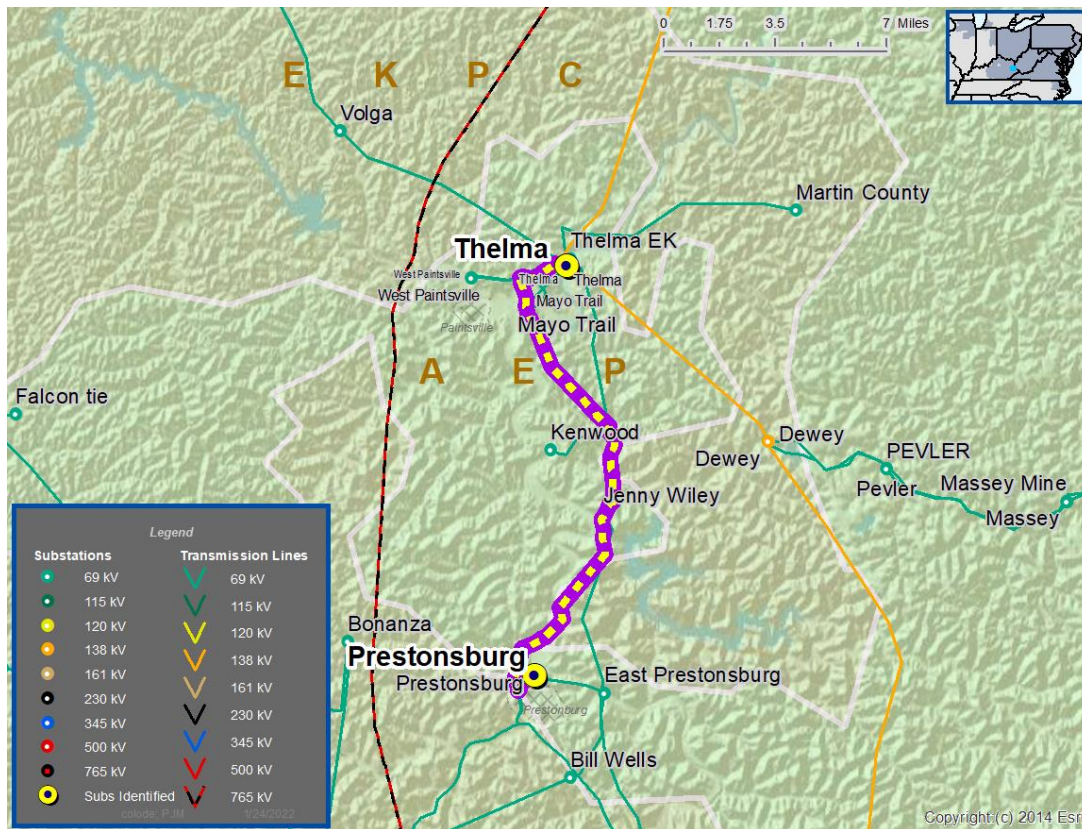
Logan and Wyoming stations), and there will also be a 46 kV feed from this station to Becco station (distribution will have two 12 kV feeds). The project retires the Dehue station in its entirety, and brings the Logan-Sprigg No. 2 138 kV circuit in and out of Tin Branch station by constructing approximately 1.75 miles of new overhead double circuit 138 kV line. The Logan-Wyoming No. 1 138 kV circuit will be brought in and out of the new Argyle substation. Double circuit T3 series lattice towers will be used along with 795,000 cm ACSR26/7 conductor. One shield wire will be conventional 7 No. 8 ALUMOWELD, and one shield wire will be optical ground wire (OPGW). Approximately 10 miles of the 46 kV line between Becco and the new Argyle substation will be rebuilt, and approximately 16 miles of 46 kV line between the new Argyle substation and Chauncey substation will be retired. Relay settings need to be adjusted due to new line terminations and retirements at Logan, Wyoming, Sprigg, Becco and Chauncey substations. The estimated cost for this project is \$65.8 million, with a required in-service of November 2026. The projected in-service date is June 2026, and the local transmission owner, AEP, will be designated to complete this work.

Baseline Project b3361: Prestonsburg-Thelma 46 kV Rebuild

AEP Transmission Zone

In the 2026 RTEP winter case, there are voltage magnitude and voltage drop violations at McKinney, Salsbury, Allen, East Prestonsburg, Prestonsburg, Middle Creek and Kenwood 46 kV buses for multiple N-1 outage combinations.

Map 3. b3361: Prestonsburg-Thelma 46 kV



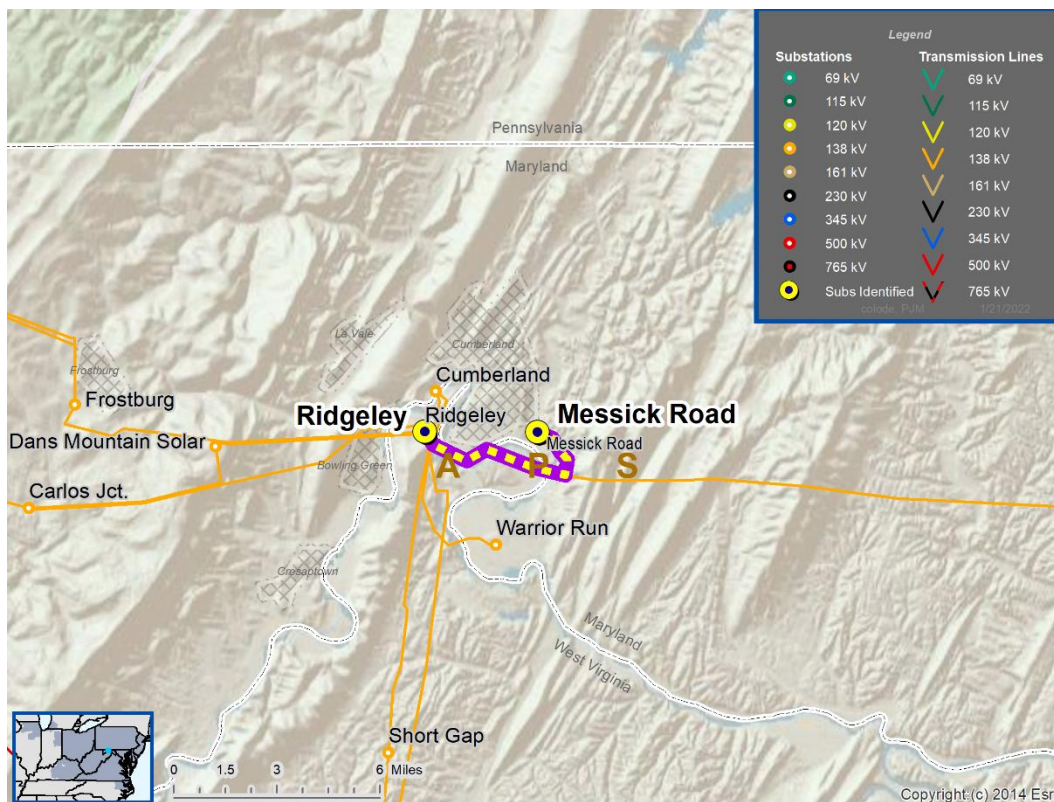
The recommended solution, which was excluded from the competitive proposal process for the below 200 kV exclusion, addresses both the identified reliability needs and a supplemental need identified through the M-3 process. There are equipment condition issues with structures that make up the Prestonsburg-Thelma 46 kV line. These conditions include damaged/rotted poles, guy wires and cross arms. The majority of this line utilizes 1960s wood structures and 336.4 ACSR conductor. The solution is to rebuild the Prestonsburg-Thelma 46 kV line (approximately 14 miles) and retire Jenny Wiley 46 kV switching station. The estimated cost for this project is \$33.01 million, with a required in-service date of December 2026. The projected in-service date is October 2025, and the local transmission owner, AEP, will be designated to complete this work.

Baseline Project b3683: Messick Road-Ridgeley 138 kV Upgrades

APS Transmission Zone

In the 2026 RTEP summer case, the Messick Road-Ridgeley 138 kV line is overloaded for multiple N-2 outage combinations.

Map 4. b3683: Messick Road-Ridgeley 138 kV



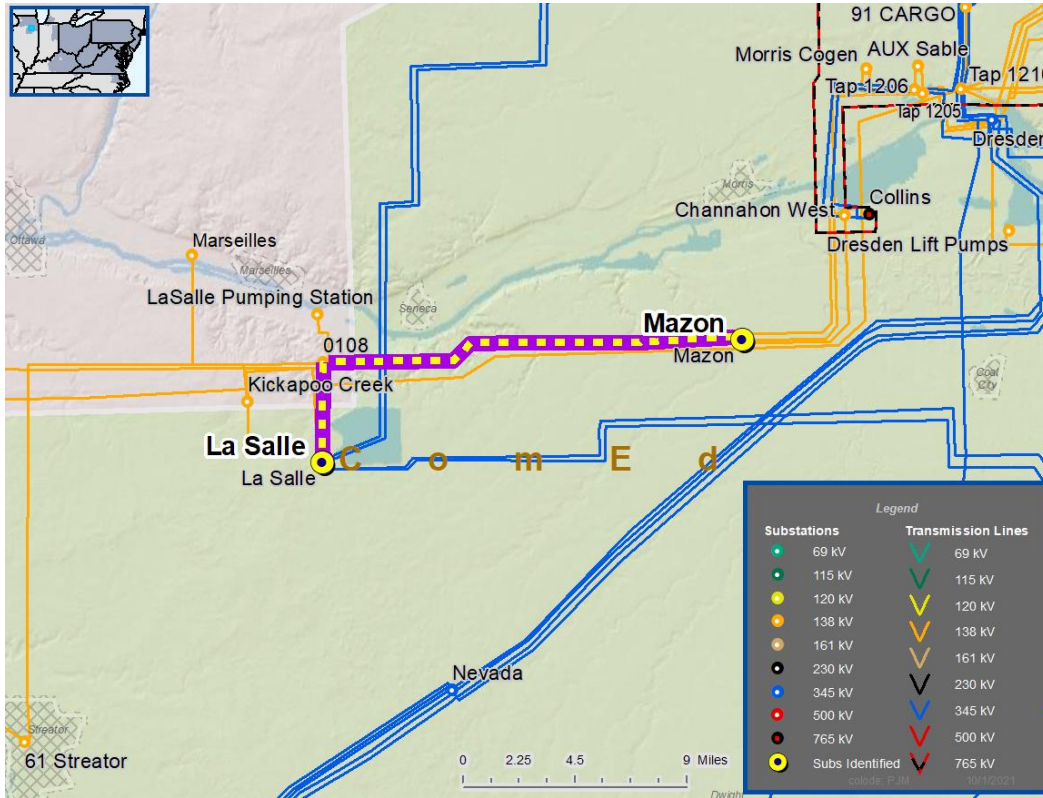
The recommended solution, which was excluded from the competitive proposal process for the below 200 kV exclusion, is to reconductor the existing 556.5 ACSR line segments on the Messick Road-Ridgeley WC4 138 kV line with 954 45/7 ACSR. The remote end equipment for the Messick Road-Ridgeley WC4 138 kV line will also be replaced. The estimated cost for this project is \$11.2 million, with a required and projected in-service date of June 2026. The local transmission owner, APS, will be designated to complete this work.

Baseline Project b3677: LaSalle-Mazon 138 kV Rebuild

ComEd Transmission Zone

In the 2026 RTEP light load case, the LaSalle-Mazon 138 kV line is overloaded for an N-2 outage.

Map 5. b3677: LaSalle-Mazon 138 kV



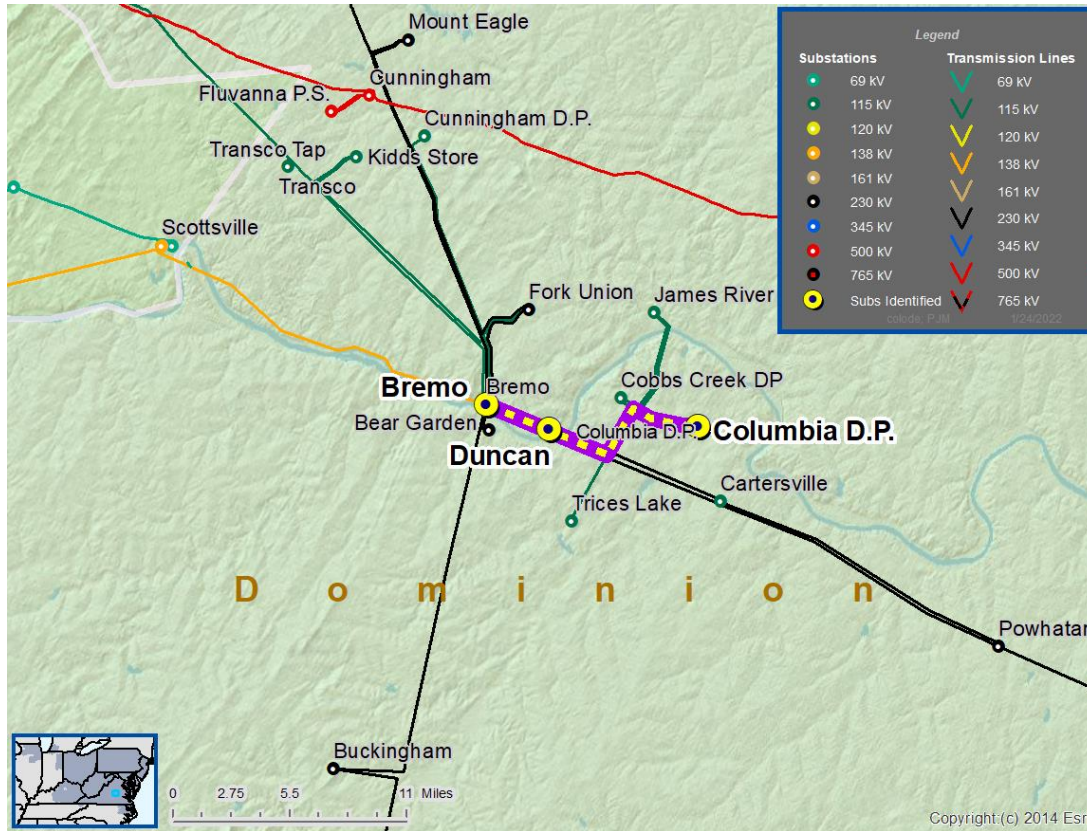
The recommended solution, which was excluded from the competitive proposal process for the below 200 kV exclusion, is to rebuild a 13 mile section of 138 kV line 0108 between LaSalle and Mazon with 1113 ACSR or higher rated conductor. The estimated cost for this project is \$42.06 million, with a required in-service date of November 2026. The projected in-service date is December 2024, and the local transmission owner, ComEd, will be designated to complete this work.

Baseline Project b3686: Bremo-Columbia D.P. 115 kV Switching Station

Dominion Transmission Zone

In the 2026 RTEP winter case, the Bremo-Columbia D.P. 115 kV line (No. 4) is a radial transmission line and exceeds the 700 MW-Mile threshold under Dominion’s FERC 715 Planning Criteria.

Map 6. b3686: Bremo-Columbia D.P. 115 kV



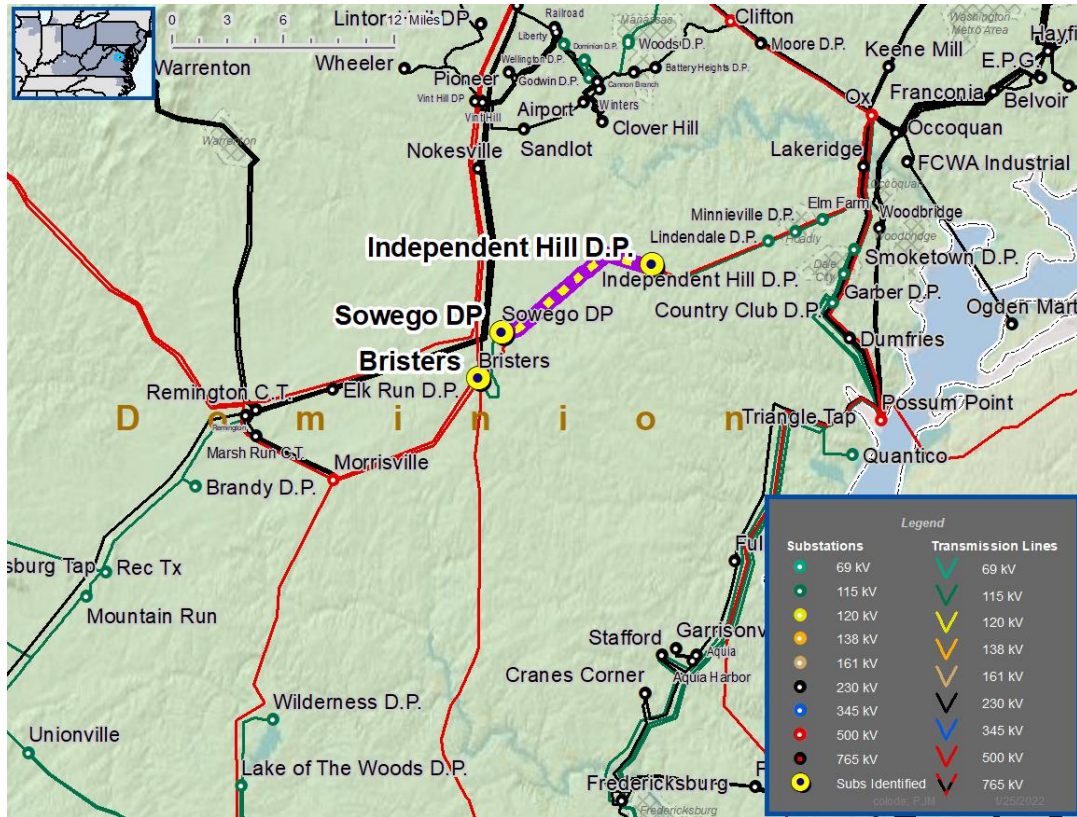
The recommended solution, which was excluded from the competitive proposal process for the below 200 kV exclusion, is to purchase land close to the bifurcation point of line No. 4 (where the line is split into two sections) and build a new 115 kV switching station called Duncan Store 115 kV. The new switching station will require space for an ultimate transmission interconnection consisting of a 115 kV six-breaker ring bus (with three breakers installed initially). The estimated cost for this project is \$16 million, with a required and projected in-service date of December 2026. The local transmission owner, Dominion, will be designated to complete this work.

Baseline Project b3687: Bristers-Minnieville D.P. 115 kV Rebuild

Dominion Transmission Zone

In the 2026 RTEP summer case, the Bristers 230/115 kV transformer is overloaded for an N-1 outage under the generator deliverability study and for Dominion’s Stress Case (FERC 715 Planning Criteria). The 115 kV line No. 183 (Sowego-Independent Hill segment) is overloaded for N-1 and N-2 outages, along with multiple N-1 outage combinations under PJM reliability studies and Dominion’s Stress Case.

Map 7. b3687: Bristers-Minnieville D.P. 115 kV Area



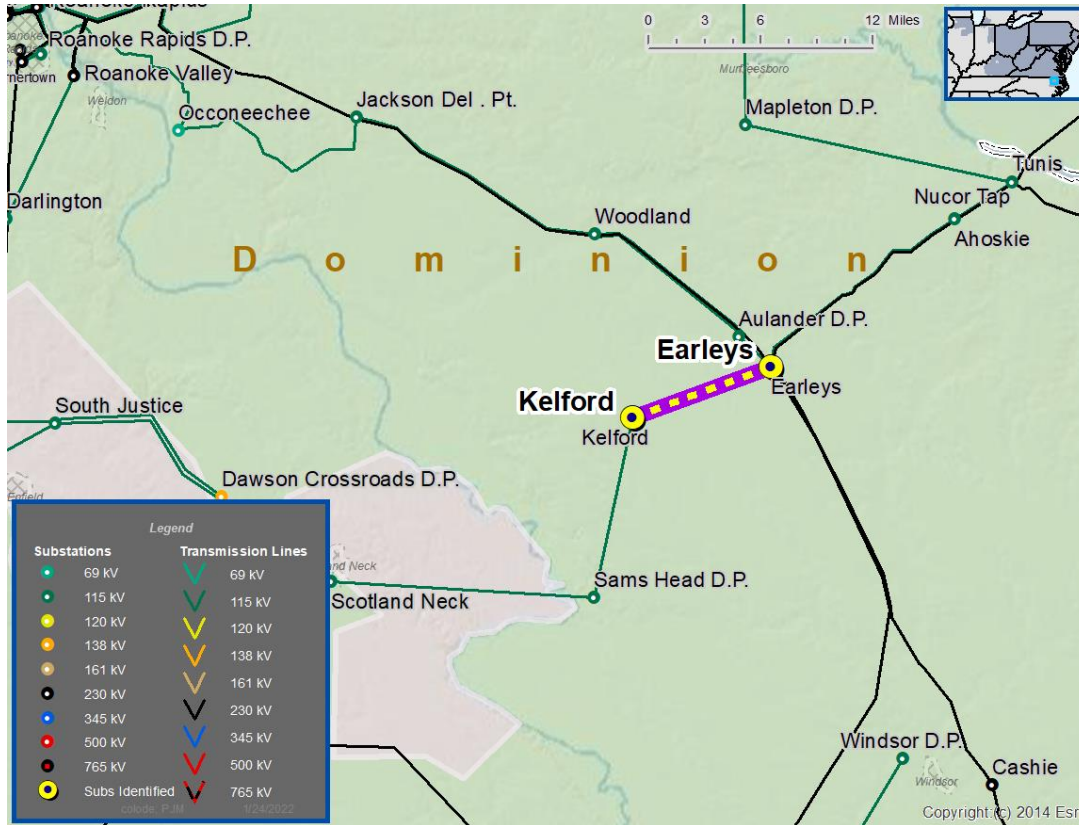
The recommended solution, which was excluded from the competitive proposal process for the below 200 kV exclusion, is to rebuild of the approximately 15.1-mile-long line segment between Bristers and Minnieville D.P. with 2-768 ACSS and 4000 A supporting equipment from Bristers to Ox to allow for future 230 kV capability of 115 kV line No. 183 (Sowego-Independent Hill segment). The estimated cost for this project is \$30 million, with a required and projected in-service date of June 2026. The local transmission owner, Dominion, will be designated to complete this work.

Baseline Project b3684: Earleys-Kelford 115 kV Rebuild

Dominion Transmission Zone

In the 2026 RTEP summer case, the 115 kV line No. 126 segment from Earleys to Kelford is overloaded for an N-2 outage.

Map 8. b3684: Earleys-Kelford 115 kV



The recommended solution, which was excluded from the competitive proposal process for the below 200 kV exclusion, is to rebuild 12.4 miles of 115 kV line No. 126 segment from Earleys to Kelford line with a summer emergency rating of 262 MVA and replace structures as needed to support the new conductor. The breaker switch 13668 at Earleys will also be upgraded from 1200 A to 2000 A. The estimated cost for this project is \$18.75 million, with a required and projected in-service date of June 2026. The local transmission owner, Dominion, will be designated to complete this work.

Baseline Project b3692: Elmont-Chickahominy 500 kV Rebuild

Dominion Transmission Zone

The Elmont-Chickahominy 500 kV line (No. 557) was constructed in 1971 with 2500 ACAR conductor and 5-series Corten towers that need to be rebuilt to current standards based on Dominion’s End-of-Life Criteria.

Map 9. b3692: Elmont-Chickahominy 500 kV



The recommended solution, solicited through the 2021 Window 1 competitive proposal process, is to rebuild approximately 27.7 miles of 500 kV transmission line from Elmont to Chickahominy with current 500 kV standards construction practices to achieve a summer rating of 4330 MVA. The estimated cost for this project is \$58.16 million, with a required and projected in-service date of June 2026. The local transmission owner, Dominion, will be designated to complete this work.

Baseline Project b3694: Fredericksburg/Carson/Hopewell Area Improvements

Dominion Transmission Zone

In the 2026 RTEP summer case, in the Fredericksburg area, the Cranes Corner-Stafford 230 kV line (No. 2104) is overloaded for an N-1 and N-2 outage as well as under Dominion stress case criteria, and there is load loss of 307 MW for N-1 outage combinations. In the Carson area, the Carson 500/230 kV transformer No. 2 is overloaded for an N-2 outage, and the Carson-Chaparral 230 kV line (No. 249) is overloaded for an N-1 outage. In the Hopewell area, the Chesterfield-Hopewell 230 kV line (No. 211) is overloaded for an N-1 outage, and the Chesterfield-Hopewell 230 kV line (No. 228) is overloaded for an N-1 and N-2 outage.

minimum summer emergency rating of 393 MVA (terminal equipment at Locks and Harrowgate will be upgraded to not limit the new conductor rating), and will perform line No. 100 Chesterfield terminal relay work.

In the Hopewell area, the project will reconductor approximately 2.9 miles each of 230 kV lines No. 211 (Chesterfield-Hopewell) and No. 228 (Chesterfield-Hopewell) to achieve a minimum summer emergency rating of 1046 MVA (equipment at Chesterfield and Hopewell substations will be upgraded to not limit ratings on lines No. 211 and No. 228).

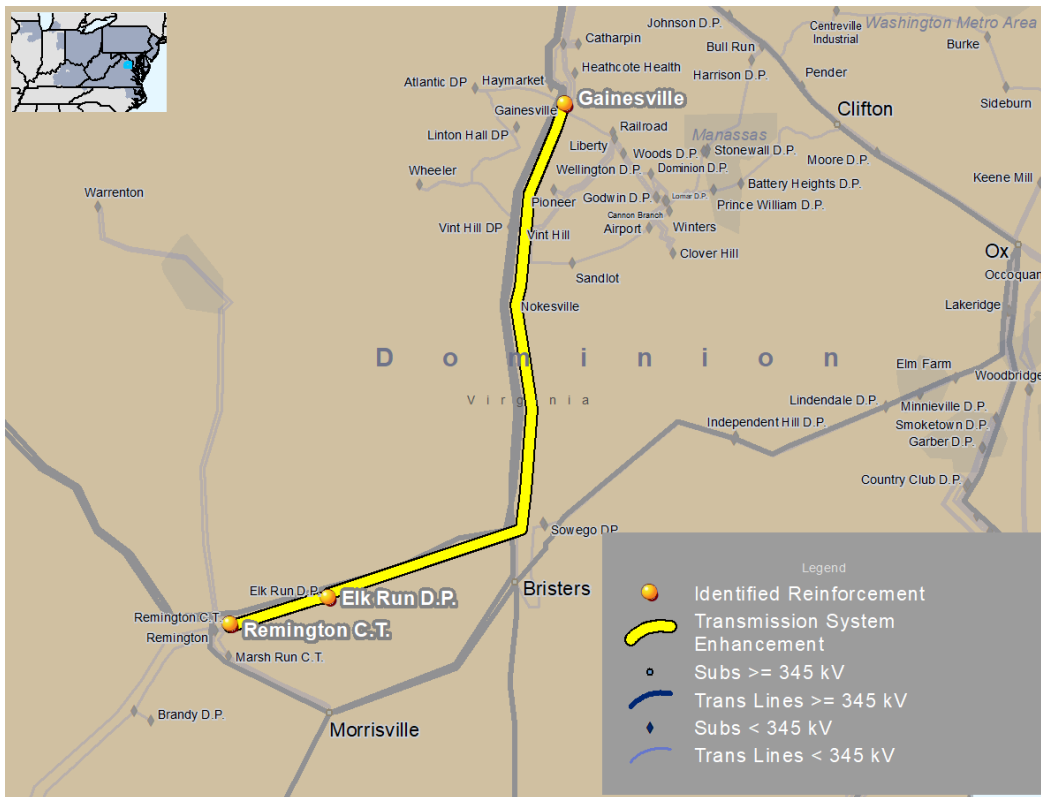
The total estimated cost for this project is \$93.41 million, with a required and projected in-service date of June 2026. The local transmission owner, Dominion, will be designated to complete this work.

Baseline Project b3689: Remington CT-Gainesville 230 kV Reconductor

Dominion Transmission Zone

In the 2026 RTEP summer case, the Remington CT-Gainesville 230 kV line (No. 2114) is overloaded for multiple N-1 and N-2 outages.

Map 11. b3689: Remington CT-Gainesville 230 kV



The recommended solution, solicited through the 2021 Window 1 competitive proposal process, is to reconductor approximately 24.42 miles of Remington CT-Elk Run-Gainesville 230 kV line (No. 2114) to achieve a summer rating of 1574 MVA (by fully reconductoring the line and upgrading the wave trap and substation conductor at Remington CT and Gainesville 230 kV). The project will replace 230 kV breakers SC102, H302, H402 and 218302 at

Brambleton substation with 4000 A 80 kA breakers and associated equipment, including breaker leads as necessary, to address breaker duty issues identified in short circuit analysis. The estimated cost for this project is \$30.68 million, with a required and projected in-service date of June 2026. The local transmission owner, Dominion, will be designated to complete this work.

IV. Baseline Market Efficiency Projects Summary

A summary of baseline projects with estimated costs equal to or greater than \$10 million is provided below. A complete listing of all recommended projects and their associated cost allocations is included in Attachment A (allocations to a single zone) and Attachment B (allocations to multiple zones). Projects with estimated costs less than \$10 million typically include, by way of example, transformer replacements, line reconductoring, breaker replacements and upgrades to terminal equipment, including relay and wave trap replacements.

A. Dominion Transmission Zone

- Baseline project b3702 – Charlottesville-Proffit D.P. 230 kV Series Reactor: \$11.38 million

PJM also recommended projects totaling \$10.39 million, which include 230 kV line reconductoring and terminal equipment replacements, whose individual cost estimates are less than \$10 million.

A more detailed description of the larger-scope projects that PJM recommended to the Board is provided below.

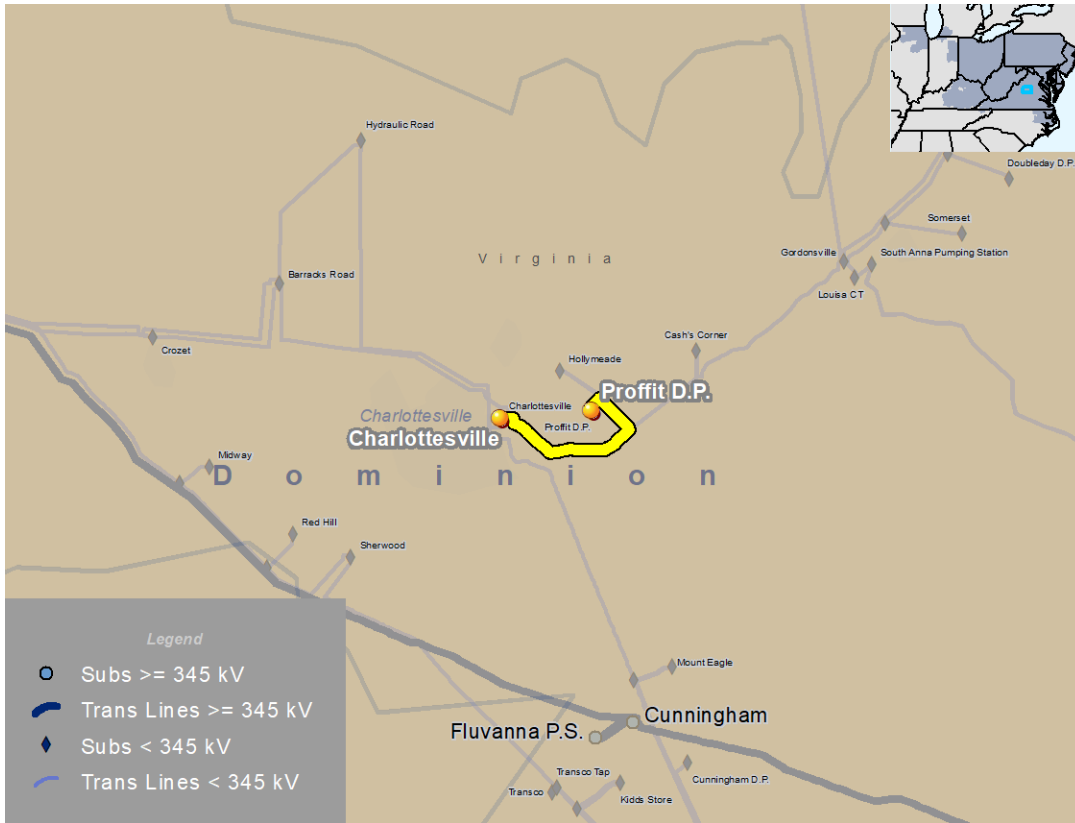
B. Baseline Market Efficiency Project Details

Baseline Project b3702: Charlottesville-Proffit D.P. 230 kV Series Reactor

Dominion Transmission Zone

In the 2020 market efficiency economic models, used to simulate the 2025 and 2028 study years, there is market efficiency eligible congestion on the Charlottesville-Proffit D.P. 230 kV line.

Map 12. b3702: Charlottesville-Proffit D.P. 230 kV



The recommended solution, solicited through the 2020/21 Long-Term Window 1 competitive proposal process, is to install a series reactor on the Charlottesville-Proffit D.P. 230 kV line. The project has a B/C ratio of 16.05 and alleviates 99.52% of congestion. The estimated cost for this project is \$11.38 million, with a projected in-service date of June 2023. The local transmission owner, Dominion, will be designated to complete this work.

V. Baseline Operational Performance Projects Summary

A complete listing of all recommended projects and their associated cost allocations is included in Attachment A (allocations to a single zone) and Attachment B (allocations to multiple zones). A more detailed description of the project that PJM recommended to the Board is provided below.

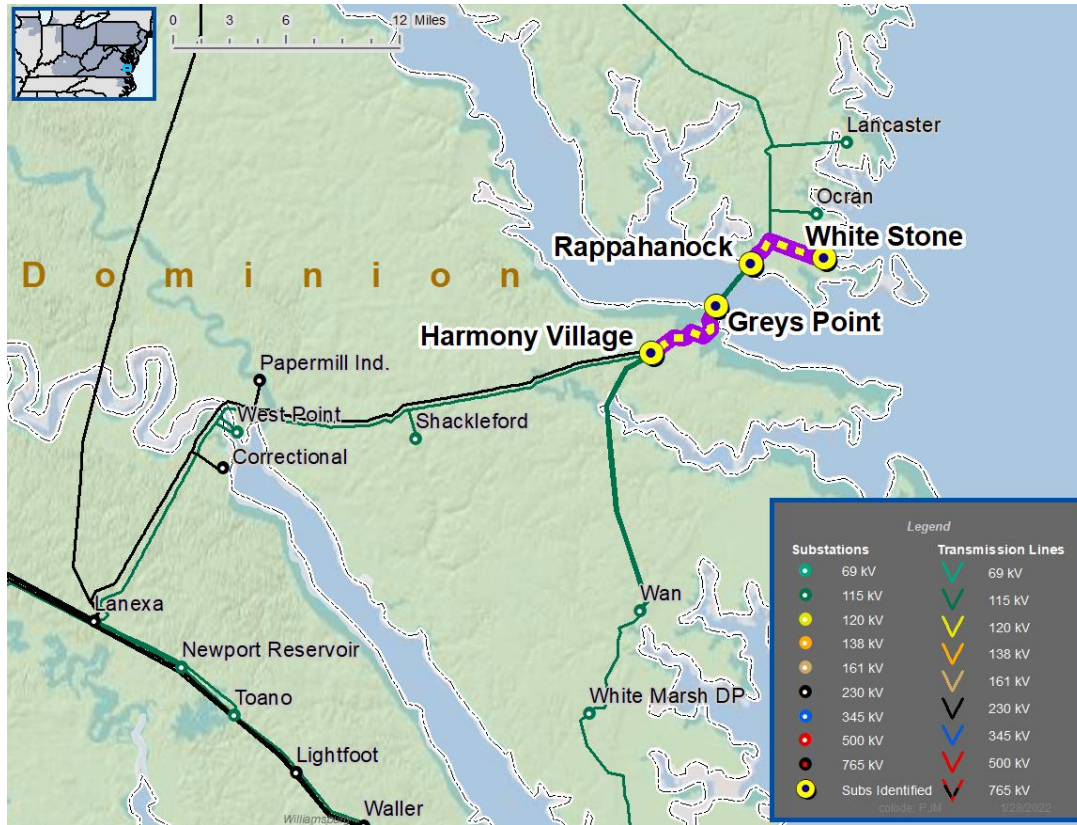
A. Baseline Operational Performance Project Details

Baseline Project b3707: Harmony Village/White Stone Area Improvements

Dominion Transmission Zone

The Harmony Village-Greys Point (line No. 1021) and Rappahannock-White Stone (line No. 65) 115 kV line segments are experiencing significant thermal overloads requiring Emergency Procedures during the current outage of Lanexa-Northern Neck 230 kV (line No. 224) that is being rebuilt as an End-of-Life project (baseline project b3089). The outage is expected to continue through December 2023.

Map 13. b3707: Harmony Village/White Stone Area



The recommended solution is an immediate need project, and will reconductor approximately 0.57mi of the Harmony Village-Greys Point and approximately 0.97mi of the Rappahannock-White Stone 115 kV line segments with 768 ACSS conductor. The estimated cost for this project is \$3 million, and has a projected in-service date of May 2022. The local transmission owner, Dominion, will be designated to complete this work.

VI. Transmission Owner Criteria Projects

Of the \$519.37 million of new recommended baseline transmission system enhancements, approximately \$240.56 million is driven by transmission owner planning criteria, which makes up approximately 46.3% of the new project cost estimates.

VII. Changes to Previously Approved Projects

A. Cancellations

The following cancellation was recommended:

AMPT Project in ATSI Transmission Zone

- Baseline project b3153 (Amherst area improvements, including construction of a greenfield 0.3 mile 138 kV double circuit line tapping the Beaver-Black River 138 kV line) is no longer needed because the single-point radial exposure criteria has been removed from the AMPT's FERC 715 Planning Criteria. Instead, the project is being resubmitted as a supplemental project. The project had an estimated cost of \$7.5 million.

This change yields a net RTEP decrease of \$7.5 million.

B. Scope/Cost Changes

The following scope/cost modification was recommended:

Dominion Transmission Zone

- Baseline project b2443.6 (installation of second Possum Point 500/230 kV transformer) has undergone a scope change and cost increase. The b2443.6 project was initially slated to be cancelled in 2021, as it was determined that the deficiencies were no longer present in the updated summer 2023 & 2025 RTEP cases. However, the cancellation was placed on hold due to an issue identified in the 2021 RTEP and potential for the project to be brought back if the proposal was provided to mitigate the violation. Based on what was previously submitted for b2443.6 back in 2019, there was a modest change in scope to include a wreck and rebuild of an existing line that connects the 500 kV and 230 kV Possum Point substations. Double circuit structures will be installed to carry both the new and old lines, and there is some rearrangement work in the 230 kV substation. The total cost of the project has increased from \$21 million to \$24.54 million, yielding an RTEP increase of \$3.54 million.

This change yields a net RTEP increase of \$3.54 million.

VIII. Review by the Transmission Expansion Advisory Committee (TEAC)

Project needs and recommended solutions as discussed in this report were reviewed with stakeholders during 2021 and 2022, most recently at the January 2022 TEAC meeting. Written comments were requested to be submitted to PJM to communicate any concerns with project recommendations. No comments have been received as of this white paper publication date.

IX. Cost Allocation

Cost allocations for recommended projects are shown in Attachment A (for allocation to a single zone) and Attachment B (for allocation to multiple zones).

Cost allocations are calculated in accordance with Schedule 12 of the Open Access Transmission Tariff (OATT). Baseline reliability project allocations are calculated using a distribution factor methodology that allocates cost to the load zones that contribute to the loading on the new facility. The allocations will be filed at FERC 30 days following approval by the Board.

X. Board Approval

The PJM Reliability and Security Committee is requested to endorse the changes to the RTEP proposed in this white paper, and recommended to the full Board for approval the changes to existing RTEP projects as detailed in this white paper to be included in PJM's RTEP. On February 16, 2022, the Board approved the addition of RTEP baseline projects as well as other changes to the RTEP as summarized in this paper. The RTEP is published annually on PJM's website.

Attachment A – Reliability Project Single-Zone Allocations

Upgrade ID	Description	Cost Estimate (\$M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3346.1	Rebuild approximately 3.5 miles of overloaded 69 kV line between North Delphos-East Delphos-Elida Road switch. This includes approximately 1.1 miles of double circuit line that makes up a portion of the North Delphos-South Delphos 69 kV line and the North Delphos-East Delphos 69 kV line. Approximately 2.4 miles of single circuit line will also be rebuilt between the double circuit portion to East Delphos station and from East Delphos to Elida Road Switch.	\$8.43	AEP	AEP	6/1/2026
b3346.2	Replace the line entrance spans at South Delphos to eliminate the overloaded 4/0 Copper and 4/0 ACSR conductor.	\$0.44	AEP	AEP	6/1/2026
b3348.1	Construct a 138 kV single bus station (Tin Branch) consisting of a 138 kV box bay with a distribution transformer and 12 kV distribution bay. Two 138 kV lines will feed this station (from Logan and Sprigg stations), and distribution will have one 12 kV feed. Install two 138 kV circuit breakers on the line exits. Install 138 kV circuit switcher for the new transformer.	\$5.58	AEP	AEP	11/1/2026
b3348.2	Construct a new 138/46/12 kV Argyle station to replace Dehue station. Install a 138 kV ring bus using a breaker-and-a-half configuration, with an autotransformer with a 46 kV feed and a distribution transformer with a 12 kV distribution bay. Two 138 kV lines will feed this station (from Logan and Wyoming stations). There will also be a 46 kV feed from this station to Becco station. Distribution will have two 12 kV feeds. Retire Dehue station in its entirety.	\$10.00	AEP	AEP	11/1/2026
b3348.3	Bring the Logan-Sprigg #2 138 kV circuit in and out of Tin Branch station by constructing approximately 1.75 miles of new overhead double circuit 138 kV line. Double circuit T3 series lattice towers will be used along with 795,000 cm ACSR 26/7 conductor. One shield wire will be conventional 7 #8 ALUMOWELD, and one shield wire will be OPGW.	\$8.58	AEP	AEP	11/1/2026

Upgrade ID	Description	Cost Estimate (\$M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3348.4	Logan-Wyoming No. 1 circuit in and out of the proposed Argyle station. Double circuit T3 series lattice towers will be used along with 795,000 cm ACSR 26/7 conductor. One shield wire will be conventional 7 #8 ALUMOWELD, and one shield wire will be OPGW.	\$7.70	AEP	AEP	11/1/2026
b3348.5	Rebuild approximately 10 miles of 46 kV line between Becco and the new Argyle substation. Retire approximately 16 miles of 46 kV line between the new Argyle substation and Chauncey station.	\$33.71	AEP	AEP	11/1/2026
b3348.6	Adjust relay settings due to new line terminations and retirements at Logan, Wyoming, Sprigg, Becco and Chauncey stations.	\$0.23	AEP	AEP	11/1/2026
b3349	Replace Bellefonte 69 kV risers on the section between Bellefonte TR #3 and 69 kV Bus #2.	\$0.54	AEP	AEP	6/1/2026
b3351	Replace the 69 kV in-line switches at Monterey 69 kV substation.	\$0.00	AEP	AEP	6/1/2026
b3352	Replace MOAB W, MOAB Y, line and bus side jumpers of both W and Y at 47th Street 69 kV station. Upgrade the 69 kV strain bus between MOABs W and Y to 795 KCM AAC. Change the connectors on the tap to MOAB X1 to accommodate the larger 795 KCM AAC.	\$0.00	AEP	AEP	6/1/2026
b3353.1	Allen substation: Rebuild Allen station to the northwest of its current footprint utilizing a standard air-insulated substation with equipment raised by 7' concrete platforms and control house raised by a 10' platform to mitigate flooding concerns. Install five 69 kV 3000A 40 kA circuit breakers in a ring bus (operated at 46 kV) configuration with a 13.2 MVAR capacitor bank. Existing Allen station will be retired (does not include the distribution cost). Distribution scope of work: Install 69/46 kV-12 kV 20 MVA transformer along with 2-12 kV breakers on 7' concrete platforms (conversion of S2405.1).	\$10.55	AEP	AEP	12/1/2026
b3353.2	Allen-East Prestonsburg: A 0.20 mile segment of this 46 kV line will be relocated to the new station (SN/SE/WN/WE: 53/61/67/73MVA). (Conversion of S2405.2)	\$0.33	AEP	AEP	12/1/2026

Upgrade ID	Description	Cost Estimate (\$M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3353.3	McKinney-Allen: The new line extension will walk around the south and east sides of the existing Allen station to the new Allen station being built in the clear. A short segment of new single circuit 69 kV line and a short segment of new double circuit 69 kV line (both operated at 46 kV) will be added to the line to tie into the new Allen station bays. (Conversion of S2405.3)	\$1.95	AEP	AEP	12/1/2026
b3353.4	Stanville-Allen: A segment of this line will have to be relocated to the new station (SN/SE/WN/WE: 50/50/63/63MVA). (Conversion of S2405.4)	\$0.17	AEP	AEP	12/1/2026
b3353.5	Allen-Prestonsburg: 0.25 mile segment of this existing single circuit will be relocated. The relocated line segment will require construction of one custom self-supporting double circuit dead-end structure and single circuit suspension structure. A short segment of new double circuit 69 kV line (energized at 46 kV) will be added to tie into the new Allen station bays, which will carry Allen-Prestonsburg 46 kV and Allen-East Prestonsburg 46 kV lines. A temporary 0.15 mile section double circuit line will be constructed to keep Allen-Prestonsburg and Allen-East Prestonsburg 46 kV lines energized during construction. (Conversion of S2405.5)	\$2.66	AEP	AEP	12/1/2026
b3353.6	Remote end work will be required at Prestonsburg, Stanville and McKinney stations. (Conversion of S2405.6)	\$0.34	AEP	AEP	12/1/2026
b3358	Install a 69 kV 11.5 MVAR capacitor at Biers Run station.	\$0.85	AEP	AEP	6/1/2026
b3359	Rebuild approximately 2.3 miles of the existing North Van Wert Sw-Van Wert 69 kV line utilizing 556 ACSR conductor.	\$6.20	AEP	AEP	6/1/2026
b3360	Replace Thelma Transformer #1 with a 138/69/46 kV 130/130/90 MVA transformer and replace 46 kV risers and relaying toward Kenwood substation. Existing TR# 1 to be used as spare.	\$3.54	AEP	AEP	12/1/2026
b3361	Rebuild Prestonsburg-Thelma 46 kV circuit, approximately 14 miles. Retire Jenny Wiley SS.	\$33.01	AEP	AEP	12/1/2026
b3362	Rebuild approximately 3.1 miles of the overloaded conductor on the existing Oertels Corner-North Portsmouth 69 kV line utilizing 556 ACSR.	\$8.00	AEP	AEP	6/1/2026

Upgrade ID	Description	Cost Estimate (\$M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3668	Upgrade Windy Edge 115 kV substation conductor to increase ratings of the Windy Edge-Chesco Park 110501 circuit.	\$0.50	BGE	BGE	6/1/2026
b3669.1	Replace terminal equipment (stranded bus, disconnect switch and circuit breaker) at Church substation (Townsend-Church 138 kV).	\$1.00	DPL	DPL	12/1/2026
b3669.2	Replace terminal equipment (circuit breaker) at Townsend substation (Townsend-Church 138 kV).	\$0.45	DPL	DPL	12/1/2026
b3670	Upgrade terminal equipment on the Loretto-Fruitland 69 kV circuit. Replace the 477 ACSR stranded bus on the 6711 line terminal inside Loretto substation and the 500 SDCU stranded bus on the 6711 line terminal inside Fruitland substation with 954 ACSR conductor.	\$0.80	DPL	DPL	6/1/2026
b3671	Rebuild approx. 3.6 miles of 875 (N. Boyertown-W. Boyertown). Upgrade terminal equipment (circuit breaker, disconnect switches, substation conductor) and relays at N. Boyertown and W. Boyertown substation.	\$8.79	ME	ME	6/1/2026
b3672	East Towanda-North Meshoppen 115 kV line: Rebuild 2.5 miles of 636 ACSR with 1113 ACSS conductor using single circuit construction. Upgrade all terminal equipment to the rating of 1113 ACSS.	\$6.66	PENELEC	PENELEC	6/1/2026
b3673	Replace the relay panels at Bethlehem 33 46 kV substation on the Cambria Prison line.	\$0.30	PENELEC	PENELEC	6/1/2026
b3674	Replace five Atlantic 34.5 kV breakers (J36, BK1A, BK1B, BK3A and BK3B) with 63 kA rated breakers and associated equipment.	\$3.50	JCPL	JCPL	6/1/2026
b3675	Replace six Werner 34.5 kV breakers (E31A_Prelim, E31B_Prelim, V48 future, W101, M39 and U99) with 40 kA rated breakers and associated equipment.	\$4.20	JCPL	JCPL	6/1/2026
b3676	Replace one Freneau 34.5 kV breaker (BK6) with 63 kA rated breakers and associated equipment.	\$0.70	JCPL	JCPL	6/1/2026
b3677	Rebuild a 13 mile section of 138 kV line 0108 between LaSalle and Mazon with 1113 ACSR or higher rated conductor.	\$42.06	ComEd	ComEd	11/1/2026
b3678	Expand 138 kV substation; Install 100 MVAR reactor, associated breaker and relaying.	\$1.70	ATSI	ATSI	11/1/2026
b3679	Replace West Fremont 138/69 kV TR2 with a transformer having additional high-side taps.	\$2.90	ATSI	ATSI	11/1/2026
b3680	At Sanborn, replace limiting substation conductors on Ashtabula 138 kV exit to make transmission line conductor the limiting element.	\$0.30	ATSI	ATSI	6/1/2026

Upgrade ID	Description	Cost Estimate (\$M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3681	Upgrade the Shingletown #82 230-46 kV transformer circuit by installing a 230 kV breaker and disconnect switches, removing existing 230 kV switches, replacing 46 kV disconnect switches, replacing limiting substation conductor, and installing/replacing relays.	\$1.66	APS	APS	6/1/2026
b3682	Install a second 345/138 kV transformer at Hayes, 448 MVA nameplate rating. Add one 345 kV circuit breaker (3000A) to provide transformer high-side connection between breaker B-18 and the new breaker. Connect the new transformer low side to the 138 kV bus. Add one 138 kV circuit breaker (3000A) at Hayes 138 kV substation between B-42 and the new breaker. Relocate the existing 138 kV No. 1 capacitor bank between B-42 and the new breaker. Protection per FE standard.	\$7.59	ATSI	ATSI	6/1/2026
b3683	Reconductor the existing 556.5 ACSR line segments on the Messick Road-Ridgeley WC4 138 kV line with 954 45/7 ACSR to achieve 308/376 MVA SN/SE and 349/445 MVA WN/WE ratings. Replace the remote end equipment for the Messick Road-Ridgeley WC4 138 kV line. The total length of the line is 5.02 miles.	\$11.20	APS	APS	6/1/2026
b3684	Rebuild 12.4 miles of 115 line #126 segment from Earleys to Kelford with a summer emergency rating of 262 MVA. Replace structures as needed to support the new conductor. Upgrade breaker switch 13668 at Earleys from 1200 A to 2000 A.	\$18.75	Dominion	Dominion	6/1/2026
b3685	Install a 33 MVAR cap bank at Cloud 115 kV bus along with a 115 kV breaker. Add 115 kV circuit breaker for 115 kV line #38.	\$1.50	Dominion	Dominion	6/1/2026
b3686	Purchase land close to the bifurcation point of 115 kV line #4 (where the line is split into two sections) and build a new 115 kV switching station called Duncan Store. The new switching station will require space for an ultimate transmission interconnection consisting of a 115 kV six-breaker ring bus (with three breakers installed initially).	\$16.00	Dominion	Dominion	12/1/2026

Upgrade ID	Description	Cost Estimate (\$M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3687	Rebuild approximately 15.1-mile-long line segment between 115 kV line #183 Bristers and Minnieville D.P. with 2-768 ACSS and 4000 A supporting equipment from Bristers to Ox to allow for future 230 kV capability of 115 kV line #183. The continuous summer normal rating will be 523 MVA from Ox-Minnieville. The continuous summer normal rating will be 786 MVA from Minnieville-Bristers.	\$30.00	Dominion	Dominion	6/1/2026
b3689.1	Reconductor approximately 24.42 miles of 230 kV line #2114 Remington CT-Elk Run-Gainesville to achieve a summer rating of 1574 MVA by fully reconductoring the line and upgrading the wave trap and substation conductor at Remington CT and Gainesville.	\$28.99	Dominion	Dominion	6/1/2026
b3689.2	Replace 230 kV breakers SC102, H302, H402 and 218302 at Brambleton substation with 4000A 80 kA breakers and associated equipment including breaker leads as necessary to address breaker duty issues identified in short circuit analysis.	\$1.69	Dominion	Dominion	6/1/2026
b3690	Reconductor approximately 1.07 miles of 230 kV line #2008 segment from Cub Run-Walney to achieve a summer rating of 1574 MVA. Replace line switch 200826 with a 4000A switch.	\$1.93	Dominion	Dominion	6/1/2026
b3691	Reconductor approximately 1.4 miles of 230 kV line #2141 from Lakeview-Carolina to achieve a summer rating of 1047 MVA.	\$1.19	Dominion	Dominion	6/1/2026
b3694.1	Convert line #29 Aquia Harbor to Possum Point to 230 kV (Extended line #2104) and swap line #2104 and converted line #29 at Aquia Harbor backbone termination. Upgrade terminal equipment at Possum Point to terminate converted line 29 (now extended line #2104). (Line #29 from Fredericksburg to Aquia Harbor is being rebuilt under baseline b2981 to 230kV standards.)	\$9.39	Dominion	Dominion	6/1/2026
b3694.10	Reconductor approximately 2.9 miles of 230 kV line #211 Chesterfield-Hopewell to achieve a minimum summer emergency rating of 1046 MVA.	\$4.91	Dominion	Dominion	6/1/2026
b3694.11	Reconductor approximately 2.9 miles of 230 kV line #228 Chesterfield-Hopewell to achieve a minimum summer emergency rating of 1046 MVA.	\$4.91	Dominion	Dominion	6/1/2026
b3694.12	Upgrade equipment at Chesterfield substation to not limit ratings on lines 211 and 228.	\$0.76	Dominion	Dominion	6/1/2026

Upgrade ID	Description	Cost Estimate (\$M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3694.13	Upgrade equipment at Hopewell substation to not limit ratings on lines 211 and 228.	\$1.71	Dominion	Dominion	6/1/2026
b3694.2	Upgrade Aquia Harbor terminal equipment to not limit 230 kV line #9281 conductor rating.	\$0.63	Dominion	Dominion	6/1/2026
b3694.3	Upgrade Fredericksburg terminal equipment by rearranging 230 kV bus configuration to terminate converted line 29 (now becoming 9281). The project will add a new breaker at the 230 kV bay and reconfigure line termination of 230 kV lines #2157, #2090 and #2083.	\$2.73	Dominion	Dominion	6/1/2026
b3694.4	Reconductor/rebuild approximately 7.6 miles of 230 kV line #2104 Cranes Corner-Stafford to achieve a summer rating of 1047 MVA(1). Reconductor/rebuild approximately 0.34 miles of 230 kV line #2104 Stafford-Aquia Harbor to achieve a summer rating of 1047 MVA. Upgrade terminal equipment at Cranes Corner to not limit the new conductor rating.	\$19.60	Dominion	Dominion	6/1/2026
b3694.5	Upgrade wave trap and line leads at 230 kV line #2090 Ladysmith CT terminal to achieve 4000A rating.	\$0.15	Dominion	Dominion	6/1/2026
b3694.6	Upgrade Fuller Road substation to feed Quantico substation via 115 kV radial line. Install four-breaker ring and break 230 kV line #252 into two new lines: 1) #252 between Aquia Harbor to Fuller Road and 2) #9282 between Fuller Road and Possum Point. Install a 230/115 kV transformer which will serve Quantico substation.	\$24.16	Dominion	Dominion	6/1/2026
b3694.7	Energize in-service spare 500/230 kV Carson Tx#1.	\$0.00	Dominion	Dominion	6/1/2026
b3694.8	Partial wreck and rebuild 10.34 miles of 230 kV line #249 Carson-Locks to achieve a minimum summer emergency rating of 1047 MVA. Upgrade terminal equipment at Carson and Locks to not limit the new conductor rating.	\$15.37	Dominion	Dominion	6/1/2026
b3694.9	Wreck and rebuild 5.4 miles of 115 kV line #100 Locks-Harrowgate to achieve a minimum summer emergency rating of 393 MVA. Upgrade terminal equipment at Locks and Harrowgate to not limit the new conductor rating and perform line #100 Chesterfield terminal relay work.	\$9.10	Dominion	Dominion	6/1/2026
b3697	Replace station conductor and metering inside Whipain and Plymouth substations to increase the ratings of the 220-13/220-14 Whipain-Plymouth 230 kV line facilities.	\$0.62	PECO	PECO	6/1/2025

Upgrade ID	Description	Cost Estimate (\$M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3701	Replace terminal equipment on the French's Mill-Junction JST1 138 kV line.	\$0.77	APS	APS	4/1/2022
b3707.1	Reconductor approximately 0.57mi of 115kV Line #1021 from Harmony Village to Greys Point with 768 ACSS to achieve a summer emergency rating of 237MVA. The current conductor is 477 ACSR.	\$1.11	Dominion	Dominion	6/1/2022
b3707.2	Reconductor approximately 0.97mi of 115 kV Line #65 from Rappahanock to White Stone with 768 ACSS to achieve a summer emergency rating of 237MVA. The current conductor is 477 ACSR.	\$1.89	Dominion	Dominion	6/1/2022

Attachment B – Reliability Project Multi-Zone Allocations

Upgrade ID	Description	Cost Estimate (\$M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3692	Rebuild approximately 27.7 miles of 500 kV transmission line from Elmont to Chickahominy with current 500 kV standards construction practices to achieve a summer rating of 4330 MVA.	\$58.16	Dominion	AEC (0.84%) / AEP (6.97%) / APS (2.82%) / ATSI (4.01%) / BGE (2.06%) / ComEd (6.73%) / Dayton (1.06%) / DEOK (1.69%) / DL (0.88%) / DPL (1.27%) / Dominion (56.49%) / EKPC (0.90%) / JCPL (1.96%) / ME (0.97%) / Neptune (0.12%) / OVEC (0.03%) / PECO (2.70%) / PENELEC (0.92%) / PEPCO (1.86%) / PPL (2.39%) / PSEG (3.20%) / RE (0.13%)	6/1/2026
b3693	Expand substation and install approximately 294 MVAR cap bank at 500 kV Lexington substation along with a 500 kV breaker. Adjust the tap positions associated with the two 230/69 kV transformers at Harrisonburg to neutral position and lock them.	\$5.86	Dominion	AEC (0.84%) / AEP (6.97%) / APS (2.82%) / ATSI (4.01%) / BGE (2.06%) / ComEd (6.73%) / Dayton (1.06%) / DEOK (1.69%) / DL (0.88%) / DPL (1.27%) / Dominion (56.49%) / EKPC (0.90%) / JCPL (1.96%) / ME (0.97%) / Neptune (0.12%) / OVEC (0.03%) / PECO (2.70%) / PENELEC (0.92%) / PEPCO (1.86%) / PPL (2.39%) / PSEG (3.20%) / RE (0.13%)	11/1/2026
b3698	Reconductor the 14.2 miles of the existing Juniata-Cumberland 230 kV line with 1272 ACSS/TW HS285 "Pheasant" conductor.	\$9.00	PPL	AEC (4.17%) / BGE (13.18%) / DEOK (1.22%) / Dominion (3.25%) / DPL (9.14%) / EKPC (0.22%) / HTP (0.20%) / JCPL (1.15%) / ME (27.02%) / NEPTUNE (0.64%) / PECO (18.88%) / PEPCO (4.68%) / PSEG (16.14%) / MFT (0.11%)	12/1/2023

Upgrade ID	Description	Cost Estimate (\$M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3702	Install one 13.5 Ohm series reactor to control the power flow on the 230 kV line #2054 from Charlottesville substation to Proffit Rd 230 kV line.	\$11.38	Dominion	AEC (1.59%) /APS (8.85%) /ATSI (5.54%) /BGE (10.79%) /ComEd (1.86%) /Dayton (0.21%) /DEOK (1.16%) /Dominion (18.99%) /DPL (3.68%) /DL (1.16%) /HTP (0.22%) /JCPL (4.53%) /ME (1.73%) /NEPTUNE (0.68%) /PECO (6.95%) /PENELEC (4.75%) /PEPCO (9.69%) /PPL (9.78%) /PSEG (7.28%) /RE (0.29%) /FT (0.27%)	6/1/2023