# **Application, Appendix, DEQ Supplement,** Routing Study**, Direct Testimony and Exhibits of Virginia Electric and Power Company**

**Before the State Corporation Commission of Virginia**

**500 kV Morrisville-Wishing Star Line #5008, 230 kV Anderson Branch-Morrisville Line #2464, Expanded Corridor Optimization and Related Projects**

**Application No. 3**57

**Case No. PUR-202**6-00021

**Filed:** February 27**, 202**6

**Volume** 2 of 7

***Application of Virginia Electric and Power Company***
***for Approval and Certification of Electric Transmission Facilities:***
***500 kV Morrisville-Wishing Star Line #5008, 230 kV Anderson Branch-Morrisville Line #2464,***
***Expanded Corridor Optimization and Related Projects***
**Case No. PUR-2026-00021**

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## I. NECESSITY FOR THE PROPOSED PROJECT

**J. If the proposed project has been approved by the RTO, provide the line number, regional transmission expansion plan number, cost responsibility assignments, and cost allocation methodology. State whether the proposed project is considered to be a baseline or supplemental project.**

Response: The following is a summary of approvals and scope changes followed by a more detailed timeline of TEAC Meetings as they relate to identification of the need for the Project.

***Summary of Approvals and Scope Changes***

In January 2023, PJM identified the need for a new 500 kV transmission line between Morrisville and Wishing Star Stations to solve several NERC reliability violations in the Project area under the 2027 Summer High Load Growth ("HLG") case scenario of PJM's Data Center Planning Initiative.

In February 2023, the Company submitted an initial proposal to PJM to expand the Vint Hill Station as a solution to N-1-1 thermal violations identified in the Do-No-Harm analysis of two supplemental projects (DOM-2022-0046-DNH and DOM-2022-0047-DNH), which included cutting two new 500 kV sources (Lines #535 and #569) into Vint Hill Station.

In October 2023, PJM presented (First Read)[73] a robust baseline solution to address violations of NERC reliability violations identified in both the 2027 and 2028 RTEP cases, which included installation of the proposed Line #5008 by wrecking and rebuilding all of the existing 500 kV, 230 kV, and 115 kV transmission lines within the existing Morrisville-Wishing Star Corridor.[74]

As a result of the PJM Board approval of the 2022 RTEP Open Window #3 proposals in December 2023, it was determined that swapping the cut-in of Line #569 at Vint Hill Station with the newly proposed Line #5008 was a more effective long-term solution.

PJM Board approvals in December 2023 also included the rebuild of the approximately 7.9-mile Line #545 and approximately 1.3 miles of Line #569, as baseline projects to replace aging infrastructure under end-of-life criteria.

PJM's Second Read of the solution in December 2023, which included Line #5008 and the wreck and rebuild of all 500 kV, 230 kV, and 115 kV lines within the existing transmission corridor, also identified scoping updates to stakeholders due to the changes described above regarding the Vint Hill Station and partial rebuild

[73] In the context of PJM's RTEP process, "First Read" and "Second Read" refer to the first and second formal stages of presenting proposed transmission projects to stakeholders, particularly within TEAC meetings, to allow for review, feedback, and transparency before inclusion in a PJM Board-approved RTEP.

[74] *But see also supra,* n.18, n.51, and n.61.

of Line #569. The 2023 RTEP was approved by PJM at its board meeting on December 11, 2023, including Line #5008 and the wreck and rebuild of the entire Morrisville-Wishing Star Corridor.

In April 2024, as PJM's 2024 series 2029 RTEP model had been updated to include the proposed solutions approved within the 2024 Open Window #1, it had been determined that the termination of Line #5008 into the expanded Vint Hill Station was no longer required.[75]

To address localized NERC reliability violations, as well as N-1-1 thermal secondary violations within the 2029 RTEP model, PJM's set of recommended solutions for the 2024 Open Window #1 included the proposal for the installation of a new 230 kV line between Anderson Branch and Morrisville (*i.e.*, Line #2464), as well as the associated terminal work required at each end. PJM presented the First Read of this proposed solution in December 2024, and the Second Read in January 2025.

In April 2025, the end-of-life components associated with the rebuild of Line #545 and Line #569 were cancelled by PJM due to the scope overlapping with the work already being performed by the installation of Line #5008, Line #2464, and the wreck and rebuild of the entire Morrisville-Wishing Star Corridor.

Reliability projects from the 2024 Reliability Open Window #1 were approved by PJM at its board meeting on February 26, 2025, including Line #2464, and the Line #569 end-of-life component was removed.

**Timeline of TEAC Meetings**

With the scoping update and approvals to all baseline and supplemental projects affected by the proposed Project being brought to stakeholders via the PJM TEAC process, the section below is organized into a combined timeline, identifying the meeting in which a change or approval occurred, as well as the result of and information provided in each meeting.

January 10, 2023 TEAC Meeting

During the 2022 RTEP Open Window #3, PJM identified the need for a new 500 kV transmission line between Morrisville and Wishing Star Stations to solve several NERC reliability violations in the Project area stemming from the overloads of Line #545, Line #569, and the Ox Station 500-230 kV transformer under the 2027 Summer HLG case scenario of PJM's Data Center Planning Initiative, integrating a refined forecast into PJM's planning models to account for the high data center load growth activity in the NOVA Load Area. See Attachment I.J.1.

[75] As a result of scope changes via the April 2024 and January 2025 TEAC meetings described herein, the expansion of Vint Hill Station was no longer considered as a component of the proposed Project. As a result, expansion of the Vint Hill Station is not a component of the proposed Project.

February 7, 2023 TEAC Meeting

At the February 7, 2023 TEAC meeting, the Company submitted an initial proposal to expand the Vint Hill Station to PJM as a solution to N-1-1 thermal violations identified in the Do-No-Harm analysis of two supplemental projects (DOM-2022-0046-DNH and DOM-2022-0047-DNH), which included cutting two new 500 kV sources (Lines #535 and #569) into Vint Hill Station. See Attachment I.J.2.

October 31, 2023 TEAC Meeting

In October 2023, PJM presented (First Read) a robust baseline solution to address violations of NERC reliability violations identified in both the 2027 and 2028 RTEP cases. These violations were included in PJM's Competitive Planning Process and listed in the 2022 RTEP Open Window #3, which opened on February 24, 2023, and closed on May 31, 2023. This Competitive Planning Process afforded non-incumbent transmission developers an opportunity to participate in the regional planning and expansion of the PJM bulk electric system. See Attachment I.J.3. PJM shows the selection of Line #5008 and full wreck and rebuild of the Morrisville-Wishing Star Corridor as the preferred solution on slides 35 and 36 of Attachment I.J.3. At this time, the solution identified the rebuild of Line #569 as a baseline project to replace infrastructure at the end of its service life, as well as the Vint Hill Station expansion.

Within this meeting, PJM highlighted the general requirements that would be evaluated when reviewing each proposal (see slide 19 of Attachment I.J.3):

- Holistic solutions were to be designed such that they are robust and expandable as the load grows within the area.

- A scalable solution ensures, at a minimum, near-term reliability needs are address while also enabling future expansion (beyond the 2027-2028 baseline levels).

PJM also evaluated each proposal on its effectiveness in consideration of flexibility and robustness, as well as their performance in enhancing reactive power and transmission system load deliverability across the PJM footprint. Given this criterion, PJM listed the following high-level benefits driving their selection of proposed Line #5008 and the wreck and rebuild of the entire Morrisville-Wishing Star Corridor (see slide 70 of Attachment I.J.3):

- Needed development to provide supply to the Company's data center loads under both the 2027 and 2027/2028 needs; and

- Efficiently utilizes existing (incumbent owned) right-of-way.

Additionally, at the October 2023 TEAC Meeting, PJM presented the Company's submission of the Line #545 rebuild as part of PJM's 2022 RTEP Open Window #3 (First Read). The rebuild of the 7.9-mile Line #545 was necessary to solve

NERC reliability thermal violations identified in Open Window #3 by optimizing the existing transmission corridor. Additionally, Line #545 was identified by the Company for replacement as aging infrastructure that is nearing the end of its service life in order to comply with the Company's Planning Criteria. Line #545 was built in 1976 on COR-TEN® towers that were identified for rebuild based on the Company's assessment in accordance with the Company's mandatory Planning Criteria as validated by a third-party company, Quanta Technology, LLC ("Quanta") in its 500 kV Loop Review—Consulting Services Report submitted to the Company in 2013 ("2013 Quanta Report") and in its 230 kV & 500 kV COR-TEN Lines Review—Consulting Services Report submitted to the Company in 2016 ("2016 Quanta Report.")

December 5, 2023 TEAC Meeting

In December 2023, PJM presented (Second Read) a more detailed description of the selected solution, outlining the scope of work, as well as the change in facility ratings once Line #5008 is in service. See Attachment I.J.4.[76] Also released during the December TEAC was PJM's Constructability & Financial Analysis Report, which provided an additional overview of the submitted proposals, as well as described the assumptions, analysis, and methodology behind the selection process used during the 2022 RTEP Window #3. See Attachment I.J.5. This report also included a summary of the transmission line risk analysis performed by PJM during their assessment of Line #5008. As a result of the study, a medium level of risk was assigned, with PJM indicating the need for a significant amount of outage coordination, as well as the risk for a potential cascading effect on the outage schedule for the separate components of the solution in the event of any delays in construction. See pages 73-75 of Attachment I.J.5.

At this time, the scope of work continued to account for the Vint Hill Station expansion and the Line #569 end-of-life component. See pages 72-77 of Attachment I.J.5.

PJM released the 2022 RTEP Window 3 Reliability Analysis Report dated December 8, 2023, further detailing the justification for Line #5008 and wreck and rebuild of the entire Morrisville-Wishing Star Corridor based on the identified violations and both short-term and long-term drivers, including the significant increased load growth in the area. See Attachment I.J.6. At this time, the rebuild of Line #545 was included as part of PJM's selection of the preferred solution to identified violations of NERC Reliability Standards in the 2027 and 2028 RTEP cases (Second Read).

The 2023 RTEP was approved by PJM at its board meeting on December 11, 2023, including the Line #5008 and the wreck and rebuild of the entire Morrisville-

[76] Note that the reference to "partial" solution on slides 27-28 refers to PJM selecting and discussing a portion of the proposal "2022-W3-711," which included upgrades/ projects beyond what is in this filing. PJM is able to select pieces of different proposals rather than having to select all or none. This is not referring to the right-of-way or specifics of the Project in that regard.

Wishing Star Corridor. See Attachment I.J.7 for a copy of the TEAC Recommendations to the PJM Board, PJM Staff White Paper, at page 4. Line #5008 and the full wreck and rebuild of the Morrisville-Wishing Star Corridor is classified as a baseline project and is assigned the following sub identification numbers: b3800.306; b3800.309-333; b3800.336-357. See Attachment I.J.8 for a summary of the cost estimates and description of each sub identification number assignment.

April 30, 2024 TEAC Meeting

Subsequently, certain changes were required to the scope of the Vint Hill Station expansion approved through the Competitive Open Window Process, necessitating two revisions to the proposal originally submitted to PJM due to the evolving nature of the Company's 500 kV transmission system. The first revised proposal was presented during the April 30, 2024 TEAC meeting. See Attachment I.J.9.

December 3, 2024 TEAC Meeting

In December 2024, PJM presented (First Read) a collection of baseline solution proposals to address violations of NERC reliability violations identified in the 2029 RTEP case. These violations were included in PJM's Competitive Planning Process and listed in the 2024 RTEP Open Window #1, which opened on July 15, 2024, and closed on September 17, 2024. As a part of this meeting, the proposal of a new 230 kV line between Anderson Branch and Morrisville was presented.[77] As shown in Attachment I.J.10, proposed Line #2464 is an element of the solution package submitted by the Company.

January 7, 2025 TEAC Meeting

In January 2025, PJM presented (Second Read) its selection of recommended solutions to address localized NERC reliability violations, as well as N-1-1 thermal secondary violations within the 2029 RTEP. See Attachment I.J.11. The selected solutions contained the proposal for the installation of a new 230 kV line between Anderson Branch and Morrisville, as well as the associated terminal work required at each end.

Baseline reliability projects resolving violations identified in the 2024 RTEP were approved by PJM as part of the 2025 RTEP at its board meeting on February 26, 2025, including Line #2464. The construction of Line #2464 between Anderson Branch and Morrisville and associated terminal work to connect the transmission

[77] For reference, due to spatial constraints when expanding Bristers Station to accommodate a second 500-230 kV transformer via the PJM Supplemental M-3 process, all 230 kV and 115 kV assets were moved to their own bus configurations within the existing Bristers property. Due to the Company's protection and fencing requirements, the 230 kV and 115 kV equipment required its own fence and thus its own separate name, Anderson Branch. In regard to the topology within PJM's RTEP models, referencing "Bristers 115 kV and 230 kV" or "Anderson Branch" are 100% equivalent. This updated naming convention will be applied by PJM in future RTEP models.

line is classified as a baseline project and was assigned the following sub-identification numbers: b4000.337 – b4000.339.

Additionally, upon review and analysis of the violations and proposed solutions approved by PJM in the 2024 Open Window #1, a second revision was made to the layout at Vint Hill Station in which the proposed Line #5008 would no longer terminate into the site, leaving Line #535 as the only 500 kV termination into Vint Hill Station.

Therefore, as a result of scope changes from the April 2024 and January 2025 TEAC meetings, the expansion of Vint Hill Station was no longer considered as a component of the proposed Project.

April 1, 2025 TEAC Meeting

In April 2025, PJM presented a cancellation of baseline project b3211, consisting of the rebuild of a section of 500 kV Line #569 between the Loudoun and Morrisville Stations, justified under end-of-life criteria. See Attachment I.J.12. The rebuild of this section of Line #569 was then re-assigned to be covered under baseline project b3800.312, a component of the proposed Project, due to overlapping scopes. At this time, the end-of-life component to rebuild Line #569 had been removed. Originally presented by PJM at the August 8, 2019 TEAC meeting during their first review of FERC Form No. 715 violations,[78] Line #569 is approximately 32 miles long, with 1.6 miles of this line constructed on COR-TEN® structures. These COR-TEN® towers were identified for rebuild based on the Company's assessment in accordance with the Company's mandatory Planning Criteria as validated by Quanta in the 2013 Quanta Report and the 2016 Quanta Report as nearing the end of their useful life. Reliability studies also indicated that retiring Line #569 would result in thermal overloads in accordance with P6 NERC criteria violations.

While the rebuild of Line #545 and partial rebuild of a section of Line #569 are no longer components of the solution as proposed and approved by the PJM Board, the rebuilds will remain beneficial to the transmission system by replacing infrastructure that is at the end of its service life thereby supporting Dominion Energy Virginia's continued reliable electric service to retail and wholesale customers as well as the future overall growth and system generation capability in the area.

[78] In compliance with § 213(b) of the Federal Power Act, FERC has determined that potential customers must be able to reasonably anticipate the outcome of the technical studies a transmitting utility would perform that assess the availability of transmission capacity to satisfy a request for transmission service. As a result, each utility or its designated agent must submit an annual report via FERC Form No. 715 (Annual Transmission Planning Evaluation Report). On behalf of all its TOs, PJM then reports this information (*e.g.*, violations identified) to FERC. For additional information related to FERC Form 715, *see* https://www.pjm.com/library/request-access/ferc-form-715.

**Cost Allocation**

The 230 kV components of the Project are 100% cost allocated to the DOM Zone. The cost allocation for the 500 kV components is shown in the tables below from the PJM Staff White Paper released for the December 5, 2023 TEAC Meeting. See Attachment I.J.7.

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.310 | Install one 500 kV, 293.8MVAr Shunt Capacitor Bank & associated equipment at Wishing Star substation. | $3.97 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (100.00%) | 6/1/2027 |
| b3800.311 | Rebuild 500 kV line No. 545 Bristers-Morrisville as a single circuit monopole line to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. | $65.86 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (91.07%) / PEPCO (8.93%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.312 | Rebuild 500 kV line No. 569 Loudoun-Morrisville to accommodate the new 500 kV line in the existing right-of-way. New conductor to have a summer rating of 4357 MVA. | $175.62 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (11.72%) / Dominion (88.28%) | 6/1/2027 |
| b3800.313 | Rebuild approximately 10.29 miles line segment of line No. 535 (Meadow Brook to Loudoun) to accommodate the new 500 kV line in the existing ROW. | $65.86 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (13.93%) / BGE (6.86%) / Dominion (70.92%) / PEPCO (8.29%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.336 | Upgrade and install equipment at Bristers substation to support the new conductor 5000A rating for 500 kV line No. 545. | $5.72 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (91.07%) / PEPCO (8.93%) | 6/1/2027 |
| b3800.344 | Upgrade and install equipment at Loudoun substation to support the new conductor 5000A rating for 500 kV line No. 569 Loudoun-Morrisville. | $10.70 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (11.72%) / Dominion (88.28%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.346 | Upgrade and install equipment at Morrisville substation to support the new 500 kV conductor termination. All terminal equipment to be rated for 5000 A for 500 kV line No. 545 & No. 569. Upgrade 500 kV bus 2 to 5000 A. | $17.54 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (11.72%) / Dominion (88.28%) | 6/1/2027 |
| b3800.350 | Install terminal equipment at Vint Hill substation to support a 5000A line to Morrisville. Update relay settings for 230 kV lines No. 2101, No. 2163, and 500 kV line No. 535. | $23.64 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (9.79%) / Dominion (90.21%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.356 | Build a new 500 kV line from Vint Hill to Wishing Star. The line will be supported on single circuit monopoles. New conductor to have a summer rating of 4357 MVA. Line length is approximately 16.59 miles. | $87.81 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (21.45%) / Dominion (78.55%) | 6/1/2027 |
| b3800.357 | Build a new 500 kV line from Morrisville to Vint Hill. New conductor to have a summer rating of 4357 MVA. Line length is approximately 19.71 miles. | $101.89 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (9.79%) / Dominion (90.21%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.353 | Update relay settings at Vint Hill for 500 kV line No. 535 Vint Hill-Loudoun. | $0.03 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (13.93%) / BGE (6.86%) / Dominion (70.92%) / PEPCO (8.29%) | 6/1/2027 |
| b3800.354 | Install terminal equipment at Wishing Star substation to support a 5000A line to Vint Hill. Update relay settings for 500 kV lines No. 546 and No. 590. | $12.30 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (21.45%) / Dominion (78.55%) | 6/1/2027 |

# Data Center Planning & Need Assessment Update

Sami Abdulsalam, Senior Manager

Transmission Expansion Advisory Committee

January 10, 2023

# Agenda

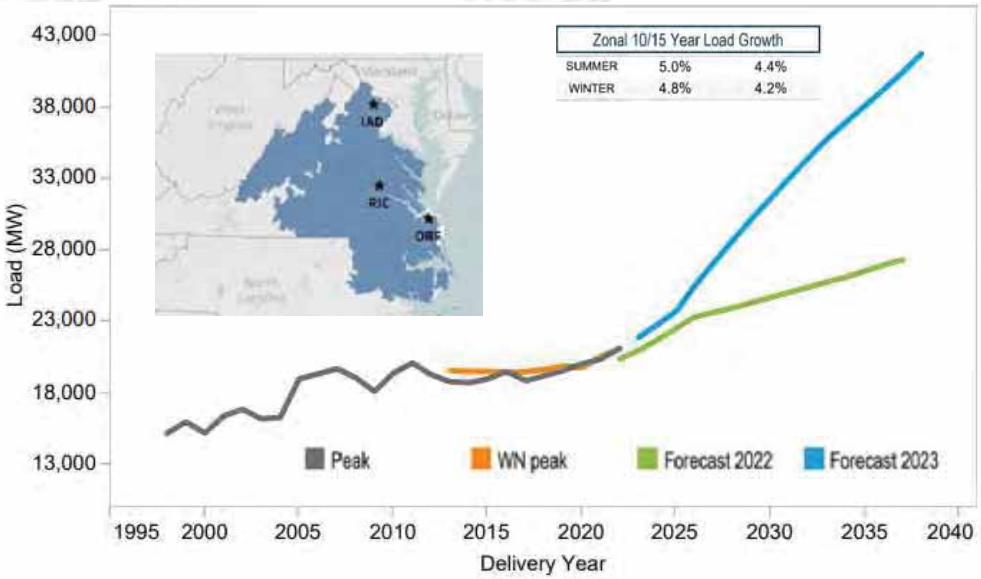
- Data Center Load Growth - Background
- Forecast Updates
  - 2023 Load Forecast
  - Base Case Development
  - Case Zonal Load Overview
- Power Flow Profile into and around Data Center Loads
  - 2027 Summer High Load Growth
  - Reactive Interface Impact on Baseline Case
- Summary of Need
- Next Steps

# Data Center Load Growth - Background

- Earlier in 2022, PJM shared its forecast for 2022 and indicated high Data Center Load growth activity, particularly in Northern VA.
- In July 2022, PJM directed an Immediate Need transmission enhancement project to enable the integration of the forecasted load within the Dominion Data Center Alley up to and including year 2025.
- Since then, Data Center Loads within Northern Virginia have been increasing at an unprecedented rate.
- Currently, the recorded actual Summer Peak in 2022 was 21,156 MWs while the 2022 Forecast called for 20,424 MWs.
- PJM continued its consultation efforts with Transmission and Distribution owners in the area to refine its forecast and further enhance its need assessment.

# Forecast and Planning Approach

- PJM has began receiving near and long term forecast input from Dominion, First Energy and NOVEC for Data Center load growth projections up to and including 2038 (15 year planning horizon).
- The PJM 2023 Forecast calls for approximately between 5% to 4.2% annual load growth in the Dominion area over the next 10-15 year timeframe.
- The Load Forecast information was refined and developed down to a bus/substation level for the 2028 and 2030 study years.
- PJM reassessed the transmission Development Needs in the area based on the refined forecast information and localized allocation of load.




https://pjm.com/-/media/library/reports-notices/load-forecast/2022-load-report.ashx

Initially, PJM developed and studied two load scenarios: Baseline and High-Growth. The latest revision of PJM 2023 load forecast trends closely towards the high-load growth scenario.

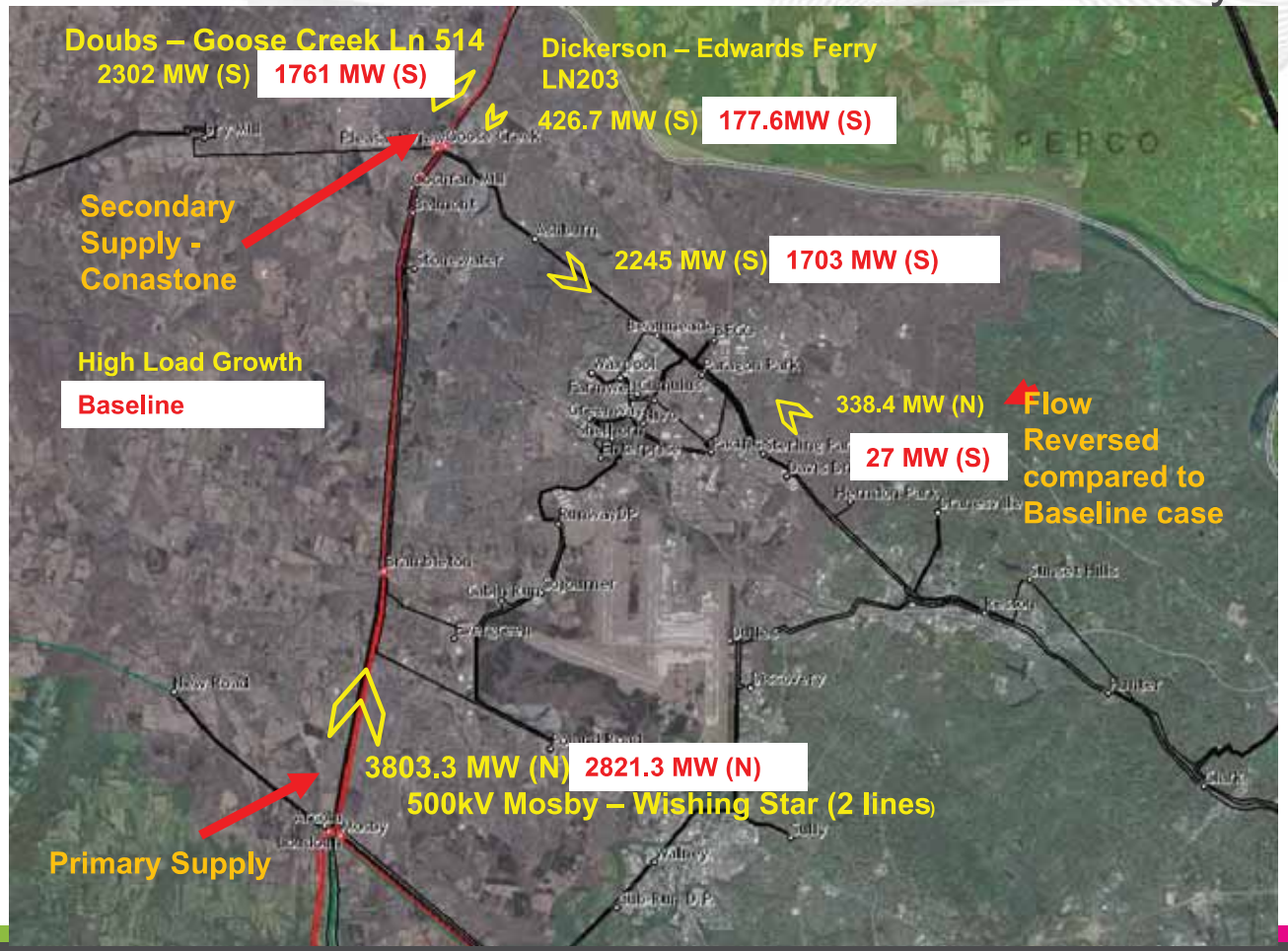
# 2027/28 Case Zonal Load Overview

| Dominion/NOVEC | Zonal Load (MW) - SUM |
|---|---|
| 2022 peak | 20,424(forecast)/21,156(actual) |
| 2027 RTEP | 23,681 |
| 2027 Baseline | 26,393 |
| 2027 High Load Growth | 28,893 |
| 2028 RTEP (2023 Load Forecast) | 28,705 |

| First Energy (APS) | Zonal Load (MW) - SUM |
|---|---|
| 2022 peak | 8,675(forecast)/8,412(actual) |
| 2027 RTEP | 8,780 |
| 2027 Baseline | 9,607 |
| 2027 High Load Growth | 10,559 |
| 2028 RTEP (2023 Load Forecast) | 9,568 |

- Based on 2027 RTEP case with the following included:
  - 2027 Dominion immediate need solution (b3718)
  - 33 supplemental projects from Dominion from Jan to Sept 2022
  - Bus level data center load additions
  - Some loads are allocated to “nearest” bus (focus on regional driven needs)
  - Summer, Winter and Light Load (LL) cases developed for Baseline and High Load Growth (HLG) scenarios

# Power Flows around Data Center Alley – 2027 Summer



# Summary of Need

- The Data Center Load Growth rate (currently concentrating in areas of Northern Virginia) continues to increase.
- FirstEnergy's APS zone (just north of Virginia) is also experiencing Data Center load development.
- This concentrated load growth is driving high flows:
  - Within the Northern Virginia Dominion Transmission System
  - Into the Data Center concentrated load pocket (Regional Flows) from
    - West and East towards Doubs-Goose Creek
    - South into and out of Bristers towards Loudon
- Major voltage support needs within Dominion and APS will be required.
  - Some of the voltage violations are observed under N-0 conditions (fictitious VARs required to solve the case).
  - Heavy Regional transfers will require reinforcement to support the regional transfers.

# Next Steps

- PJM is currently wrapping up its need assessment to address the Data Center Load growth in and around Northern Virginia Transmission network.

- PJM is working towards opening a competitive window in early February 2023 to address the identified violations.

# Dominion Supplemental Projects

Transmission Expansion Advisory Committee
February 7, 2023

# Solutions

Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

# Dominion Transmission Zone: Supplemental Do No Harm Analysis

**Need Number:** DOM-2022-0046-DNH & DOM-2022-0047-DNH
**Process Stage:** Solutions Meeting 02/07/2023
**Project Driver:** Do No Harm Analysis

**Specific Assumption References:**

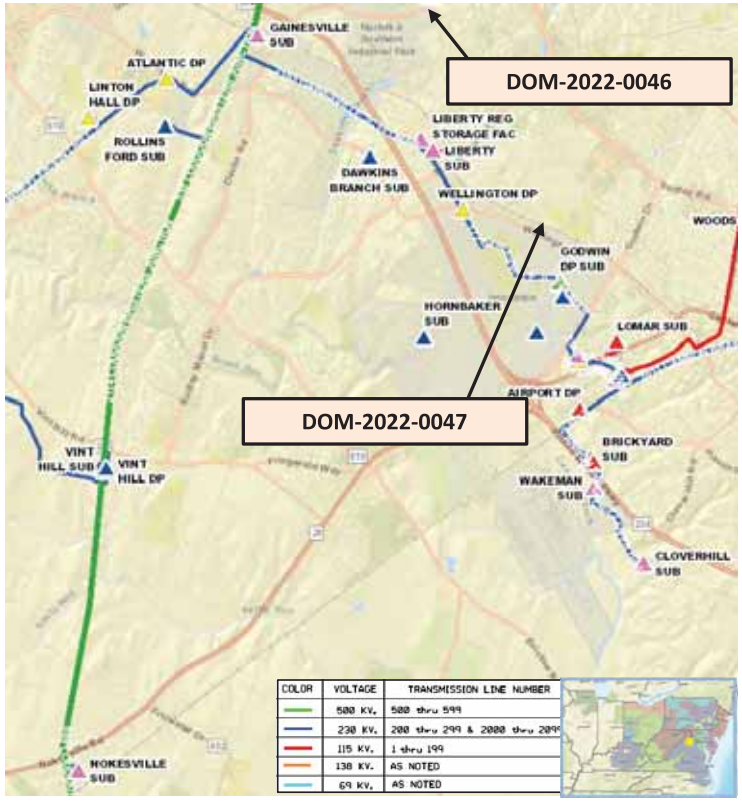
Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

**Problem Statement:**

PJM has identified N-1-1 thermal violations on the following separate facilities in the 2022 Do-No-Harm analysis:

- Line #2101 (Nokesville to Bristers Segment)
  - Contingency Scenario: DVP_P1-2: LN 569 and DVP_P1-2: LN 539
- Bristers 500-230 kV TX#1
  - Contingency Scenario: DVP_P1-3: 8BRISTER-TX#1 and DVP_P1-2: LN 539
- Bristers 500-230 kV TX#2
  - Contingency Scenario: DVP_P1-3: 8BRISTER-TX#2 and DVP_P1-2: LN 539

The violations are caused by previously presented Supplemental Projects DOM-2022-0046 and DOM-2022-0047 in the Dominion Zone.



# Dominion Transmission Zone: Supplemental Do No Harm Analysis

**Need Number:** DOM-2022-0046-DNH & DOM-2022-0047-DNH
**Process Stage:** Solutions Meeting 02/07/2023

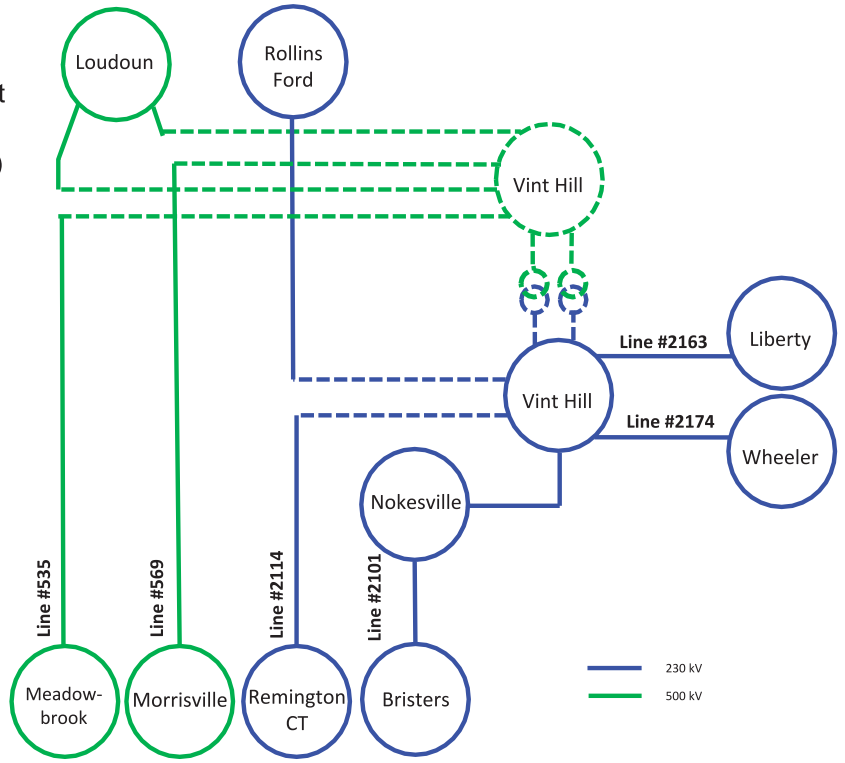
**Proposed Solution (Part 2 of 2):**

To address: Bristers 500-230 kV TX #1 & 2 Violation

- Install (2) 1400 MVA 500-230 kV transformer and associated 500 kV and 230 kV equipment (breakers, switches, leads) at Vint Hill Substation to supply the area with a 500 kV source
- Cut and loop 500 kV line #535 (Loudoun – Meadowbrook) and #569 (Loudoun - Morrisville) as the 500 kV sources into the proposed 500 kV ring bus
- Vint Hill Substation will be expanded to the north of the existing site to accommodate the 500 kV ring required for the addition of the new transformers
- Existing terminations for 230 kV line #2174 (Wheeler – Vint Hill), line #2101 (Bristers – Vint Hill), and line #2163 (Liberty – Vint Hill) will be rearranged to terminate into the expanded Vint Hill Substation
- 230 kV line #2114 (Remington CT – Rollins Ford) will also be cut and looped into the expanded Vint Hill Substation due to spatial constraints along the existing right-of-way

**Estimated Project Cost:** $115.0M (Total)
Transmission Line Cost: $5.0M
Substation Cost: $110.0M

**Alternatives Considered:**
No feasible alternatives
**Projected In-service Date:** 12/31/2027
**Project Status:** Conceptual
**Model:** 2025 RTEP



# Reliability Analysis Update



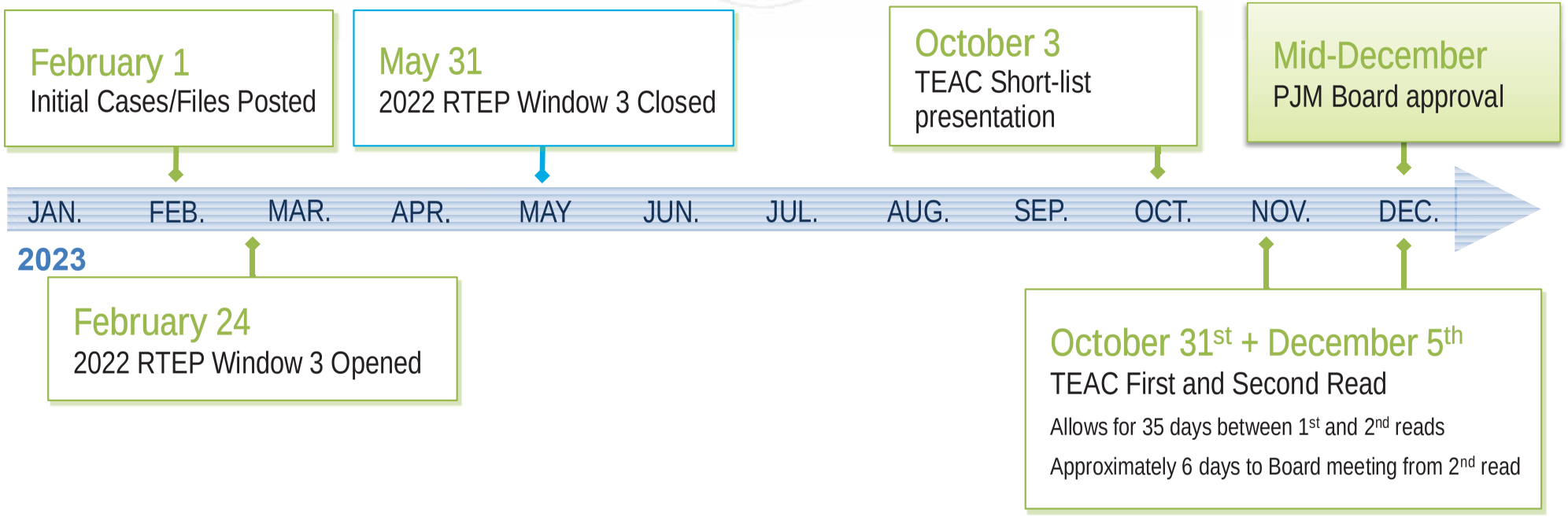
Sami Abdulsalam, Senior Manager
PJM Transmission Planning

Transmission Expansion Advisory Committee
October 31, 2023

# First Read – 2022 Window 3

## Baseline Reliability Projects

# 2022 RTEP Window 3 - Timeline

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# 2022 RTEP Window 3 – Objective & Evaluation

- Develop robust, holistic and expandable solutions that address the 2027-28 baseline violations associated with:
  - Local constraints: resulting from directly serving data center loads in APS / Dominion
  - Regional constraints resulting from imports into load center areas (500 kV primarily):
  - Needed reactive power VAR reinforcements, both static and dynamic as necessary.
  - Address reliability impacts due to the deactivation of 11GWs of generation.
- Adhere to all applicable planning criteria, including PJM, NERC, SERC, RFC and Local Transmission Owner Criteria.
- Evaluation on both 2027 and 2028 RTEP cases
  - Generation deliverability analysis
  - Load deliverability analysis
  - N-1-1 analysis
  - Baseline contingency analysis
  - Short circuit analysis
  - Dynamic analysis
  - Critical Substation Planning Analysis-CSPA

# 2022 RTEP Window 3 - Requirements

- Holistic solutions are to be designed such that they are robust and expandable as the load grows within the area.

- A scalable solution ensures, at a minimum, near-term reliability needs are addressed while also enabling future expansion (beyond the 2027-28 baseline levels).

  – Consider flexibility, robustness and scalability of 2027-28-baseline solutions against the Interim 2027-28 Summer, Winter and Light Load basecases.
  – Evaluate proposals for their effectiveness towards existing reactive interfaces in the area, particularly those supporting the Dominion and APS zones.
  – Evaluate the effectiveness of the proposed solutions towards the transmission system load deliverability into the Dominion and APS zones (CETL).

## Two Rounds of PJM Meetings With Proposing Entities:

- Discussions to clarify details of proposed developments, assumptions, rationale of proposed alternatives/variations
- First round was conducted in June/July 2023.
- Second round was initiated in late July and concluded mid-August:
  - Focus on outage scheduling, routing, risk and cost assumptions/considerations



## Scenario Development and Analysis

To date, PJM developed and analyzed:

- >30 scenarios for the 2027 model (Combination of proposals and components from different proposals)
- >80 scenarios for the 2028 model

## Scenarios Were Built Based On:

- Full combination scenarios by proposing entities (Incumbents, Nextera, LS Power and Transource)
- Optimized scenarios using components from incumbent and non-incumbent proposing entities

# 2022W3 – Window Evaluation Criteria

## Scenarios With Their Associated Proposed Developments Will Be Evaluated Based On the Following Principles:

| Performance | Scalability | Impact | Validated Cost |
|---|---|---|---|
| Meeting the system needs of 2027 and being flexible to address 2028 needs | Scenario/development longevity – system robustness and utilization | Utilization of existing ROWs where possible and efficient. | Cost evaluation using third-party benchmarking metrics |

**Risks**

- Triggering additional costs:
  - Substation rebuilds due to extreme short-circuit levels
  - Avoid extended critical outages (Peach Bottom / Conastone rebuilds)
- Imposing high permitting
- Inability to meeting in-service date

**Efficiencies**

- Avoidance of redundant capital investment including recognizing synergies with EOL facilities and overlaps of previously approved (or imminent) supplemental/baseline upgrades.

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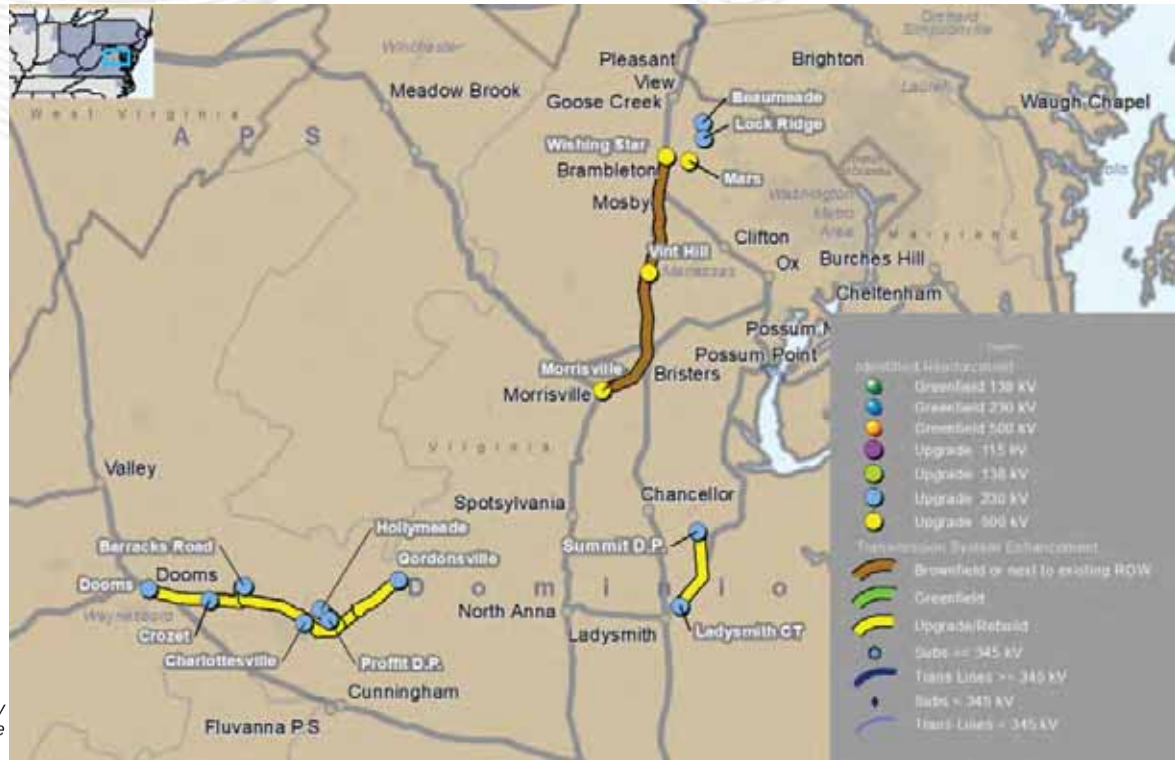
# 2022W3 – Preferred Solutions: South Cluster

**Proposed Solution:** 2022-W3-711 Revised

- Build a new 500kV line from Morrisville – Vint Hill – Wishing Star (approximately 36.3 miles) while maximizing the use of existing ROW within this corridor.
- Wrecking and rebuilding both the 5-2 towers in the Morrisville-Loudoun-Brambleton corridor to free up space for the new single-500kV monopole within the same corridor.
  - Line #545 (Bristers - Morrisville) Rebuild
  - Line #569 (Loudoun to Morrisville) Rebuild
  - Line #535 (Vint Hill- Loudoun) Resag/Rebuild
  - Line #546 (Mosby - Wishing Star) Rebuild
  - Line #590 (Mosby - Wishing Star) Rebuild
  - Line #2030 (Gainesville - Loudoun) Rebuild
  - Line #2045 (Loudoun - Brambleton) Rebuild
  - Line #2094 & 2227 (Brambleton - Racefield - Loudoun) Rebuild
  - Line #2101 (Bristers - Vint Hill) Rebuild
  - Line #2114 (Remington CT - Rollin Ford) Rebuild




***NOTE:*** *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Continued on next slide…

# 2022W3 – Preferred Solutions: South Cluster

**Proposed Solution:** 2022-W3-711 Revised

- Line #2140 (Loudoun - Heathcote) Rebuild
- Line #2151 (Railroad DP - Gainesville) Rebuild
- Line #2163 (Vint Hill - Liberty) Rebuild
- Line #2176 (Heathcote - Gainesville) Rebuild
- Line #2222 (Rollins Ford - Gainesville) Rebuild
- Line #183 (Bristers - Ox) Rebuild
- Line #37 (Spotsylvania - Wilderness D.P.) Rebuild

- Substation upgrades at:
  - Bristers, Brambleton, Dawkins Branch, Gainesville, Heathcote, Loudoun, Mint Springs, Morrisville, Mosby, North Star, Racefield, Railroad, Spotsylvania, Vint Hill, Wishing Star, Youngs Branch
- Breaker upgrades at the following substations:
  - Loudoun 230kV, Ox 500kV, North Anna 500kV

**Estimated Cost: $953.71 M**

**Required IS Date:** 6/1/2027
**Projected IS Date:** 6/1/2028

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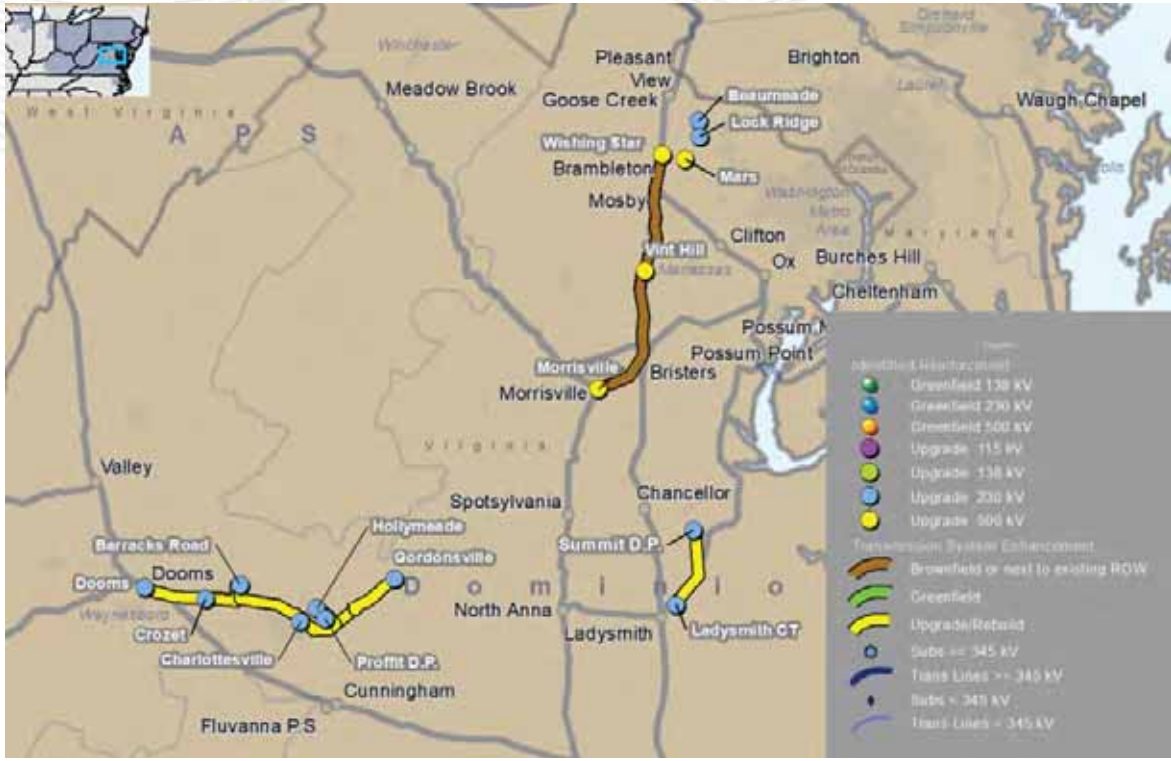



***NOTE:*** *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

# Summary of Selected Projects and Rationale

| Project Area | Proposal ID | Entity | Key Facilities Included | Reason for Selection |
|---|---|---|---|---|
| South | 837 | FirstEnergy | Doubs - Goose Creek 500 kV Rebuild (FE)<br>New Doubs - Aspen 500 kV Line (FE) | Debottlenecks the existing transmission corridor between the APS and Dominion systems and allows for 2X500 kV high capacity lines<br>Utilizes existing ROW |
| | 516 | Dominion | Doubs - Goose Creek 500 kV Rebuild (DOM)<br>New Doubs - Aspen 500 kV Line (DOM)<br>New Aspen Substation upgrade | This development enables the First Energy scope above (south of the Potomac River)<br>Allows for a new substation in the area as the existing Goose Creek and Pleasant View substations are congested |
| | 711 | Dominion | Morrisville - Vint Hill - Wishing Star 500 kV<br>Bristers - Morrisville 500 kV Rebuild<br>Loudoun - Morrisville 500 kV Rebuild<br>Mosby - Wishing Star 500 kV Rebuild | Needed development to provide supply to the Dominion Data Center loads under both the 2027 and 2027/28 needs<br><br>Efficiently utilizes existing (incumbent owned ROW) |
| | 231 | Dominon | Morrisville Substation (230 kV 150 MVAR Cap)<br>Wishing Star Substation (230 kV 150 MVAR Cap, 500 kV 293.8 MVAR Cap)<br>Mars Substation (230 kV 150 MVAR Cap, 500 kV 300 MVAR STATCOM)<br>Beaumeade Substation (230 kV 300 MVAR STATCOM) | Provides needed local VAR support to reliably serve the forecasted load in the study area (Load Center) |
| | 74, 211, 731, 967 | Dominion | Charlottesville to Hollymead 230 kV Reconductor<br>Ladysmith CT - Fredericksburg 230 kV Rebuild<br>Hollymead - Gordonsville 230 kV Rebuild<br>Locks 230 kV Substation Transformer upgrade | Needed local 230kV upgrades to provide transmission system capability to serve local load on existing infrastructure (upgrades)<br>Cost Effective<br>Minimal new disturbances |
| | PJM Identified Upgrades | Dominion | Line #256 Rebuild St. Johns - Ladysmith CT 230 kV<br>Sterling Park – Golden 230 kV Reconductor<br>Davis Drive – Sterling Park 230 kV Reconductor | Maximizes utliziation of existing transmission system capability<br>Cost effective |

# 2022 Window 3 Recommended Solution

| Project Area | Proposal ID | Key Facilities Included | Entity | Proposal Cost ($M) | Independent Cost ($M) | Proposed In-Service Date | Greenfield/ Brownfield |
|---|---|---|---|---|---|---|---|
| East | 344 | New Peach Bottom - North Delta - Highridge 500 kV (PECO)<br>Rebuild 5012: Peach Bottom - North Delta - Graceton -Conastone (PECO) | PECO | 60.90 | 67.55 | 12/1/2029 | Brownfield routes |
| | b3780.3 | Cancel West Cooper Substation scope from Brandon Shores Immediate Need Approved Projects | PECO | (60.00) | (60.00) | N/A | N/A |
| | b3737.47* | Enhanced North Delta 500/230 kV Substation (NJ SAA Project) | Transource | 104.11 | 93.88 | 12/1/2027 | Greenfield substation |
| | 660 | High Ridge 500 kV Expansion<br>New Peach Bottom - North Delta - Highridge 500 kV (BGE)<br>Rebuild 5012: Peach Bottom - North Delta - Gracetone -Conastone (BGE) | PEPCO | 653.42 | 479.99 | 12/1/2030 | Brownfield routes, substation expansion |
| | 374 | New Otter Creek 500 kV (tie-in to TMI - Peach Bottom 500 kV)<br>New Otter Creek - Conastone 500/230 kV DCT (Conastone Bypass for 500 kV) | PPL | 144.12 | 152.70 | 5/1/2027 | Brownfield route, Greenfield substation |
| | 637 | New Conastone - Doubs 500 kV line | PSEG | 447.28 | 492.50 | 6/1/2027 | Greenfield route |
| | 837 | New Carroll - Hunterstown 230 kV line | FirstEnergy | 137.45 | 202.30 | 6/1/2030 | Brownfield routes |
| | b3768 | Cancel Rebuild/Reconductor Germatown - Lincoln 115 kV project from 2022 RTEP Window Approved Projects | FirstEnergy | (17.36) | (17.36) | N/A | N/A |
| West | 853 | New Woodside 500 kV substation with 500 MVAR STATCOM & Capbanks (NextEra)<br>New 502 Junction - Woodside - Aspen 500 kV line (NextEra/FE)<br>Aspen 500 kV line Termination (Dominion) | Nextera<br>FirstEnergy<br>Dominion | 646.69 | 1,038.75 | 6/1/2027 | Mostly Greenfield parallel to existing ROW, Part Brownfield, Part Greenfield |
| South | 837<br>516<br>660 | Doubs - Goose Creek 500 kV Rebuild<br>New Doubs - Aspen 500 kV Line | FirstEnergy<br>Dominion<br>PEPCO | 336.20 | 378.51 | 12/1/2027 | Brownfield routes |
| | 711 | New Morrisville - Vint Hill - Wishing Star 500 kV | Dominion | 953.71 | 1,010.48 | 12/1/2027 | Brownfield routes |
| | 231 | Morrisville, Wishing Star, Mars and Beaumeade Substation Reactive Upgrades | Dominion | 103.80 | 103.80 | 12/1/2027 | Substation upgrades |
| | 74, 211, 731, 967 | Proposed Dominion 230 kV Upgrades | Dominion | 302.82 | 302.82 | 12/1/2027 | Brownfield upgrades |
| | PJM Identified Upgrades | Line #256 Rebuild St. Johns - Ladysmith CT 230 kV<br>Sterling Park – Golden 230 kV Reconductor<br>Davis Drive – Sterling Park 230 kV Reconductor | Dominion | 51.39 | 51.39 | 12/1/2027 | Brownfield upgrades |
| Dominion Data Center Alley | 692 | New Aspen and Golden 500/230 kV Substation & Mars Station Upgrade<br>New Aspen - Golden - Mars 500 kV and 230 kV lines | Dominion | 1,058.45 | 1,098.96 | 12/1/2027 | Greenfield routes & greenfield substation |
| Local | 410 | Cloverdale Breaker Reconfiguration | AEP | 11.59 | 11.59 | 10/1/2026 | Substation upgrades |
| * NJ SAA Project b3737.47 accelerated from 6/1/2029 ISD to 12/1/2027 ISD and scope updated to address 2022W3 needs | | | TOTAL | 4,934.56 | 5,407.86 | | |

# Reliability Analysis Update



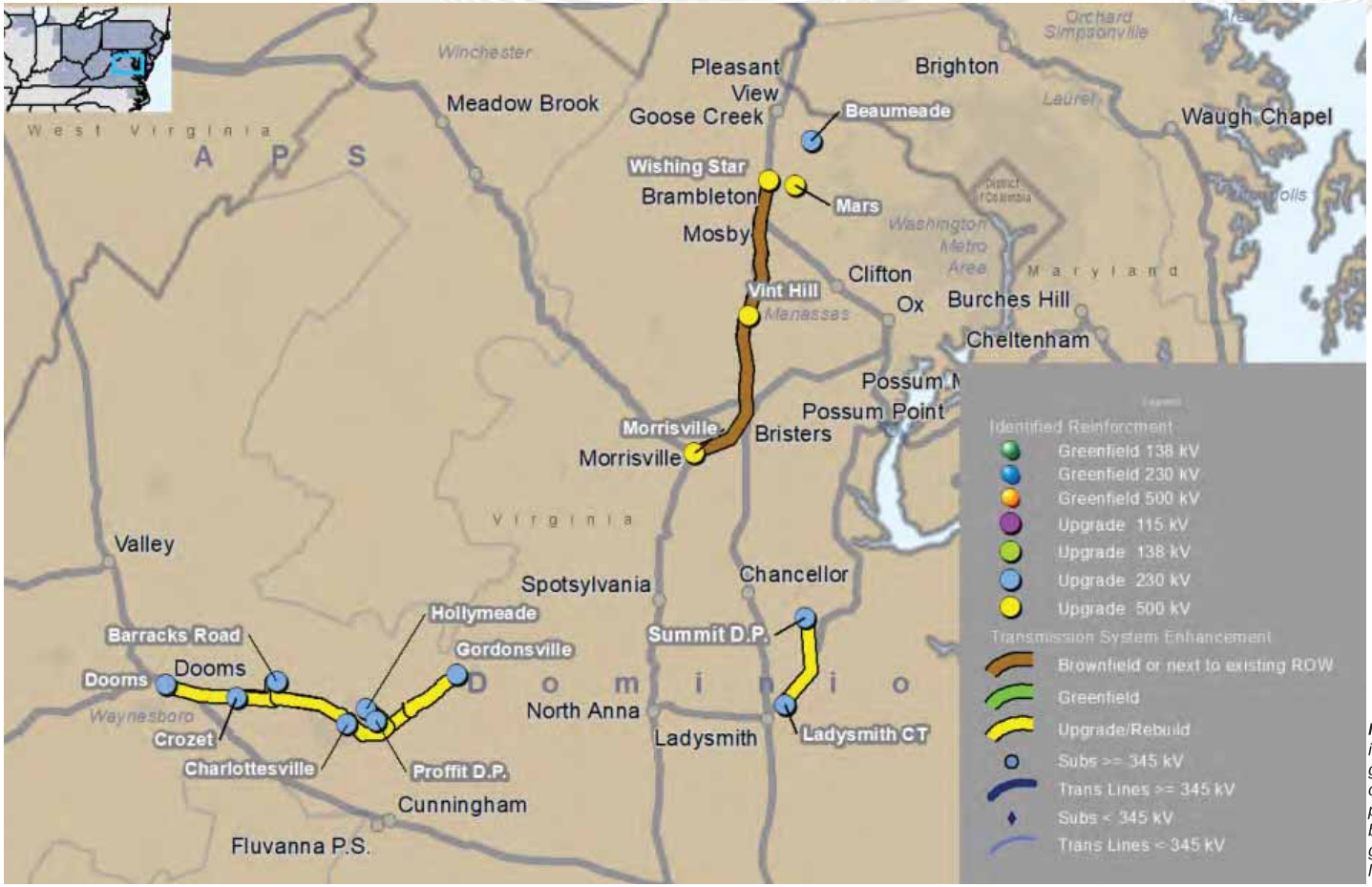
Sami Abdulsalam, Senior Manager
PJM Transmission Planning

Transmission Expansion Advisory Committee
December 5, 2023

# South Cluster - Selected Proposals

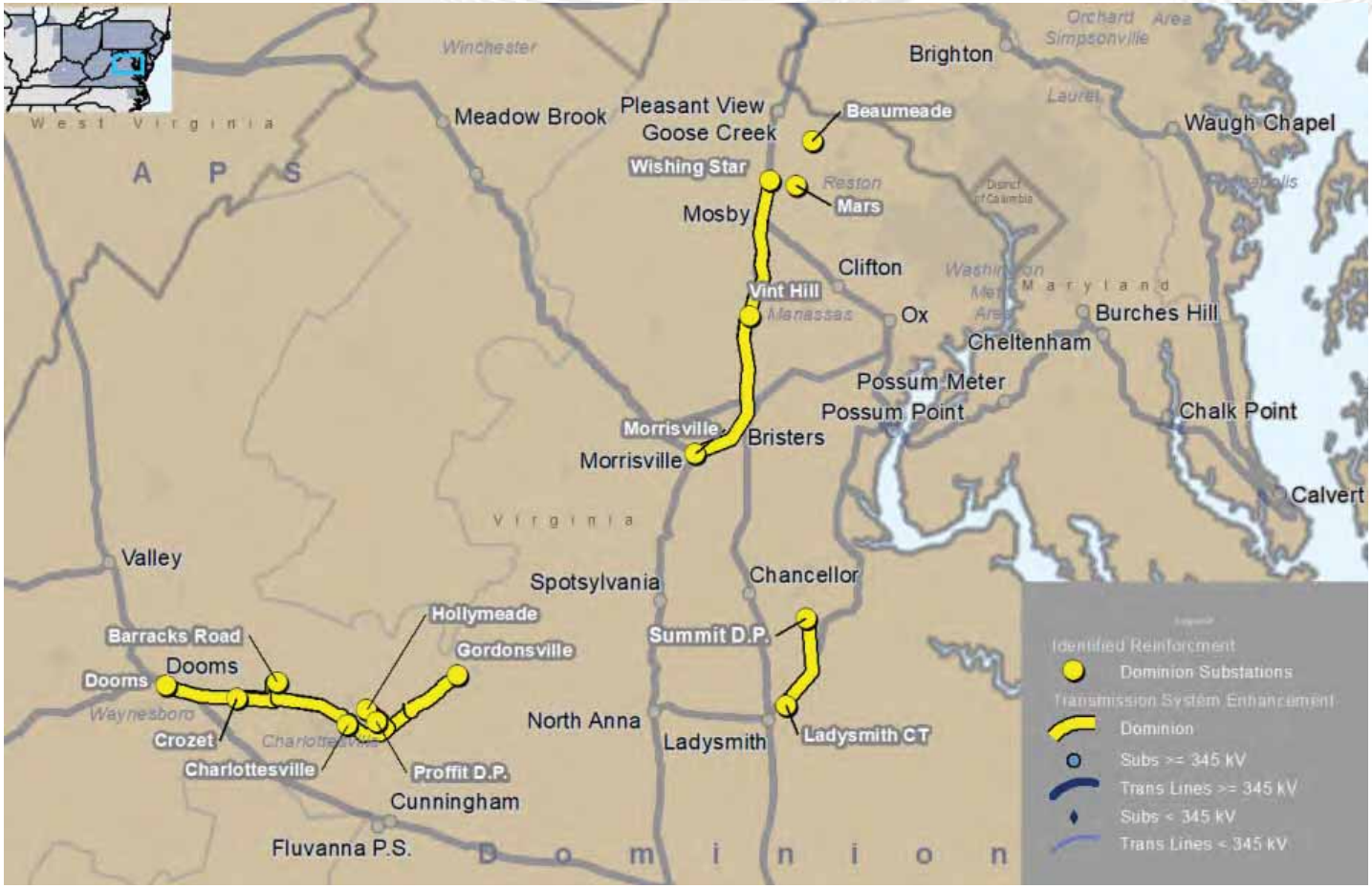
## Baseline Reliability Projects

# 2022W3 – Recommended Solutions: South Cluster




***NOTE:*** *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

# 2022W3 – Recommended Solutions: South Cluster by Designated Entity

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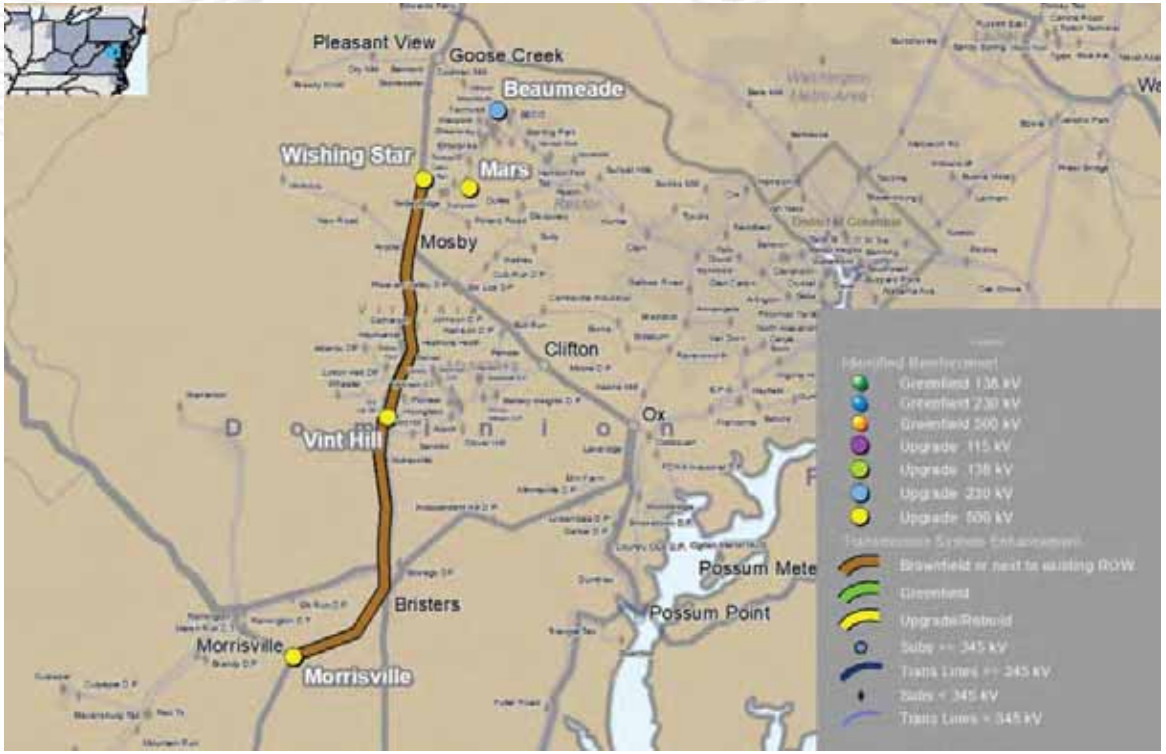
# 2022W3 – Recommended Solutions: South Cluster

**Recommended Solution:** 2022-W3-711 (**Partial**)

- Build a new 500kV line from Morrisville – Vint Hill – Wishing Star (approximately 36.3 miles) while maximizing the use of existing ROW within this corridor.
- Wrecking and rebuilding both the 5-2 towers in the Morrisville-Loudoun-Brambleton corridor to free up space for the new single-500kV monopole within the same corridor.
  - 500kV Line #545 Bristers - Morrisville rebuild
  - 500kV Line #569 Loudoun to Morrisville rebuild
  - 500kV Line #535 Meadowbrook - Loudoun rebuild
  - 500kV Line #546 Mosby - Wishing Star rebuild
  - 500kV Line #590 Mosby - Wishing Star rebuild
  - 230kV Line #2030 Gainesville - Loudoun rebuild
  - 230kV Line #2045 Loudoun - Brambleton rebuild
  - 230kV Line #2094 & 2227 Brambleton - Racefield - Loudoun rebuild
  - 230kV Line #2101 Bristers - Vint Hill rebuild
  - 230kV Line #2114 Remington CT - Rollins Ford rebuild




***NOTE:*** *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

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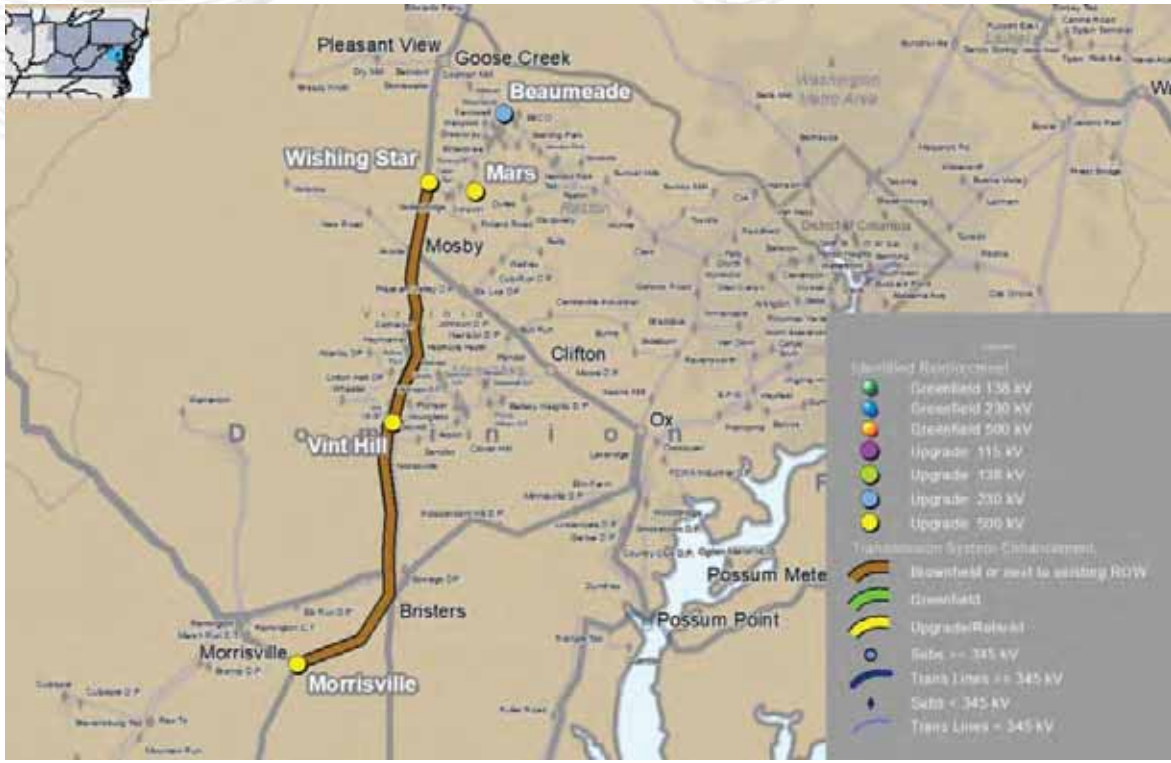
# 2022W3 – Recommended Solutions: South Cluster

Recommended **Solution:** 2022-W3-711 (Partial)

- 230kV Line #2140 Loudoun - Heathcote rebuild
- 230kV Line #2151 Railroad DP - Gainesville rebuild
- 230kV Line #2163 Vint Hill - Liberty rebuild
- 230kV Line #2176 Heathcote - Gainesville rebuild
- 230kV Line #2222 Rollins Ford - Gainesville rebuild
- 115kV Line #183 Bristers - Ox rebuild

- Substation upgrades at:
  - Bristers, Brambleton, Dawkins Branch, Gainesville, Heathcote, Loudoun, Mint Springs, Morrisville, Mosby, North Star, Racefield, Railroad, Vint Hill, Wishing Star, Youngs Branch
- Breaker upgrades at the following substations:
  - Loudoun 230kV, Ox 500kV

**Baseline # B3800.311 – B3800.357**



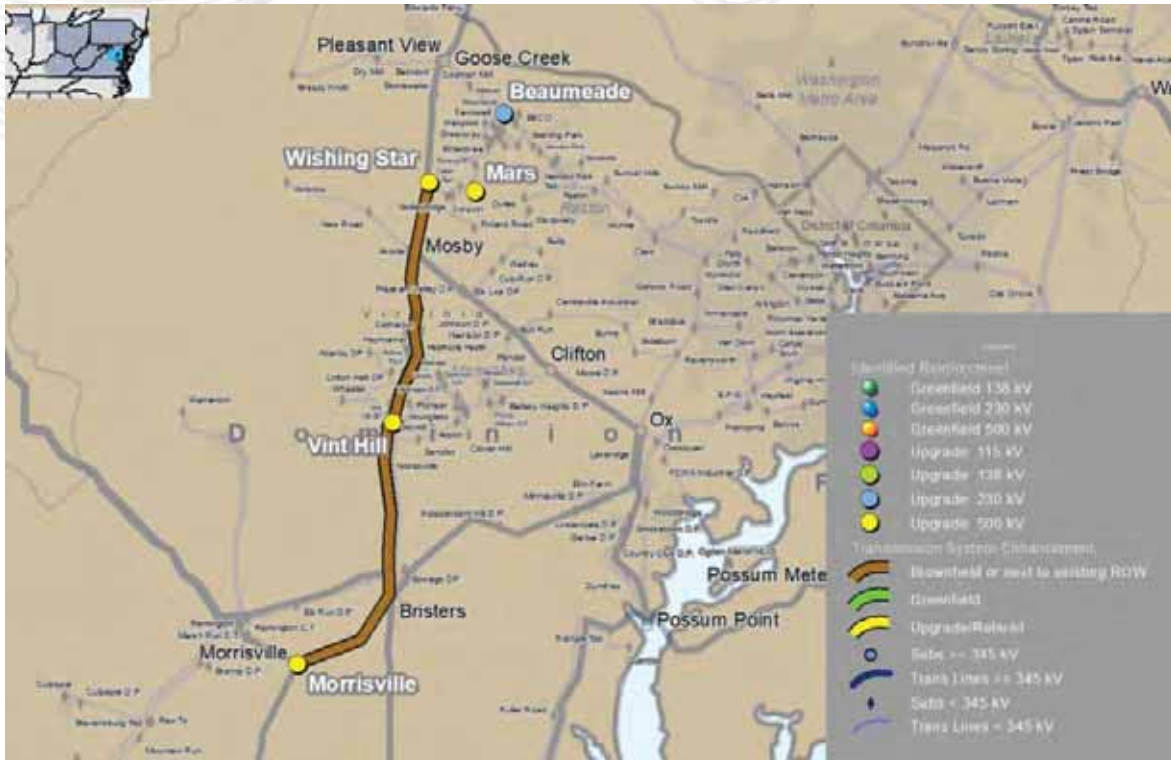

***NOTE:*** *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Continued on next slide…

# 2022W3 – Recommended Solutions: South Cluster

**Existing Facility Ratings:**

| Branch | SN/SE/WN/WE (MVA) |
|---|---|
| 500kV Line #545 Bristers – Morrisville | 3426/3426/4375/4375 |
| 500kV Line #569 Loudoun - Morrisville | 3426/3426/3464/3464 |
| 500kV Line #535 Vint Hill – Loudoun | 3572/3622/4560/4599 |
| 500kV Line #546 Mosby - Wishing Star | 4295/4357/5155/5155 |
| 500kV Line #590 Mosby - Wishing Star | 3464/3464/3984/4018 |
| 230kV Line #2030 Gainesville – Loudoun | 1047/1047/1160/1160 |
| 230kV Line #2045 Loudoun – Brambleton | 1047/1047/1160/1160 |
| 230kV Line #2094 & 2227 Brambleton - Racefield - Loudoun | 1047/1047/1160/1160 |
| 230kV Line #2101 Bristers - Vint Hill | 1047/1047/1160/1160 |
| 230kV Line #2114 Remington CT - Rollin Ford | 1573/1573/1648/1648 |
| 230kV Line #2140 Loudoun – Heathcote | 1047/1047/1160/1160 |
| 230kV Line #2151 Railroad DP – Gainesville | 1573/1573/1648/1648 |
| 230kV Line #2163 Vint Hill – Liberty | 1573/1573/1648/1648 |
| 230kV Line #2176 Heathcote – Gainesville | 1047/1047/1160/1160 |
| 230kV Line #2222 Rollins Ford – Gainesville | 1573/1573/1648/1648 |
| 115kV Line #183 Bristers – Ox | 1573/1573/1648/1648 (@230kV) |
| 500kV Line Vint Hill to Wishing Star | NA |
| 500kV Line Morrisville - Vint Hill | NA |



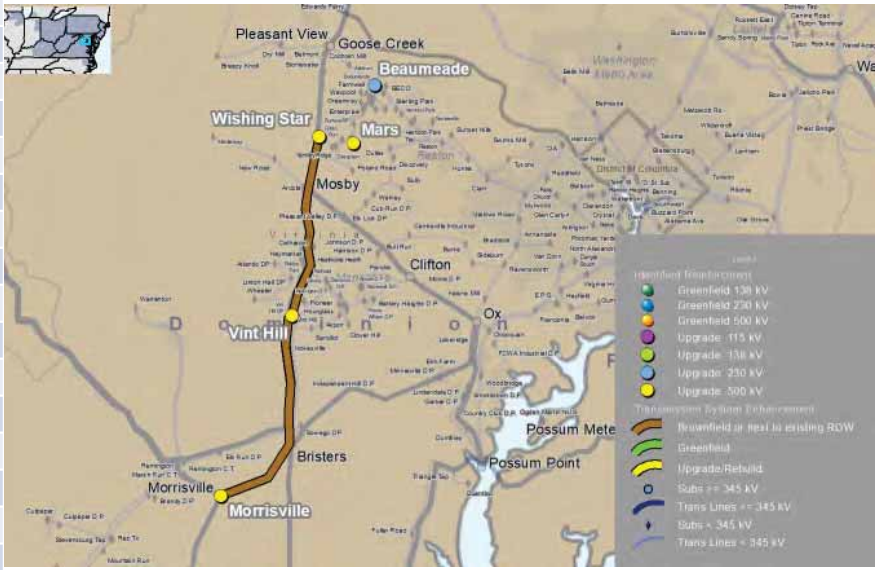

***NOTE:*** *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Continued on next slide…

# 2022W3 – Recommended Solutions: South Cluster

**Preliminary Facility Ratings:**

| Branch | SN/SE/WN/WE (MVA) |
|---|---|
| 500kV Line #545 Bristers – Morrisville | 4357/4357/5155/5155 |
| 500kV Line #569 Loudoun - Morrisville | 4357/4357/5155/5155 |
| 500kV Line #535 Vint Hill – Loudoun | 4357/4357/5155/5155 |
| 500kV Line #546 Mosby - Wishing Star | 4357/4357/5155/5155 |
| 500kV Line #590 Mosby - Wishing Star | 4357/4357/5155/5155 |
| 230kV Line #2030 Gainesville – Loudoun | 1573/1573/1648/1648 |
| 230kV Line #2045 Loudoun – Brambleton | 1573/1573/1648/1648 |
| 230kV Line #2094 & 2227 Brambleton - Racefield - Loudoun | 1573/1573/1648/1648 |
| 230kV Line #2101 Bristers - Vint Hill | 1573/1573/1648/1648 |
| 230kV Line #2114 Remington CT - Rollin Ford | 1573/1573/1648/1648 |
| 230kV Line #2140 Loudoun – Heathcote | 1573/1573/1648/1648 |
| 230kV Line #2151 Railroad DP – Gainesville | 1573/1573/1648/1648 |
| 230kV Line #2163 Vint Hill – Liberty | 1573/1573/1648/1648 |
| 230kV Line #2176 Heathcote – Gainesville | 1047/1047/1160/1160 |
| 230kV Line #2222 Rollins Ford – Gainesville | 1573/1573/1648/1648 |
| 115kV Line #183 Bristers – Ox | 1573/1573/1648/1648 (@230kV) |
| 500kV Line Vint Hill to Wishing Star | 4357/4357/5155/5155 |
| 500kV Line Morrisville - Vint Hill | 4357/4357/5155/5155 |




***NOTE:*** *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

**Estimated Cost: $842.19 M**

**Required IS Date:** 6/1/2027
**Projected IS Date:** 6/1/2028

Continued on next slide…

# Constructability & Financial Analysis Report

## 2022 RTEP Window 3

November 17, 2023

For Public Use

*The information contained herein is based on information provided in project proposals submitted to PJM by third parties through its 2022 RTEP Window 3. PJM analyzed such information for the purpose of identifying potential solutions for the 2022 RTEP Window 3. Any decision made using this information should be based upon independent review and analysis and shall not form the basis of any claim against PJM.*

*This maps contained in this report are only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.*

# Table of Contents

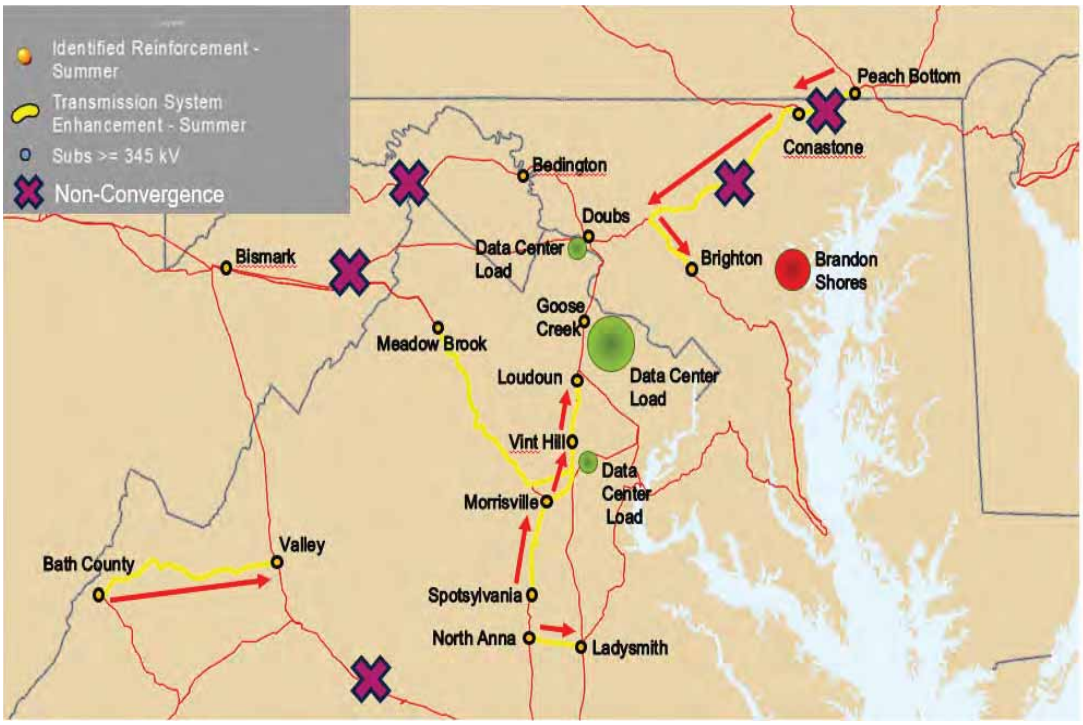
# INTRODUCTION

## Window Objective

The objective of the 2022 RTEP Window 3 is to develop robust, holistic and expandable solutions that address the 2027/28 baseline violations as illustrated in Map 1 associated with:

- Local Constraints: Resulting from directly serving the data center loads in APS and Dominion zones through the respective 230 kV networks and into the points of delivery:
  - Goose Creek-Ashburn-Mars-Wishing Star and Brambleton
- Regional Constraints: Resulting from imports into load center areas (500 kV primarily):
  - Doubs-Goose Creek
  - Front Royal-Morrisville-Vint Hill-Loudoun/Mosby
  - Meadow Brook-Loudoun/Mosby
  - Morrisville-Bristers-Ox
  - Peach Bottom-Conastone-Brighton-Doubs
- Reactive Power Needs: Needed reactive power MVAR reinforcements, both static and dynamic as deemed necessary, to address the reactive power needs of the system for the 2027/28 baseline scenario
- Cummulative Impact of Generation Changes and Deactivations:
  - 11,100 MW of announced deactivations to the west and south of Conastone
  - Approximately 5,300 MW occurring after the 2022 RTEP 2027 case was created
  - The vast majority of the new generation with signed ISAs has been solar, which has low availability during the winter period.
  - The replacement generation is coming from the region to the east of Peach Bottom as well as west of Doubs to meet projected load growth.
  - PJM has implemented a new block dispatch procedure.
  - The old dispatch procedure in the past (including that implemented in the 2027 study cases) maintained historical intraregional transfers, dispatching most of the generators in the Dominion zone at 100%.
- Adherance to All Applicable Criteria: The recommended solution must adhere to all applicable planning criteria, including PJM, NERC, SERC, RFC and local Transmission Owner FERC 715 criteria.

Map 1. 2022 RTEP Window 3 Map of Regional/Local Needs




## Proposals Submitted to PJM

PJM received 72 proposals from ten different entities as part of this window. Of the ten proposing entities, six were incumbent Transmission Owners (TOs) and four were non-incumbent entities. PJM received 22 proposals that involve upgrades to existing facilities, and 50 proposals that include new greenfield/brownfield facilities. The total cost of all proposals received, not all of which are required, add up to approximately $50.7 billion. The proposals include:

- 230 kV, 500 kV and 765 kV developments
- HVDC developments
- Underground 500 kV AC cable developments
- 500 kV GIS substations
- Double circuit 500 kV proposals

## *Proposal Clusters/Groupings*

Map 2 below shows the regional nature of the proposals, concentrating in four clusters: West, South, East and Northern Virginia (VA) Data Center areas. Each cluster included proposals by different entities in the same need area and/or addressed the same local/regional needs.

Map 2. Regional Clusters

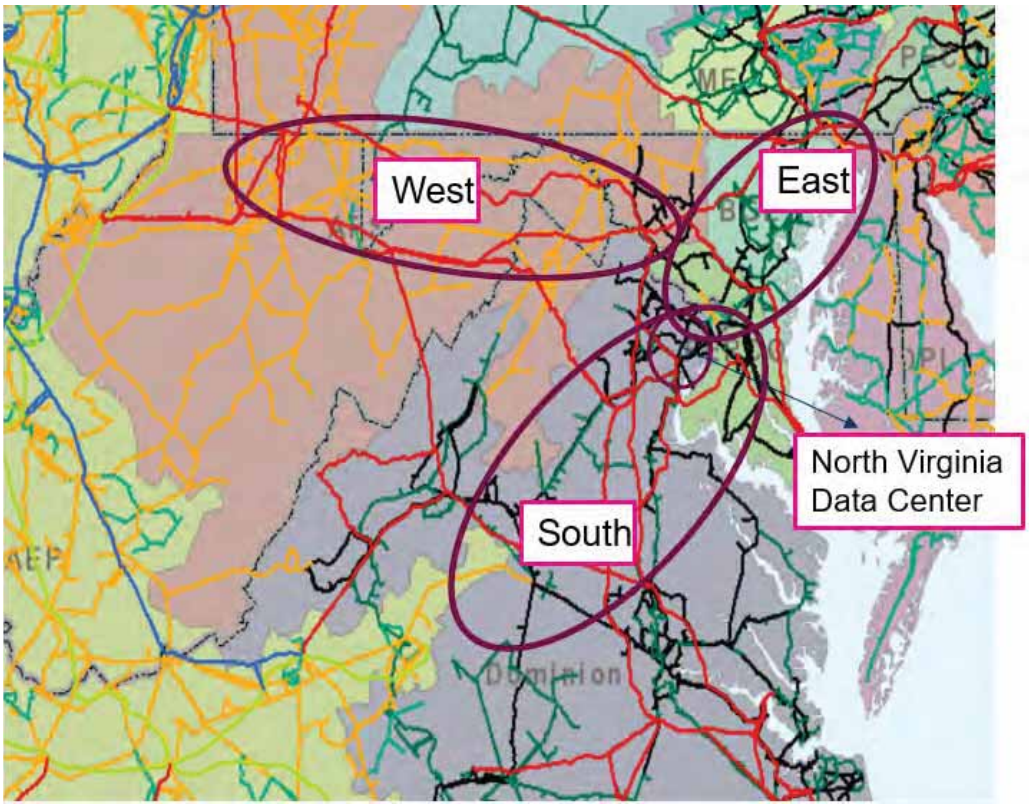



Table 1. 2022 RTEP Window 3 Submitted Proposals

| # | ID | Proposing Entity | Focus Area | Project Title | Submitted Cost ($M) |
|---|---|---|---|---|---|
| 1 | 9 | AEP | Local AEP | Scottsville-Bremo Sag Study | $1.27 |
| 2 | 55 | | | Boxwood-Scottsville 138 kV Rebuild | $104.88 |
| 3 | 181 | | | Boxwood-Scottsville 138 kV Sag Study | $4.26 |
| 4 | 196 | | | Glen Lyn-Peters Mountain Rebuild | $21.89 |
| 5 | 202 | | | Cloverdale Transformer Addition | $57.29 |
| 6 | 234 | | | Glen Lyn-Peters Mountain Sag Study | $0.80 |
| 7 | 410 | | | Cloverdale Breaker Reconfiguration | $11.59 |
| 8 | 477 | | | Fieldale-Franklin Rebuild | $74.89 |
| 9 | 524 | | | Opossum Creek and New London Reactors | $8.86 |
| 10 | 537 | | | Fieldale-Franklin Sag Study | $30.19 |
| 11 | 629 | | | Scottsville-Bremo Rebuild | $31.31 |
| 12 | 856 | | | Leesville-Altavista Rebuild | $28.85 |
| 13 | 487 | Transource | Combo | Maryland & Pennsylvania Baseline Reliability Solution | $492.75 |
| 14 | 858 | | Northern VA | Stork-Flys 500 kV Greenfield Line and Substations | $510.44 |

| # | ID | Proposing Entity | Focus Area | Project Title | Submitted Cost ($M) |
|---|---|---|---|---|---|
| 15 | 904 | | Combo | Joshua Falls-Yeat 765 kV Greenfield Line and Substation | $1,048.10 |
| 16 | 977 | | South | Yeat 500/230 kV Greenfield Station | $232.14 |
| 17 | 30 | Dominion | Local DOM | Charlottesville-Hollymead Line No. 2054 Rebuild | $159.87 |
| 18 | 74 | | | Line No. 2090 (Ladysmith CT-Fredericksburg) Rebuild | $57.34 |
| 19 | 129 | | South | Dominion Aggregate 500 kV Proposal | $3,035.05 |
| 20 | 211 | | Local DOM | Hollymead-Gordonsville Line No. 2135 Rebuild | $54.85 |
| 21 | 231 | | | Reactive Power VAR Reinforcements | $155.82 |
| 22 | 516 | | East | Interregional solution-Aspen-Doubs Second 500 kV Line | $61.72 |
| 23 | 671 | | Local DOM | Lines No. 541 (Front Royal to Morrisville) Rebuild | $299.03 |
| 24 | 692 | | Northern VA | Data Center Alley Local solution-New 500 kV/230 kV Aspen-Golden & Golden-Mars lines | $1,058.45 |
| 25 | 704 | | Local DOM | Hollymead-Gordonsville Line No. 2135 Rebuild | $36.89 |
| 26 | 711 | | South | Regional Solution-500 kV North Anna-Wishing Star Upgrades | $1,227.84 |
| 27 | 731 | | Local DOM | Locks Substation 230/115 kV Transformer Upgrade | $7.14 |
| 28 | 923 | | South | Second 500 kV line from Lexington to Dooms | $232.18 |
| 29 | 967 | | Local DOM | Charlottesville-Hollymead Line # 2054 Rebuild | $183.48 |
| 30 | 548 | LS Power | Combo | RTEP Window 3 Solution | $2,404.48 |
| 31 | 28 | NextEra | West | Hunterstown-Doubs-Goose Creek, Black Oak-Pike-Goose Creek, Pike SVC + Cap Banks | $884.05 |
| 32 | 116 | | | Hunterstown-Doubs-Gant Solution | $478.87 |
| 33 | 175 | NextEra | Combo | Combination of PEBO 215A + WOP 1F + SOP 8E | $6,265.95* |
| 34 | 217 | | East | North Delta-Conastone Solution | $155.99 |
| 35 | 255 | | West | Hunterstown-Doubs-Gant Solution | $411.61 |
| 36 | 279 | | West | Black Oak-Woodside-Goose Creek, Woodside SVC + Cap Banks Solution | $429.18 |
| 37 | 347 | | West | Black Oak-Woodside-Gant, Woodside SVC + Cap Banks | $483.83 |
| 38 | 385 | | East | New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation | $1,140.73 |
| 39 | 419 | | West | Hunterstown-Doubs-Audobon-Goose Creek | $548.75 |
| 40 | 445 | | East | Muddy Creek/Delta-Conastone/Hunterstown-Doubs-Goose Creek Solution | $637.80 |
| 41 | 530 | | East | Muddy Creek/North Delta-Conastone Solution | $166.74 |
| 42 | 564 | | East | New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation | $876.88 |

| # | ID | Proposing Entity | Focus Area | Project Title | Submitted Cost ($M) |
|---|---|---|---|---|---|
| 43 | 577 | | South | Front Royal-Racefield, Warrenton-Wheeler, North Anna-Lady Smith | $258.38 |
| 44 | 598 | | Combo | Combination of PEBO 220 + WOP 1F + SOP 8E | $2,036.47 |
| 45 | 631 | | East | Muddy Creek/North Delta-Conastone Solution | $184.47 |
| 46 | 642 | | West | 502 Junction-Black Oak-Woodside-Gant, Woodside SVC + Cap Banks, Gant-Farmwell, Cochran Tap-Round Table | $747.31 |
| 47 | 663 | | South | Front Royal-Racefield, Warrenton-Rixlew, Warrenton-Hourglass, Mars-Ocean Court-Davis Drive | $284.17 |
| 48 | 676 | | West | Black Oak-Stonewall-Gant, Stonewall SVC + Cap Banks, Gant-Farmwell, Cochran Tap-Round Table Solution | $552.49 |
| 49 | 685 | | West | Ft. Martin-Black Oak-Woodside, Woodside SVC + Cap Banks Solution | $609.78 |
| 50 | 719 | | West | Ft. Martin-Black Oak-Pike, Pike SVC + Cap Banks Solution | $600.90 |
| 51 | 728 | | West | Barnhart Substation, Bartholow Substation, Barnhart-Bartholow-Goose Creek solution | $385.36 |
| 52 | 766 | | South | Front Royal-Racefield, Warrenton-Wheeler | $239.59 |
| 53 | 846 | | West | Hunterstown-Doubs-Goose Creek, Black Oak-Woodside-Goose Creek, Stonewall SVC + Cap Banks | $892.94 |
| 54 | 853 | | West | 502 Junction-Black Oak-Woodside-Gant, Woodside SVC + Cap Banks | $683.55 |
| 55 | 948 | | East | New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation, and Keeney to Waugh Chapel tie-in | $5,381.25* |
| 56 | 951 | NextEra | West | Black Oak-Gore-Goose Creek, Pike SVC + Cap Bank Solution | $419.86 |
| 57 | 344 | PECO | East | PECO Expansion Plan for DOM Window 2023 | $302.86 |
| 58 | 600 | | Local Other | Exelon Replacement Upgrades | $423.79 |
| 59 | 660 | PEPCO | East | West Cooper BGE-PEPCO | $1,105.62 |
| 60 | 691 | | | Mid-Atlantic Power Pathway (MAPP) | $1,990.28 |
| 61 | 23 | POTOED-FirstEnergy | Combo | Data Center Reinforcement Proposal No. 2 | $3,503.86 |
| 62 | 837 | | | Data Center Reinforcement Proposal No. 1 | $2,991.77 |
| 63 | 374 | PPL | East | Otter Creek-Conastone 500 and 230 kV double circuit Line | $154.21 |
| 64 | 606 | | Local Other | Juniata-Lewistown 230 kV No. 2 line | $141.16 |
| 65 | 24 | PSEG | East | Proposal A-North Delta-New Raphael-Waugh Chapel 500 kV | $739.40 |
| 66 | 125 | | Local Other | Proposal B-North Delta-Northeast 230 kV | $313.34 |
| 67 | 229 | | East | Proposal C-Hunterstown-New Green Valley 500 kV | $529.11 |
| 68 | 325 | | Combo | Proposal E-Brambleton-Hinsons Ford Rd 500 kV | $944.05 |

| # | ID | Proposing Entity | Focus Area | Project Title | Submitted Cost ($M) |
|---|---|---|---|---|---|
| 69 | 637 | | East | Proposal D-Conastone-Doubs 500 kV | $684.22 |
| 70 | 741 | | | Proposal G-Peach Bottom-New Brandon Shores 500 kV; Peach Bottom-Doubs 500 kV | $1,065.32 |
| 71 | 808 | | | Proposal F-Peach Bottom-New Raphael-Waugh Chapel 500 kV; Peach Bottom-Doubs 500 kV | $1,150.80 |
| 72 | 962 | | | Proposal H-Peach Bottom-Doubs 500 kV (Circuits No. 1 and No. 2) | $977.71 |
| | | | | Total: | $54,408.06 |

**The NextEra proposal No. 175 cost was increased due to cost revision provided by proposing entity from approximately $1.6 billion to $5.4 billion.*

## Overview of Evaluation Approach

Following the submittal of proposals in a competitive planning solicitation, PJM performs technical analysis to assess the performance of proposed solutions to meet the identified system need(s). As described in PJM Manual 14F, the approach to technical analysis typically involves an initial analysis and screening phase followed by a more detailed analysis phase as may be required to evaluate solutions in a window with multiple competitive proposals and/or complex system needs. The detailed analysis included reliability, constructability, financial and legal reviews.

As noted in the previous section, PJM received 72 proposals from ten different entities as part of this window – six incumbent Transmission Owners (TOs) and four non-incumbent entities.

PJM performed an initial analysis and screening of all proposals as depicted in Figure 1. This phase of analysis also included a minimum of two rounds of PJM meetings with the proposing entities. The first round of meetings was conducted between June and July 2023, with the discussions intended to clarify details of proposed developments, assumptions and rationale of proposed alternatives/variations. The second round of meetings was conducted between July and August, with the focus of these discussions on outage scheduling, routing, risk and an explanation of cost containment mechanisms proposed.

PJM's initial analysis and screening involved generator deliverability screening of proposals for a preliminary understanding of reliability performance, and to ascertain how each proposal and its components may be used as stand-alone solutions or combined with other proposals to address the identified system needs. To aid in this process, PJM organized the proposals into regional clusters (East, West, South and Northern VA Data Center), thereby enabling selection of proposals and their components from each cluster to form holistic scenarios that address the overall system needs.

A select group of proposals were identified for detailed constructability and financial analysis, based on their performance in the initial analysis and screening. These selected proposals were then used to create a number of holistic scenarios to address the overall system needs that were then subject to further evaluation.

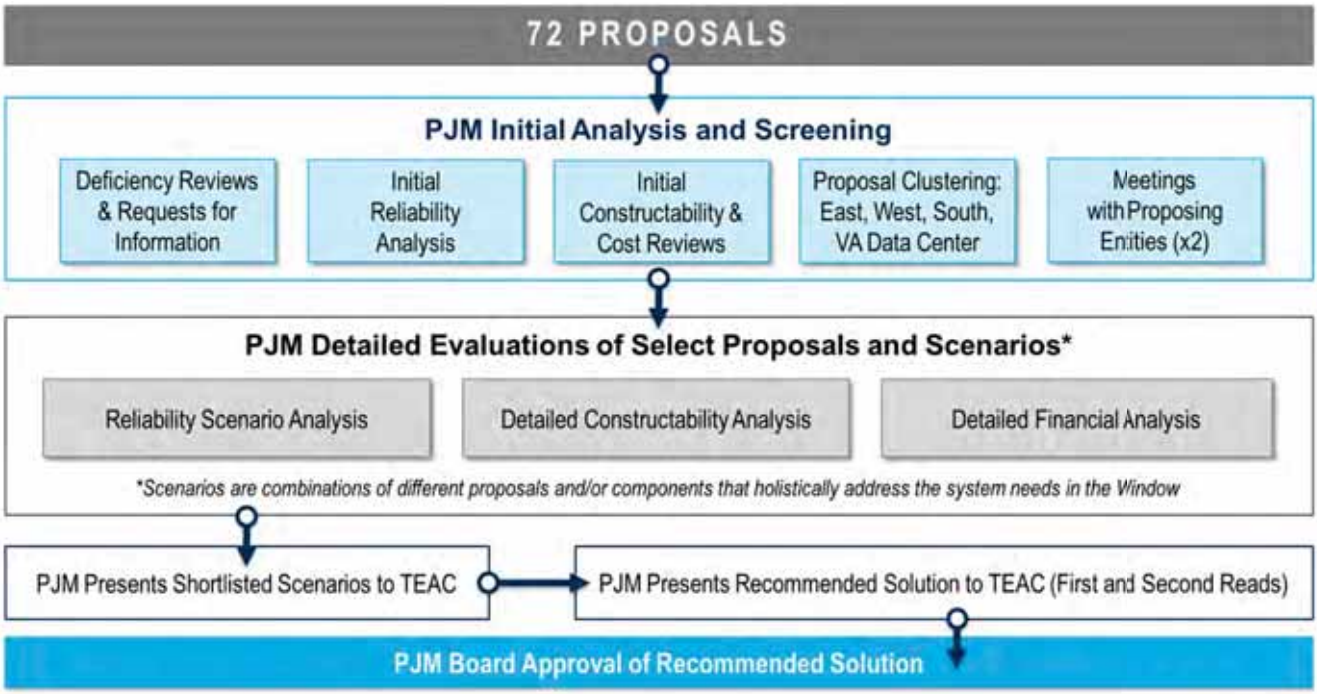
These scenarios, with their associated proposed developments, were evaluated based on the following principles:

- Performance
  - Meeting the system needs of 2027 and being flexible to address 2028 needs

- Scalability
  - Scenario/development longevity – system robustness and utilization
- Impact
  - Utilization of existing Right-of-Way (ROW) where possible and efficient.
- Validated
  - Cost evaluation using third-party benchmarking metrics
- Risks
  - Triggering additional costs:
    - Substation rebuilds due to extreme short-circuit levels
  - Avoid extended critical outages (Peach Bottom/Conastone rebuilds)
    - Imposing high permitting
    - Inability to meeting required in-service date
- Efficiencies
  - Avoidance of redundant capital investment including recognizing synergies with EOL facilities and overlaps of previously approved (or imminent) supplemental/baseline upgrades

The scenarios were developed and tested to first address the regional needs, then were refined through new scenarios to address local needs. Scenarios were further refined using more effective proposal components as demonstrated through their performance in the analysis.

Figure 1. Evaluation Process Overview




## Proposals Selected for Detailed Evaluations

### *East Proposal Cluster*

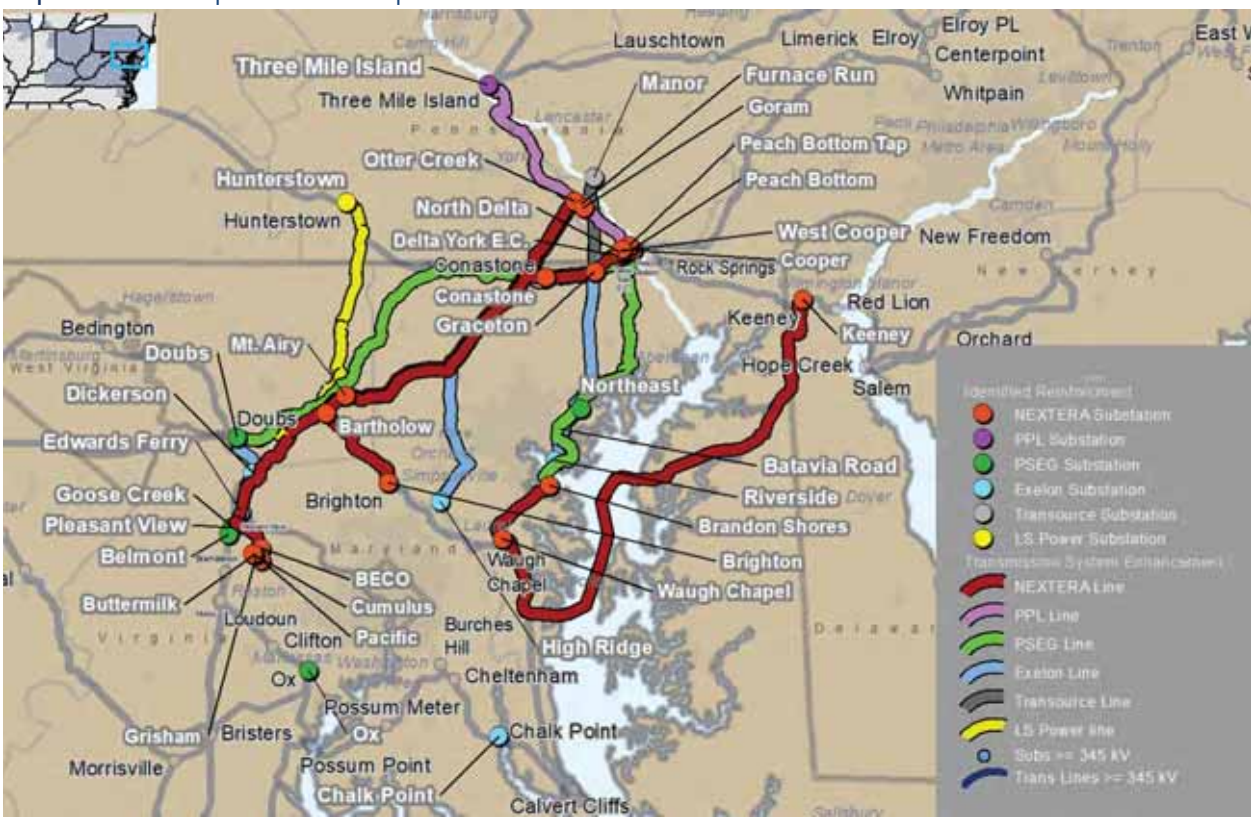
Seven entities submitted proposals to address the East cluster violations, and the selected proposals for detailed evaluations are provided in Table 2 and Map 3 below.

Table 2. East Proposal Cluster

| PJM Proposal ID | Proposing Entity | Project Title | Component ID | Component Name |
|---|---|---|---|---|
| 344 | Exelon (PECO) | PECO Expansion Plan for DOM Window 2023 | 1 | New 500 kV 4 Leg Breaker and a Half Substation (West Cooper): PECO |
| | | | 2 | New 230 kV Line from Cooper to West Cooper: PECO |
| | | | 4 | Peach Bottom North (PECO)-Graceton (BGE) New 500 kV Line: PECO Portion |

| PJM Proposal ID | Proposing Entity | Project Title | Component ID | Component Name |
|---|---|---|---|---|
| | | | 5 | West Cooper-Peach Bottom South New 500 kV Line: PECO |
| 344 Cont. | | | 6 | Rebuild 5012 500 kV Line and Cut-in West Cooper (Peach Bottom South-West Cooper): PECO |
| | | | 7 | Rebuild 5012 500 kV Line and Cut-in West Cooper (Graceton-West Cooper): PECO Portion |
| | | | 8 | New Breaker and a Half Leg at Peach Bottom North: PECO |
| | | | 10 | West Cooper (PECO)-High Ridge (BGE) New 500 kV Line: PECO Portion |
| | | | 14 | Calpine-Peach Bottom South 500 kV Line Cut In: PECO |
| | | | 15 | Peach Bottom South Substation Bypass: PECO |
| 660 | Exelon (BGE-PEPCO) | West Cooper BGE-PEPCO | All | All |
| 548 (East) | LS Power | RTEP Window 3 Solution-East Components | 10 | Conastone Substation Upgrade |
| | | | 13 | Hunterstown Substation Upgrade |
| | | | 14 | North Delta Substation Upgrade |
| | | | 21 | Peach Bottom Substation Upgrade |
| | | | 23 | Conastone-Peach Bottom Rebuild |
| | | | 27 | Hunterstown-Doubs Greenfield 500 kV Transmission Line |
| | | | 32 | Hunterstown-Doubs Greenfield 500 kV Transmission Line (Shared ROW) |
| | | | 35 | Conastone-North Delta Greenfield 500 kV Transmission line (Shared ROW) |
| | | | 37 | Peach Bottom-North Delta Reconductor |
| 637 | PSEG | Proposal D-Conastone-Doubs 500 kV | All | All |
| 741 | PSEG | Proposal G-Peach Bottom-New Brandon Shores 500 kV; Peach Bottom-Doubs 500 kV | All | All |
| 487 | Transource | Maryland & Pennsylvania Baseline Reliability Solution | All | All |
| 374 | PPL | Otter Creek-Conastone 500 and 230 kV double circuit Line | All | All |
| 948 | NextEra | New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation, and Keeney to Waugh Chapel tie-in. | All | All |

Map 3. East Proposal Cluster Map




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## *West Proposal Cluster*

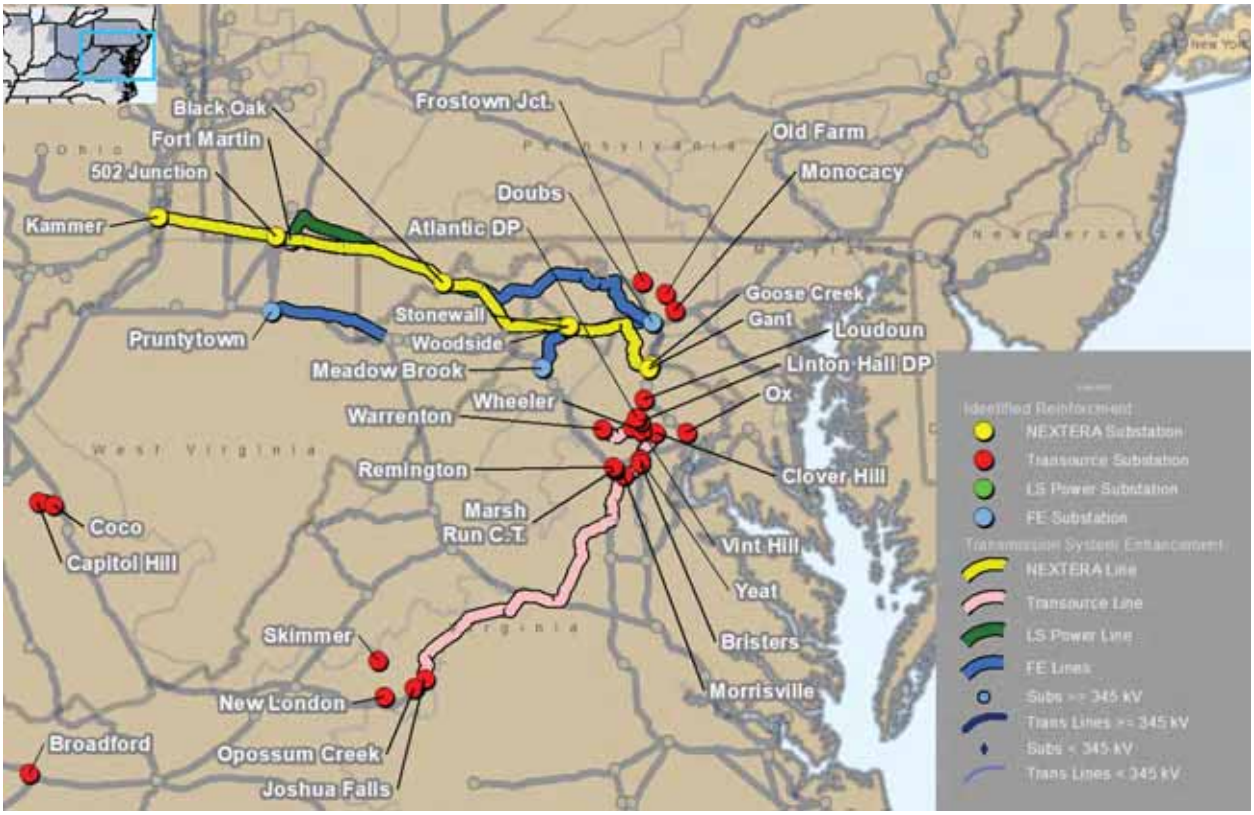
Four entities submitted proposals to address the West cluster violations, and the selected proposals for detailed evaluations are provided in Table 3 and Map 4 below.

Table 3. West Proposal Cluster

| PJM Proposal ID | Proposing Entity | Project Title | Component ID | Component Name |
|---|---|---|---|---|
| 837 (West) | POTOED – FirstEnergy | Data Center Reinforcement Proposal No. 1 | 1 | Doubs Substation – Install 500 kV Breaker |
| | | | 2 | Doubs Substation – Expand 500 kV Switchyard |
| | | | 3 | Meadow Brook Substation - Expand 500 kV Switchyard |
| | | | 4 | Fort Martin Substation – Install 500 kV Breaker |
| | | | 5 | Pruntytown Substation – Expand 500 kV Switchyard |
| | | | 6 | Bedington Substation – Rebuild & Install 600 MVAR STATCOM |
| | | | 7 | Fort Martin-Doubs 500 kV No. 1 Line |
| | | | 8 | Meadow Brook-Doubs 500 kV Line |

| PJM Proposal ID | Proposing Entity | Project Title | Component ID | Component Name |
|---|---|---|---|---|
| | | | 9 | Meadow Brook-Pruntytown 500 kV Line |
| 837 (West) Cont. | | | 10-13 | Relaying Upgrades – Various Stations |
| | | | 14,15 | Overduty Breaker Replacements – Doubs & Pruntytown |
| | | | 18-30 | Carroll-Hunterstown 230 kV Line |
| 548 (West) | LS Power | RTEP Window 3 Solution – West Components | 7 | 502 Junction Substation Upgrade |
| | | | 9 | Black Oak Substation Upgrade |
| | | | 11 | Doubs Substation Upgrade |
| | | | 25 | 502 Junction-Black Oak 500 kV Transmission Line |
| | | | 26 | Black Oak-Doubs Greenfield 500 kV Transmission Line |
| | | | 29 | Black Oak-Doubs Greenfield 500 kV Transmission Line (Shared ROW) |
| 853 | NextEra | 502 Junction-Black Oak-Woodside-Gant, Woodside SVC + Cap Banks | All | All |
| 904 | Transource | Joshua Falls-Yeat 765kV Greenfield Line and Substation | All | All |

Map 4. West Proposal Cluster Map




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## *South Proposal Cluster*

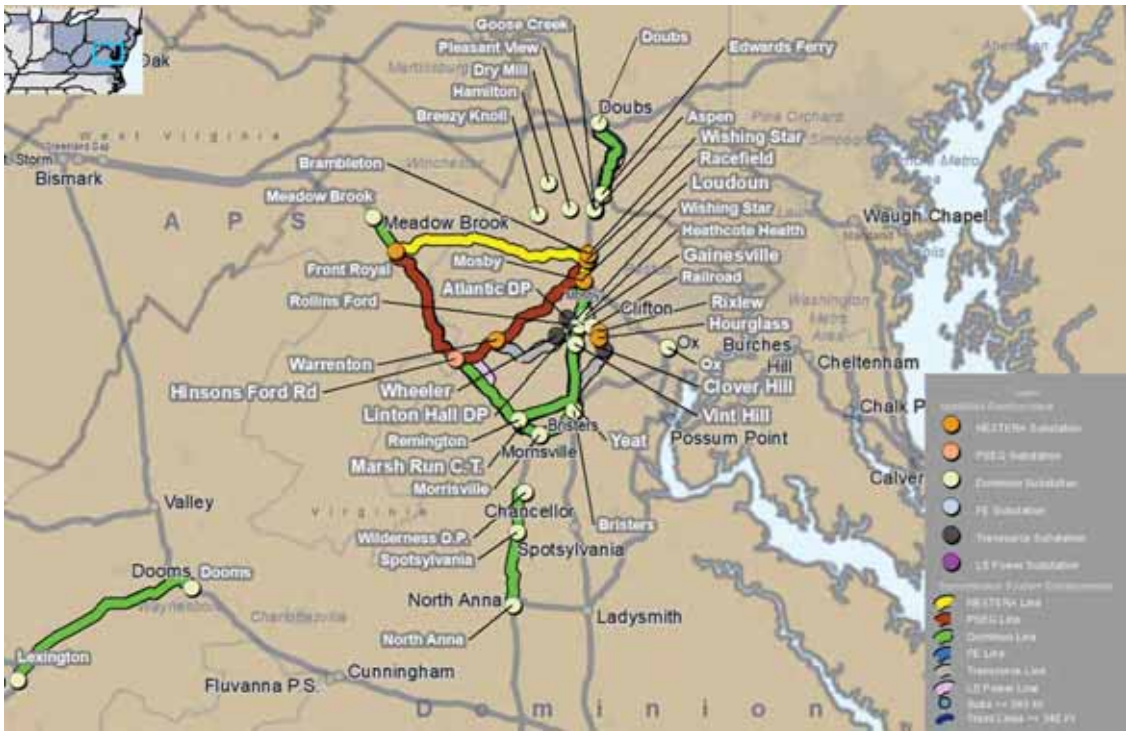
Five entities submitted proposals to address the South cluster violations, and the selected proposals for detailed evaluations are provided in Table 4 and Map 5 below.

Table 4. South Proposal Cluster

| PJM proposal ID | Proposing Entity | Project Title | Component ID | Component Name |
|---|---|---|---|---|
| 516 | Dominion | Interregional solution-Aspen-Doubs Second 500 kV Line | All | All |
| 711 | Dominion | Regional Solution-500 kV North Anna-Wishing Star Upgrades | All | All |
| 548 (South) | LS Power | RTEP Window 3 Solution | 12 | Goose Creek Substation Upgrade |
| | | | 15 | Vint Hill Substation Upgrade |
| | | | 22 | Vint Hill-Loudoun Reconductor |

| | | | | |
|---|---|---|---|---|
| | | | 28 | Doubs-Goose Creek Greenfield 500 kV Transmission Line |
| | | | 30 | Front Royal Substation Upgrade |
| | | | 33 | Doubs-Goose Creek Greenfield 500 kV Transmission Line (Shared ROW) |
| | | | 34 | Front Royal-Vint Hill Greenfield 500 kV Transmission Line |
| 325 | PSEG | Proposal E-Brambleton-Hinsons Ford Rd 500 kV | 9 | New Brambleton to Hinsons Ford Rd 500 kV Line |
| | | | 10 | Reconductor Front Royal-Hinson Ford Rd 500 kV |
| | | | 12 | Hinsons Ford Rd 500 kV |
| 837 (South) | POTOED - FirstEnergy | Data Center Reinforcement Proposal No. 1 | 16 | Doubs-Goose Creek 500 kV Rebuild |
| | | | 17 | Doubs-Aspen 500 kV Line |
| 663 | NextEra | Front Royal-Racefield, Warrenton-Rixlew, Warrenton-Hourglass, Mars-Ocean Court-Davis Drive | All | All |

## Map 5. South Proposal Cluster Map




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

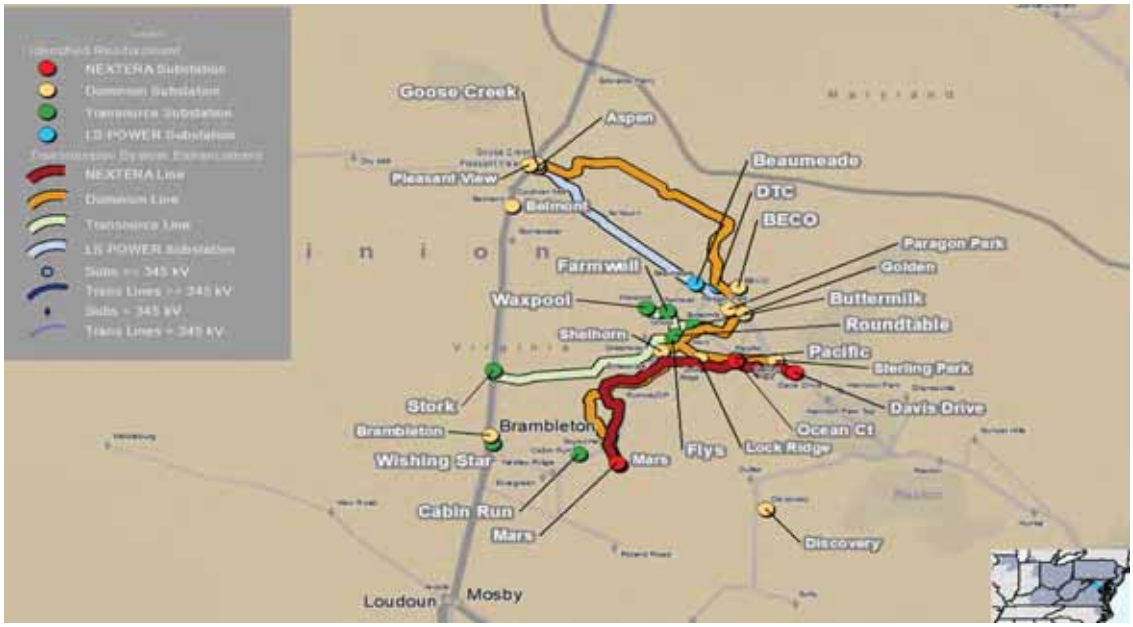
## *Northern VA Data Center Proposal Cluster*

Three entities submitted proposals to address the Northern VA Data Center cluster violations, and the selected proposals for detailed evaluations are provided in Table 5 and Map 6 below.

Table 5. Northern VA Data Center Cluster

| PJM Proposal ID | Proposing Entity | Project Title | Component ID | Component Name |
|---|---|---|---|---|
| 692 | Dominion | Data Center Alley Local solution – New 500 kV/230 kV Aspen-Golden & Golden-Mars lines | All | All |
| 858 | Transource | Stork-Flys 500 kV Greenfield Line and Substations | All | All |
| 548 (Dominion) | LSPower | RTEP Window 3 Solution | 8 | Beaumeade Substation Upgrade |
| | | | 16 | DTC Substation Upgrade |
| | | | 17 | Mars Substation Upgrade |
| | | | 24 | Beaumeade-BECO-DTC 230 kV Transmission Line Upgrade |
| 548 (Dominion) Cont. | | | 31 | BECO Substation Upgrade |
| | | | 36 | Goose Creek-Beaumeade Greenfield Underground 500 kV Double Circuit Transmission Line |

Map 6. Northern VA Data Center Proposal Cluster Map




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

# CONSTRUCTABILITY ANALYSIS

## Approach

The following is an outline of PJM and its consultant's approach for detailed constructability analysis of the selected projects:

**1 |** Environmental (Regulatory) Analysis: Examine each project utilizing available public-sector data, aerial photographs and internet-based real estate records to determine if the project is feasible and to identify potential regulatory permitting risks. The following is a list of the subtasks that are performed as part of this task:

(a) Conduct a desktop review to identify significant barriers that might add additional risk to the project, and determine whether the proposed project area (a study area that is defined for each project) can support the economical construction of the electric transmission and/or substation facilities.

The following target information will be referenced by as required and as allowable by available public data sources:

- National Wetland Inventory mapping from United States Fish and Wildlife Service (USFWS), which will include counts and acreages of:
  - Total Wetlands
  - Non-Tidal (Non-Forested) Wetlands
  - Non-Tidal (Forested) Wetlands
  - Total Non-Tidal Wetlands
  - Wetlands of Special State Concern
  - Subaqueous Lands
- Mapping of specially designated wetlands, streams or rivers, which will include:
  - Non-Tidal Waterbodies (Count/Acres)
  - 100-Year Flood Plain (Acres)
  - Watershed Boundaries (Count)
  - Outstanding and Exceptional Waters (Count)
  - Wild and Scenic Rivers (Count
  - United States Geologic Survey Blue Line Streams (Count)
- United States Department of Agriculture(USDA)/The Natural Resources Conservation Service (NRCS) Land Cover mapping, which will include acreages of:
  - Sub-Aquatic Vegetation
  - Forested Uplands
  - Unforested Uplands
  - Agricultural Lands
- Land Use Mapping, which will include:
  - Residences within 100 feet (Count)
  - Residences within 250 feet (Count)
  - Land Zoned Conservation (Acres)
  - Rural Legacy (Acres)
  - Program Open Space (Acres)
  - Private Conservation Easements (Acres & Count)
  - Public Land (Acres & Count)
  - Parcels Crossed (Count)
  - Green Infrastructure/Green Acres program (Acres)
  - National Estuarine Research Reserve Project Areas (Acres & Count)
  - Natural Heritage Areas (Acres & Count)
  - Environmental Trust Easements (Acres & Count)
  - Forest Legacy Easements (Acres & Count)
  - Tidelands

- Public Lands Mapping Review, which will include the types, counts and acreages of the following:
  - State/National Forests
  - Natural Areas
  - Preserves
  - Game Lands
  - Recreation Areas
- Cultural Resources Mapping Review, including the count of previously identified resources, which will include the types, counts, and acreages of the following:
  - Listed and Eligible Historic Structures
  - Listed and Eligible Historic Districts
  - Listed and Eligible Archeological Sites
- Aquatic Resource Mapping, including the count of Submerged Historic Resources (if applicable)
- Online distribution data of rare, threatened and endangered species within a 0.5 mile radius of the study area
- Major utility and transportation (roads and rail lines) corridors

(b) Identify those permits and agency consultations that are complex and require long lead times, therefore, potentially significantly affecting the project in-service date. Specifically, evaluate federal and state authorizations required for potential impacts to sensitive environmental resources such as wetlands, rivers and streams, coastal zone management areas, critical habitats, wildlife refuges, conservation land, rare, threatened and endangered species. The assessment will result in a preliminary list of potential siting issues and permits that could impact cost and/or schedule including estimated Agency review times. Anticipated permit requirements may include the following:

- U.S. Army Corps of Engineers (USACE) – Section 404 Clean Water Act and Section 10 Rivers and Harbors Act
- U.S. Fish and Wildlife Service (USFWS) – Section 7 Endangered Species Act, Migratory Bird Treaty Act, and Bald and Golden Eagle Protection Acts
- U.S. Forest Service – National Forest Special Use Permit and Archaeological Protection Resources Act
- National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service – Magnuson-Stevens Fishery Conservation and Management Act (MSA)
- U.S. Bureau of Ocean Energy Management
- U.S. Bureau of Land Management – ROW Grant and Archaeological Protection Resources Act
- Federal Aviation Administration (FAA) – Obstruction Determination and FAA Hazard Evaluation
- U.S. Coast Guard – Aids to Navigation
- State Commission approvals
- State Agency – Rare, threatened, and endangered species issues and clearance requirements
- State Historic Preservation Office (SHPO) and clearance requirements
- State Agency – Section 401 Water Quality Certifications and other applicable water permits
- State Agency – National Pollutant Discharge Elimination System permit
- Local and/or State floodplain permit requirements
- State Department of Transportation and clearance requirements

(c) Identify potential high-level risks and items that may require protracted permitting time frames or that may raise serious issues during the permitting process.

2 | Transmission Line Analysis: Review of transmission line modifications proposed based on desktop reviews investigating routing, conductor size and length, ROWs and easements, structures, and construction required

3 | Substation Analysis: Review of substation modifications proposed based on industry practices to estimate the equipment, bus and general layout required

4 | Construction Schedule: Prepare a preliminary project schedule for each project. The project schedule will be broken into four project phases: engineering; siting and major permit acquisition; long lead equipment procurement; and construction and commissioning. Any significant risks to the project schedule will be discussed.

5 | Cost Review: Prepare preliminary estimate for each project based on engineering expertise and the most recent material and equipment costs. Costs will be broken into seven (8) categories, as required: materials and equipment; engineering and design; construction and commissioning; permitting/routing/siting; right of-way (ROW)/land acquisition; construction management; company overheads and other miscellaneous costs; and project contingency (30%).

## Analysis Results

The following sections outline the results of PJM and its consultants' detailed constructability evaluations performed on select proposals and their components organized into the regional clusters defined by PJM. These results are also the basis for the Constructability Risk Assessment matrices that are included in Appendix A – Constructability Matrices of this report.

## East Proposal Cluster

### *Proposal 344 – Exelon (PECO)*

Proposal No. 344 (Map 7), described as PECO Expansion Plan for DOM Window 2023, is located within York, Lancaster and Chester counties, Pennsylvania, and includes the construction of several new lines and other distribution components. The majority of the components will be developed within existing ROWs. The proposed components will traverse within York County, Pennsylvania. Proposal No. 344 comprises the PECO portion of Exelon's West Cooper Max solution and is intended to be combined with Proposal No. 660, the BGE/PEPCO portion of Exelon's West Cooper Max solution.

Map 7. Proposal 344


*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

Proposal No. 344 includes seventeen components, representing two alternative solutions proposed by Exelon:

- The primary West Cooper Max solution, which involves building a new West Cooper 500/230 kV substation by cutting into and reconfiguring several 500 kV lines near Cooper substation, rebuilding the 5012 Peach Bottom-Conastone 500 kV, and building two new 500 kV lines from Peach Bottom to Graceton and the new West Cooper to High Ridge
- The alternative Peach Bottom Expansion solution, which involves expanding Peach Bottom substation to build two new 500 kV lines to Graceton (BGE) and High Ridge substation by retiring the 220-93 Cooper to Graceton to utilize the existing ROW, and also building new 230 kV substation to serve Cooper by cutting into existing 220-07 Muddy Run-Peach Bottom 230 kV line and building new line to Cooper, and rebuild of the 5012 Peach Bottom-Conastone 500 kV line

From Proposal 344, based on PJM's initial screening and analysis, only the 10 out of the 17 components associated with the West Cooper Max solution were selected for the detailed evaluations. These components are as follows:

- Component 1: New 500 kV 4 Leg breaker-and-a-half substation (West Cooper): PECO
- Component 2: New 230 kV line from Cooper to West Cooper: PECO

- Component 4: Peach Bottom North (PECO)-Graceton (BGE) new 500 kV line: PECO portion
- Component 5: West Cooper-Peach Bottom South new 500 kV line: PECO
- Component 6: Rebuild 5012 500 kV line and cut-in West Cooper (Peach Bottom South-West Cooper): PECO
- Component 7: Rebuild 5012 500 kV line and cut-in West Cooper (Graceton-West Cooper): PECO portion
- Component 8: New breaker-and-a-half leg at Peach Bottom North: PECO
- Component 10: West Cooper (PECO)-High Ridge (BGE) new 500 kV line: PECO portion
- Component 14: Calpine-Peach Bottom South 500 kV line cut in: PECO
- Component 15: Peach Bottom South substation bypass: PECO

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*Peach Bottom North (PECO)-Graceton (BGE) New 500 kV Line: PECO Portion*

This component of the proposal is for PECO's approximately 5.5-mile portion of greenfield 500 kV overhead transmission line from Peach Bottom North substation heading toward the Graceton substation. The line will travel through new ROW parallel to the existing Peach Bottom-Conastone 5012 500 kV line ROW for about 1.6 miles between Peach Bottom North and Cooper, transitioning to existing ROW from Cooper to Graceton by rebuilding Cooper to Graceton 230 kV line up to the Maryland/Pennsylvania state line. The line continues on to Graceton under BGE's portion of the line as part of Proposal 660.

*West Cooper-Peach Bottom South New 500 kV Line: PECO*

This component of the proposal is for an approximate 2.5-mile portion of 500 kV overhead transmission line from Peach Bottom South substation to the new West Cooper substation. The line will travel within new ROW between Peach Bottom South and West Cooper parallel to the existing Peach Bottom-Conastone 5012 500 kV line ROW. As proposed, the project will repurpose existing tie No. 1 transmission line between Peach Bottom North and Peach Bottom South; this is an additional feed line to West Cooper.

*West Cooper (PECO)-High Ridge (BGE) New 500 kV Line: PECO Portion*

This component of the proposal is for an approximate 4-mile portion of 500 kV greenfield overhead transmission line from the new West Cooper substation heading toward the expanded High Ridge substation. The line will travel on single circuit structures within existing ROW created by the demolition of Cooper to Graceton 230 kV and rebuild of Peach Bottom to Conastone 5012 500 kV line up to the Maryland/Pennsylvania state line. The line continues on to High Ridge under BGE's portion of the line as part of Proposal 660.

Overall, the ROW risk for components of this proposal is low, with extensive usage of existing ROWs for most of its alignment. It is anticipated that the proposal could require permits, consultations, clearances and authorizations from York County in Pennsylvania. State PSC Approval, CPCN and DOT utility permits and driveway/local road permits may be required.

### Environmental Risk Analysis

*Peach Bottom North (PECO)-Graceton (BGE) New 500 kV Line: PECO Portion*

Wetlands, waterbodies and high-risk flood zones appear to be crossed by the proposed line routes. The routes intersect seven waters that are subject to USACE Section 404 permitting. An on-site delineation would be required to

determine the actual location and extent of wetlands and waterbodies present and to assess permitting implications for jurisdictional features.

The proposed project components are within the range of both federally and state-listed species. The majority of the proposed routes are in woodlands. Construction restrictions, time frame, or mitigation may be necessary to comply with avoidance of sensitive species; however, the extent of which cannot be known until field studies are completed, and coordination with the USFWS and state wildlife agencies takes place.

Proposed routes intersect with protected areas (Private Easements). Coordination with NRCS Admin State PA; Pennsylvania State Government; and Pennsylvania Department of Agriculture – Farmland Preservation Program may be required.

Overall, the constructability risk for components of this proposal is low, with extensive usage of existing ROWs for most of its alignment.

### Transmission Line Risk Analysis

Given the extensive reuse of existing ROW for this proposal, transmission line construction risks are low and limited to concerns with existing overhead transmission infrastructure components needing to be removed/salvaged before construction of proposed brownfield lines can commence, and potential design limitations for reuse of existing infrastructure/assets.

A medium risk for this project involves the existing facility outages that will be necessary for the project, particularly for the extensive line rebuilds and substation expansions. To mitigate these risks, Exelon provided a detailed schedule outlining a sequence of construction that will ensure that new brownfield transmission lines are energized within the corridor prior to the rebuild of existing facilities that will require lengthy outages.

### Substation Risk Analysis

*New West Cooper 500/230 kV Substation*

The West Cooper substation is a proposed new 500/230 kV breaker-and-a-half substation in York County, Pennsylvania that would tie into two existing 500 kV lines and one existing 230 kV line in the area. The proposed substation will be a four bay breaker-and-a-half air-insulated 500 kV substation with 14, 5000A, 500 kV live tank circuit breakers, and a new 200 MVA, 500/34.5/13 kV autotransformer that will feed the new Cooper distribution substation.

Other substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, if selected, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

### Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 6.

Table 6. Proposal 344 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 1 | New 500 kV 4 Leg Breaker and a Half Substation (West Cooper): PECO | 68.75 | 93.88 |
| 2 | New 230 kV Line from Cooper to West Cooper: PECO | 1.96 | 2.98 |
| 4 | Peach Bottom North (PECO)-Graceton (BGE) New 500 kV Line: PECO Portion | 13.05 | 30.39 |
| 5 | West Cooper-Peach Bottom South New 500 kV Line: PECO | 5.50 | 9.40 |
| 6 | Rebuild 5012 500 kV Line and Cut-in West Cooper (Peach Bottom South-West Cooper): PECO | 7.86 | 13.09 |
| 7 | Rebuild 5012 500 kV Line and Cut-in West Cooper (Graceton-West Cooper): PECO Portion | 29.86 | 22.26 |
| 8 | New Breaker and a Half Leg at Peach Bottom North: PECO | 25.93 | 22.99 |
| 10 | West Cooper (PECO)-High Ridge (BGE) New 500 kV Line: PECO Portion | 13.36 | 16.45 |
| 14 | Calpine-Peach Bottom South 500 kV Line Cut In: PECO | 1.57 | 1.75 |
| 15 | Peach Bottom South Substation Bypass: PECO | 0.79 | 1.64 |
| | Total | 168.63 | 214.81 |

The total proposal cost estimate is within 10–20% of the independent cost estimate and is considered medium risk.

### Schedule Review

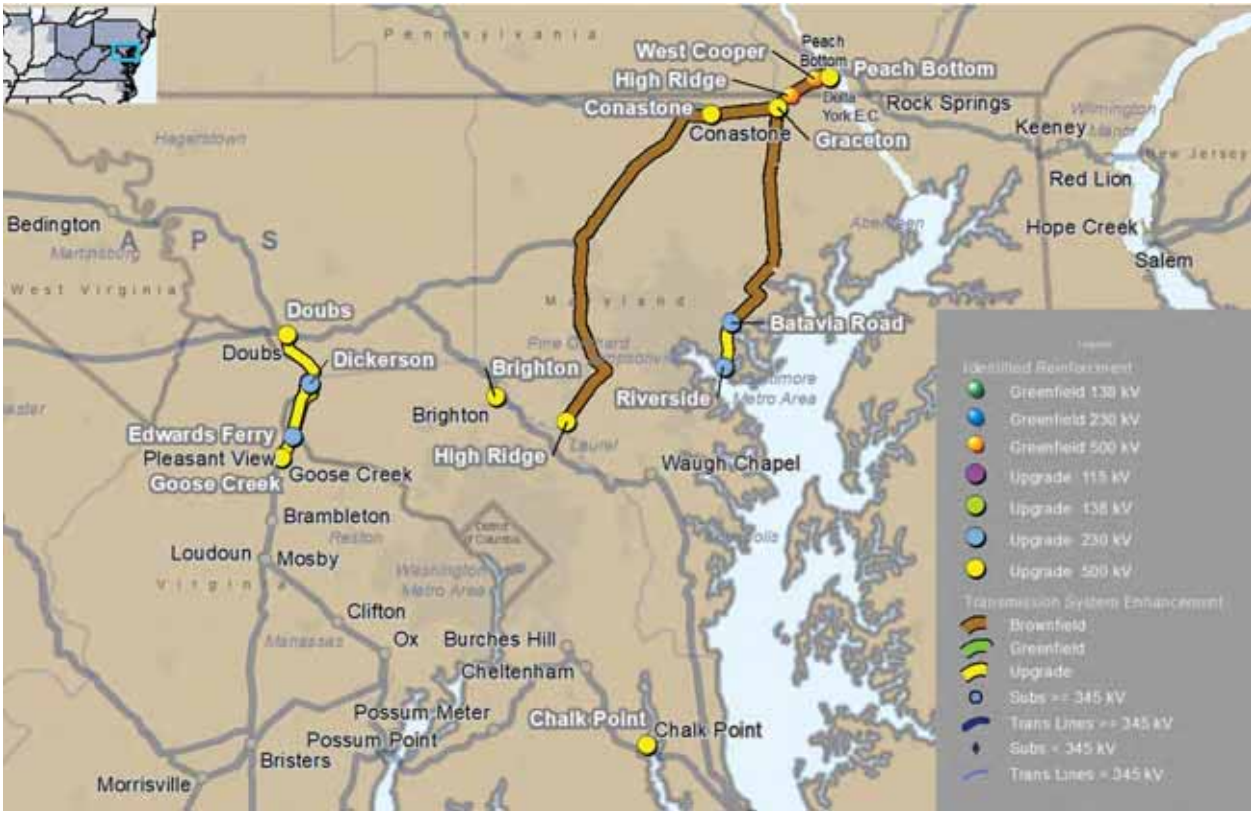
The proposed in-service date of December 2029 is reasonable for the proposed scope of the project, given the extensive use of existing ROW for routing the brownfield transmission lines. The most significant schedule risks to the project involve the long lead time anticipated for procurement of substation equipment such as EHV breakers and transformers for the proposed new substations and substation expansions.

## *Proposal 660 – Exelon (BGE-PEPCO)*

Proposal No. 660 (Map 8), described as West Cooper BGE-PEPCO, is located within Howard, Baltimore and Harford counties, Maryland, and includes the construction of several new substations. The majority of the components will be developed within existing ROWs. Proposal No. 660 comprises the BGE-PEPCO portion of Exelon's West Cooper Max solution and is intended to be combined with Proposal No. 344, the PECO portion of Exelon's West Cooper Max

solution. In addition, two components within this proposal is in coordination with a FirstEnergy and Dominion's joint rebuild of the Doubs to Goose Creek corridor to accommodate a new 500 kV circuit, with further details provided in FirstEnergy Proposal 837 (South) and Dominion Proposal (516) reviews.

Map 8. Proposal 660




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

Proposal No. 660 includes 22 components all of which are selected for the detailed evaluations.

- Component 1: Graceton 500 kV substation expansion
- Component 2: Batavia Road 230 kV switching station
- Component 3: High Ridge 500 kV substation expansion
- Component 4: West Cooper-High Ridge (500 kV)
- Component 5: Graceton-Batavia Rd (230 kV)
- Component 6: Peach Bottom-Graceton (500 kV)
- Component 7: 5012 line rebuild Graceton-Conastone (BGE Only)
- Component 8: 5012 line rebuild West Cooper-Graceton (BGE Only)
- Component 9: 230 line rebuild Batavia Road to Riverside

- Component 10: 230 kV Dickerson station H to Ed's Ferry
- Component 11: Graceton 230 kV terminal eqp. (BGE)
- Component 12: High Ridge 230 kV terminal eqp. (BGE)
- Component 13: Conastone 500 kV cap bank (BGE)
- Component 14: Conastone 500 kV 5012 line terminal eqp. (BGE)
- Component 15: Brighton 5053 terminal eqp. (PEPCO)
- Component 16: Brighton Statcom (PEPCO)
- Component 17: Brighton 500 kV cap bank (PEPCO)
- Component 18: Brighton 5011 terminal eqp. (PEPCO)
- Component 19: Dickerson to Ed's Ferry terminal eqp. (PEPCO) – associated with proposals FE 837 and DOM 516
- Component 20: Conastone 500 kV 5011 terminal eqp. (BGE)
- Component 21: Chalk Point 500 kV 5073 relay upgrade (PEPCO)
- Component 22: 500 kV Doubs to Goose Creek (PEPCO only) – associated with proposals FE 837 and DOM 516

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*Peach Bottom North (PECO)-Graceton (BGE) New 500 kV Line: BGE Portion*

The line is a continuation from PECO's portion of the line as part of Proposal 344 that terminated at the Maryland/Pennsylvania state line. This component of the proposal is for BGE's approximately 2-mile portion of greenfield 500 kV overhead transmission line from the Maryland/Pennsylvania state line, to the expanded Graceton substation. The new 500 kV line route entails rebuilding existing Cooper to Graceton 230 kV line as a 500 kV circuit.

*West Cooper (PECO)-High Ridge (BGE) New 500 kV Line: BGE Portion*

The line is a continuation from PECO's portion of the line as part of Proposal 344 that terminated at the Maryland/Pennsylvania state line. This component of the proposal is for BGE's approximately 59.4-mile portion of greenfield 500 kV overhead transmission line from the MD/PA state line to the expanded High Ridge substation.

The line will travel on single circuit structures within existing ROW created by the demolition of Cooper to Graceton 230 kV and rebuild of Peach Bottom to Conastone 5012 500 kV line from the Maryland/Pennsylvania state line up to Graceton. From Graceton to Conastone, the proposal entails building new 500 kV single circuit poles on the edge of the current ROW (8.6 mi) and transfer existing 5012 circuit to new poles, allowing for the new West Cooper High Ridge 500 kV circuit to be built in place of legacy 5012 structures. From Conastone to Northwest No. 2, the proposal entails building new 500 kV single circuit poles on the edge of the current ROW (24.2 miles) and transfer existing 5011 circuit to new poles, allowing for the new West Cooper-High Ridge 500 kV circuit to be built in place of legacy 5011 structures. The next portion of the route (20.5 miles) entails using free ROW space available on Northwest No. 2 Pleasant Hills 230 kV, Pleasant Hills to Granite 230 kV, Granite to Howard 230 kV, Howard to Columbia 230 kV, and then rebuilds of the Columbia to Snowden River 230 kV and Snowden River to High Ridge 230 kV for 4.6 miles to accommodate the West Cooper-High Ridge 500 kV circuit.

*Graceton to Batavia (BGE) New Double Circuit 230 kV Line*

This component of the proposal is for an approximately 29-mile double circuit 230 kV greenfield overhead transmission line from the existing Graceton substation to the new Batavia substation. This line will be constructed on the edge of the current ROW of the Graceton to Bagley to Raphael Road to Northeast 230 kV line corridor, with no expansion required.

Overall, the ROW risk for components of this proposal is low, with extensive usage of existing ROWs for its entire alignment. It is anticipated that the proposal could require permits, consultations, clearances and authorizations from three counties in Maryland (Howard, Baltimore and Harford). State PSC approval, CPCN and DOT utility permits and driveway/local road permits may be required.

## Environmental Risk Analysis

Wetlands, waterbodies and high-risk flood zones appear to be crossed by the project components of the proposal.

Proposed project intersects waters subject to USACE Section 404 and/or Section 10 permitting. Numerous wetlands subject to USACE Section 404 intersect the project. Coordination with USACE is required for jurisdictional determination. An on-site delineation would be required to determine the actual location and extent of wetlands and waterbodies present and to assess permitting implications for jurisdictional features.

The proposed project components are within the range of both federally and state-listed species. The majority of the proposed routes are in woodlands. Construction restrictions, time frame or mitigation may be necessary to comply with avoidance of sensitive species; however, the extent of which cannot be known until field studies are completed and coordination with the USFWS and state wildlife agencies takes place.

Proposed project components do not intersect conservation easements/protected areas. Coordination with easement holders is not anticipated.

## Transmission Line Risk Analysis

Given the extensive reuse of existing ROW for this proposal, transmission line construction risks are low and limited to concerns with existing overhead transmission infrastructure components needing to be removed/salvaged before construction of proposed brownfield lines can commence, and potential design limitations for reuse of existing infrastructure/assets.

Other moderate risks for this project involve the existing facility outages that will be necessary for the project, particularly for the extensive line rebuilds, and substation expansions. To mitigate these risks, Exelon provided a detailed schedule outlining a sequence of construction that will ensure that new brownfield transmission lines are energized within the corridor prior to the rebuild of existing facilities that will require lengthy outages.

## Substation Risk Analysis

*New Batavia Road 230 kV Station*

The Batavia Road 230 kV switching station is a proposed new four four-bay, eight-position 230 kV switching station to be built with ten 230 kV 4000A breakers, associated station bus, control house, relaying and grounding.

Other substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 7.

Table 7. Proposal 660 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 1 | Graceton 500 kV Substation Expansion | 78.96 | 82.52 |
| 2 | Batavia Road 230 kV Switching Station | 32.91 | 44.73 |
| 3 | High Ridge 500 kV Substation Expansion | 116.00 | 70.03 |
| 4 | West Cooper-High Ridge (500 kV) | 407.11 | 304.57 |
| 5 | Graceton-Batavia Rd (230 kV) | 176.84 | 247.94 |
| 6 | Peach Bottom-Graceton (500 kV) | 10.44 | 19.58 |
| 7 | 5012 Line Rebuild Graceton-Conastone (BGE ONLY) | 70.00 | 45.94 |
| 8 | 5012 Line Rebuild West Cooper-Graceton (BGE ONLY) | 10.44 | 9.66 |
| 9 | 230 Line Rebuild Batavia Road to Riverside | 20.16 | 22.09 |
| 10 | 230 kV Dickerson Sta H to Ed's Ferry | 18.60 | 42.80 |
| 11 | Graceton 230 kV Terminal Eqp. (BGE) | 8.77 | 5.32 |
| 12 | High Ridge 230 kV Terminal Eqp. (BGE) | 6.11 | 4.72 |
| 13 | Conastone 500 kV Cap Bank (BGE) | 14.31 | 10.33 |
| 14 | Conastone 500 kV 5012 Line Terminal Eqp. (BGE) | 4.93 | 5.99 |
| 15 | Brighton 5053 Terminal Eqp. (PEPCO) | 4.13 | 6.23 |
| 16 | Brighton Statcom (PEPCO) | 52.20 | 67.46 |
| 17 | Brighton 500 kV Cap Bank (PEPCO) | 14.31 | 11.42 |
| 18 | Brighton 5011 Terminal Eqp. (PEPCO) | 4.13 | 6.54 |
| 19 | Dickerson To Ed's Ferry Terminal Eqp. (PEPCO) | 10.58 | 8.51 |
| 20 | Conastone 500 kV 5011 Terminal Eqp. (BGE) | 7.16 | 8.99 |
| 21 | Chalk Point 500 kV 5073 Relay Upgrade (PEPCO) | 0.34 | 0.57 |
| 22 | 500 kV Doubs to Goose Creek (PEPCO Only) | 37.20 | 34.68 |
| | Total | 1,105.62 | 1,060.63 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

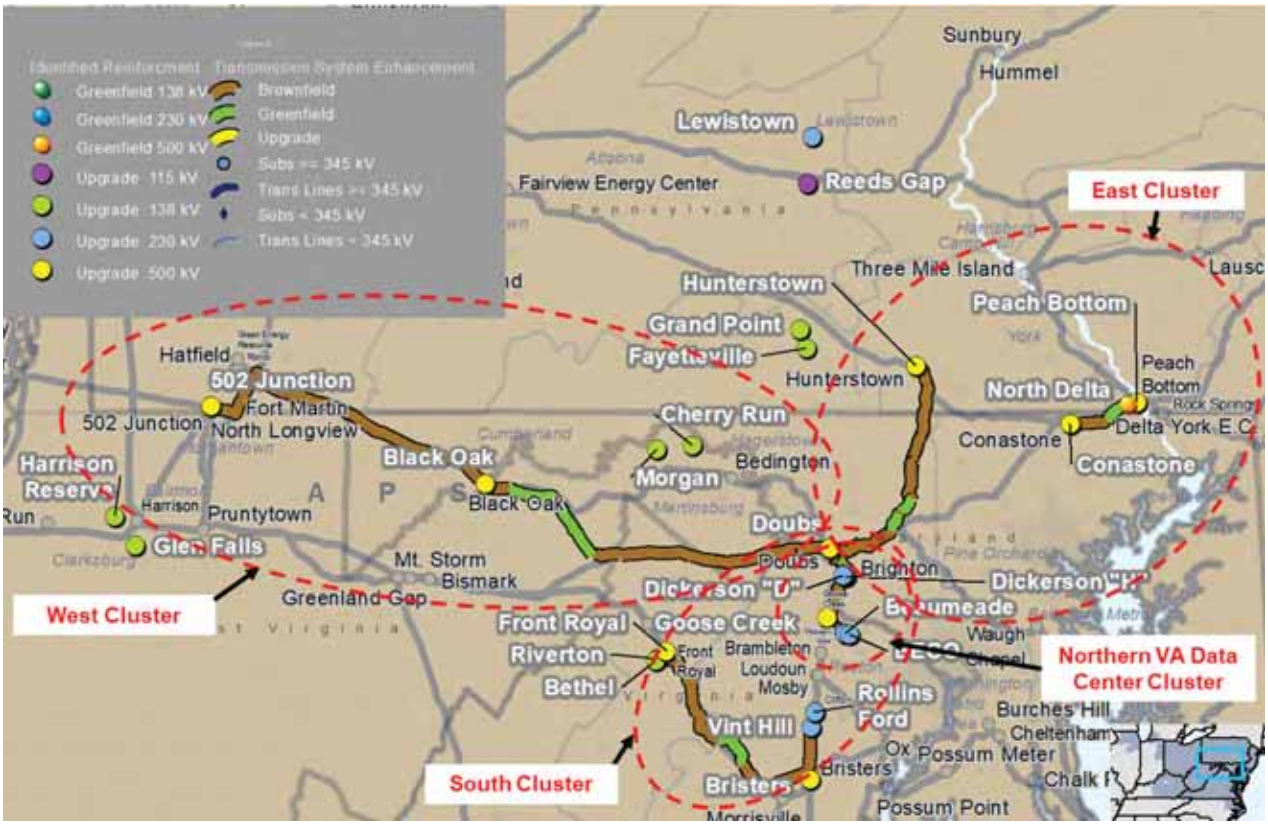
### Schedule Review

The proposed in-service date of December 2030 is reasonable for the proposed scope of the project, given the extensive use of existing ROW for routing the brownfield transmission lines. The most significant schedule risks to the project involve the long lead time anticipated for procurement of substation equipment such as EHV breakers and transformers for the proposed new substations and substation expansions.

## *Proposal 548 (East) – LS Power*

LS Power Proposal No. 548 (Map 9), described as RTEP Window 3 Solution, provides a holistic solution to the RTEP Window 3 needs, comprising 37 components, which can be grouped into the four regional clusters identified for the Window. Specifically for the East cluster, LS Power proposed several components within multiple counties in Pennsylvania (York, Adams) and Maryland (Harford, Carroll, Frederick).

Map 9. Proposal 548




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

LS Power Proposal 548 components selected for evaluation in the East cluster are as follows:

- Component 10: Conastone substation upgrade
- Component 13: Hunterstown substation upgrade
- Component 14: North Delta substation upgrade
- Component 21: Peach Bottom substation upgrade
- Component 23: Conastone-Peach Bottom rebuild
- Component 27: Hunterstown-Doubs Greenfield 500 kV transmission line
- Component 32: Hunterstown-Doubs Greenfield 500 kV transmission line (shared ROW)
- Component 35: Conastone-North Delta Greenfield 500 kV transmission line (shared ROW)
- Component 37: Peach Bottom-North Delta reconductor

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*Conastone to Peach Bottom – 500/230 kV OH Line Rebuild*

This component of the proposal is for a double circuit approximately 8-mile 500/230 kV overhead transmission line rebuild from Conastone substation to the Peach Bottom substation. The new line will utilize the existing ROW and is assumed will be able to be completely built within the existing ROW. The existing lattice towers will be taken down and replace with the new double circuit 500/230 kV structures.

The ROW risk for this component is low due to the rebuild occurring within the existing ROW.

*Huntertown to Doubs 500 kV OH Line*

This component of the proposal is for a 55-mile single circuit, partially greenfield 500 kV overhead transmission line from the existing Huntertown substation to the Existing Doubs substation. The line parallels an existing 500 kV ROW for the first 7 miles of the line, and then follow its own new ROW for approximately 3 miles. At this point, it will replace Germantown-Taneytown 138 kV line and become a double circuit 500/138 kV line for ~13 miles. It will then break off to single circuit for a few structures, and then meet the existing Carroll-Mt Airy 230 kV corridor, which it will rebuild as a 500/230 kV line for about seven miles. Then it becomes a single 500 kV circuit with its own new ROW for ~10 miles, before paralleling Doubs-Brighton 500 kV ROW for the remaining ~15 miles to Doubs substation.

The ROW risk for this component is medium-high to high, with about 35 miles of greenfield route, although only 13 miles are pure greenfield for its entire alignment.

*Conastone to North Delta 500 kV OH Line*

This component of the proposal is for a ~5.5 mile 500 kV overhead transmission line rebuild from Peach Bottom substation to the North Delta substation. The new line will utilize the existing ROW and is assumed will be able to be completely built within the existing ROW. The existing lattice towers will be taken down and replaced with the new double circuit 500/230 kV structures.

The ROW risk for this component is low due to the rebuild occurring within the existing ROW.

*Peach Bottom to North Delta 500 kV OH Line Upgrades*

This component of the proposal is for a ~2.5 mile 500 kV overhead transmission line reconductor from Peach Bottom substation to the North Delta substation. It is assumed that existing structures will be used for the upgrades. No new ROW is anticipated for this project.

The ROW risk for this component is low, as this is an upgrade occurring within the existing ROW.

Overall, due primarily to the Hunterstown to Doubs 500 kV OH line component, LS Power's East components ROW risk are considered medium-high.

### Environmental Risk Analysis

The proposed Hunterstown-Doubs greenfield route entails seven railroad crossings, 16 transmission line crossings, and 96 road crossings in Adams County, Pennsylvania, and Carroll and Frederick counties in Maryland.

Proposed project components do not intersect conservation easements/protected areas. Coordination with easement holders is not anticipated.

### Transmission Line Risk Analysis

The Hunterstown-Doubs component poses some medium construction risks as the design ROW is based on assumed ROW limits. It is not clear that the existing ROW will be adequate to contain the new line (sections that include 138 kV and 230 kV rebuilt to 500/138 kV and 500/230 kV respectively), as requirements may be larger for the 500 kV portion that what the existing ROW can hold. Alongside this, there are many portions where new ROW needs to be obtained, both paralleling existing ROW, and completely new ROW. It should also be noted that the conductor selection for each section may not be adequate to support the specified ratings, especially for the 500 kV line. Final conductor selection can affect span lengths, structure heights, material cost and hardware costs.

Medium-high risks are assessed for outage coordination for the proposed Conastone to Peach Bottom – 500/230 kV OH line rebuild component. This will involve extensive outage of the Conastone-Peach Bottom 500 kV line for its rebuild, and no details were provided regarding mitigation for the anticipated issues with these outages.

### Substation Risk Analysis

The substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 8.

Table 8. Proposal 548 (East) Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 10 | Conastone Substation Upgrade | 7.56 | 11.83 |
| 13 | Hunterstown Substation Upgrade | 14.34 | 17.00 |
| 14 | North Delta Substation Upgrade | 7.56 | 11.02 |
| 21 | Peach Bottom Substation Upgrade | 4.99 | 5.26 |
| 23 | Conastone-Peach Bottom Rebuild | 77.26 | 111.35 |
| 27 & 32 | Hunterstown-Doubs Greenfield 500 kV Transmission Line | 303.98 | 348.36 |
| 35 | Conastone-North Delta Greenfield 500 kV Transmission line (Shared ROW) | 77.26 | 100.28 |
| 37 | Peach Bottom-North Delta Reconductor | 2.88 | 4.34 |
| | Total | 495.83 | 609.44 |

The total proposal cost estimate is within 10–20% of the independent cost estimate and is considered medium risk.

## Schedule Review

The proposed in-service date of December 2030 appears to be reasonable for the proposed scope of the project, with a conservative time required to manage outage scheduling risks for Conastone-Peach Bottom rebuild and the ROW risks that may be associated with the Hunterstown-Doubs component.

## *Proposal 637 – PSEG*

PSEG Proposal No. 637 (Map 10), described as Proposal D: Conastone-Doubs 500 kV, is located within York County, Pennsylvania, and Frederick, Carroll, Baltimore, and Harford counties, Maryland, and includes the upgrade of multiple substations as well as two greenfield lines.

Map 10. Proposal 637


*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

### Project Overview

PSEG Proposal 637 components selected for evaluation in the East cluster are as follows:

- Component 1: North Delta 500/230 kV upgrade
- Component 2: Northeast 230 kV upgrade
- Component 3: Peach Bottom 500 kV upgrade
- Component 4: Doubs 500/230 kV upgrade
- Component 5: Conastone 500/230 kV upgrade
- Component 6: Ox 500 kV upgrade
- Component 7: North Delta-Northeast 230 kV
- Component 8: Conastone-Doubs 500 kV

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*New 230 kV Line From North Delta to Northeast*

This component of the proposal is for a 36.5-mile greenfield 230 kV overhead transmission line tie from the North Delta substation to the Northeast substation. The line will travel through new ROW between North Delta and Northeast.

The ROW risk for this component is high due to the pure greenfield nature of the route.

*New 500 kV Line From Conastone to Doubs*

This component of the proposal is for an approximate 40.1-mile portion of a greenfield 500 kV overhead transmission line from Conastone substation to the Doubs substation. The line will travel through new ROW between Conastone and Doubs.

The ROW risk for this component is high due to the pure greenfield nature of the route.

Overall, with both transmission line components using a pure greenfield route, this proposal's ROW risk are considered high.

### Environmental Risk Analysis

*New 230 kV Line From North Delta to Northeast*

The proposed North Delta to Northeast route has the potential to impact environmental and cultural resources including: the Lower Deer Creek Valley Historic District, flood plains, streams/wetlands subject to USACE permitting, and woodlands with the potential to serve as a suitable habitat for federally listed threatened and endangered species.

Impacts to these resources will require: coordination with the VA SHPO, the county flood plain administrator, USACE Section 404 and/or Section 10 permitting, and USFWS consultation.

The proposed route intersects a recorded underground storage tank (UST) that may require further soil characterization studies.

Nine easements are intersected by the proposed route. Coordination with easement holders will be required.

*New 500 kV Line From Conastone to Doubs*

Approximately six railroad crossings with CSXT and one is with Maryland Midland Railway (MMID). Approximately 121 road crossings (242 road entrances) in four counties. Approximately one cemetery crossing. Notification/Agreement may be required with Mount Zion United Methodist Church Cemetery. Approximately one crossing at Torrey C Brown Rail Trail, with the operator MD Department of Natural Resources.

The proposed route has the potential to impact environmental resources including: 19 FEMA High-Risk Flood Zones, 187 streams and 155 wetlands subject to USACE Section 404 and/or Section 10 permitting, and woodlands with the potential to serve as suitable habitat for federally listed threatened and endangered species. Impacts to these resources will require: USACE Section 404 and/or Section 10 permitting and USFWS consultation. The proposed

route intersects six Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects a property listed on the National Register of Historic Places – National Park Service (Chambers, Whitakker, Farms), Parker Conservation Area, Union Mills Reservoir Park and a unnamed local park. Coordination with entities is required.

### Transmission Line Risk Analysis

The primary transmission line risks are those associated with permitting and land acquisition for the proposed greenfield lines.

### Substation Risk Analysis

The substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 9.

Table 9. Proposal 637 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates($M) |
|---|---|---|---|
| 1 | North Delta 500/230 kV Upgrade | 8.44 | 10.42 |
| 2 | Northeast 230 kV Upgrade | 56.43 | 39.45 |
| 3 | Peach Bottom 500 kV Upgrade | 6.57 | 7.83 |
| 4 | Doubs 500/230 kV Upgrade | 25.20 | 31.80 |
| 5 | Conastone 500/230 kV Upgrade | 8.14 | 9.84 |
| 6 | Ox 500 kV Upgrade | 1.17 | 1.71 |
| 7 | North Delta-Northeast 230 kV | 187.98 | 139.81 |
| 8 | Conastone-Doubs 500 kV | 390.28 | 435.50 |
| | Total | 684.22 | 673.36 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

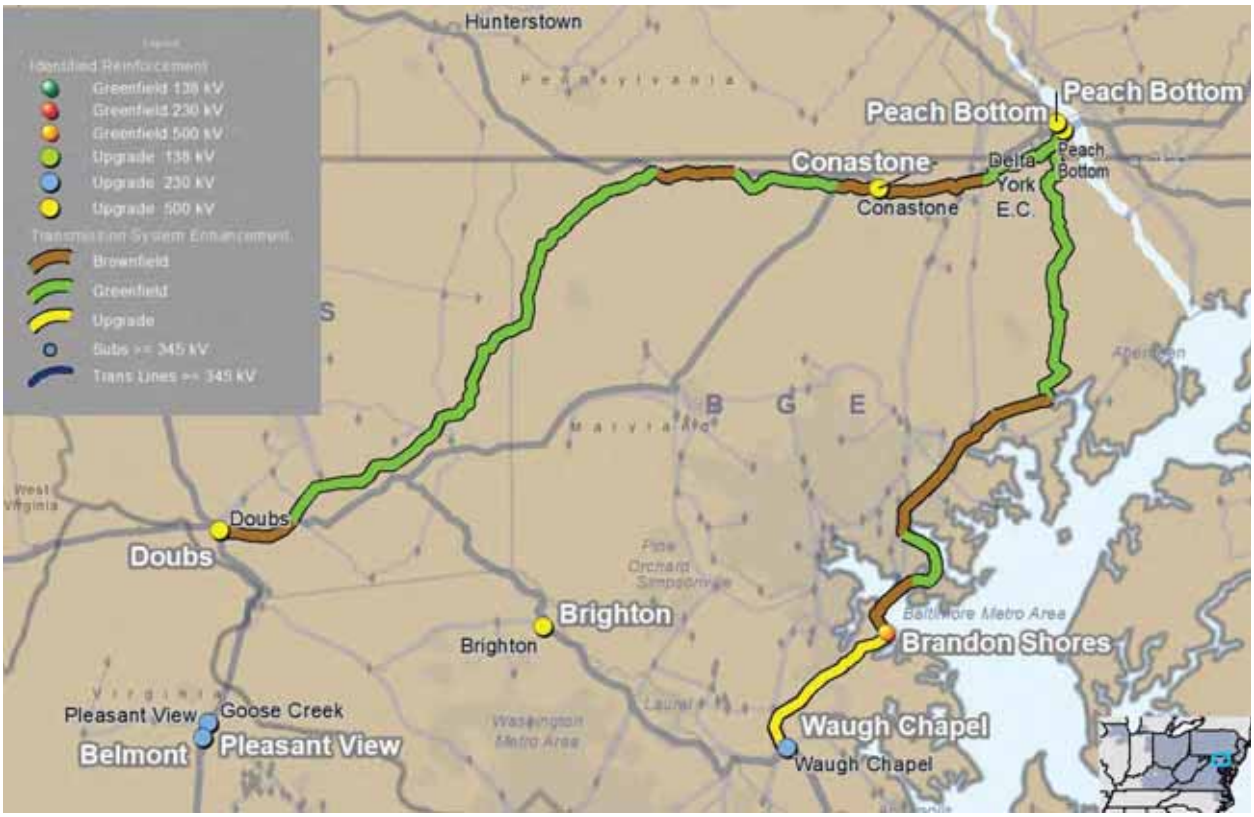
### Schedule Review

The proposed in-service date of June 2027 seems to be aggressive for the proposed scope of the project, with a more conservative time required to manage ROW permitting and land acquisition risks associated with the two greenfield line routes.

## *Proposal 741 – PSEG*

PSEG Proposal No. 741 (Map 11), is described as Proposal G: Peach Bottom-New Brandon Shores 500 kV; Peach Bottom-Doubs 500 kV is located within York County, Pennsylvania, and Frederick, Carroll, Baltimore, Anne Arundel, and Harford counties, Maryland, and includes new greenfield substations and lines, as well as multiple substation and line upgrades.

Map 11. Proposal 741 (see next page)




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

PSEG Proposal 741 includes 10 components, all of which are selected for the detailed evaluations.

- Component 1: New 500 kV line from Peach Bottom station to Brandon Shores station
- Component 2: New 500 kV line from Doubs Station to Peach Bottom station
- Component 3: Reconductor 230 kV line from Brandon Shores to Waugh Chapel
- Component 4: Reconductor Peach Bottom North to Peach Bottom South Tie #1 and #2
- Component 5: New Brandon Shores 500 kV station
- Component 6: Peach Bottom 500 kV upgrade
- Component 7: Doubs 500/230 kV upgrade
- Component 8: Brandon Shores 230 kV upgrade
- Component 9: Conastone/Brighton 500 kV upgrade
- Component 10: Pleasant View/Belmont 230 kV upgrade

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*New 500 kV Line From Peach Bottom to Brandon Shores*

This component of the proposal is for a 56-mile portion of a greenfield 500 kV overhead transmission line from the existing Peach Bottom substation to the existing Brandon Shores substation. The line is a single circuit steel monopole of either vertical or delta configuration. Part of the line passes through the urban Baltimore area. A major river crossing over the Patapsco River is required. The crossing will have 10–12 structures and will require major permitting and construction costs. Portions of this route parallel existing utility corridors, while the remainder are pure greenfield.

The ROW risk for this component is high due to the extensive greenfield nature of the proposed route.

*New 500 kV Line From Doubs to Peach Bottom*

This component of the proposal is for an 87-mile portion of a greenfield 500 kV overhead transmission line from the existing Doubs substation to the existing Peach Bottom substation. The line is a single circuit steel H-frame in a horizontal configuration. The line is in a mostly hilly rural area.

The ROW risk for this component is high due to the pure greenfield nature of the proposed route.

### Environmental Risk Analysis

*New 500 kV Line From Peach Bottom Station to Brandon Shores Station*

The proposed route has the potential to impact environmental and cultural resources including: Lower Deer Creek Valley Historic District; 45 FEMA High-Risk Flood Zones; 13 waters subject to USACE Section 10 permitting; numerous streams/wetlands subject to USACE Section 404 permitting; and woodlands with the potential to serve as suitable habitat for federally listed threatened and endangered species. Tree removal restrictions will likely apply due to the likelihood of the presence of listed endangered bats. Field verification of bat habitat is needed to determine presence. Coordination with the following is recommended: MD SHPO, flood plain administrator from each county,

USACE, USFWS. Nine conservation easements are intersected by the proposed route. Coordination with easement holders will be required.

This project will require ROWs with widths of 80–85 feet in residential areas, 125–130 feet in farmland, 150 feet in farmland, and 170 feet at the Patapsco River.

Approximately 39 transmission line crossings with BG&E. Approximately six park crossings: two state parks owned by MD Department of Natural Resources, one local park crossing with Baltimore County, three local park crossings with Harford County. Approximately 32 railroad crossings with the Federal Railroad Administration. Approximately 132 road crossings (264 road entrances) in four counties.

*New 500 kV Line From Doubs Station to Peach Bottom Station*

Proposed route has the potential to impact environmental resources including: 19 FEMA High-Risk Flood Zones; 187 streams and 155 wetlands subject to USACE Section 404 and/or Section 10 permitting; and woodlands with the potential to serve as suitable habitat for federally listed threatened and endangered species. Impacts to these resources will require: USACE Section 404 and/or Section 10 permitting and USFWS consultation. The proposed route intersects six Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects property listed on the National Register of Historic Places – National Park Service (Chambers, Whitakker, Farms) and 46 conservation easements including Parker Conservation Area, Union Mills Reservoir Park and an unnamed local park. Coordination with entities is required.

Approximately six railroad crossings. Five are with CSXT and one is with Maryland Midland Railway (MMID). Approximately 11 transmission line crossings. Approximately 148 road crossings (296 road entrances) in five counties. Approximately one cemetery crossing. Notification/Agreement may be required with Mount Zion United Methodist Church Cemetery. Approximately two park crossings with the operator MD Department of Natural Resources.

## Transmission Line Risk Analysis

For the Peach Bottom to Brandon Shores line route, river crossing is a major risk due to engineering, construction and permitting unknowns.

For both routes, conductor selection for each section may not be adequate to support the specified ratings, especially for the 500 kV line. Final conductor selection can affect span lengths, structure heights, material cost and hardware costs. ROW widths may not be adequate for the line to be reliably operated.

## Substation Risk Analysis

*New Brandon Shores 500 kV Substation*

Brandon Shores is a proposed new 500 kV substation that will include two 500/230 kV transformers and a four breaker ring bus.

The other substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 10.

Table 10. Proposal 741 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 1 | New 500 kV line from Peach Bottom station to Brandon Shores station | 433.99 | 424.67 |
| 2 | New 500 kV line from Doubs Station to Peach Bottom Station | 464.48 | 574.36 |
| 3 | Reconductor 230 kV line from Brandon Shores to Waugh Chapel | 20.79 | 14.38 |
| 4 | Reconductor Peach Bottom North to Peach Bottom South Tie #1 and #2 | 3.01 | 1.27 |
| 5 | New Brandon Shores 500 kV station | 90.05 | 74.79 |
| 6 | Peach Bottom 500 kV Upgrade | 31.75 | 40.95 |
| 7 | Doubs 500/230 kV Upgrade | 17.94 | 20.19 |
| 8 | Brandon Shores 230 kV Upgrade | 3.31 | 8.09 |
| 9 | Conastone/Brighton 500 kV Upgrade | 0.00 | 14.37 |
| 10 | Pleasant View/Belmont 230 kV Upgrade | 0.00 | 5.69 |
| | Total | 1,065.32 | 1,178.75 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

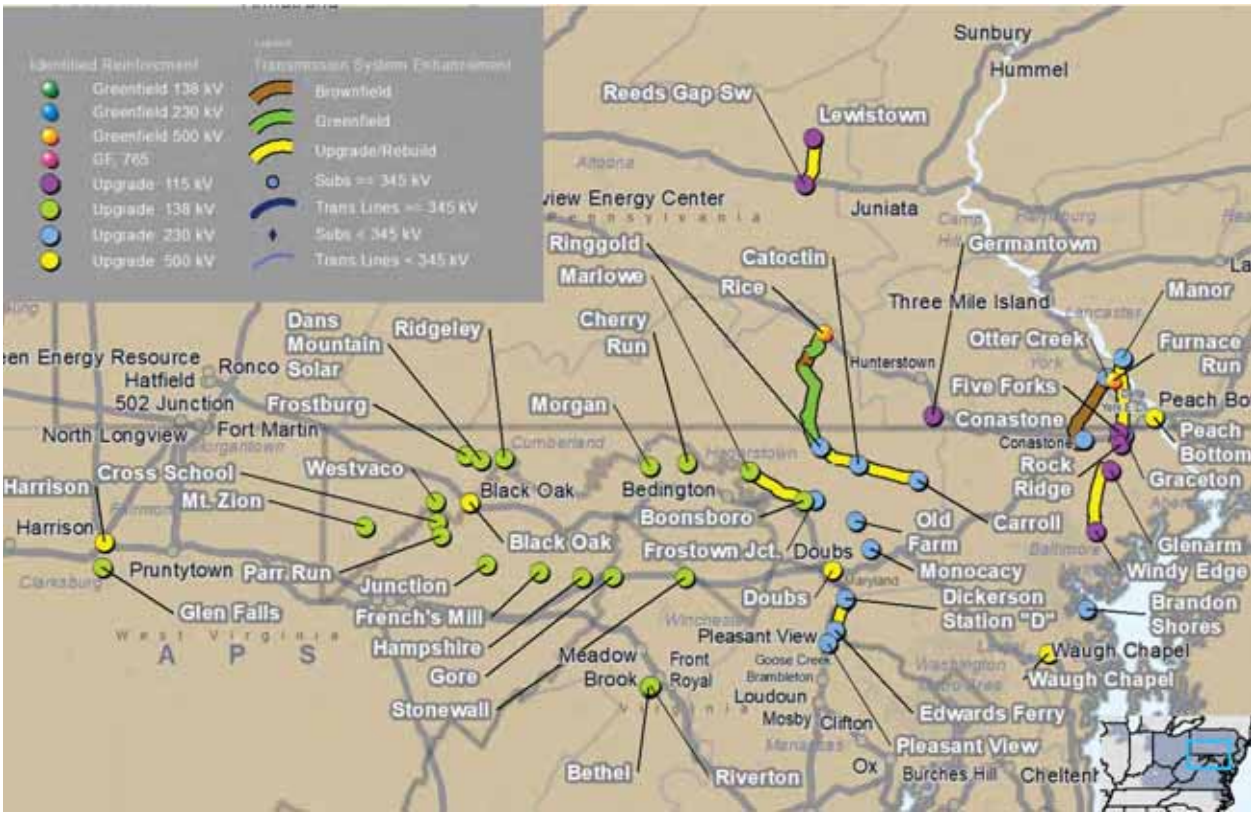
## Schedule Review

The proposed in-service date of December 2028 is quite aggressive for the proposed scope of the project, considering the ROW permitting and land acquisition risks associated with the two Greenfield line routes. In particular, the permitting, engineering and construction risks anticipated with the Peach Bottom to New Brandon Shores route have potential to introduce significant schedule challenges. Overall, the schedule risk is considered medium-high.

## *Proposal 487 – Transource*

Transource Proposal No. 487 (Map 12), described as the Maryland & Pennsylvania Baseline Reliability Solution, is based on the Transource IEC East and West projects (Project 9A) previously approved by PJM but currently under suspension. This project was submitted with additional incumbent upgrades to address more violations in the Maryland-Pennsylvania corridor. The IEC East components span across Harford and Baltimore counties in Maryland, and York County in Pennsylvania. The IEC West components span across Washington County in Maryland and Franklin County in Pennsylvania.

Map 12. Proposal 487




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

### Project Overview

Transource Proposal 487 includes 39 components that make up the IEC East and West proposal.

- Component 1: Rice-Ringgold 230 kV greenfield transmission line
- Component 2: Ringgold 230/138 kV station upgrade
- Component 3: Rice 500/230 kV greenfield station
- Component 4: Manor-Graceton 230 kV upgrade
- Component 5: Conastone-Otter Creek 230 kV transmission line upgrade

- Component 6: Furnace Run 500/230 kV greenfield station
- Component 7: Graceton station upgrade
- Component 8: Conastone station upgrade
- Component 9: Ringgold-Catoctin line upgrade (138 kV to 230 kV)
- Component 10: Dickerson station upgrade
- Component 11: Conemaugh-Hunterstown 500 kV line tie-in
- Component 12: Peach Bottom-Three Mile Island tie-in
- Component 13: Catoctin to Carroll line upgrade (138 kV to 230 kV)
- Component 14: Catoctin station upgrade
- Component 15: Carroll station upgrade
- Component 16: Glen Arm 2-Windy Edge 1 115 kV line upgrade
- Component 17: Five Forks-Rock Ridge 1 115 kV line upgrade
- Component 19: Peach Bottom station upgrade
- Component 21: Marlowe-Boonesboro 138 kV series reactor
- Component 22: Germantown station capacitor upgrade
- Component 23: Garrett to Garrett Tap 115 kV line upgrade
- Component 25: Dickerson-Edwards Ferry-Twin Creek-Pleasant View 230 kV rebuild and terminal equipment upgrade
- Remaining components: terminal upgrades at various stations

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*New 230 kV Line From Rice to Ringgold*

This component of the proposal is for a 29-mile portion of a greenfield 230 kV overhead transmission line from the new 500/230 kV Rice substation to the existing Ringgold substation. While this constitutes a greenfield route with about 42% of its ROW paralleling existing ROWs, the ROW risk for this component is medium due to the extensive permitting and acquisition that has already been completed with 70% of the required ROW obtained by the proposing entity.

### Environmental Risk Analysis

*Rice 500/230 kV Greenfield Station*

The proposed substation footprint intersects with a Karst zone. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching.

### Transmission Line Risk Analysis

A medium risk for this project involves the existing facility outages that will be necessary to perform the numerous line and terminal upgrades.

## Substation Risk Analysis

*Rice 500/230 kV Greenfield Station*

The proposed substation, which the proposing entity already has under option for purchase, will tie into the existing Hunterstown-Conemaugh 500 kV line. The Rice station will be laid out as a three-breaker 500 kV ring bus on the 500 kV side with six single-phase 500 kV/230 kV/13.8 kV transformers for two transformer banks.

*Furnace Run 500/230 kV Greenfield Station*

The proposed substation, which the proposing entity already has under option for purchase, will tie into the existing TMI-Peach Bottom 500 kV line. The Rice station will be laid out as an eight-breaker 500 kV GIS in a breaker-and-a-half configuration, and a fourteen breaker 230 kV AIS in a breaker-and-a-half configuration, with three 500/230 kV transformer banks.

Other substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 11.

Table 11. Proposal 487 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 1 | Rice-Ringgold 230 kV Greenfield Transmission Line | 64.55 | 70.00 |
| 2 | Ringgold 230/138 kV Station Upgrade | 14.80 | 16.00 |
| 3 | Rice 500/230 kV Greenfield Station | 31.62 | 35.00 |
| 4 | Manor-Graceton 230 kV Upgrade | 21.80 | 16.50 |
| 5 | Conastone-Otter Creek 230 kV Transmission Line Upgrade | 29.00 | 35.00 |
| 6 | Furnace Run 500/230 kV Greenfield Station | 75.82 | 75.00 |
| 7 | Graceton Station Upgrade | 9.40 | 9.30 |
| 8 | Conastone Station Upgrade | 9.00 | 9.30 |
| 9 | Ringgold-Catoctin Line Upgrade (138 kV to 230 kV) | 47.20 | 47.00 |

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 10 | Dickerson Station Upgrade | 1.00 | 1.13 |
| 11 | Conemaugh-Hunterstown 500 kV line Tie-in | 15.20 | 12.00 |
| 12 | Peach Bottom-Three Mile Island Tie-in | 15.20 | 12.00 |
| 13 | Catoctin to Carroll Line Upgrade (138 kV to 230 kV) | 45.51 | 47.00 |
| 14 | Catoctin Station Upgrade | 9.10 | 8.00 |
| 15 | Carroll Station Upgrade | 10.19 | 8.00 |
| 16 | Glen Arm 2-Windy Edge 1 115 kV Line Upgrade | 3.06 | 3.00 |
| 17 | Five Forks-Rock Ridge 1 115kV Line Upgrade | 7.41 | 7.50 |
| 19 | Peach Bottom Station Upgrade | 4.70 | 4.80 |
| 21 | Marlowe-Boonesboro 138 kV Series Reactor | 3.92 | 4.00 |
| 22 | Germantown Station Capacitor Upgrade | 0.72 | 1.00 |
| 23 | Garrett to Garrett Tap 115 kV Line Upgrade | 9.41 | 9.90 |
| 25 | Dickerson-Edwards Ferry-Twin Creek-Pleasant View 230 kV Rebuild and Terminal Equipment Upgrade | 28.62 | 35.00 |
| Remaining Components | Terminal Upgrades at various substations | 35.52 | 37.00 |
| | Total | 492.75 | 503.43 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

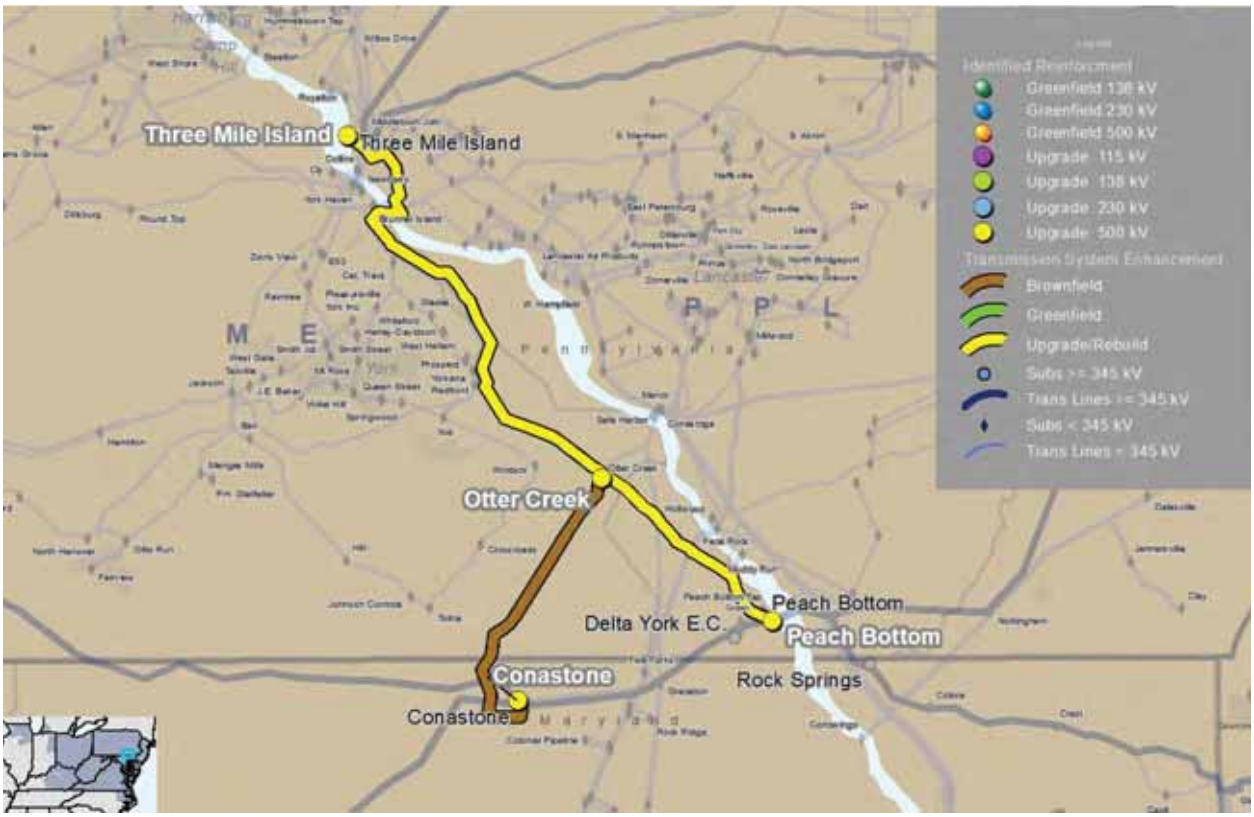
### Schedule Review

The proposed in-service date of March 2027 is reasonable for the proposed scope of the project considering the extensive amount of permitting, land acquisition and equipment procurement that has already been completed for this project. Overall, this project poses a low schedule risk.

## *Proposal 374 – PPL*

PPL Proposal No. 374 (Map 13), described as Otter Creek-Conastone 500 and 230 kV double circuit line, is located within York County, Pennsylvania, and Baltimore and Harford counties in Maryland and includes a greenfield substation and a greenfield double circuit transmission line.

Map 13. Proposal 374




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

PPL Proposal 374 has the following components:

- Component 1: Tap TMI-Peach Bottom 500 kV line
- Component 2: Otter Creek-Conastone 500 and 230 kV double circuit line (PPL EU section)
- Component 3: Otter Creek-Conastone 500 and 230 kV double circuit line (BGE section)
- Component 4: Otter Creek 500 kV switchyard
- Component 5: Conastone 500 kV substation upgrade
- Component 6: Peach Bottom South Yard bus upgrades

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*New 500/230 kV Line From Otter Creek to Conastone*

This component of the proposal is for an approximately 17-mile greenfield 230 kV overhead transmission line tie from the new Otter Creek 500 kV substation, which taps into the existing TMI to Peach Bottom 500 kV line to the existing

Conastone station. This will involve expanding existing Otter Creek-Conastone 230 kV line ROW and wrecking and rebuilding the existing 230 kV structures to accommodate a double circuit 500 kV and 230 kV line. The first 12 miles of the line from Otter Creek is owned by PPL, and about 4.76 miles of the remainder of the line to Conastone is owned by BG&E. Additional ROW will need to be acquired to widen the existing transmission line corridor from 150 feet to 200 feet.

The ROW risk for this component is medium, as this project is routed entirely within the existing ROW with the noted expansion included.

### Environmental Risk Analysis

*New 500/230 kV Line From Otter Creek to Conastone*

Wetlands, waterbodies and high-risk flood zones appear to be crossed by project components.

Proposed project intersects with waters subject to USACE Section 404 and/or Section 10 permitting. Coordination with USACE is required for jurisdictional determination. An on-site delineation would be required to determine the actual location and extent of wetlands and waterbodies present and to assess permitting implications for jurisdictional features.

The proposed project components are within the range of both federally and state-listed species. Project components intersect with woodlands. Due to the likelihood of endangered bat species being present, tree-clearing seasonal restrictions are recommended. The project proponents should conduct an independent TE species review once the potential limits of disturbance and environmental impacts are better known. Construction restrictions, time frame or mitigation may be necessary to comply with avoidance of sensitive species; however, the extent of which cannot be known until field studies are completed and coordination with the USFWS and state wildlife agencies takes place.

The proposed project components do not intersect with historic districts. No impacts to cultural resources are anticipated.

Proposed project components intersect conservation easements. Coordination with easement holders is anticipated.

It is anticipated that the proposal could require permits, consultations, clearances and authorizations from three counties in Maryland (Baltimore & Harford) and Pennsylvania (York). State PSC approval, CPCN and DOT utility permits and driveway/local road permits may be required with about 31 road crossings estimated.

### Transmission Line Risk Analysis

Given the extensive reuse of existing ROW for this proposal, transmission line construction risks are low and limited to concerns with existing overhead transmission infrastructure components needing to be removed/salvaged before construction of proposed brownfield lines can commence, and potential design limitations for reuse of existing infrastructure/assets.

Other moderate risks for this project involve the existing facility outages that will be necessary for the project, particularly for the line rebuild and substation upgrades.

### Substation Risk Analysis

*New Otter Creek 500 kV Substation*

Otter Creek is a proposed new 500 kV substation tapped into the TMI-Peach Bottom 500 kV line that will include a double-bus double-breaker design with two bays and three breakers with a location for one future breaker.

Other substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 12.

Table 12. Proposal 374 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 1 | Tap TMIS-Peach Bottom 500 kV line | 6.33 | 6.00 |
| 2 | Otter Creek-Conastone 500 and 230 kV double circuit line (PPL EU Section) | 77.40 | 74.23 |
| 3 | Otter Creek-Conastone 500 and 230 kV double circuit line (BGE Section) | 29.95 | 30.60 |
| 4 | Otter Creek 500 kV Switchyard | 30.44 | 41.87 |
| 5 | Conastone 500 kV Substation upgrade | 8.86 | 7.98 |
| 6 | Peach Bottom South Yard bus upgrades | 1.24 | 2.00 |
| | Total | 154.21 | 162.69 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

## Schedule Review

The proposed in-service date of May 2027 is reasonable for the proposed scope of the project, given the extensive use of the incumbent's existing ROW for the new line construction.

## *Proposal 948 – NextEra*

NextEra Proposal No. 948 (Map 14), described as New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation, and Keeney to Waugh Chapel tie-in, is located York County, Pennsylvania; Frederick, Montgomery, Anne Arundel, Kent, Baltimore, Cecil, Carroll and Harford counties, Maryland; Loudoun County, Virginia; and New Castle County, Delaware, and includes new greenfield substations and lines, as well as multiple substation and line upgrades.

Map 14. Proposal 948


*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

### Project Overview

NextEra Proposal 948 includes the following components:

- Component 1: 24e – North Delta to Cooper 230 kV rebuild
- Component 2: 24f – North Delta to Graceton 230 kV rebuild
- Component 3: 26A – New 500 kV transmission line from new North Delta substation to BGE's Conastone substation
- Component 4: 40AB1 – New two single circuit 230 kV transmission lines from new Bartholow substation to new Grisham substation
- Component 5: 27d – North Peach Bottom to South Peach Bottom 500 kV upgrade

- Component 6: 39H1 – New Grisham substation – 6 terminal
- Component 7: 45F1 – New Bartholow substation – 12 terminal
- Component 8: 26b2 – New North Delta substation – 10 terminal
- Component 9: 26c2 – Conastone substation 500 kV and 230 kV substation expansion
- Component 10: 39h1a – Nimbus to Buttermilk 230 kV loop in/out work
- Component 11: 39h1b – Pacific to Beco 230 kV loop in/out work
- Component 12: 47ab – New 230 kV transmission from new Goram substation to existing Otter Creek substation
- Component 13: 47abc – New 500 kV transmission line from new Goram substation to new Bartholow substation
- Component 14: 47ad – New 230 kV transmission line from existing Otter Creek substation to new Bartholow substation
- Component 15: 47b – New double circuit 230 kV transmission from the existing Conastone substation to new Bartholow substation
- Component 16: 47A – New Goram substation
- Component 17: 47ax– Loop in Conastone to Brighton 500 kV line to new Bartholow substation
- Component 18: 43EF – Mt Airy 230 kV substation single breaker expansion
- Component 19: 43e – New 230 kV transmission line from new Bartholow substation to existing Mt. Airy substation
- Component 20: 48b – Two (2) new 230 kV single circuit transmission lines from the existing Keeney substation to existing Waugh Chapel substation
- Component 21: 47ac – Otter Creek 230 kV four circuit breaker expansion
- Component 22: 48C – Keeney substation two new 230 kV terminations
- Component 23: 48d – Waugh Chapel substation two new 230 kV terminations
- Component 24: 50B – Peach Bottom to North Delta 500 kV upgrade

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*26A – New 500 kV Transmission Line From New North Delta Substation to BGE's Conastone Substation*

This component of the proposal is for an approximate 15-mile portion of new 500 kV overhead transmission line from new North Delta substation to BGE's Conastone substation. The line will largely travel within new ROW between North Delta and Conastone.

*40AB1 – New Two Single Circuit 230 kV Transmission Lines From Bartholow to Grisham Substation*

This component of the proposal is for an approximate 35-mile portion of two new 230 kV overhead and underground transmission lines from new Bartholow substation to new Grisham substation. The two lines will travel on single circuit structures within new ROW for approximately 60% of the route length. The ROW will be an expansion of existing ROWs for approximately 35% of the route length, while approximately 5% of the route will be underground in narrower and congested areas.

*47ab – New 230 kV Transmission From New Goram Substation to Existing Otter Creek Substation*

This component of the proposal is for an approximate 1-mile 230 kV greenfield overhead transmission line from the new Goram substation to the existing Otter Creek substation. The line will travel on single circuit structures within new ROW.

*47abc – New 500 kV Transmission Line From New Goram Substation to New Bartholow Substation*
This component of the proposal is for an approximate 61-mile 500 kV greenfield overhead transmission line from the new Goram substation to the new Bartholow substation. The line will travel on new single circuit monopoles within a new ROW as part of expanded easement alongside existing ROW.

*47ad – New 230 kV Transmission Line From Existing Otter Creek Substation to New Bartholow Substation*
This component of the proposal is for an approximate 61-mile 230 kV greenfield overhead transmission line from the existing Otter Creek substation to the new Bartholow substation. The line will largely travel on new single circuit monopoles within a new ROW as part of expanded easement alongside existing ROW.

*47b – New Double Circuit 230 kV Transmission From the Existing Conastone Substation to New Bartholow Substation*
This component of the proposal is for an approximate 48-mile 230 kV greenfield overhead transmission line double circuit project from existing Conastone substation to new Bartholow substation. The line will largely travel on new double circuit monopoles within a new ROW as part of expanded easement alongside existing ROW.

*43e – New 230 kV Transmission Line From New Bartholow Substation to Existing Mt. Airy Substation*
This component of the proposal is for an approximate 5-mile 230 kV greenfield overhead transmission line from the new Bartholow substation to the existing Mt. Airy substation. The line will largely travel on new single circuit monopoles within a new ROW as part of expanded easement alongside existing ROW.

*48b – Two New 230 kV Single Circuit Transmission Lines From Existing Keeney to Existing Waugh Chapel Substation*
This component of the proposal is for an approximate 104-mile section of 230 kV line with 34 miles of submarine cable, and roughly 70 miles of new 230 kV overhead transmission from the existing Keeney substation to the existing Waugh Chapel substation. The two single circuit 230 kV lines will be staggered and offset to utilize the same ROW width as a 230 kV double circuit design. The submarine cable will be used to cross the Chesapeake Bay. The ROW will have its own corridor for approximately 85% of the route length. The ROW will be an expansion of an existing transmission corridor for approximately 15% of the route length. Approximately 30% of the route will be submarine.

Overall, the ROW risk for components in this proposal is high due to the extensive greenfield nature of the proposed new transmission line routes.

## Environmental Risk Analysis

*48b – Two New 230 kV Single Circuit Transmission Lines From Existing Keeney to Existing Waugh Chapel Substation*
The proposed route has the potential to impact environmental and cultural resources including New Castle and Frenchtown Railroad ROW, Delaware Boundary Markers, Odessa Historic District (Boundary Increase), and Cooch's Bridge Historic District (Boundary Decrease).

Fifty-seven designated high-risk flood zones, 156 streams and 225 wetlands subject to USACE Section 404 and/or Section 10 permitting are required for crossing the Chesapeake Bay and woodlands with the potential to serve as suitable habitat for federally listed threatened and endangered species.

Coordination with the USACE; USFWS; National Park Service; SHPO (PA); and the county flood plain administrator from New Castle County, Pennsylvania; Cecil County, Kent County, Anne Arundel County, and Queen Anne's County, Maryland, will be required. Proposed route intersects 23 conservation easements and 13 parks/conservation areas. Coordination with easement holders will be required.

New Castle and Frenchtown railroad ROW, Delaware boundary markers, Odessa Historic District (boundary increase), and Cooch's Bridge Historic District (boundary decrease) are intersected by the proposed route.

*47abc – New 500 kV Transmission Line From New Goram Substation to New Bartholow Substation*
The proposed route has the potential to impact environmental resources including 13 designated high-risk flood zones, 96 streams, and 150 wetlands subject to USACE Section 404 and/or Section 10 permitting, and woodlands with the potential to serve as suitable habitat for federally listed threatened and endangered species.

Coordination with the USACE; USFWS; MD Dept. of Natural Resources; and the county flood plain administrator from Frederick County, Carroll County, Baltimore County, Maryland; and York County, Pennsylvania, will be required.

Proposed route intersects 45 conservation easements. Coordination with easement holders: Maryland Rural Legacy Program; Maryland Environmental Trust; Maryland Agricultural Land Preservation Foundation; NRCS - Admin State PA; Pennsylvania State Government; York County Agricultural Land Preservation Program, Pennsylvania; York County, Pennsylvania; Pennsylvania Department of Agriculture - Farmland Preservation Program; unknown local government will be required.

The proposed route intersects with parks/conservation areas including: Morgan Run Natural Environment Area (MD Department of Natural Resources). Coordination is recommended to determine construction constraints such as special-use permits, construction timing during public use, sound and/or noise considerations, traffic plans and restoration requirements.

*New Grisham 230 kV Substation*
Proposed location of the Grisham substation appears to intersect with wetlands.

## Transmission Line Risk Analysis

*48b – Two New 230 kV Single Circuit Transmission Lines From Existing Keeney to Existing Waugh Chapel Substation*
Significant engineering, permitting and constructions risks anticipated for the proposed Keeney to Waugh Chapel line route, particularly the 34 miles of submarine line required to cross the Chesapeake Bay. Cable supply constraints are also a significant concern for this proposed route with cost and schedule risks associated with this component.

## Substation Risk Analysis

*New Grisham 230 kV Substation*
Grisham is a proposed new three-bay breaker-and-a-half 230 kV substation to be connected by tapping Pacific to BECO and Buttermilk to Nimbus 230 kV lines. The proposed scope includes looping in and out existing Buttermilk to Nimbus and Pacific to BECO 230 kV lines and terminating two new single circuit 230 kV lines from new Bartholow (T-Point) substation. Major equipment proposed for the new Grisham 230 kV (breaker-and-a-half) switchyard includes three bays, six line terminals, two 150 MVAR shunt capacitor banks, one -300 to +500 MVAR Static VAR

Compensator (SVC), and eleven 230 kV, 5000A, 80 kAIC breakers. The capacitor banks are proposed to be installed on the east bus, and the SVC is proposed to be installed on the west bus.

*New Bartholow 230 kV Substation*

Bartholow is a proposed new 500-230 kV substation near the location where Conastoane-Brighton and Doubs-Brighton 500 kV lines form a "T-Point." The proposed substation will include two 500/230 transformer banks, a 500 kV switchyard, and a 230 kV breaker-and-a-half switchyard. The new 500 kV switchyard is proposed to be built with three bays, six line terminals, twelve 500 kV, 5000A, 63 kAIC breakers, two shunt 150 MVAR capacitor banks, one -300 to +500 MVAR Static VAR Compensator (SVC), and two 500-230 kV transformer banks. The new breaker-and-a-half 230 kV switchyard is proposed to be built with three bays, six line terminals, and eleven 230 kV, 5000A, 80 kAIC breakers. The proposal includes looping in of existing 500 kV Conastone-Brighton and existing 500 kV Doubs-Brighton lines and termination of one new 500 kV line and six new 230 kV lines.

*New Goram 230 kV Substation*

Goram is a proposed new 500 kV breaker-and-a-half switchyard to be constructed near existing Otter Creek substation with two bays, three line terminals, six 500 kV, 5000A, 63 kAIC breakers, one 500/230 kV transformer bank, and one 230 kV, 5000A, 80 kAIC breaker. It is also proposed to loop in existing 500 kV Peach Bottom-Three Mile Island line, terminate one new 500 kV line, and terminate one new 230 kV line to existing Otter Creek.

The other substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 13.

Table 13. Proposal 948 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 1 | 24e – North Delta to Cooper 230 kV rebuild | 1.84 | 3.49 |
| 2 | 24f – North Delta to Graceton 230 kV rebuild | 15.93 | 43.47 |
| 3 | 26A – New 500 kV transmission line from new North Delta substation to BGE's Conastone substation. | 76.24 | 106.22 |
| 4 | 40AB1 – New two single circuit 230 kV transmission lines from new Bartholow substation to new Grisham substation | 273.05 | 350.14 |
| 5 | 27d – North Peach Bottom to South Peach Bottom 500 kV upgrade | 1.51 | 1.72 |
| 6 | 39H1 – New Grisham Substation – 6 terminal | 40.92 | 135.78 |
| 7 | 45F1 – New Bartholow Substation – 12 terminal | 99.29 | 221.49 |
| 8 | 26b2 – New North Delta Substation – 10 terminal | 71.44 | 90.83 |
| 9 | 26c2– Conastone substation 500 kV and 230 kV substation expansion | 2.80 | 10.54 |
| 10 | 39h1a – Nimbus to Buttermilk 230 kV loop in/out work | 5.00 | 2.61 |
| 11 | 39h1b – Pacific to Beco 230 kV loop in/out work | 5.00 | 2.61 |
| 12 | 47ab – New 230 kV transmission from new Goram substation to existing Otter Creek substation | 2.37 | 9.27 |
| 13 | 47abc – New 500 kV transmission line from new Goram substation to new Bartholow substation | 165.08 | 415.13 |
| 14 | 47ad – New 230 kV transmission line from existing Otter Creek substation to new Bartholow substation | 141.43 | 267.93 |
| 15 | 47b – New double circuit 230 kV transmission from the existing Conastone substation to new Bartholow substation | 142.21 | 204.43 |
| 16 | 47A – New Goram substation | 53.27 | 72.89 |
| 17 | 47ax – Loop in Conastone to Brighton 500 kV line to new Bartholow substation | 5.00 | 6.22 |
| 18 | 43EF – Mt Airy 230 kV substation single breaker expansion | 2.80 | 5.71 |
| 19 | 43e – New 230 kV transmission line from new Bartholow substation to existing Mt. Airy substation | 11.87 | 23.91 |
| 20 | 48b – Two new 230 kV single circuit transmission lines from the existing Keeney substation to existing Waugh Chapel substation | 4250.00* | 4250.00* |
| 21 | 47ac – Otter Creek 230 kV four circuit breaker expansion | 1.40 | 12.06 |
| 22 | 48C – Keeney substation two new 230 kV terminations | 5.00 | 10.01 |
| 23 | 48d – Waugh Chapel substation two new 230 kV terminations | 2.80 | 8.96 |
| 24 | 50B – Peach Bottom to North Delta 500 kV Upgrade | 5.00 | 10.47 |
| | Total | 5,381.25 | 6,265.88 |

**Note: The cost estimate for the Component 20 for Keeney – Waugh Chapel was revised by the proposing entity from $490 M to $4,250 M due to cost estimation error, which raised the overall proposal cost estimate from $1,622 M to $5,381 M.*

The total proposal cost estimate is within 10–20% of the independent cost estimate and is considered medium risk.

### Schedule Review

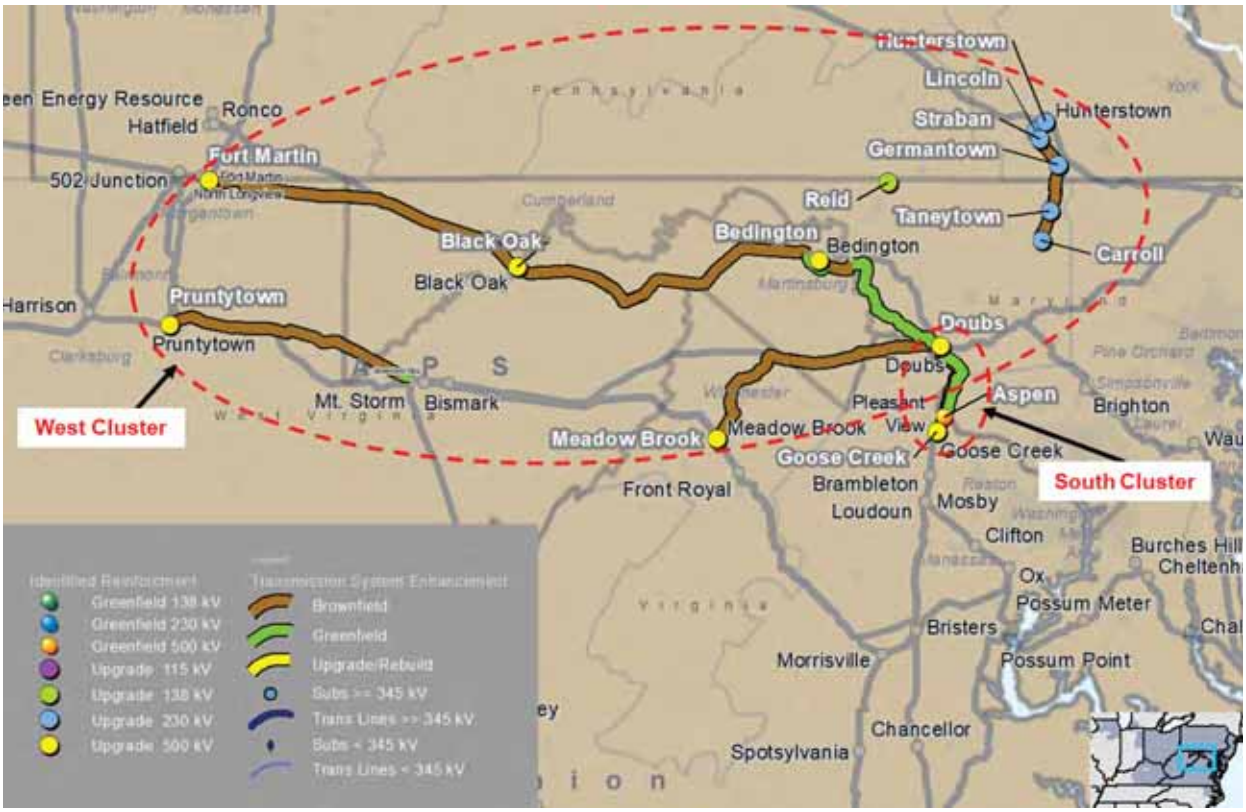
The proposed in-service date of June 2028 is very aggressive for the proposed scope of the project, considering the significant permitting, engineering and construction and land acquisition risks associated with the greenfield line routes. In particular, the permitting, engineering and construction risks anticipated with the Keeney to Waugh Chapel route has the potential to introduce significant schedule challenges. Overall, the schedule risk is considered high.

## West Proposal Cluster

## *Proposal 837 (West) – FirstEnergy (Potomac Edison)*

FirstEnergy Proposal No. 837 (Map 15), described as Data Center Reinforcement Proposal No. 1, has 30 components, which PJM has grouped into West and South clusters. Specifically for the West cluster, FirstEnergy proposed components in multiple counties across Pennsylvania, West Virginia, Virginia and Maryland, and includes new greenfield lines, as well as multiple substation upgrades.

Map 15. Proposal 837




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

FirstEnergy Proposal 837 includes the following components for the West Cluster:

- Component 1: Doubs substation – Install 500 kV breaker
- Component 2: Doubs substation – Expand 500 kV switchyard
- Component 3: Meadow Brook substation – Expand 500 kV switchyard
- Component 4: Fort Martin substation – Install 500 kV breaker
- Component 5: Pruntytown substation – Expand 500 kV switchyard
- Component 6: Bedington substation – Rebuild & Install 600 MVAR STATCOM
- Component 7: Fort Martin-Doubs 500 kV No. 1 line
- Component 8: Meadow Brook-Doubs 500 kV line
- Component 9: Meadow Brook-Pruntytown 500 kV line
- Components 10–13: Relaying Upgrades – Various stations
- Components 14–15: Overduty Breaker Replacements – Doubs & Pruntytown
- Components 18–30: Carroll-Hunterstown 230 kV line

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*Fort Martin to Doubs 500 kV OH Line*

This component of the proposal is for a single circuit 158-mile greenfield 500 kV overhead transmission line from the existing Fort Martin substation to the existing Doubs substation. The project is located across West Virginia, Virginia and Maryland. The new 500 kV is assumed to parallel an existing ROW for 85.6 miles of the route and has its own ROW that is not adjacent to any existing ROW for approximately 74.4 miles. The terrain for the route is hilly and passes through state and national parks, which may require alternative access route and construction methods.

*Meadow Brook to Doubs 500 kV OH Line*

This component of the proposal is for a 55.3-mile single circuit greenfield 500 kV overhead transmission line from the existing Meadow Brook substation to the existing Doubs substation. The project is located across West Virginia, Virginia and Maryland. The new 500 kV is assumed to parallel an existing ROW for 22.8 miles of the route and has its own ROW that is not adjacent to any existing ROW for approximately 32.5 miles. The terrain for the route is hilly and passes through state and national parks, which may require alternative access route and construction methods.

*Meadow Brook to Pruntytown 500 kV OH Line*

This component is for a 50.8-mile new 500 kV transmission line from the existing Pruntytown substation to the structure just north of the existing Mt. Storm substation. It will then cut the existing Meadow Brook to Mt. Storm line and connect to Pruntytown substation to create the new Meadow Brook to Pruntytown line. The project is located across West Virginia and Maryland. The new 500 kV is assumed to parallel an existing ROW for 14.5 miles of the route and has its own ROW that is not adjacent to any existing ROW for approximately 36.3 miles.

*Hunterstown to Carroll 230 kV OH Line*

This component is for a 24.3-mile new 230 kV overhead transmission line from the existing Hunterstown substation to the existing Carroll substation, using single circuit tubular steel monopole suspension structures. The project spans across Carroll County, Maryland, and Adams County, Pennsylvania. The new line will use the existing ROW of the 115/138 kV transmission corridor from Hunterstown-Lincoln-Germantown-Carroll substations. No additional ROW is required for this proposed line route.

Overall, the ROW risk for the new transmission line components in this proposal is medium-high to high, as the proposed new transmission lines are routed parallel to an existing ROW for most of their alignment, or use entirely new ROW, with the exception of the Hunterstown to Carroll 230 kV line that is an entirely brownfield development.

## Environmental Risk Analysis

*Fort Martin to Doubs 500 kV OH Line*

The proposed route intersects floodways, flood plains, wetlands, navigable waters and public lands, and as a result, permitting is expected to be a lengthy process. This route crosses Cheat and Sleepy Creek lakes, and the Potomac River, and also goes through several national scenic and historic trails (South Mountain State Park and the Appalachian Scenic Trail), historical areas (Antietam, Harpers Ferry and Sharpsburg), intersects public lands, and crosses the Chesapeake and Ohio Canal National Historical Park. This may require permission from the National Park Service (NPS) and require an Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) to analyze the impacts to the environment and park resource, which could be a lengthy process. Route crosses MD Department of Natural Resource (DNR)-recognized public lands and is also within a short distance of residential areas.

*Meadow Brook to Doubs 500 kV OH Line*

The proposed route crosses the Potomac River, and also goes through several national scenic and historic trails (Harpers Ferry National Historical Park and the Appalachian Scenic Trail), intersects public lands and conservation easements, and intersects the Chesapeake and Ohio Canal National Historical Park. This may require permission from the National Park Service (NPS) and require an Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) to analyze the impacts to the environment and park resource, which could be a lengthy process. This route is also within a short distance of residential and commercial areas.

*Meadow Brook to Pruntytown 500 kV OH Line*

This route crosses national forests in West Virginia and is within a short distance of residential areas.

Medium-high constructability risks assessed for the proposed line routes due to anticipated lengthy regulatory process, potential public opposition, construction difficulty, environmental constraints and property acquisition, which may have significant impacts on the cost and schedule for the proposed project.

## Transmission Line Risk Analysis

Significant engineering and construction challenges anticipated for the Ft Martin-Doubs line to construct a 158-mile transmission line through three states, and will require parallel crews and construction where possible to mitigate schedule challenges that will be introduced by the anticipated lengthy permitting process. This is also true, although to a lesser extent, for the Meadow Brook to Doubs and Meadow Brook to Pruntytown lines.

### Substation Risk Analysis

The substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 14.

Table 14. Proposal 837 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 1 | Doubs Substation – Install 500 kV Breaker | 4.72 | 5.41 |
| 2 | Doubs Substation – Expand 500 kV Switchyard | 14.44 | 16.65 |
| 3 | Meadow Brook Substation – Expand 500 kV Switchyard | 16.55 | 17.88 |
| 4 | Fort Martin Substation – Install 500 kV Breaker | 6.04 | 5.41 |
| 5 | Pruntytown Substation – Expand 500 kV Switchyard | 28.21 | 26.32 |
| 6 | Bedington Substation – Rebuild & Install 600 MVAR STATCOM | 131.38 | 219.32 |
| 7 | Fort Martin – Doubs 500 kV #1 Line | 1445.81 | 1502.52 |
| 8 | Meadow Brook – Doubs 500 kV Line | 460.60 | 275.45 |
| 9 | Meadow Brook – Pruntytown 500 kV Line | 418.59 | 245.99 |
| 10-13 | Relaying Upgrades – Various Stations | 8.27 | 8.14 |
| 14-15 | Overduty Breaker Replacements – Doubs & Pruntytown | 116.33 | 116.67 |
| 18-30 | Carroll-Hunterstown 230 kV Line | 137.45 | 202.30 |
| | Total | 2,788.40 | 2,642.05 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

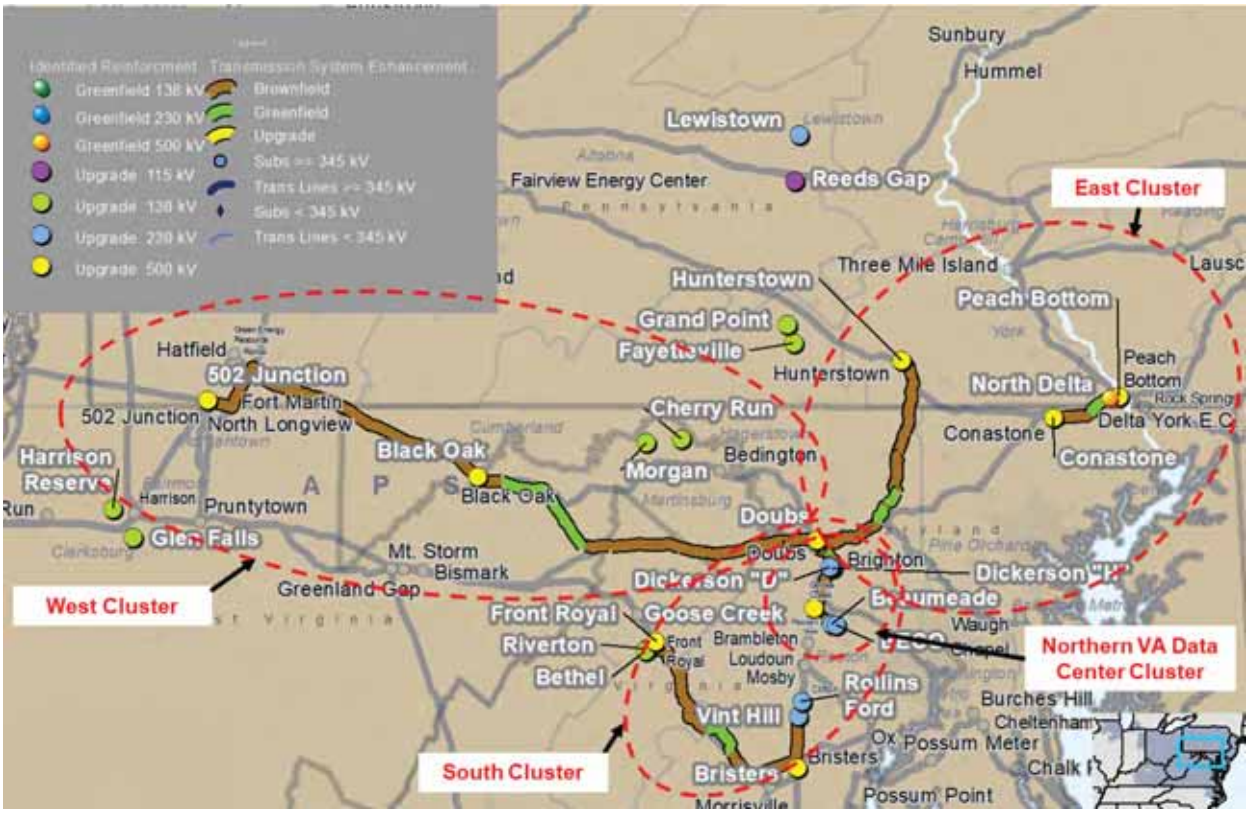
### Schedule Review

The proposed in-service date of June 2030, although more reasonable compared to other West cluster proposals of similar scale, is still aggressive for the proposed scope of the project, considering the significant permitting and land acquisition challenges associated with the three proposed 500 kV greenfield line routes through three states. Overall, the schedule risk is considered medium.

## *Proposal 548 (West) – LS Power*

LS Power Proposal No. 548 (Map 16), described as RTEP Window 3 Solution, provides a holistic solution to the RTEP Window 3 needs, comprising 37 components that can be grouped into the four regional clusters identified for the window. Specifically for the West cluster, LS Power proposed components in multiple counties across Pennsylvania, West Virginia, Virginia and Maryland and includes new greenfield lines as well as multiple substation upgrades.

Map 16. Proposal 548 (see next page)




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

LS Power Proposal 548 includes the following components for the West Cluster:

- Component 7: 502 Junction substation upgrade
- Component 9: Black Oak substation upgrade
- Component 11: Doubs substation upgrade
- Component 25: 502 Junction-Black Oak 500 kV transmission line
- Components 26 and 29: Black Oak-Doubs Greenfield 500 kV transmission line

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*502 Junction-Black Oak 500 kV OH Line*

This component of the proposal is for a 73-mile single circuit greenfield 500 kV overhead transmission line from the existing 502 Junction substation to the existing Black Oak substation. The line parallels existing 500 kV ROWs for the entirety of the line, outside of a few short sections to route around constraints adjacent to the existing corridor.

*Black Oak to Doubs 500 kV OH Line*

This component of the proposal is for an 83-mile single circuit, partially greenfield 500 kV overhead transmission line from the existing Black Oak substation to the existing Doubs substation. The line parallels existing 500 kV ROWs for of the first 31 miles of the line, outside of a 10-mile section to route around constraints adjacent to the existing corridor. At the 32-mile mark, the line route will then involve a rebuild of the existing Hampshire to Stonewall 138 kV line, Stonewall to Millville 138 kV, and Millville to Doubs 138 kV lines as 500/138 kV line until a few spans outside of Doubs substation. At that point, the 500 kV circuit will diverge from the 138 kV centerline to connect to Doubs as single circuit 500 kV. The proposing entity assumes that the entire 52 miles of the 500/138 kV underbuilt development will fit entirely within the existing ROW. This assumption was not researched by the proposing entity with a high degree of confidence, and there is reasonable risk that this underbuilt segment will require additional ROW to accommodate the 500/138 kV double circuit structures.

Overall, the ROW risk for the new West cluster transmission line components in this proposal is medium-high, as the proposed new transmission lines are routed parallel to an existing ROW for majority of their alignment.

### Environmental Risk Analysis

*502 Junction-Black Oak 500 kV OH Line*

Route crosses Pennsylvania and MD Department of Natural Resource (DNR)-recognized public lands and is also within a short distance of residential areas.

*Black Oak to Doubs 500 kV OH Line*

The proposed route crosses the Potomac River and goes through several national scenic and historic trails (Harpers Ferry National Historical Park and the Appalachian Scenic Trail), intersects public lands and conservation easements, and intersects the Chesapeake and Ohio Canal National Historical Park. This may require permission

from the National Park Service (NPS) and require an Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) to analyze the impacts to the environment and park resource, which could be a lengthy process. This route is also within a short distance of residential and commercial areas.

Medium-high constructability risks assessed for the proposed line routes due to anticipated lengthy regulatory process, potential public opposition, construction difficulty, environmental constraints and property acquisition, which may have significant impacts on the cost and schedule for the proposed project.

### Transmission Line Risk Analysis

Significant engineering and construction challenges anticipated for the proposed lines to construct a total of 156 miles of new transmission through four states and will require parallel crews and construction where possible to mitigate schedule challenges that will be introduced by the anticipated lengthy permitting process.

For the rebuild portions of the proposed line routes, there are challenges with existing overhead transmission infrastructure components needing to be removed/salvaged before construction of proposed brownfield lines can commence and potential design and ROW limitations for reuse of existing infrastructure/assets.

Other medium risks for this project involve the existing facility outages that will be necessary for the project, particularly for the line rebuild, and substation upgrades.

### Substation Risk Analysis

The substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 15.

Table 15. Proposal 548 (West) Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 7 | 502 Junction Substation Upgrade | 7.56 | 9.94 |
| 9 | Black Oak Substation Upgrade | 11.35 | 13.20 |
| 11 | Doubs Substation Upgrade | 17.02 | 24.00 |
| 25 | 502 Junction-Black Oak 500 kV Transmission Line | 458.92 | 335.91 |
| 26 | Black Oak-Doubs Greenfield 500 kV Transmission Line | 200.02 | 173.55 |
| 29 | Black Oak-Doubs Greenfield 500 kV Transmission Line (Shared ROW) | 277.84 | 319.42 |
| | Total | 972.71 | 876.03 |

The total proposal cost estimate is more conservative than the independent cost estimate and is considered low risk.

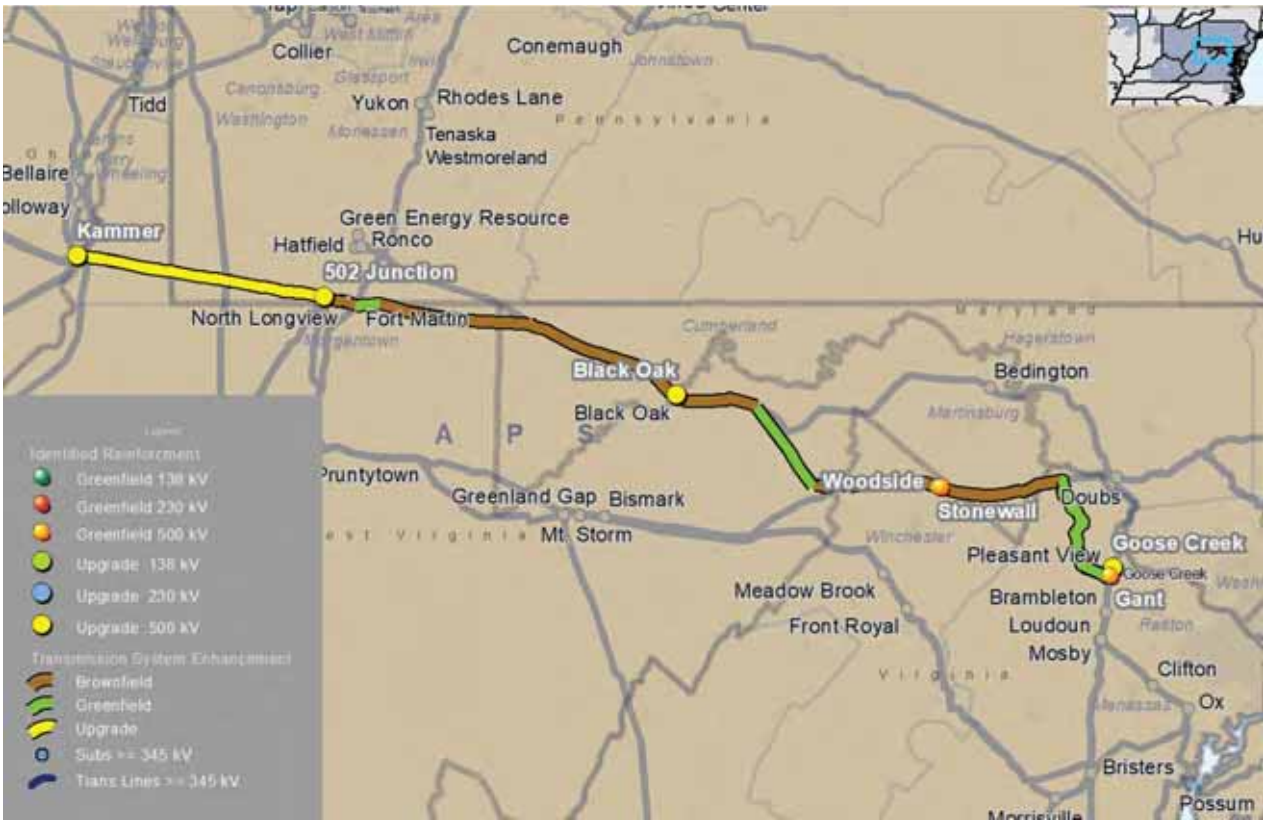
### Schedule Review

The proposed in-service date of June 2030, although more reasonable compared to other West cluster proposals of similar scale, is still aggressive for the proposed scope of the project considering the significant permitting and land acquisition challenges associated with the two proposed 500 kV greenfield line routes through four states. Overall, the schedule risk is considered medium.

## *Proposal 853 – NextEra*

NextEra Proposal No. 853 (Map 17), described as 502 Junction-Black Oak-Woodside-Gant, Woodside SVC + Cap Banks, includes components in multiple counties across Pennsylvania, West Virginia, Virginia and Maryland and includes new greenfield lines and substations as well as multiple substation upgrades.

Map 17. Proposal 853




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

NextEra Proposal 853 includes the following components for the West cluster:

- Component 1: 4CA – New 500 kV transmission line from existing Black Oak substation and new Woodside substation
- Component 2: 10C1A – New 500 kV transmission line from new Woodside substation to new Gant substation (Segment 1)
- Component 3: 23s5 – New Woodside Substation – 6 terminal
- Component 4: 23sb – Stonewall substation two 138 kV breaker expansion
- Component 5: 04AE – Black Oak substation 500 kV six breaker and new transformer expansion
- Component 6: 10C3 – New 500 kV line between new Woodside substation and new Gant substation (Segment 2)
- Component 7: 39a3 – New Gant substation – 3 terminal
- Component 8: 46a – New 500 kV line from existing 502 Junction substation to existing Black Oak substation
- Component 9: 46b – 502 Junction substation two 500 kV circuit breaker expansion
- Component 10: 46b1 – Kammer to 502 Junction 500 kV upgrade

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*46a – 502 Junction to Black Oak OH 500 kV Line*

This component of the proposal is for a single circuit 67-mile 500 kV overhead transmission line from the existing 502 substation to the existing Black Oak substation. The project follows an existing transmission ROW, paralleling 502 Jct-Ft Martin 500 kV, then West Run-Lake Lynn-Hazelton-Jennings 138 kV, and then Black Oak-Hatfield 500 kV, only deviating from the existing ROW to route around potential conflict areas. The ROW width for the project will be 165 ft. and will be an expansion of the existing transmission corridor, and this additional ROW width will be reduced to a 75 ft. row for about 5% of the line due to ROW constraints.

*4CA – Black Oak to Woodside OH 500 kV Line*

This component of the proposal is for a single circuit 53-mile 500 kV overhead transmission line from the new Black Oak substation to the Woodside substation. The line utilizes existing ROW, paralleling Black Oak-Bedington 500 kV, then Hampshire-Ridgeley 138 kV, Hampshire-Gore 138 kV, and then Doubs-Bismark 500 kV up to Gore substation. Starting at Gore, the Gore-Stonewall 138 kV line is rebuilt as a 500/138 kV double circuit for 15 miles to the new Woodside substation. The ROW width will range between 125 ft.–165 ft. depending on location.

*10C1A – Woodside to Gant (Segment 1) OH 500 kV Line*

This component of the proposal is for a single circuit 22-mile 500 kV overhead transmission line from the new Woodside substation to the point east of the Appalachian Trail where the component 10C3 Segment 2 of the Woodside to Gant line begins to continue the route to Goose Creek substation. For approximately 80% of the route, the line uses existing ROW, rebuilding the Stonewall-Feagan's Mill-Millville-Lovettsville 138 kV lines as double 500/138 kV double circuit, and a ROW width expansion of 30 ft. will be required from the assumed ROW edge. The remaining 20% of the line will use new greenfield ROW with a corridor width of 115 ft.–165 ft. depending on location.

*10C3 – Woodside to Gant (Segment 2) OH 500 kV Line*

This component of the proposal picks up from the end of the component 10C1A Segment 1 of the proposed Woodside to Gant line. This component is a single circuit 25-mile-long line, which parallels Doubs-Bismark 500 kV for about 0.5 miles before continuing on its own greenfield ROW to the new Gant substation. The anticipated ROW width for this segment of the line route is 165 ft.

Overall, the ROW risk for the new West cluster transmission line components in this proposal is medium-high to high, as the proposed new transmission lines are routed parallel to an existing ROW for majority of their alignment.

### Environmental Risk Analysis

*46a – 502 Junction to Black Oak OH 500 kV Line*

Route crosses West Virginia and MD Department of Natural Resource (DNR)-recognized public lands and is also within a short distance of residential areas.

*4CA – Black Oak to Woodside OH 500 kV Line*

Route crosses through the Appalachian Mountains and intersects with VA Natural Heritage easements.

*10C1A – Woodside to Gant (Segment 1) OH 500 kV Line*

The proposed route for this line segment goes through several national scenic and historic trails (Harpers Ferry National Historical Park and the Appalachian Scenic Trail), and intersects public lands and conservation easements. This may require permission from the National Park Service (NPS) and require an Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) to analyze the impacts to the environment and park resource, which could be a lengthy process. This route is also within a short distance of residential and commercial areas.

*10C3 – Woodside to Gant (Segment 2) OH 500 kV Line*

The proposed route for this greenfield line segment goes through highly developed residential and commercial developments, as well as state and local conservation easements. This route also crosses the Washington & Old Dominion (W&OD Trail), a regional park in northern Virginia. There is significant risk of public opposition to the proposed route, which may lead to rerouting this segment along the existing corridor from Doubs to Goose Creek.

Overall, for Proposal 853, medium-high constructability risks are assessed for the proposed line routes due to anticipated lengthy regulatory process, potential public opposition, construction difficulty, environmental constraints and property acquisition, which may have significant impacts on the cost and schedule for the proposed project.

### Transmission Line Risk Analysis

Significant engineering and construction challenges are anticipated for the proposed lines to construct a total of 167 miles of new transmission through four states and will require parallel crews and construction where possible to mitigate schedule challenges that will be introduced by the anticipated lengthy permitting and land acquisition process.

For the rebuild portions of the proposed line routes, there are challenges with existing overhead transmission infrastructure components needing to be removed/salvaged before construction of proposed brownfield lines can commence, and potential design and ROW limitations for reuse of existing infrastructure/assets.

Other medium risks for this project involve the existing facility outages that will be necessary for the project, particularly for the line rebuild and substation upgrades.

### Substation Risk Analysis

*New Woodside 500/138 kV Substation*

Woodside substation is a proposed new 3-bay breaker-and-a-half 500/138 kV switchyard to be located on about 18 acres. Proposed new equipment to be installed includes three bays; five line terminals; twelve 500 kV, 5000A 63 kAIC breakers; two 500 kV, 150 MVAR shunt capacitor banks; one -300 to +500 MVAR Static VAR Compensator (SVC); two 500 kV–138 kV transformer banks; and two 138 kV, 5000A 80 kAIC breakers. Additionally, termination of one new 500 kV line to Gant and one new 500 kV line Black Oak are proposed along with looping in of the existing 500 kV Doubs-Bismark line.

*New Gant 500/230 kV Substation*

Gant substation is a proposed new 500/230 kV breaker-and-a-half substation. New 500 kV breaker-and-a-half switchyard equipment proposed includes two bays; three line terminals; seven 500 kV, 5000A 63 kAIC breakers; and two 500/230 kV transformer banks. There is also a proposed 230 kV ring bus switchyard with seven line terminals;

seven 230 kV 80 kAIC breakers; and two 1% reactance series reactors. The proposed scope includes looping in existing 500 kV Goose Creek-Brambleton line, terminating one new 500 kV line, terminating one new 230 kV line, and looping in existing 230 kV Pleasant View-Roundtable line.

The other substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 16.

Table 16. Proposal 853 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates($M) |
|---|---|---|---|
| 1 | 4CA – New 500 kV transmission line from existing Black Oak substation and new Woodside substation | 163.50 | 258.98 |
| 2 | 10C1A – New 500 kV transmission line from new Woodside substation to Goose Creek substation | 58.45 | 114.07 |
| 3 | 23s5 – New Woodside Substation – 6 terminal | 125.30 | 167.58 |
| 4 | 23sb – Stonewall substation two 138kV breaker expansion | 2.80 | 5.18 |
| 5 | 04AE – Black Oak substation 500 kV six breaker and new transformer expansion | 14.00 | 23.31 |
| 6 | 10C3 – New 500 kV line between new Woodside substation and new Gant substation | 64.72 | 155.23 |
| 7 | 39a3 – New Gant substation – 3 terminal | 58.08 | 93.85 |
| 8 | 46a – New 500 kV line from existing 502 Junction substation to existing Black Oak substation | 181.90 | 314.70 |
| 9 | 46b – 502 Junction substation two 500 kV circuit breaker expansion | 9.80 | 9.09 |
| 10 | 46b1 – Kammer to 502 Junction 500 kV upgrade | 5.00 | 53.23 |
| | Total | 683.55 | 1,195.24 |

The total proposal cost estimate is less than 30% of the independent cost estimate and is considered high risk

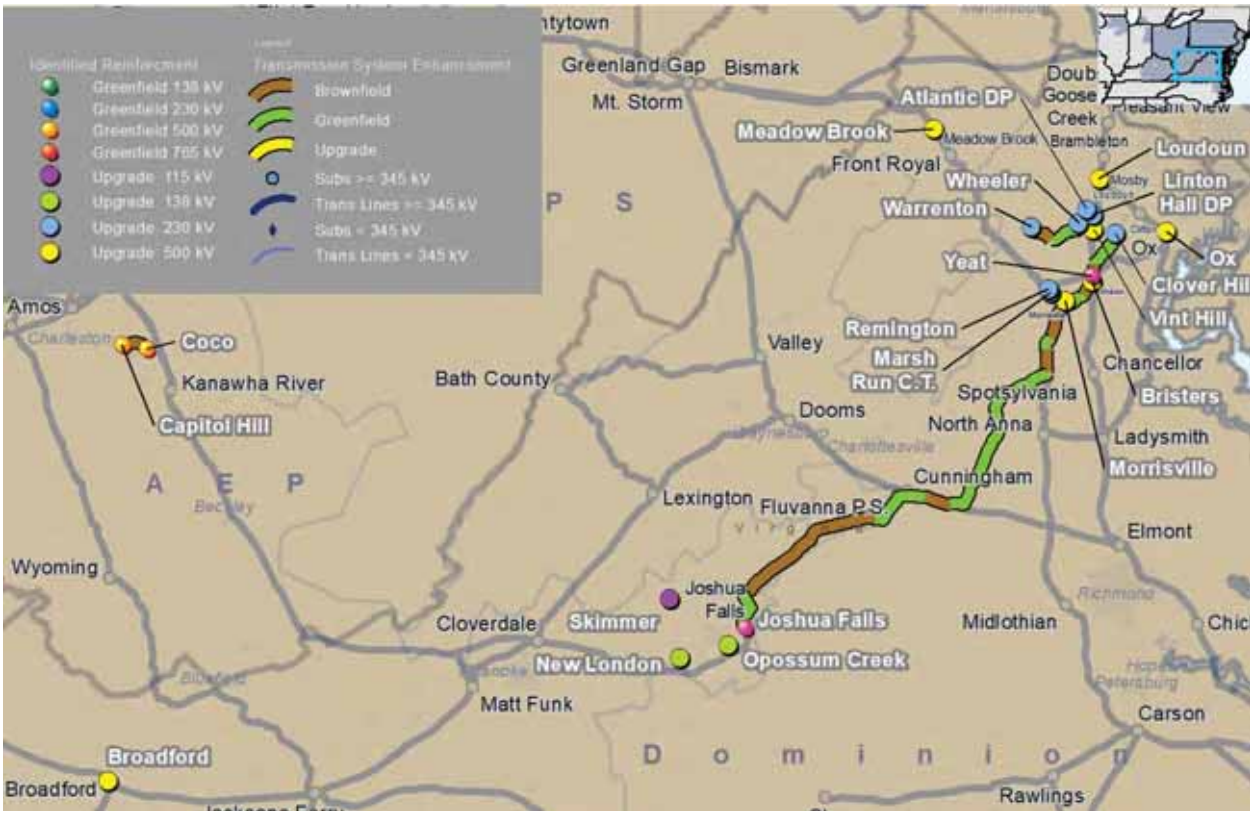
### Schedule Review

The proposed in-service date of June 2027 is very aggressive for the proposed scope of the project considering the significant permitting and land acquisition challenges associated with the proposed 500 kV greenfield line routes through four states. Overall, the schedule risk is considered medium-high.

## *Proposal 904 – Transource*

Transource Proposal No. 904 (Map 18), described as Joshua Falls-Yeat 765 kV greenfield line and substation, spans across multiple counties across Virginia and includes new greenfield lines and a greenfield substation, as well as multiple line and substation upgrades.

Map 18. Proposal 904




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

### Project Overview

Transource Proposal 904 includes the following components for the West Cluster:

- Component 1: Joshua Falls-Yeat 765 kV greenfield transmission line
- Component 2: Yeat greenfield station

- Component 3: Bristers-Ox 500 kV and Meadowbrook-Vint Hill 500 kV tie-in lines
- Component 4: Yeat-Clover Hill 230 kV greenfield transmission line
- Component 5: Warrenton-Wheeler 230 kV greenfield transmission line
- Component 6: Vint Hill-Morrisville series reactor
- Component 7: Vint Hill-Loudon 1 series reactor
- Component 8: Marsh Run-Remington Ct 230 kV line upgrade
- Component 9: Wheeler-Linton Tap-Atlantic 230 kV line upgrade
- Component 10: Bristers-Yeat 500 kV line upgrade
- Component 11: Wheeler station 230 kV breaker upgrade
- Component 12: Opossum Creek series reactor
- Component 13: New London station series reactor
- Component 14: Broadford station upgrade
- Component 15: Skimmer station upgrade
- Component 16: Coco-Capitol Hill 500 kV line upgrade
- Component 17: Joshua Falls station upgrade

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*Joshua Falls-Yeat 765 kV OH Line*

A major component of this proposal is the Joshua Falls-Yeat 765 kV transmission line. The proposed route is approximately 135 miles in length and traverses through 11 counties (Albemarle, Amherst, Buckingham, Campbell, Culpeper, Fauquier, Fluvanna, Louisa, Nelson, Orange and Spotsylvania) in Virginia. Land use in the area is mostly agricultural and wooded parcels in relatively hilly terrain. The proposed route parallels existing transmission corridors (ranging from 46 kV sub transmission to 500 kV transmission) for 59 miles (44%) of its alignment and has its own corridor for the remaining 76 miles, with a ROW width of 200 feet.

*Yeat-Clover Hill 230 kV OH Line*

This component has an 11.69-mile-long route, from the new Yeat substation to the existing Clover Hill substation using a greenfield corridor. The line crosses mostly residential and agricultural parcels in Fauquier and Prince William counties in Virginia.

*Warrenton-Wheeler 230 kV OH Line*

This component has an 8.8-mile-long route, and from the existing Warrenton substation to the existing Wheeler substation, using a mostly new greenfield corridor, paralleling existing transmission corridors for a portion of its alignment. The line crosses woodland, residential and agricultural parcels in Fauquier and Prince William counties in Virginia.

## Environmental Risk Analysis

*Joshua Falls-Yeat 765 kV OH Line*

The proposed line route has the potential to impact environmental and cultural resources including: the Southern Albemarle Rural Historic District, a FEMA High-Risk Flood Zone, wetlands and several waters subject to USACE Section 10 permitting, the most significant being the James River. The route also intersects local conservation easements and appears to co-locate with pipeline ROWs.

*Warrenton-Wheeler 230 kV OH Line*

The line crosses woodland, residential and agricultural parcels in Fauquier and Prince William counties in Virginia. The route intersects local conservation easements and potentially impacts environmental resources such as Auburn Battlefield Historic District, flood plains and wetlands.

There are medium constructability risks assessed for the proposed line routes due to anticipated lengthy land acquisition process, potential public opposition and environmental constraints, which will have impacts on the cost and schedule for the proposed project.

## Transmission Line Risk Analysis

Transource has an optimistic schedule for several aspects of this component and would require a near perfect execution to maintain the proposed in-service date. Given the scale of the component, a 135 mile 765 kV line with everything from permitting to land acquisition to construction poses a risk for delay, the most critical being land acquisition.

For the 230 kV developments, Yeat-Clover Hill and Warrenton-Wheeler, these facilities will utilize BOLD (Breakthrough Overhead Line Design), which is a structure family developed by AEP. The design features a monopole structure with two arched crossarms to hold two circuits in a delta configuration. Benefits of BOLD include increased line capacity with lower-profile structures. However, utilizing this structure family poses risks to the schedule, specifically procurement of the arched crossarms, construction and maintenance of a non-typical design.

## Substation Risk Analysis

*Joshua Falls 765 kV Substation Upgrade*

The Joshua Falls substation is an existing 765 kV substation with a single 765 kV circuit breaker. The proposed modification of the substation would expand the substation by adding two additional 765 kV circuit breakers to the existing substation. This would require expansion of the existing substation layout. It is not clear if additional space is available for this site expansion. The modification would also require work in the proximity to existing energized facilities, which would limit construction activities without utilizing outages. There is a high risk to the schedule due to the difficult nature of scheduling prolonged outages at a 765 kV facility.

*Yeat 765/500/230 kV Greenfield Substation*

The Yeat substation is proposed with a Phase 1 construction consisting of 10-500 kV circuit breakers and two 500 kV-230 kV transformers in a breaker-and-a-half configuration. The 500 kV-230 kV transformers are proposed to be connected to common bus in the break-and-a-half configuration, instead of the industry standard of the breaker positions. During Phase 2, the construction would consist of installing one 765 kV circuit breaker and two 765 kV-500 kV 750 MVA transformers. The 765 kV transformers are proposed to be installed in parallel and connected to a single

breaker location on the 500 kV breaker and a half. Proper operation of this substation may require additional equipment and an expanded arrangement compared to what is proposed.

Other substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 17.

Table 17. Proposal 904 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates($M) |
|---|---|---|---|
| 1 | Joshua Falls-Yeat 765 kV Greenfield Transmission Line | 671.16 | 742.50 |
| 2 | Yeat Greenfield Station | 184.92 | 200.00 |
| 3 | Bristers-Ox 500 kV, and Meadowbrook-Vint Hill 500 kV Tie-in Lines | 8.60 | 9.00 |
| 4 | Yeat-Clover Hill 230 kV Greenfield Transmission Line | 45.17 | 41.00 |
| 5 | Warrenton-Wheeler 230 kV Greenfield Transmission Line | 32.46 | 31.00 |
| 6 | Vint Hill-Morrisville Series Reactor | 5.76 | 5.00 |
| 7 | Vint Hill-Loudon 1 Series Reactor | 5.76 | 5.00 |
| 8 | Marsh Run-Remington Ct 230 kV Line Upgrade | 5.83 | 6.00 |
| 9 | Wheeler-Linton Tap-Atlantic 230 kV Line Upgrade | 1.47 | 6.00 |
| 10 | Bristers-Yeat 500 kV Line Upgrade | 3.33 | 4.50 |
| 11 | Wheeler Station 230 kV Breaker Upgrade | 1.96 | 3.00 |
| 12 | Opossum Creek Series Reactor | 2.16 | 1.50 |
| 13 | New London Station Series Reactor | 4.03 | 1.50 |
| 14 | Broadford Station Upgrade | 17.64 | 17.64 |
| 15 | Skimmer Station Upgrade | 1.96 | 1.96 |

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates($M) |
|---|---|---|---|
| 16 | Coco-Capitol Hill 500 kV Line Upgrade | 11.80 | 16.80 |
| 17 | Joshua Falls Station Upgrade | 44.10 | 30.00 |
| | Total | 1,048.10 | 1,122.40 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

### Schedule Review

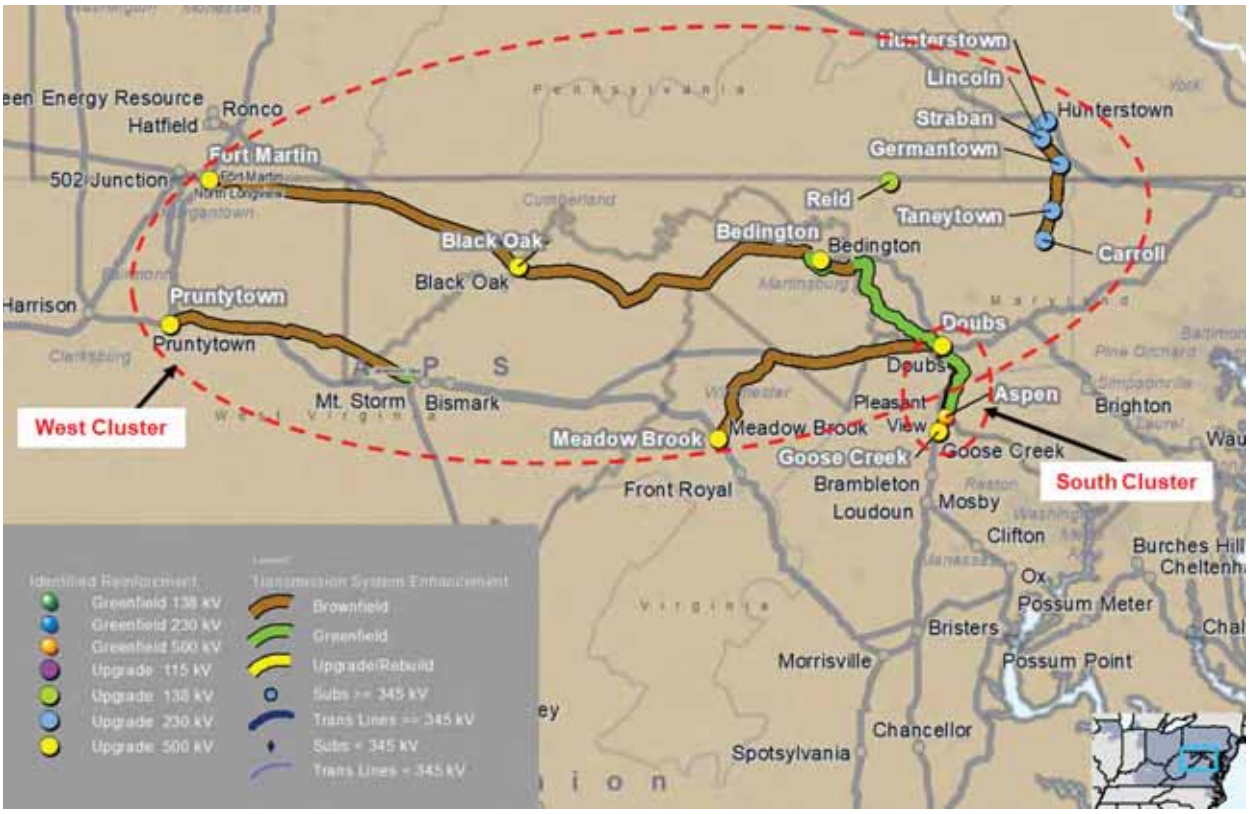
This proposal includes 765 kV substation and transmission line construction, as well as utilization of BOLD (Breakthrough Overhead Line Design) technology for the greenfield 230 kV lines. The sum of all components is a very aggressive undertaking to be completed within the proposed schedule. The primary risks for this proposal are related to the magnitude of the scope of work, procurement and construction of 765 kV equipment and BOLD structures, state permitting and land acquisition for both the 765 kV and 230 kV developments. These all pose a medium-high risk to the December 2029 in-service date proposed by Transource.

## South Proposal Cluster

### *Proposal 837 (South) – FirstEnergy (Potomac Edison)*

FirstEnergy Proposal No. 837 (Map 19), described as Data Center Reinforcement Proposal No. 1, has 30 components, which PJM has grouped into West and South clusters. Specifically for the South cluster, FirstEnergy proposed components in a joint proposal with Dominion's Proposal 516 that rebuilds the Doubs-Goose Creek 500 kV line and adds a new Doubs to Aspen 500 kV line within the same corridor.

Map 19. Proposal 837




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

FirstEnergy Proposal 837 includes the following components for the South cluster:

- Component 16: Doubs-Goose Creek 500 kV rebuild
- Component 17: Doubs-Aspen 500 kV line

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*Doubs to Aspen 500 kV OH Line and Doubs to Goose Creek 500 kV Rebuild*

The new line from existing Doubs to new Aspen 500 kV OH line and Doubs to Goose Creek 500 kV rebuild projects will occur in the same transmission corridor, which currently contains the existing Doubs-Goose Creek '514' 500 kV, Doubs to Dickerson/Doubs to Aqueduct to Dickerson double circuit 230 kV, and Dickerson to Edwards Ferry to Pleasant View '203' 230 kV. These existing circuits will be rebuilt to accommodate the rebuilt Doubs to Goose Creek line, the existing 230 kV lines, and a new Doubs to Aspen 500 kV line using double circuit 500/230 kV structures for about 8 miles to Dickerson, and as two single circuit 500 kV lines for 7.5 miles up to the Maryland/Virginia state line.

Exelon (PEPCO) will have responsibility for their portion of the scope of work for the Dickerson-Edwards Ferry-Pleasant View 230 kV rebuild to double circuit 500/230 kV to accommodate the new Doubs-Aspen 500 kV line up to the Maryland/Virginia state line, and this scope is incorporated within PEPCO's proposal 660, component 22.

FirstEnergy proposal 837 scope ends at the Maryland/Virginia state line, and Dominion's proposal 516 continues with the rebuild of the Doubs to Goose Creek '514' 500 kV line as a double circuit 500/230 kV, and a rebuild of the Dickerson-Edwards Ferry-Pleasant View '203' 230 kV line as a double circuit 500/230 kV to accommodate the both the new Doubs to Aspen 500 kV line and the existing '203' 230 kV line. Dominion's scope will occur within the same transmission corridor which is about 3 miles long.

Overall, the ROW risk for both FirstEnergy proposal 837 and Dominion proposal 516 is low due to the utilization of existing ROW for the entire alignment of the proposed new line and rebuild projects.

### Environmental Risk Analysis

*Doubs to Aspen 500 kV OH Line and Doubs to Goose Creek 500 kV Rebuild*

The project area is in the northern Virginia Piedmont region, which is predominately vegetated utilizing existing ROW. The proposed line routes will cross the Potomac and Monocacy rivers, the Dickerson Conservation Park, and parallels the Chesapeake and Ohio Canal National Historical Park. However, given the use of existing ROW for the route's entire alignment, permitting impacts are likely to be reasonable.

### Transmission Line Risk Analysis

For the rebuild portions of the proposed line routes, there are challenges with existing overhead transmission infrastructure components needing to be removed/salvaged before construction of proposed brownfield lines can commence and potential design and ROW limitations for reuse of existing infrastructure/assets.

Other medium risks for this project involve the existing facility outages that will be necessary for the project, particularly for the line rebuild, and required substation upgrades.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 18.

Table 18. Proposal 837 (South) Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 16 | Doubs-Goose Creek 500 kV Rebuild | 87.74 | 76.56 |
| 17 | Doubs-Aspen 500 kV Line | 115.64 | 132.60 |
| | Total | 203.38 | 209.16 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

### Schedule Review

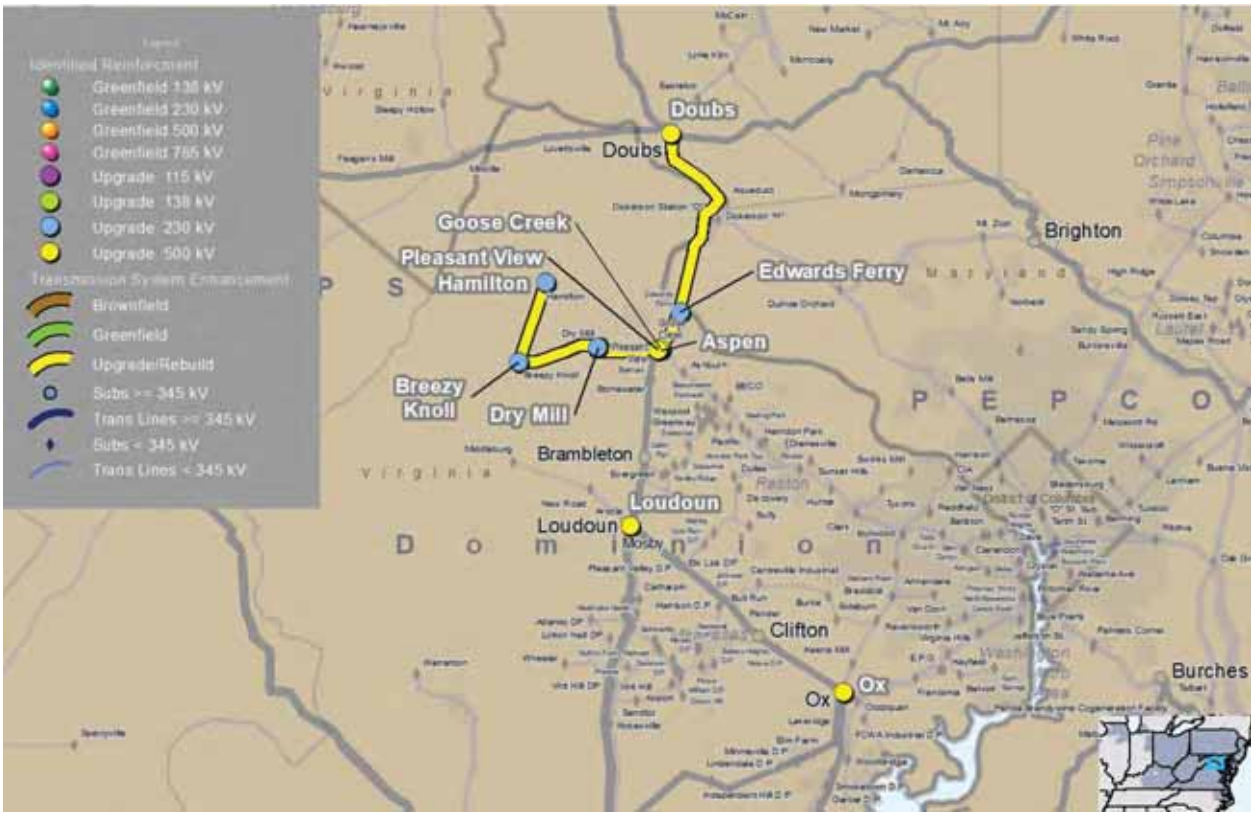
FirstEnergy proposal 837 South components are assumed to have the same December 2027 in-service date as Dominion joint-proposal proposal 516, instead of the overall Proposal 837 in-service date of June 2030, which is more applicable to the Proposal 837's West cluster components.

Given the low-risk brownfield development proposed for proposals 837 and 516, the proposed December 2027 in-service date is reasonable, and schedule risk is considered low.

## *Proposal 516 – Dominion*

Dominion's Proposal No. 516 (Map 20), described as interregional solution Aspen-Doubs second 500 kV line, is a joint proposal with FirstEnergy's Proposal 837 that rebuilds the Doubs-Goose Creek 500 kV line, and adds a new Doubs to Aspen 500 kV line within the same corridor.

Map 20. Proposal 516




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

Dominion's Proposal 516 includes the following components for the South cluster:

- Component 1: Aspen substation terminal equipment installation for 5000A line to Doubs
- Component 2: Breezy Knoll relay reset
- Component 3: Dry Mill South relay reset
- Component 4: Goose Creek substation equipment upgrade
- Component 5: Hamilton relay reset
- Component 6: Pleasant View substation equipment upgrade
- Component 7: Line No. 203 (Pleasant View-Dickerson) rebuild
- Component 8: New 500 kV line (Aspen to Doubs)
- Component 9: Line No. 514 (Goose Creek-Doubs) rebuild
- Component 10: Line No. 2098 (Pleasant View-Hamilton) partial rebuild
- Component 11: Loudoun substation overdutied breaker replacement
- Component 12: Ox substation overdutied breaker replacement
- Component 13: Pleasant View substation overdutied breaker replacement
- Component 14: Edwards Ferry substation equipment upgrade

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*Doubs to Aspen 500 kV OH Line and Doubs to Goose Creek 500 kV Rebuild*

The new line from existing Doubs to new Aspen 500 kV OH line and Doubs to Goose Creek 500 kV rebuild projects will occur in the same transmission corridor, which currently contains the existing Doubs-Goose Creek '514' 500 kV, Doubs to Dickerson/Doubs to Aqueduct to Dickerson double circuit 230 kV, and Dickerson to Edwards Ferry to Pleasant View '203' 230 kV. These existing circuits will be rebuilt to accommodate the rebuilt Doubs to Goose Creek line, the existing 230 kV lines, and a new Doubs to Aspen 500 kV line, using double circuit 500/230 kV structures for about 8 miles to Dickerson, and as two single circuit 500 kV lines for 7.5 miles up to the Maryland/Virginia state line. Exelon (PEPCO) will have responsibility for the Proposal 837 scope of work for the Dickerson-Edwards Ferry-Pleasant View 230 kV rebuild to double circuit 500/230 kV to accommodate Doubs-Aspen up to the Maryland/Virginia state line.

FirstEnergy proposal 837 scope ends at the MD/VA state line, and Dominion's proposal 516 continues with the rebuild of the Doubs to Goose Creek '514' 500 kV line as a double circuit 500/230 kV, and a rebuild of the Dickerson-Edwards Ferry-Pleasant View '203' 230 kV line as a double circuit 500/230 kV to accommodate the both the new Doubs to Aspen 500 kV line and the existing '203' 230 kV line. Dominion's scope will occur within the same transmission corridor which is about 3 miles long.

Overall, the ROW risk for both FirstEnergy proposal 837 and Dominion proposal 516 is low due to the utilization of existing ROW for the entire alignment of the proposed new line and rebuild projects.

### Environmental Risk Analysis

*Doubs to Aspen 500 kV OH Line and Doubs to Goose Creek 500 kV Rebuild*

The project area is in the northern Virginia Piedmont region, which is predominately vegetated utilizing existing ROW. The proposed line routes will cross the Potomac and Monocacy rivers, the Dickerson Conservation Park, and parallels the Chesapeake and Ohio Canal National Historical Park. However, given the use of existing ROW for the route's entire alignment, permitting impacts are likely to be reasonable.

### Transmission Line Risk Analysis

For the rebuild portions of the proposed line routes, there are challenges with existing overhead transmission infrastructure components needing to be removed/salvaged before construction of proposed brownfield lines can commence and potential design and ROW limitations for reuse of existing infrastructure/assets.

Other medium risks for this project involve the existing facility outages that will be necessary for the project, particularly for the line rebuild, and required substation upgrades.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 19.

Table 19. Proposal 516 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates($M) |
|---|---|---|---|
| 1 | Aspen Substation Terminal Equipment Installation for 5000A Line to Doubs | 12.99 | 16.00 |
| 2 | Breezy Knoll Relay Reset | 0.02 | 0.05 |
| 3 | Dry Mill South Relay Reset | 0.02 | 0.05 |
| 4 | Goose Creek Substation Equipment Upgrade | 4.09 | 5.60 |
| 5 | Hamilton Relay Reset | 0.01 | 0.05 |
| 6 | Pleasant View Substation Equipment Upgrade | 3.62 | 5.00 |
| 7 | Line #203 (Pleasant View-Dickerson) Rebuild | 6.87 | 7.90 |
| 8 | New 500 kV Line (Aspen to Doubs) | 12.02 | 14.00 |
| 9 | Line #514 (Goose Creek-Doubs) Rebuild | 12.02 | 14.00 |
| 10 | Line #2098 (Pleasant View-Hamilton) Partial Rebuild | 3.44 | 3.50 |

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates($M) |
|---|---|---|---|
| 11 | Loudoun Substation Overdutied Breaker Replacement | 2.32 | 5.00 |
| 12 | Ox Substation Overdutied Breaker Replacement | 2.51 | 4.20 |
| 13 | Pleasant View Substation Overdutied Breaker Replacement | 1.29 | 2.10 |
| 14 | Edwards Ferry Substation Equipment Upgrade | 0.51 | 0.50 |
| | Total | 61.72 | 77.95 |

The total proposal cost estimate is within 20–30% of the independent cost estimate and is considered medium-high risk.

### Schedule Review

Given the low-risk brownfield development proposed for Dominion's Proposal 516 and FirstEnergy Proposal 837, the proposed December 2027 in-service date is reasonable, and schedule risk is considered low.

## *Proposal 711 – Dominion*

Dominion's Proposal No. 711 (Map 21), described as Regional Solution 500 kV North Anna-Wishing Star Upgrades, involves a comprehensive solution to add new 500 kV transmission lines from North Anna to Wishing Star with extensive use of existing transmission ROWs. The project spans multiple counties in Virginia and involves addition of three new greenfield 500 kV transmission lines and multiple existing line rebuilds and substation upgrades.

Map 21. Proposal 711


*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

Dominion's Proposal 711 includes the following components:

- Component 1: New 500 kV line (North Anna-Spotsylvania) (993169)
- Component 2: North Anna equipment uprate (993169)
- Component 3: Spotsylvania equipment uprate (993169)
- Component 4: Loudoun 230 kV overdutied breaker replacement (993208_2)
- Component 5: North Anna 500 kV overdutied breaker replacement (993208_2)
- Component 6: Ox 500 kV overdutied breaker replacement (993208_2)
- Component 7: New 500 kV line (Spotsylvania to Vint Hill) (993232)
- Component 8: New 500 kV line (Vint Hill to Wishing Star) (993232)
- Component 9: Line No. 37 (Spotsylvania-Wilderness D.P.) rebuild
- Component 10: Line No. 545 (Bristers-Morrisville) rebuild
- Component 11: Line No. 569 (Loudoun to Morrisville) rebuild
- Component 12: Line No. 535 (Meadow Brook-VintHill- Loudoun) rebuild

- Component 13: Line No. 546 (Mosby-Wishing Star) rebuild
- Component 14: Line No. 590 (Mosby-Wishing Star) rebuild
- Component 15: Line No. 2030 (Gainesville-Loudoun) rebuild
- Component 16: Line No. 2045 (Loudoun-Brambleton) rebuild
- Component 17: Line No. 2094 & 2227 (Brambleton-Racefield-Loudoun) rebuild
- Component 18: Line No. 2101 (Bristers-Vint Hill) rebuild
- Component 19: Line No. 2114 (Remington CT-Rollin Ford) rebuild
- Component 20: Line No. 2140 (Loudoun-Heathcote) rebuild
- Component 21: Line No. 2151 (Railroad DP-Gainesville) rebuild
- Component 22: Line No. 2163 (Vint Hill-Liberty) rebuild
- Component 23: Line No. 2176 (Heathcote-Gainesville) rebuild
- Component 24: Line No. 2222 (Rollins Ford-Gainesville) rebuild
- Component 25: Line No. 183 (Bristers-Ox) rebuild
- Component 26: Line No. 535 (Meadow Brook-VintHill- Loudoun) Resag
- Component 27: Bristers substation
- Component 28: Brambleton substation
- Component 29: Dawkins branch substation
- Component 30: Gainesville substation
- Component 31: Heathcote substation
- Component 32: Loudoun substation
- Component 33: Mint Springs substation
- Component 34: Morrisville substation
- Component 35: Mosby substation
- Component 36: North Star substation
- Component 37: Racefield substation
- Component 38: Railroad substation
- Component 39: Spotsylvania substation
- Component 40: Vint Hill substation
- Component 41: Wishing Star substation
- Component 42: Youngs branch substation

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*New 500 kV OH Line (North Anna-Spotsylvania) (993169)*

The new 13.94-mile 500 kV OH line from existing North Anna to existing Spotsylvania will be built parallel to the existing North Anna to Spotsylvania '573' line, using the same transmission corridor, which will not require any expansion. The line route is located in a predominantly vegetated area within Virginia Piedmont region.

*New 500 kV OH Lines (Spotsylvania to Vint Hill and Vint Hill to Wishing Star) (993232)*

The project involves a rebuild of Dominion's existing two 500/230 kV line corridor from Spotsylvania-Morrisville-Bristers-Nokesville-Vint Hill in order to accommodate the new Spotsylvania to Vint Hill (16.59 miles) and Vint Hill to Wishing Star (38.45 miles) 500 kV OH lines The final configuration will be a three-structure configuration, with the new 500 kV lines on single circuit monopoles, and the existing 500 kV and 230 kV lines on two 500/230 kV double circuit poles existing transmission corridor all fitting within the same existing transmission ROW, which will not require any expansion in width.

Overall, the ROW risk for this proposal is low due to the utilization of existing ROW for the entire alignment of the proposed new lines and rebuild projects.

### Environmental Risk Analysis

The project area is in the northern Virginia Piedmont region, which is predominately vegetated utilizing existing ROW. Given the use of existing ROW for the route's entire alignment, environmental impacts are expected to be minimal.

### Transmission Line Risk Analysis

The proposed three structure configuration for the Spotsylvania to Wishing Star line route poses some design risk and will require significant detailed engineering to ensure construction feasibility. Special considerations may need to be taken into account for the close proximity of the lines for outage scheduling when pulling conductor and swinging from wind gusts.

The outage coordination required for rebuilding multiple transmission line rebuilds and building three new transmission lines in existing ROW is significant. Delays to any project component would have a cascading effect on the following outage schedule for other components. To help address these concerns, Dominion provided a reasonable outage sequencing plan for the project, with potential transmission outage windows already identified. Overall, a medium risk was assessed for outage coordination for the project.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 20.

Table 20. Proposal 516 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 1 | New 500 kV Line (North Anna-Spotsylvania) (993169) | 119.37 | 105.00 |
| 2 | North Anna Equipment Uprate (993169) | 11.43 | 12.00 |
| 3 | Spotsylvania Equipment Uprate (993169) | 7.06 | 6.50 |
| 4 | Loudoun 230 kV Overdutied Breaker Replacement (993208_2) | 1.72 | 4.00 |
| 5 | North Anna 500 kV Overdutied Breaker Replacement (993208_2) | 1.33 | 2.80 |
| 6 | Ox 500 kV overdutied Breaker Replacement (993208_2) | 1.29 | 2.80 |
| 7 | New 500 kV Line (Spotsylvania to Vint Hill) (993232) | 219.53 | 230.00 |
| 8 | New 500 kV Line (Vint Hill to Wishing Star) (993232) | 87.81 | 99.00 |
| 9 | Line #37 (Spotsylvania-Wilderness D.P.) Rebuild | 17.56 | 17.84 |
| 10 | Line #545 (Bristers-Morrisville) Rebuild | 65.86 | 59.00 |
| 11 | Line #569 (Loudoun to Morrisville) Rebuild | 175.62 | 185.00 |
| 12 | Line #535 (Meadow Brook-VintHill- Loudoun) Rebuild | 65.86 | 62.00 |
| 13 | Line #546 (Mosby-Wishing Star) Rebuild | 43.91 | 36.00 |
| 14 | Line #590 (Mosby-Wishing Star) Rebuild | 43.91 | 36.00 |
| 15 | Line #2030 (Gainesville-Loudoun) Rebuild | 17.56 | 22.00 |
| 16 | Line #2045 (Loudoun-Brambleton) Rebuild | 17.56 | 17.78 |
| 17 | Line #2094 & 2227 (Brambleton-Racefield-Loudoun) Rebuild | 17.56 | 17.00 |
| 18 | Line #2101 (Bristers-Vint Hill) Rebuild | 17.56 | 43.00 |
| 19 | Line #2114 (Remington CT-Rollin Ford) Rebuild | 17.56 | 47.00 |
| 20 | Line #2140 (Loudoun-Heathcote) Rebuild | 17.56 | 20.00 |
| 21 | Line #2151 (Railroad DP-Gainesville) Rebuild | 4.39 | 2.45 |
| 22 | Line #2163 (Vint Hill-Liberty) Rebuild | 17.56 | 18.00 |
| 23 | Line #2176 (Heathcote-Gainesville) Rebuild | 8.78 | 3.00 |
| 24 | Line #2222 (Rollins Ford-Gainesville) Rebuild | 13.17 | 4.86 |
| 25 | Line #183 (Bristers-Ox) Rebuild | 8.78 | 7.20 |
| 26 | Line #535 (Meadow Brook-VintHill- Loudoun) Resag | 111.53 | 128.70 |
| 27 | Bristers Substation | 5.72 | 5.72 |
| 28 | Brambleton Substation | 4.65 | 4.00 |
| 29 | Dawkins Branch Substation | 0.02 | 0.02 |
| 30 | Gainesville Substation | 3.71 | 3.20 |
| 31 | Heathcote Substation | 0.02 | 0.02 |
| 32 | Loudoun Substation | 16.70 | 13.00 |
| 33 | Mint Springs Substation | 0.03 | 0.03 |
| 34 | Morrisville Substation | 9.30 | 14.00 |
| 35 | Mosby Substation | 11.75 | 11.20 |
| 36 | North Star Substation | 0.03 | 0.03 |
| 37 | Racefield Substation | 0.03 | 0.03 |
| 38 | Railroad Substation | 0.02 | 0.03 |

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 39 | Spotsylvania Substation | 7.98 | 8.40 |
| 40 | Vint Hill Substation | 23.73 | 24.00 |
| 41 | Wishing Star Substation | 12.30 | 12.00 |
| 42 | Youngs Branch Substation | 0.02 | 0.02 |
| | Total | 1,227.84 | 1,284.62 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

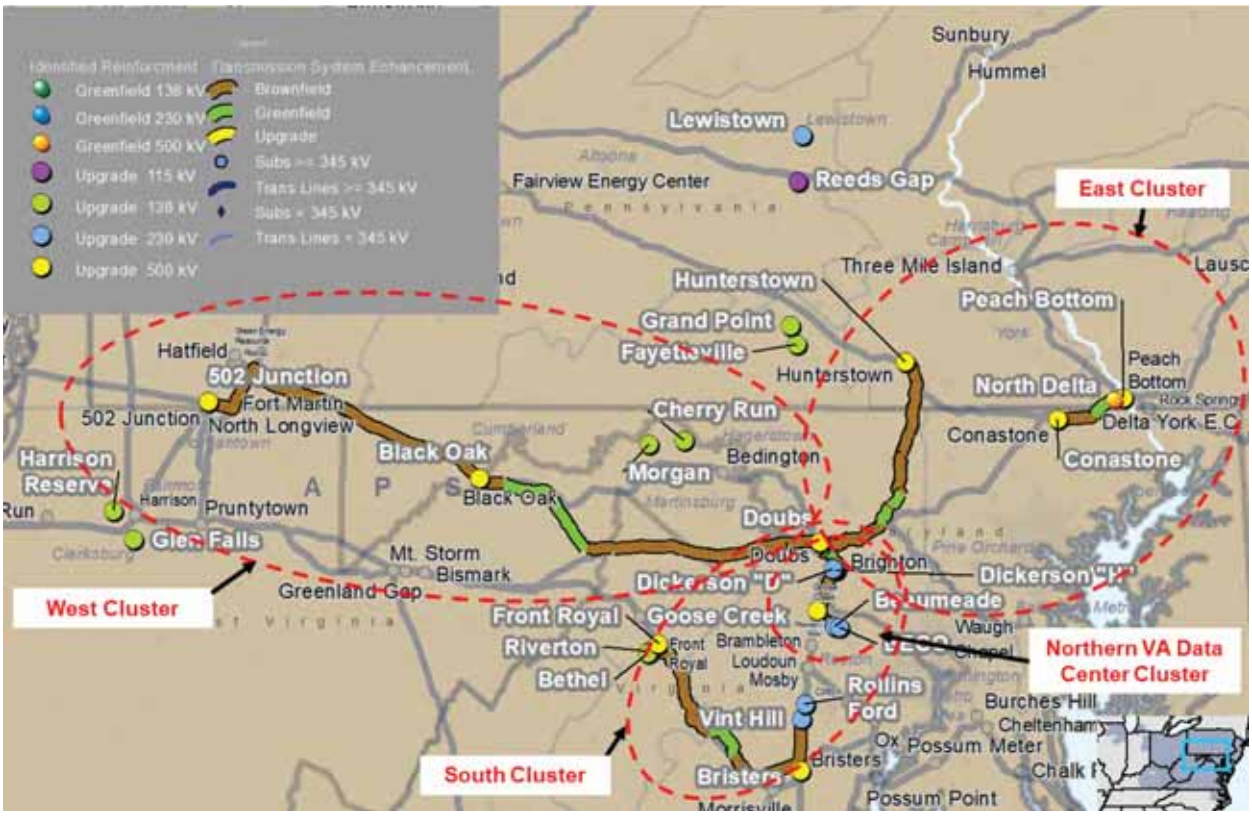
### Schedule Review

Given the low-risk brownfield development proposed for Dominion's Proposal 711, the proposed December 2027 in-service date is achievable, but in consideration of the outage coordination risks posed by the significant number of line rebuilds, a medium schedule risk is assessed for this project.

## *Proposal 548 (South) – LS Power*

LS Power Proposal No. 548 (Map 22), described as RTEP Window 3 Solution, provides a holistic solution to the RTEP Window 3 needs, comprising 37 components, which can be grouped into the four regional clusters identified for the Window. Specifically for the South cluster, LS Power proposed components in multiple counties across Maryland and Virginia, and includes new greenfield lines, as well as multiple substation upgrades.

Map 22. Proposal 548




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

LS Power Proposal 548 includes the following components for the South cluster:

- Component 12: Goose Creek substation upgrade
- Component 15: Vint Hill substation upgrade
- Component 22: Vint Hill-Loudoun reconductor
- Component 28: Doubs-Goose Creek greenfield 500 kV transmission line
- Component 30: Front Royal substation upgrade
- Component 33: Doubs-Goose Creek greenfield 500 kV transmission line (shared ROW)
- Component 34: Front Royal-Vint Hill greenfield 500 kV transmission line

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*New Doubs to Goose Creek 500 kV Line*

The new approximately 20-mile 500 kV line route from existing Doubs to existing Goose Creek 500 kV starts with the first 10 miles on new ROW parallel to the Doubs to Dickerson 230 kV line, up to Dickerson station D, and then the Dickerson station D to Pleasant View 230 kV line will be rebuilt as a double circuit 500/230 kV line to accommodate the 500 kV line for about 8 miles up to Pleasant View, and then the Pleasant View to Hamilton 230 kV line is added onto the line in a rebuilt 500/230/230 kV configuration for about 1 mile before the 500 kV circuit enters the Goose Creek substation.

*New Front Royal-Vint Hill 500 kV Line*

The new 64-mile 500 kV line route from existing Front Royal to existing Vint Hill starts from Front Royal and parallels Front Royal-Morrisville until it meets up with Remington substation. The line then parallels the Remington CT to Gainesville 230 kV line corridor all the way to Vint Hill substation. The proposed route only deviates from paralleling the existing corridor to avoid any conflicts adjacent to the existing corridor.

Overall, the ROW risk for both LS Power proposed line routes is medium-high due to the extensive utilization of greenfield paralleling existing ROW for the majority of the proposed project's alignment.

### Environmental Risk Analysis

*New Doubs to Goose Creek 500 kV Line*

The project area is in the northern Virginia Piedmont region which is predominately vegetated utilizing existing ROW. The proposed line route will cross the Potomac and Monocacy rivers, the Dickerson Conservation Park, and parallels the Chesapeake and Ohio Canal National Historical Park.

*New Front Royal – Vint Hill 500 kV Line*

The proposed route for this line segment goes through national scenic trails (Appalachian Scenic Trail). This may require permission from the National Park Service (NPS) and require an Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) to analyze the impacts to the environment and park resource, which could be a lengthy process. The route also intersects multiple conservation easements and recreation areas crossing in five counties (Fauquier, Prince William, Culpeper, Rappahanock, Warren) in Virginia.

Medium-high constructability risks assessed for the proposed Front Royal to Vint Hill line routes due to anticipated challenges with permitting, property acquisition and public opposition given historical difficulty with permitting projects in Fauquier and Prince William counties, and the need to expand the existing TRAIL corridor for the new Front Royal-Vint Hill line.

### Transmission Line Risk Analysis

For the rebuild portions of the proposed line routes, there are challenges with existing overhead transmission infrastructure components needing to be removed/salvaged before construction of proposed brownfield lines can commence and potential design and ROW limitations for reuse of existing infrastructure/assets.

Other medium risks for this project involve the existing facility outages that will be necessary for the project, particularly for the line rebuild components, and required substation upgrades.

### Substation Risk Analysis

The substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 21.

Table 21. Proposal 548 (South) Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 12 | Goose Creek Substation Upgrade | 52.36 | 54.00 |
| 15 | Vint Hill Substation Upgrade | 20.32 | 21.00 |
| 22 | Vint Hill-Loudoun Reconductor | 13.23 | 15.00 |
| 28 & 33 | Doubs-Goose Creek Greenfield 500 kV Transmission Line | 105.52 | 114.00 |
| 30 | Front Royal Substation Upgrade | 33.42 | 35.00 |
| 34 | Front Royal-Vint Hill Greenfield 500 kV Transmission Line | 403.70 | 378.00 |
| | Total | 628.56 | 617.00 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

## Schedule Review

The proposed in-service date of June 2030 is considered a medium-high risk due to the anticipated constructability challenges with the new Front Royal-Vint Hill line.

## *Proposal 325 – PSEG*

PSEG Proposal No. 325 (Map 23), described as Proposal E – Brambleton-Hinsons Ford Rd 500 kV, has 12 components out of which three were included for evaluation in the South clusters. These components involve greenfield lines and a greenfield substation, as well as a line upgrade in four counties (Prince William, Fauquier, Rappahannock, Loudoun) within Virginia.

Map 23. Proposal 325


*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

### Project Overview

PSEG Proposal 325 includes the following components for the South cluster:

- Component 9: New Brambleton to Hinsons Ford Rd 500 kV line
- Component 10: Reconductor Front Royal-Hinson Ford Rd 500 kV
- Component 12: Hinsons Ford Rd 500 kV

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*New Brambleton to Hinsons Ford Rd 500 kV Line*

The new line from existing Brambleton to new Hinsons Ford 500 kV OH line involves a 34-mile route in an entirely greenfield corridor, with the terrain a combination of urban and rural areas.

The ROW risk for this project is high due to the pure greenfield nature of the proposed development.

### Environmental Risk Analysis

*New Brambleton to Hinsons Ford Rd 500 kV Line*

The proposed route intersects flood plains, multiple conservation easements and a local park in four counties (Fauquier, Prince William, Rappahanock, Loudoun) in Virginia.

High constructability risks assessed for the proposed route due to anticipated challenges with permitting, property acquisition and public opposition given historical difficulty with permitting projects in Fauquier and Prince William counties, and also considering the greenfield nature of the project.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 22.

Table 22. Proposal 325 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 9 | New Brambleton to Hinsons Ford Rd 500 kV line | 185.48 | 204.00 |
| 10 | Reconductor Front Royal-Hinson Ford Rd 500 kV | 43.18 | 43.56 |
| 12 | Hinsons Ford Rd 500 kV | 38.71 | 28.00 |
| | Total | 267.38 | 275.56 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

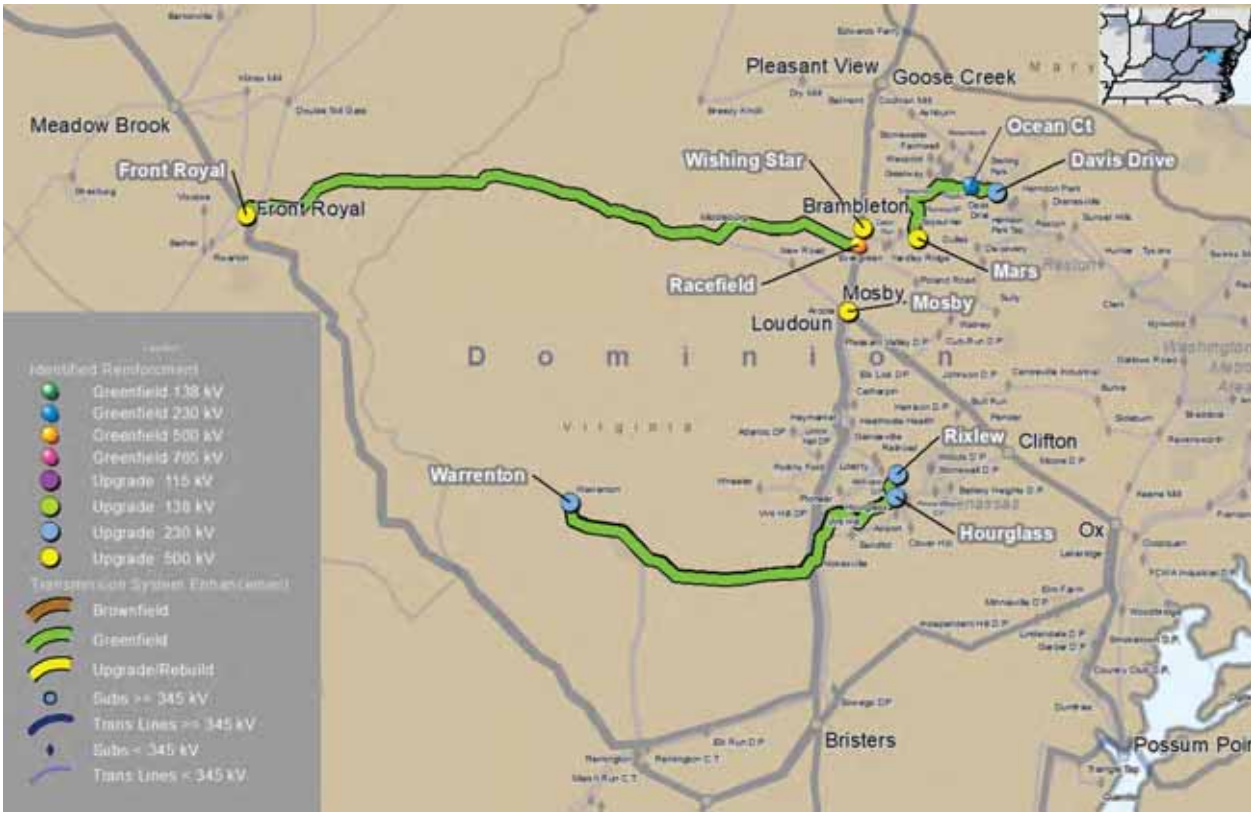
## Schedule Review

The proposed in-service date of June 2027 is considered a high schedule risk due to the anticipated constructability challenges with the new Brambleton-Hinsons Ford Rd 500 kV line.

## *Proposal 663 – NextEra*

NextEra Proposal No. 663 (Map 24), described as Front Royal-Racefield, Warrenton-Rixlew, Warrenton-Hourglass, Mars-Ocean Court-Davis Drive, has components that span Fauquier, Prince William and Loudoun counties in Virginia. These components involve greenfield lines and a greenfield GIS substation, as well as multiple substation upgrades.

Map 24. Proposal 663 (see next page)




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

### Project Overview

NextEra Proposal 663 includes the following components for the South cluster:

- Component 1: 1B – New 500 kV transmission line from Allegheny substation Front Royal to new Racefield switchyard
- Component 2: 01A – New 500 kV line termination at Front Royal substation
- Component 3: 1F – New Racefield GIS substation – 5 terminal
- Component 4: 33E – Warrenton substation 230 kV ring bus expansion
- Component 5: 40C – Mars substation 230 kV ring bus expansion

- Component 6: 40a – New 230 kV transmission line from existing Mars substation to existing Ocean Court substation
- Component 7: 40b – New 230 kV transmission line from existing Ocean Court substation to existing Davis Drive substation
- Component 8: 40f – New 230 kV transmission line from existing Warrenton substation to existing Hourglass substation
- Component 9: 40g – New 230 kV transmission line from existing Warrenton substation to future Rixlew substation
- Component 10: 40D – Ocean Court substation 230 kV ring bus expansion
- Component 11: 40E – Davis Drive 230 kV line termination
- Component 12: 40h – Hourglass substation 230 kV single breaker expansion
- Component 13: 40i – Rixlew substation 230 kV single-breaker expansion
- Component 14: 50C – Mosby to Wishing Star 500 kV upgrade

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*1B – New Front Royal to Racefield 500 kV OH Line*

The new line from existing Front Royal to new Racefield 500 kV OH line involves a 48-mile route in an entirely greenfield corridor. The project is located in the rolling hills and pastures of the Virginia Piedmont region, crossing Fauquier and Loudoun counties.

*40f and 40g – Warrenton to Hourglass and Warrenton to Rixlew 230 kV Lines*

The existing Warrenton to existing Hourglass 230 kV line route is approximately 16 miles long, with its entire route a new greenfield ROW. The existing Warrenton to future Rixlew 230 kV line route is approximately 18 miles long, with its entire route a new greenfield ROW. Both projects are located within the Prince William and Fauquier counties in Virginia.

*40a and 40b – Mars to Ocean Court and Ocean Court to Davis Drive 230 kV Lines*

The existing Mars to existing Ocean Court line is a new approximately 6-mile line, with about 60% of its route a new greenfield ROW, and the remaining 40% paralleling an existing transmission line. The existing Ocean Court to existing Davis Drive line is a new approximately 2-mile line, with its entire route a new greenfield ROW. Both projects are located in the valley south of the Potomac River in Loudoun County, Virginia.

Overall, the ROW risk for this Proposal 663 is high due to the extensive greenfield development involved in the proposed line routes.

### Environmental Risk Analysis

*1B – New Front Royal to Racefield 500 kV OH Line*

The proposed route for this line segment goes through national scenic trails (Appalachian Scenic Trail) and intersects public lands and conservation easements. This may require permission from the National Park Service (NPS) and require an Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) to analyze the

impacts to the environment and park resource, which could be a lengthy process. The proposed route also intersects flood plains, multiple conservation easements, and recreation lands in Fauquier and Loudoun counties in Virginia.

Overall, High constructability risks assessed for the proposed line routes, especially for the Front Royal to Racefield 500 kV line, due to anticipated challenges with permitting, property acquisition and public opposition given historical difficulty with permitting projects in Fauquier and Loudoun counties, and also considering the greenfield nature of the project.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 23.

Table 23. Proposal 663 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 1 | 1B – New 500 kV Transmission Line from Allegheny Substation Front Royal to new Racefield switchyard | 143.02 | 288.00 |
| 2 | 01A – New 500 kV line termination at Front Royal substation | 2.80 | 6.00 |
| 3 | 1F – New Racefield GIS Substation – 5 terminal | 23.44 | 48.00 |
| 4 | 33E – Warrenton substation 230 kV ring bus expansion | 1.40 | 8.00 |
| 5 | 40C – Mars substation 230 kV ring bus expansion | 1.40 | 2.00 |
| 6 | 40a – New 230 kV transmission line from existing Mars substation to existing Ocean Court substation | 11.51 | 20.47 |
| 7 | 40b – New 230 kV transmission line from existing Ocean Court substation to existing Davis Drive substation | 4.51 | 7.00 |
| 8 | 40f – New 230 kV transmission line from existing Warrenton substation to existing Hourglass substation | 40.92 | 56.00 |
| 9 | 40g – New 230 kV transmission line from existing Warrenton substation to future Rixlew substation | 43.88 | 63.00 |
| 10 | 40D – Ocean Court substation 230 kV Ring Bus Expansion | 2.80 | 4.00 |
| 11 | 40E – Davis Drive 230 kV line termination | 0.70 | 0.70 |
| 12 | 40h – Hourglass substation 230 kV single breaker expansion | 1.40 | 2.00 |
| 13 | 40i – Rixlew substation 230 kV single breaker expansion | 1.40 | 2.00 |
| 14 | 50C – Mosby to Wishing Star 500 kV Upgrade | 5.00 | 7.00 |
| | Total | 284.17 | 514.17 |

The total proposal cost estimate is less than 30% of the independent cost estimate and is considered high risk

### Schedule Review

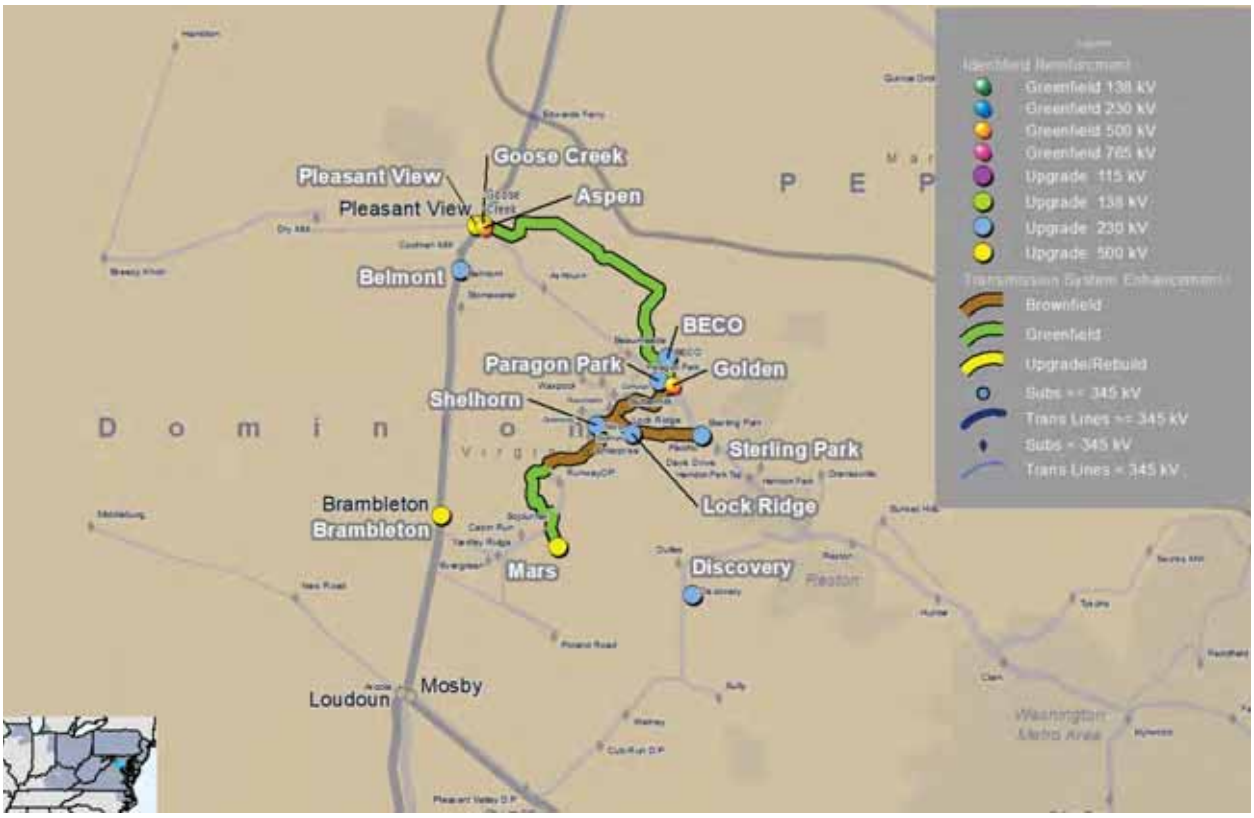
The proposed in-service date of June 2027 is considered a high schedule risk due to the anticipated constructability challenges with the proposed line routes.

## Northern VA Data Center Proposal Cluster

## *Proposal 692 – Dominion*

Dominion's Proposal No. 692 (Map 25), described as Data Center Alley Local solution – New 500 kV/230 kV Aspen-Golden and Golden-Mars lines, involves a local solution intended to facilitate interconnections of data centers in the Dominion Service area. The project includes new greenfield transmission lines and substations, as well as multiple existing line and substation upgrades, all within Loudoun County, Virginia.

Map 25. Proposal 692




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

### Project Overview

Dominion's Proposal 692 includes the following components:

- Component 1: Aspen-Golden 500 kV line build (99-2971)
- Component 2: Mars 500-230 kV transformer installation (99-3197)
- Component 3: Line No. 2150 (Golden to Paragon Park Circuit 1) reconductoring (99-3188)
- Component 4: Line No. 2081 (Golden to Paragon Park Circuit 2) reconductoring (99-3188)
- Component 5: Paragon Park substation equipment rating upgrade (99-3188)
- Component 6: Golden relay setting upgrade reset (99-3188)
- Component 7: Line No. 2207 (Paragon Park-Beco) reconductoring (99-3200)
- Component 8: Paragon Park substation equipment rating upgrade (99-3200)
- Component 9: Beco substation equipment rating upgrade (99-3200)
- Component 10: New Mars-Lockridge-Golden 230 kV line construction (99-2970)
- Component 12: New Mars-Golden 500 kV line construction (99-2970)
- Component 13: 500 kV line No. 558 (Brambleton-Goose Creek) cut-in to Aspen (99-2971)
- Component 14: New 500 kV line from Aspen to Goose Creek (99-2971)
- Component 15: Line No. 2150 (Sterling Park to Paragon Park Circuit 1) cut-in to Golden (99-2971)
- Component 16: Line No. 2081 (Sterling Park to Paragon Park Circuit 2) cut-in to Golden (99-2971)
- Component 17: New 230 kV line from Aspen-Golden (99-2971)
- Components 1–19: Golden, Lockridge and Mars substation upgrades (99-2970)
- Components 20–25: Beaumeade, Beco, Belmont, Discovery, Pleasant View and Shellhorn substation overdutied breaker replacements (99-3208)
- Component 26: New Aspen 500/230 kV substation (99-2971)
- Component 27: New Golden 500/230 kV substation (99-2971)
- Components 28–32: Brambleton, Goose Creek, Paragon Park, Sterling Park and Sycolin Creek substation upgrades (99-2971)

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*New Aspen to Golden 500 kV and 230 kV OH Lines*

The new 8.5-mile 500 kV OH lines from new Aspen to new Golden substation will require an entirely new ROW corridor for the line route using 500/230 kV double circuit two-pole structures. The line route is located in a predominantly vegetated and urban development area within northern Virginia Piedmont region in Loudoun County, Virginia.

*New Golden to Mars 500 kV and 230 kV OH Lines*

The new 8.3-mile 500 kV OH lines from new Golden to future Mars substation will require an entirely new ROW corridor for the line route using 500/230 kV double circuit two-pole structures. The line route is located in a predominantly vegetated and urban development area within northern Virginia Piedmont region in Loudoun County, Virginia.

Overall, the ROW risk for this proposal is high due to the utilization of greenfield ROW for the entire alignment of the proposed new lines.

### Environmental Risk Analysis

The proposed routes go through wetlands, and the Mars-Golden line appears to cross the Dulles Greenway.

Medium constructability risks assessed due to anticipated challenges for land acquisition, and public opposition, given historical difficulty siting projects in Loudoun County and the greenfield nature of the project.

### Transmission Line Risk Analysis

Given the short length of the proposed greenfield lines, the main transmission line risks are associated with land acquisition, siting and schedule risks.

### Substation Risk Analysis

*New Aspen 500/230 kV Substation*

Aspen is a proposed new 500/230 kV substation located in Loudoun County, Virginia. Dominion has already acquired the land for this site. The substation includes a 500 kV double breaker, double bus GIS bus, one 500/230 kV transformer bank, and a 230 kV Breaker and a Half GIS bus.

*New Golden 500/230 kV Substation*

Golden is a proposed new 500/230 kV substation located in Loudoun County, Virginia. The substation includes a 500 kV double-breaker, double-bus GIS bus, two 500/230 kV transformer banks, and a 230 kV breaker-and-a-half GIS bus.

Other substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects). Specifically for this proposal, there is some schedule risk for the procurement of the transformers and GIS bus components.

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 24.

Table 24. Proposal 692 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 1 | Aspen-Golden 500 kV Line Build (99-2971) | 98.35 | 93.50 |
| 2 | Mars 500-230 kV Transformer Installation (99-3197) | 42.19 | 38.00 |
| 3 | Line #2150 (Golden to Paragon Park Circuit 1) Reconductoring (99-3188) | 1.44 | 2.65 |
| 4 | Line #2081 (Golden to Paragon Park Circuit 2) Reconductoring (99-3188) | 1.44 | 2.65 |
| 5 | Paragon Park Substation Equipment Rating Upgrade (99-3188) | 0.09 | 0.10 |
| 6 | Golden Relay Setting Upgrade Reset (99-3188) | 0.02 | 0.05 |
| 7 | Line #2207 (Paragon Park-Beco) Reconductoring (99-3200) | 3.36 | 3.50 |
| 8 | Paragon Park Substation Equipment Rating Upgrade (99-3200) | 0.10 | 50.00 |
| 9 | Beco Substation Equipment Rating Upgrade (99-3200) | 1.86 | 2.00 |
| 10 | New Mars-Lockridge -Golden 230 kV Lines Construction (99-2970) | 76.52 | 78.15 |
| 11 | New Mars-Golden 500 kV Line Construction (99-2970) | 142.10 | 148.00 |
| 12 | 500 kV Line # 558 (Brambleton-Goose Creek) Cut-In to Aspen (99-2971) | 10.93 | 10.93 |
| 13 | New 500 kV Line from Aspen to Goose Creek (99-2971) | 21.86 | 21.86 |
| 14 | Line #2150 (Sterling Park to Paragon Park Circuit 1) Cut-In to Golden (99-2971) | 16.39 | 16.39 |
| 15 | Line #2081 (Sterling Park to Paragon Park Circuit 2) Cut-In to Golden (99-2971) | 16.39 | 16.39 |
| 16 | New 230 kV Line from Aspen-Golden (99-2971) | 54.64 | 53.00 |
| 17 - 19 | Golden, Lockridge and Mars Substation upgrades (99-2970) | 42.74 | 44.00 |
| 20 - 25 | Various Substation Overdutied Breaker Replacement (99-3208) | 8.66 | 13.65 |
| 21 | Beco Substation Overdutied Breaker Replacement (99-3208) | 1.81 | 2.86 |
| 22 | Belmont Substation Overdutied Breaker Replacement (99-3208) | 1.90 | 2.86 |
| 23 | Discovery Substation Overdutied Breaker Replacement (99-3208) | 0.49 | 0.72 |
| 24 | Pleasant View 230 kV Substation Overdutied Breaker Replacement (99-3208) | 0.51 | 0.72 |

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 25 | Shellhorn Substation Overdutied Breaker Replacement (99-3208) | 0.93 | 1.50 |
| 26 | New Aspen 500/230 kV Substation (99-2971) | 195.13 | 196.00 |
| 27 | New Golden 500/230 kV Substation (99-2971) | 315.68 | 295.00 |
| 28 - 32 | Various Substation Upgrades (99-2971) | 8.56 | 13.14 |
| | Total | 1,058.45 | 1,098.96 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

### Schedule Review

Given the greenfield nature of the proposal and the noted concerns with siting transmission projects in Loudoun County, and potential schedule risks with the new Aspen and Golden substation equipment procurement, a medium schedule risk is assessed for this project.

## *Proposal 858 – Transource*

Transource's Proposal No. 858 (Map 26), described as Stork-Flys 500 kV greenfield line and substations, involves a local solution intended to facilitate interconnections of data centers in the Dominion Service area. The project includes a new greenfield underground transmission line, greenfield substations, as well as multiple existing line and substation upgrades, all within Loudoun County, Virginia.

Map 26. Proposal 858


*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Project Overview

Transource's Proposal 858 includes the following components:

- Component 1: Stork 500 kV greenfield substation
- Component 2: Stork-Flys 500 kV underground line
- Component 3: Flys 500/230 kV substation
- Component 4: Roundtable-Buttermilk 230 kV line rebuild
- Component 5: Roundtable-Waxpool 230 kV line rebuild
- Component 6: Waxpool-Farmwell 230 kV line rebuild
- Component 7: Roundtable station upgrade
- Component 8: Wishingstar station upgrade
- Component 9: Cabin Run station upgrade
- Component 10: Pacific station upgrade
- Component 11: Goose Creek station upgrade

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*New Stork to Flys 500 kV Underground Line*

The main transmission line component for this proposal is the Storks-Flys 500 kV underground cable line, which is 5.04 miles long. The proposed route is entirely within public road right of way, and the proposed facilities are expected to occupy a 50 ft. corridor, with the specific plans to use the median of the public roads – Loudon County Pkwy. and Ryan Rd., which are large, divided thoroughfares.

Overall, the ROW risk for this proposal is high due to the utilization of greenfield ROW for the entire alignment of the proposed new lines. Although the project proposed use of public road ROW, it is considered greenfield due to the absence of an existing transmission corridor for the proposed route, which would mitigate concerns with permitting feasibility.

### Environmental Risk Analysis

The transmission line is in a dense residential and commercial area and the proposed construction will have significant impact on Loudon County Pkwy. and Ryan Rd. due to the route feasibility being largely dependent on permitting approval from state and local permitting agencies, especially the Virginia Department of Transportation (VDOT). PJM consulted VDOT to obtain their feedback on the proposed underground route.

VDOT officials shared overall concerns with feasibility of the proposed project and specifically cited concerns with the construction approach for the proposed underground circuits and potential undermining of the road integrity, traffic mitigation concerns with anticipated lengthy closures to the impacted roads, and potential conflicts with existing sensitive underground fiber communication infrastructure that already occupy the public ROW. VDOT also noted the possibility that any issued single-use permit could still be rescinded by VDOT in order to accommodate future road improvement projects, resulting in the need to move the underground transmission line.

Due to the above risks, an overall high constructability risk was assessed for the proposed project.

### Transmission Line Risk Analysis

Proposed route is along public roadways with numerous adjacent residential and commercial properties. Route crosses a major highway interchange, several busy intersections, and several culverts likely requiring trenchless crossing methods (HDD or boring). Road restoration will be required following construction. Given the short length of the proposed underground greenfield line route, the primary transmission line risks are those associated with permitting and some schedule risk associated with availability of 500 kV XLPE cables and accessories (e.g., splices).

### Substation Risk Analysis

*New Stork 500 kV Substation*

Stork is a proposed new 500/230 kV substation located in Loudoun County, Virginia. The substation includes a 500 kV three-position GIS ring bus with three 500 kV CBs.

*New Flys 500/230 kV Substation*

Flys is a proposed new 500/230 kV substation located in Loudoun County, Virginia. The substation includes a 500 kV GIS building with one 500 kV CB and connections for the Stork-Flys underground line and two transformers, two 500/230 kV transformer banks, and a four-leg 230 kV double breaker, double bus GIS bus, with eight 230 kV CBs.

Other substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk. Schedule risk for the procurement of the transformers and GIS bus components.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 25.

Table 25. Proposal 858 Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 1 | Stork 500 kV Greenfield Substation | 46.42 | 48.00 |
| 2 | Stork-Flys 500 kV Underground Line | 266.73 | 263.50 |
| 3 | Flys 500/230 kV Substation | 155.26 | 170.00 |
| 4 | Roundtable-Buttermilk 230 kV Line Rebuild | 3.41 | 3.00 |
| 5 | Roundtable-Waxpool 230 kV Line Rebuild | 9.88 | 6.30 |
| 6 | Waxpool-Farmwell 230 kV Line Rebuild | 5.00 | 3.30 |
| 7 | Roundtable Station Upgrade | 2.97 | 3.00 |
| 8 | Wishingstar Station Upgrade | 6.86 | 6.00 |
| 9 | Cabin Run Station Upgrade | 2.94 | 4.00 |
| 10 | Pacific Station Upgrade | 6.08 | 4.50 |
| 11 | Goose Creek Station Upgrade | 4.90 | 5.00 |
| | Total | 510.44 | 516.60 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

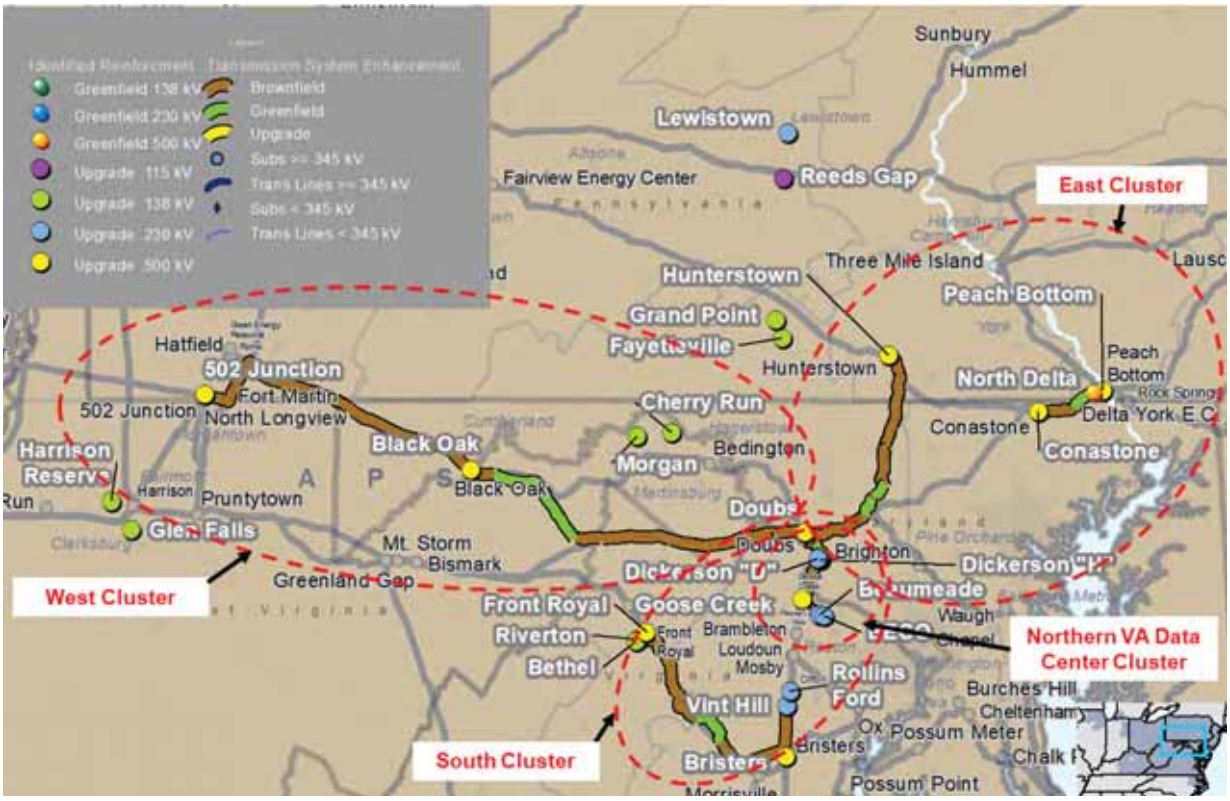
## Schedule Review

Given the noted constructability concerns with permitting the underground Stork to Flys 500 kV line, and potential schedule risks with the new Stork and Flys GIS substation equipment procurement, a medium-high schedule risk is assessed for this project's proposed December 2027 in-service date.

## *Proposal 548 (Northern VA Data Center) – LS Power*

LS Power Proposal No. 548 (Map 27), described as RTEP Window 3 Solution, provides a holistic solution to the RTEP Window 3 needs, comprising 37 components that can be grouped into the four regional clusters identified for the Window. Specifically for the Northern VA Data Center cluster, LS Power proposed components in Loudoun County, Virginia, which includes new greenfield underground line, as well as multiple substation and line upgrades.

Map 27. Proposal 548




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

### Project Overview

LS Power Proposal 548 includes the following components for the Northern VA Data Center cluster:

- Component 8: Beaumeade substation upgrade
- Component 16: DTC substation upgrade
- Component 17: Mars substation upgrade
- Component 24: Beaumeade-BECO-DTC 230 kV transmission line upgrade
- Component 31: BECO substation upgrade
- Component 36: Goose Creek-Beaumeade greenfield underground 500 kV double circuit transmission line

## Constructability Review

### Right-of-Way/Land Usage Risk Analysis

*New Goose Creek-Beaumeade Greenfield Underground 500 kV Double Circuit Line*

The main transmission line component for this proposal is the Beaumeade to Goose Creek 500 kV underground cable line, which is about 5.7 miles long. The Goose Creek-Beaumeade 500 kV underground double circuit line proposes the use of existing overhead line ROW, which also contains bicycle and walking trails on a former railroad ROW, known as the Washington and Old Dominion Trail (W&OD Trail) that traverses suburban residential areas. A ROW width of 8 feet was given for the underground corridor, but there was no information given on the need for construction or O&M easements which would undoubtedly be required.

The ROW risk for this proposal is medium-high due to the route paralleling existing overhead transmission for the entire length of greenfield ROW for the entire alignment of the proposed new lines.

### Environmental Risk Analysis

Route is already occupied by multiple overhead transmission lines and passes through many dense residential neighborhoods with homes abutting the trail. Several water and roadway crossings will require trenchless crossing methods (HDD or jack and bore).

This route proposes use of the Washington and Old Dominion Trail (W&OD Trail) and will require permitting with the Northern Virginia Regional Park Authority, which adds a layer of complexity to the overall process given the recreational use of this corridor and the NOVA Park's requirement that any construction projects must ensure continued access to the park's recreational facilities at all times. An added significant concern is that the NOVA Park's indication that the Dominion Virginia Power owns the easement for the entire W&OD Park and that construction on the park would require Dominion's explicit approval.

LS Power noted potential alternative routes were considered, with the VA State Route 7 as an example but did not offer any detailed information on these alternatives.

Due to the above risks with permitting and siting of the underground line, an overall high constructability risk was assessed for the proposed project.

### Transmission Line Risk Analysis

Given the short length of the proposed underground greenfield line route, the primary transmission line risks are those associated with permitting and some schedule risk associated with availability of 500 kV XLPE cables and accessories (e.g., splices).

### Substation Risk Analysis

The substation components of this proposal focus primarily on upgrading substations and substation equipment to achieve higher ratings. These types of upgrades in general are low risk.

There are currently long lead times of two to three years for all circuit breakers above 115 kV. Therefore, the procurement of these circuit breakers will most likely be the critical path for the majority of the substation components (projects).

Given the above lead-time constraints, it will be critical that detailed and strategic project procurement plans be developed and implemented as soon as possible for all projects.

## Cost Review

As part of the detailed constructability analysis, PJM and its consultants prepared a high-level conceptual independent cost estimate for the components of this proposal. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering and construction. The independent cost estimate includes a contingency of 30%, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates are contained in Table 26.

Table 26. Proposal 548 (Dominion) Cost Review

| Component ID | Component Description | Proposal Cost Estimates ($M) | Independent Cost Estimates ($M) |
|---|---|---|---|
| 8 | Beaumeade Substation Upgrade | 61.30 | 45.00 |
| 16 | DTC Substation Upgrade | 6.38 | 7.00 |
| 17 | Mars Substation Upgrade | 46.21 | 50.00 |
| 24 | Beaumeade-BECO-DTC 230 kV Transmission Line Upgrade | 2.30 | 3.00 |
| 31 | BECO Substation Upgrade | 5.67 | 6.00 |
| 36 | Goose Creek-Beaumeade Greenfield Underground 500 kV Double Circuit Transmission Line | 161.93 | 196.52 |
| | Total | 283.78 | 307.52 |

The total proposal cost estimate is within 10% of the independent cost estimate and is considered low risk.

## Schedule Review

Given the noted constructability concerns with permitting the underground Goose Creek to Beaumeade underground 500 kV double circuit line, a medium-high schedule risk is assessed for this project's proposed December 2030 in-service date.

# FINANCIAL ANALYSIS

## Approach

Altogether, PJM received 72 proposals submitted by 10 different entities, including both incumbent transmission owners and non-incumbent entities, and each proposal was reviewed for completeness and consistency of cost information. Ultimately, a subset of projects were selected for a more detailed analysis and are representative of the solutions being offered by the participating entities. PJM engaged an expert financial consultant for the financial evaluation of the selected proposals, which included a comparative evaluation of the proposals' present value revenue requirements (PVRR) under base case and other scenarios. The results obtained are intended to illustrate the lifetime costs to ratepayers for the proposals and the effectiveness of their cost containment mechanisms.

Each proposal received by PJM was accompanied by a number of supporting documents, all of which PJM reviewed in detail. The key documents relevant to the financial analysis included:

- PJM Competitive Planner Proposal Form – This document contains general information about the proposal, including project title, proposal ID number, a brief project description, component current year and escalated costs, and key dates (construction start, capital spend start and in service).
- Project Financial Information Schedule (Attachment 7 or CapEx Template) – Developers completed the financial information schedule for each proposed project. The financial information schedule depicts annual capital spend by project element for both the proposer and "Work by Others" entities. It also includes an estimate of AFUDC (Allowance for Funds Used During Construction), the Capital Spend Start Date, Construction Start Date, and Commercial Operation Date.
- Revenue Requirement Schedule – Developers completed the revenue requirement schedule for each proposed project. The revenue requirement schedule depicts the estimated annual revenue requirement for the project over its life. We used a consistent revenue requirement modeling process for all projects, described later in this report, to ensure comparability. However, the proposer's revenue requirement schedule was used to obtain model inputs, such as operations and maintenance (O&M), property taxes and working capital.

Additional documents submitted by some proposers included:

- Cost Containment Legal Language (Attachment 11) – Developers proposing projects with cost-capping mechanisms submitted a separate document describing their cost containment in detail and typically in the form of a draft Schedule E for potential inclusion in the non-standard terms of a Designated Entity Agreement (DEA).

Using the above information, a common template covering all proposals was created to ensure consistency in the revenue requirement modeling and comparisons across proposals. The most important sections in this common template are:

- General Information – Consists of the project description and project components from the proposal form, as well as key dates (i.e., construction start, capital spend start and in-service date)

- Capital Costs – Contains proposer estimates for total capital expenditures as well as some checks for consistency between the various proposer documents
- Cost Containment – Contains various binary indicators based on whether the overall project and certain components are capped, dollar amounts for those caps, further descriptions of the capping mechanisms and separate cost containment summaries. Key cost containment information such as the project components and elements were included as well.
- Financial Inputs & Assumptions – Contains information about the proposal's capital structure, tax assumptions, depreciation schedule and O&M

With the common template developed, PJM and its consultants then conducted a detailed cost analysis for the modeled projects using the following key steps:

- Revenue Requirement Modeling – A comparison of project cost estimates was performed, and for a more detailed cost analysis, a revenue requirement model was developed to allow comparison of the lifetime cost to ratepayers for the modeled proposals. The analysis model calculates a bottom-up revenue requirement for each of the solutions utilizing the bidders' cost and financial assumptions, as well as a number of standardized model inputs. The PVRR represents the discounted total cost of the proposed project over its lifetime.
- Review of Cost Containment Mechanisms – An evaluation of the various cost containment mechanisms offered by bidders was also performed. Particularly, a well-capped proposal could considerably lower-cost overrun risks, while a poorly capped or uncapped proposal could result in millions of extra ratepayer dollars over the lifetime of the project if actual project costs are higher than proposed.
- Sensitivity Analysis – In addition to the base case NPVRR comparison for the modeled proposals, PJM also modeled eight scenarios that alter one or multiple model inputs. Seven of the scenarios alter a single variable (setting the return on equity to 12%, increasing the cost of debt to 9%, increasing project costs by 50% or 100%, increasing O&M by 50%, setting the capital structure at 60% equity, and increasing work by others "WBO" project costs by 50%). An eighth, referred to as "downside," combines the impacts of the multiple single variable scenarios. The use of the scenarios provided insight into the impact of potential cost increases as well as the effectiveness of the proposed cost containment mechanisms.

## Analysis Results

The following sections outline the results of PJM and its consultant's detailed financial evaluations performed on select proposals. The outcome of the financial analysis factors into the cost containment risk assessment, a category within the risk assessment matrices that are included in Appendix A of this report.

Cost Containment

## *Proposal Cost Containment Overview*

The cost containment mechanisms for each proposal are defined by developer and are summarized in Figure 2 and Figure 3 detailed in the supporting text below:

Figure 2. Overview of Cost Containment by Developer

| Cap Type | Transource | LSP | NextEra | PSEG | PECO | PEPCO | PPL |
|---|---|---|---|---|---|---|---|
| Project Cost | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Soft (Hybrid) Cap | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| Hard Cap | | | | ✓ | | | ✓ |
| ROE Cap (inclusive of adders) | | ✓ | ✓ | ✓ | | | |
| Equity % Cap | | ✓ | ✓ | ✓ | | | |
| Schedule Guarantee | | | ✓ | | | | |

*Note: Proposals from AEP, Dominion and First Energy did not provide cost containment mechanisms.*

## *Detailed Cost Containment Review*

### Transource

Transource provided a hybrid cost cap. For any capital expenditures that exceed their original cost estimate, Transource's ROE on that incremental capital is reduced from 10% to 9.5%, as it is foregoing the 50 basis point RTO participation adder. Transource is still recovering all depreciation expense and debt costs associated with the incremental capital spend.

For three of their four proposals (858, 904, 977), Transource only capped four specific cost elements deemed to be within their control (Engineering and Design, Materials and Equipment, Construction and Commissioning, Construction Management).

For proposal 487, Transource capped all cost elements except contingency. Transource did not offer a binding ROE cap.

### LS Power

LS Power provided a hybrid cost cap. For any capital expenditures that exceed their original cost estimate, LS Power's ROE on that incremental capital is reduced based on the amount of the exceedance. LS Power is still recovering all depreciation expense and debt costs associated with the incremental capital spend.

The ROE LS Power will request on incremental capital spend above the original cost estimate is reduced from 9.8% according to the tiers listed below:

- For capital cost overages of 1–25% (inclusive), LSP's ROE on the incremental capital spend shall be 8.5%.
- For capital cost overages above 25% up to and including 50%, LS Power's ROE on the incremental capital spend shall be 7%.
- For capital cost overages above 50%, LSP's ROE on the incremental capital spend shall be 5.5%.

LS Power offered a binding ROE cap of 9.8% and a binding equity percentage cap of 50%. The ROE cap adjusts downward due to the project cost cap reducing total project ROE if actual capital costs exceed the CapEx estimate according to the tiers above.

### NextEra

NextEra offered a binding ROE cap of 9.8% and a binding equity percentage cap of 45%.

NextEra provided a hybrid cost cap. For any capital expenditures that exceed their original cost estimate, NextEra's ROE on that incremental capital is reduced from 9.8% to 0%. NextEra is still recovering all depreciation expense and debt costs associated with the incremental capital spend.

Twenty-three of 26 NextEra proposals have a "Soft Cap," which means that regardless of other cost containment provisions, the total earned ROE cannot be lower than 7% or 7.5%, depending on the proposal. The three proposals with a "Hard Cap" do not have a minimum earned ROE. All three NextEra proposals modeled in this evaluation (663, 853, 948) have a "Soft Cap."

NextEra provided a schedule guarantee where the total project ROE is reduced by 2.5 basis points for each month delay past the guaranteed completion date up to a maximum of 30 basis points.

### PSEG

PSEG submitted a traditional binding Hard Cap on capital costs, in which they will not request recovery of any depreciation expense, return on equity, or debt costs associated with any capital expenditures above their cost cap. All of PSEG's cost caps were set at 120% of their original capital expenditure estimate.

PSEG offered a binding ROE cap of 9.60% and a binding equity percentage cap of 45%.

### Exelon (PECO & PEPCO)

PECO and PEPCO both submitted proposals with a hybrid cost cap, which entailed a special mechanism to provide a return of 1–2% of cost overruns to ratepayers once project costs exceed 5% of estimates. This mechanism is uncapped and covers a small percentage of cost overruns relative to other proposals. However, this hybrid cost cap mechanism was not modeled due to excessive exclusions.

PECO and PEPCO excluded the following from their cost cap that led PJM's consultant to the decision to not model their cost cap for the sensitivity analysis:

- All components of proposal are not selected by PJM.
- An easement or corridor is not available as described in bid.
- Deratings of transmission lines
- A transmission line crossing is not available.
- Labor cost escalation exceeds 5% annually until 2030.
- Steel, copper and aluminum prices exceed 2.5% compound increase from date of purchase.

### PPL

PPL submitted proposals with a traditional hard cost cap, but the hard cost caps were not modeled due to excessive exclusions.

PPL excluded the following from their cost cap that led PJM's consultant to the decision to not model their cost cap for the sensitivity analysis.

- Inability to acquire land rights
- Environmental permitting delays
- Cost of materials, components or equipment increase by 10%.
- 3.5% annual increase in labor costs
- PJM does not award project before Oct. 1, 2023.

## *Cost Containment Observations*

As shown in the above section, developers submitted varying levels of cost containment. The most common cost containment mechanism was a project cost cap, with seven of ten developers offering some type of project cost cap. NextEra, LS Power and PSEG also submitted binding ROE caps and equity percentage caps.

Despite a majority of developers offering a project cost cap, it is important to differentiate between a true "traditional" Hard cost cap and what is considered as a Soft "hybrid" cost cap.

A traditional cost cap prevents the developer from requesting recovery in rates for any depreciation expense, cost of debt, or return on equity associated with incremental dollars of CapEx spent above the cost cap. A "hybrid" cost cap is one that allows the developer to recover depreciation expenses and cost of debt associated with incremental dollars above the cost cap, while the return on equity on the incremental CapEx is reduced (as low as 0%). This is a significantly less-effective cost cap, as shown by the results from the sensitivity analysis in later sections of this report. Additionally, as discussed in the above section, some entities submitted a cost cap, but the exclusions to the cost cap were so excessive that led to the decision not to model the cost cap.

# Modeling Approach & Assumptions

## *Modeling Approach*

To evaluate a proposal's lifetime cost to ratepayers, Consultant computes the Present Value Revenue Requirement (PVRR). Revenue requirement, or cost of service, reflects the total revenue that needs to be collected in rates for a company to recover its capital, operational expenses, tax expenses and earn a fair return on its capital investments.[1] In the revenue requirement model, revenue requirement in each modeling period is calculated as the sum of O&M/A&G (administrative & general) expenses, depreciation on capital investment, income and property taxes, cost of debt (interest), and equity return on rate base. The revenue requirement model was developed using a standard FERC-accepted cost recovery approach. Consultant built up the various components of revenue requirement for every month during the project's useful life, then discounted future streams of revenue requirement using a common discount rate for all proposals.

The cost-of-service inputs used in the model are mostly provided directly by developers. For fair comparison, Consultant also made several common assumptions that may be different from developers' inputs, such as the inflation rate and discount rate. These assumptions are explained in more detail in the following Modeling Assumptions section.

For certain components included in proposals, the entity responsible for construction is not the proposing entity or one of its affiliates. These are known as "Work by Others" or "WBO" components. All results shown in this report include Work by Others.

[1] The rate of return on equity will be reviewed and approved/adjusted by FERC for transmission projects.

If a proposal included WBO, the developer also provided an estimated CapEx for these WBO elements.

For some proposals, a total estimated WBO CapEx was provided, rather than an estimated CapEx in each year. In these cases, the WBO is assumed to follow the same spend curve as the proposer.

## *Baseline Assumptions*

Across all proposals, Consultant applied several standardizing assumptions, summarized in Table 27, to ensure a fair comparison of present value outcomes:

Table 27. Baseline Model Assumptions

| | |
|---|---|
| Discount Rate | 6.81% |
| Inflation Rate | 2.10%[2] |
| Earliest Capital Spend Start Date | 1/1/2024 |
| Date Used for Discounting | 1/1/2024 |

## *Modeling Period Assumptions*

Projects with construction periods starting in 2023 were adjusted to begin on Jan. 1, 2024. No project spending was modeled until 2024. Any CapEx submitted the year after the in-service date was moved to the final year of construction. Additionally, property tax and O&M were not modeled until a project is placed in service.

For projects with partial in-service dates (in which some parts of the project are placed in service during the construction period), Consultant still assumed that revenue requirement recovery does not begin until the final in-service date unless the project is earning a return on CWIP.

The revenue requirement model uses monthly granularity. While developers provided specific month-year clarity around construction start and in-service dates, much of the revenue requirement and capital spend data is provided on an annual basis. To account for this, Consultant divided annual expenditures by the number of relevant months when partial-year spending data occurs (typically only the first and last year of the project).

## *CapEx and Depreciation Assumptions*

### CapEx

Capital costs are collected from Attachment 7, which provides a year-by-year spend schedule broken down by cost element (Engineering & Design, Materials and Equipment, etc.).

[2] For the year 2024, a 3.1% inflation rate was used, but 2.1% is used for every year after 2024.

The associated financing costs of construction are modeled using either return on Construction Work In Progress (CWIP) or AFUDC for each proposal. Both returns on CWIP and AFUDC are calculated using the developer-specific after-tax WACC. If a developer does not specify collecting a return on CWIP versus AFUDC, Consultant modeled AFUDC. Transource is the only developer that clearly claimed a return on CWIP.

### Capital Streams

To isolate the financial behavior of different parts of each proposal, three capital streams were developed and modeled independently. Streams isolate the behavior of different types of CapEx:

- CapEx Stream 1 – Capped work by the proposer
- CapEx Stream 2 – Uncapped work by the proposer
- CapEx Stream 3 – Uncapped work by others

Contingency is modeled separately for each CapEx stream for the purposes of the capital spend increase sensitivities but is included in total CapEx.

All revenue requirement results in this report show the sum of the revenue requirements of each of the three CapEx streams.

### Book Depreciation

Straight-line depreciation method is used for all proposals, assuming no salvage value or removal cost. Book depreciation is calculated using the useful life, which is derived from the developer-provided revenue requirement workbooks.

### Tax Depreciation

Each project uses the 15-Year Modified Accelerated Cost Recovery System (MACRS) mid-year convention schedule for tax depreciation.

## *O&M/A&G Assumptions*

In instances where O&M/A&G is not provided, it was estimated using the following methodology:

- Consultant assumed that 1% of total CapEx would yield a reasonable estimate of Year 1 O&M. This is an industry-standard value. Additionally, Consultant verified this estimate by calculating the proportion of total capital expenditures spent on O&M for all revenue requirement workbooks that did include O&M. On average, O&M was 1.06% of total capital expenditures.
- For each proposal, Consultant calculated 1% of the proposal total CapEx and assumed this value as the Year 1 annual O&M (adjusted for in-service date as necessary).

- After the first year of in-service date, Consultant inflated O&M by 2.1% annually over the useful life of the project.

In cases where cash working capital was not provided, it was modeled as one-eighth of the total O&M for each year, which is another industry-standard value.

Consultant did not model pre-in-service O&M/A&G when a developer submitted it as part of their revenue requirement.

## *Tax Assumptions*

Each developer submitted a unique tax profile, which is used to gross up ROE requirements. Different state tax rates are provided based on the specific state geography of the projects.

### Property Tax

Consultant did not model pre-in-service property taxes when a developer submitted it as part of their revenue requirement. If property tax estimates were not provided by the developers, property tax was calculated as 1% of net plant.

In any year in which the project is not in service for the entire year (the first and last year of the project life if the in-service date is anything other than Jan. 1), Consultant scaled the depreciation by the number of months in service to calculate partial-year property tax.

### Income Tax

Deferred taxes were calculated based on tax-book life differences and used accordingly to reduce rate base each month.

## *Contingency*

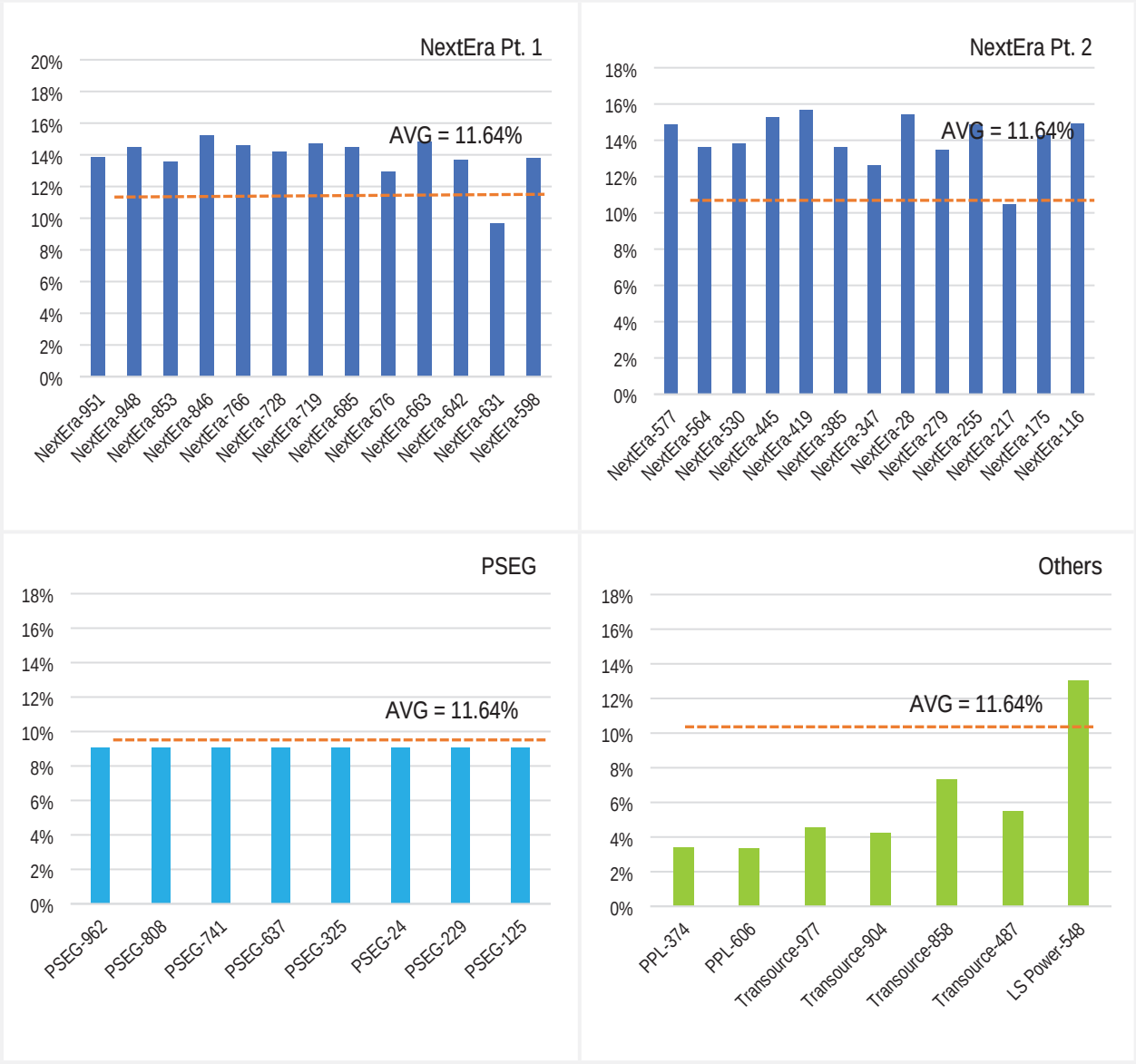
All proposers, with the exception of the Exelon companies (PECO and PEPCO), provided some level of contingency in their cost estimates. The revenue requirement model provides a vehicle to compare the revenue requirement resulting from the various proposals' submitted costs. Consultant did not choose to standardize contingency because each proposer strategically developed its own level of contingency. Additionally, there could be multiple "layers" of contingency built into each CapEx element. With that said, a brief analysis of the various levels of contingency proposed is useful in adding to the information available in the selection process.

While a low level of contingency allows the total costs to be lower than similar proposals with higher contingencies, that cost advantage comes with a greater risk of exceeding cost estimates and risking the ability to recover costs when cost containment measures are in place. Contingency (Cost-Contained Proposals) below, provides a comparison of contingency levels by proposer. Developers listed in the tables are split by whether the developer offered cost containment or not. All contingency amounts apply only to costs incurred by the proposer and exclude costs incurred by other entities (WBO). The percentages are calculated by dividing the contingency amount by the total proposer CapEx, excluding the contingency.

The contingency as a percentage of total cost across all proposals, excluding WBO, ranges from 0% to 15.67%. For the proposers that offered cost containment, the average contingency is 11.64%; however, there is significant variation.

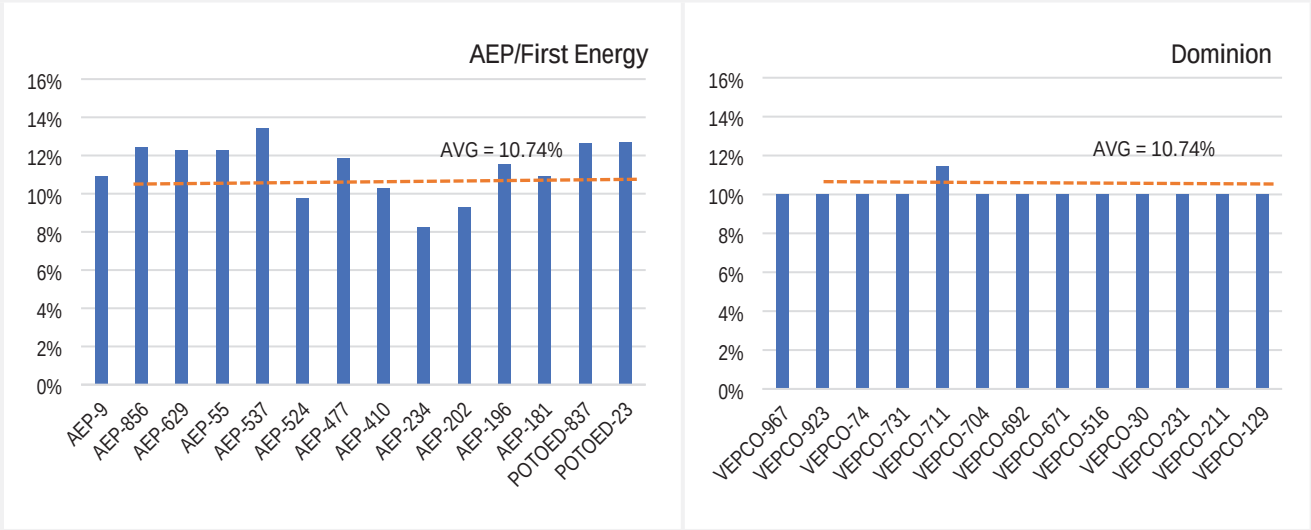
PPL proposals have a contingency of 3.37%, which is the lowest among proposers offering contingency estimates. Transource proposal contingencies range from 4.21% to 7.34%, PSEG proposals have a contingency of 9.09%, NextEra proposal contingencies range from 9.65% to 15.65%, and the LSP proposal has a contingency of 13.04%.

Figure 3. Contingency (Cost-Contained Proposals)



In Contingency (Cost-Contained Proposals) illustrates the proposals that did not offer cost containment, the contingency ranges from 8.26% to 13.43%, with an average of 10.74%. Dominion has contingencies that range from 9.99% to 11.45%, AEP ranges from 8.26% to 13.43%, and FirstEnergy ranges from 12.67% to 12.69%.

Figure 4. Contingency (Non-Cost-Contained Proposals)




For model sensitivities where capital cost increases, contingency is removed from capital cost prior to the 125% or 150% multiplier being applied (See Section 0 for Model Sensitivities). This is because Consultant assumes that the contingency will be used to absorb project cost increases. Once the contingency is fully exhausted, the sensitivity will increase the project cost accordingly, subject to cost containment.

## PJM Proposal Scenarios

PJM's proposal scenarios are a combination of individual proposals and are representative of the solutions being offered by the participating entities. These scenarios will be subjected to the sensitivity analysis. The scenarios are identified in Table 28 through Table 35 defined below:

Table 28. Transource Scenario A Definition

| Proposal ID Combination | Proposal ID Combination | Proposing Entity |
|---|---|---|
| 487 | Maryland & Pennsylvania Baseline Reliability Solution | Transource |
| 858 | Stork-Flys 500 kV Greenfield Line and Substations | Transource |
| 904 | Joshua Falls-Yeat 765 kV Greenfield Line and Substation | Transource |

Table 29. NextEra Scenario B Definition

| Proposal ID Combination | Proposal ID Combination | Proposing Entity |
|---|---|---|
| 663 | Front Royal-Racefield, Warrenton-Rixlew, Warrenton-Hourglass, Mars-Ocean Court-Davis Drive | NextEra |
| 853 | 502 Junction-Black Oak-Woodside-Gant, Woodside SVC + Cap Banks | NextEra |
| 948 | New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation, and Keeney to Waugh Chapel tie-in. | NextEra |

Table 30. LS Power Scenario C Definition

| Proposal ID Combination | Proposal ID Combination | Proposing Entity |
|---|---|---|
| 548 | RTEP Window 3 Solution | LS Power |

Table 31. Exelon Scenario D Definition

| Proposal ID Combination | Proposal ID Combination | Proposing Entity |
|---|---|---|
| 344 | PECO Expansion Plan for DOM Window 2023 | PECO |
| 660 | West Cooper BGE-PEPCO | PEPCO |

Table 32. First Energy Scenario E Definition

| Proposal ID Combination | Proposal ID Combination | Proposing Entity |
|---|---|---|
| 837 | Data Center Reinforcement Proposal #1 | POTOED |

Table 33. Dominion Scenario F Definition

| Proposal ID Combination | Proposal ID Combination | Proposing Entity |
|---|---|---|
| 74 | Line #2090 (Ladysmith CT-Fredericksburg) Rebuild | Dominion |
| 211 | Hollymead-Gordonsville Line # 2135 Rebuild | Dominion |
| 516 | Interregional solution – Aspen-Doubs Second 500 kV Line | Dominion |
| 671 | Lines #541 (Front Royal to Morrisville) Rebuild | Dominion |
| 692 | Data Center Alley Local solution – New 500 kV/230 kV Aspen-Golden & Golden-Mars lines | Dominion |
| 711 | Regional Solution – 500 kV North Anna-Wishing Star Upgrades | Dominion |
| 731 | Locks Substation 230/115 kV Transformer Upgrade | Dominion |
| 923 | The second 500 kV line from Lexington to Dooms | Dominion |
| 967 | Charlottesville-Hollymead Line # 2054 Rebuild | Dominion |

Table 34. PPL Scenario G Definition

| Proposal ID Combination | Proposal ID Combination | Proposing Entity |
|---|---|---|
| 374 | Otter Creek-Conastone 500 and 230 kV double circuit Line | PPL |
| 606 | Juniata-Lewistown 230 kV # 2 line | PPL |

Table 35. PSEG Scenario H Definition

| Proposal ID Combination | Proposal ID Combination | Proposing Entity |
|---|---|---|
| 741 | Proposal G – Peach Bottom-New Brandon Shores 500 kV; Peach Bottom-Doubs 500 kV | PSEG |

## Model Sensitivities

Eight sensitivities, summarized in Table 36, were applied to each proposal to assess financial performance. They were used to test the effectiveness of cost-containment mechanisms against potential project cost increases.

Table 36. Model Sensitivities

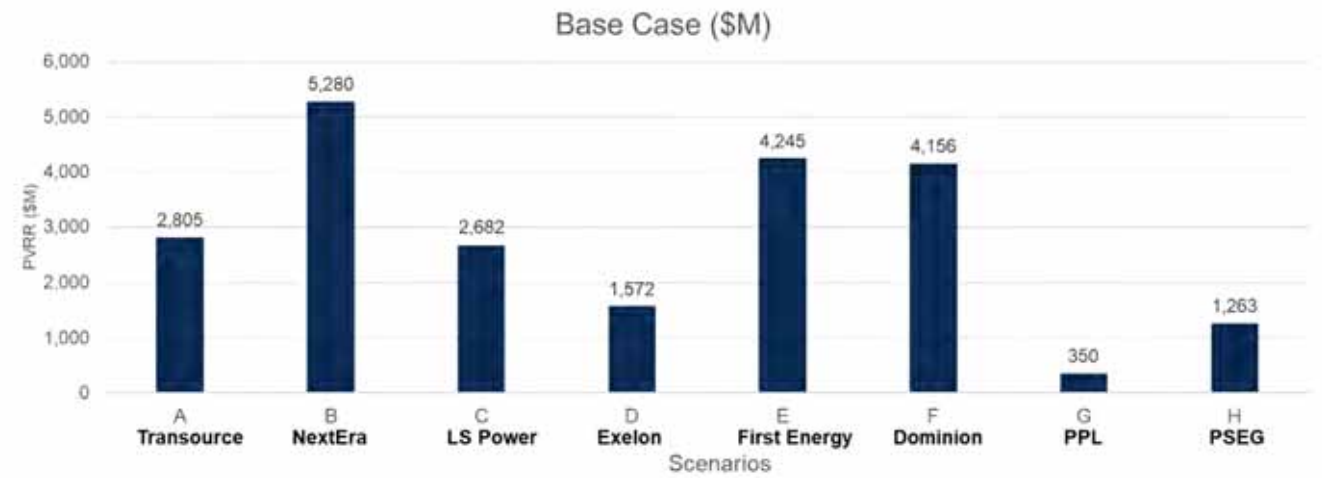
| # | Sensitivity | Variable | Description |
|---|---|---|---|
| 1 | Base Case | None | Model the proposal using inputs from developer and revenue requirement model calculations |
| 2 | WBO +50% | Single Variable | Work by others project cost increased by 50% for all periods |
| 3 | Project Cost +50% | Single Variable (*changes to capex may affect Return On Equity ("ROE") for some developers*) | Proposer's project cost increased by 50% for all periods *(unless capped)* |
| 4 | Project Cost +100% | Single Variable (*changes to capex may affect Return On Equity ("ROE") for some developers*) | Proposer's project cost increased by 100% for all periods *(unless capped)* |
| 5 | ROE 12% | Single Variable | Return on Equity raised to 12% for all periods *(unless capped)* |
| 6 | Cost of Debt 9% | Single Variable | Cost of Debt raised to 9% for all periods |
| 7 | Equity 60% | Single Variable (*changes to Debt-to-Equity ratio may affect ROE for some developers*) | Equity thickness set to 60% for all periods *(unless capped)* |
| 8 | O&M +50% | Single Variable | O&M expense increased by 50% for all periods *(unless capped)* |

| # | Sensitivity | Variable | Description |
|---|---|---|---|
| 9 | Downside (*includes various changes above*) | Multiple Variables (*changes to capex and equity % may affect ROE for some developers*) | Proposer's project cost +50% *(unless capped)*<br>O&M +50% *(unless capped)*<br>ROE 12% *(unless capped)*<br>COD 9%<br>Equity 60% *(unless capped)* |

## Results and Key Observations

### *Scenario Base Case PVRR Comparisons*

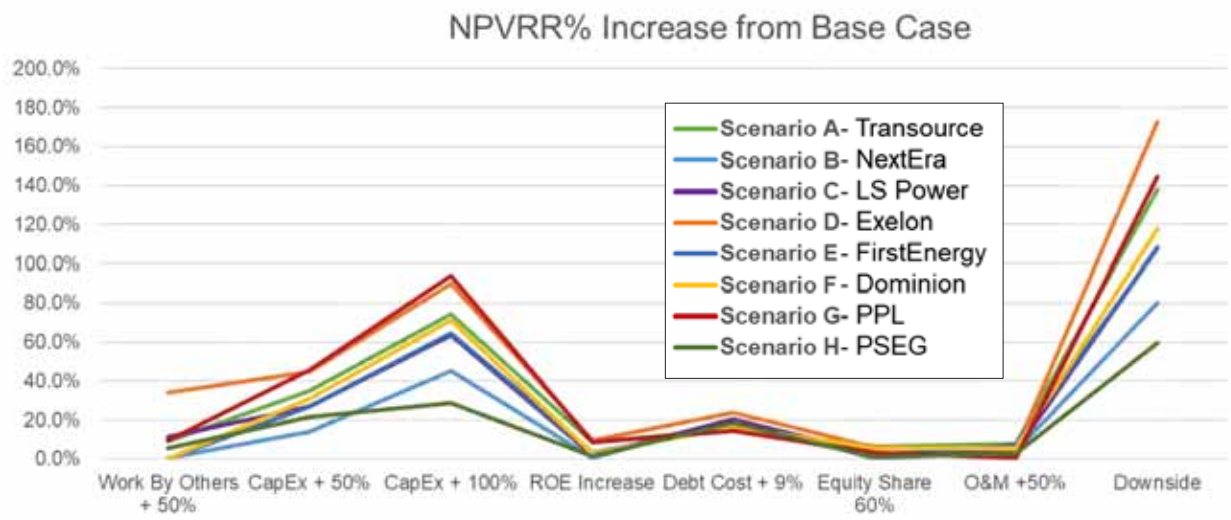
Figure 5. Base Case PVRR Comparison




PJM Scenario Results: The final PJM scenarios are grouped by developer and vary in PVRR from $0.4 B to $5.3 B based on the projects included in each scenario. Because the projects are not analogous, comparisons between proposal scenarios for the base case PVRR can best be viewed in conjunction with project benefits, which are not included in the above Figure 5. However, the next set of results focusing on scenario sensitivities are more informative about the relative performance of the developer's cost containment mechanisms in mitigating cost overruns.

## *Scenario PVRR Sensitivity Comparisons*

Figure 6. Scenario Sensitivity Results




PJM Scenario Results: The above Figure 6 demonstrates the volatility of scenarios across modeled sensitivities. PSEG Scenario H, with the traditional Hard Cost Cap displays the best performance and is least volatile in most sensitivities, including the downside sensitivity.

# APPENDIX A – CONSTRUCTABILITY MATRICES

## Risk Assessment Criteria

| PJM Risk Assessment Criteria | | | | | | |
|---|---|---|---|---|---|---|
| Risk Assessment | Cost Estimate Risks | Cost Containment Risk | Schedule Risks | Constructability Risks | Use of Existing ROW/Brownfield | Outage Coordination Risks |
| Low | Greater than or within 0-10% of Independent Estimate | Hard cost cap | Ratings assessed based on independent assessment of proposed in-service dates, and assessment of significant schedule risks such as such as permitting and constraint mitigation, long-lead material procurement, land/ROW acquisition, construction complexity. | Ratings assessed based on independent assessment of the number and severity of constructability risks assessed for the proposed project scope, such as permitting and constraint mitigation, land/ROW acquisition, construction complexity. | Rebuild/Reconductor Upgrades or Pure Brownfield | Minimal existing facility outages required, beyond short outages to cut-in to existing facilities |
| Medium | Within 10-20% of Independent Estimate | Soft cost containment (e.g ROE caps) | | | Mostly Brownfield (i.e. Uses/Overlaps existing ROW but requires expansion) | Significant existing facility outages required, with reasonable outage coordination plan proposed |
| Medium-High | Within 20-30% of Independent Estimate | Minimal cost containment/Excessive Exclusions | | | Greenfield paralleling existing ROW | Significant existing facility outages required, with no coordination plan proposed |
| High | Less than 30% of Independent Estimate | No cost containment | | | Pure Greenfield | Significant existing facility outages required, with known operational concerns and no coordination plan proposed. |

NOTE:

- PJM conducted its constructability evaluation of the project data submitted by proposers, and engaged expert consultants to evaluate the constructability, cost estimation and cost containment risks of the projects.
- PJM also reached out to key regulatory agencies for their insight on certain projects to help clarify permitting risks.
- This risk assessment is not intended as a pass/fail or quantitive test, but rather as qualitative information on potential risks PJM has considered along with the reliability performance in selection of the finalist scenarios, and ultimately the recommended solution.

## East Cluster Constructability Matrix

### East Cluster Projects – Selected for Detailed Evaluation

| PJM Proposal ID | Proposing Entity | Project Title | Proposed In-Service Date | Proposal Costs ($M) | Independent Costs ($M) | Cost Estimate Risks | Cost Containment Risks | Schedule Risks | Constructability Risks | Use of Existing ROW & Brownfield | Outage Coordination Risks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 344 | Exelon | PECO Expansion Plan for DOM Window 2023 | 12/1/2029 | $ 168.63 | $ 214.81 | Medium | Medium-High | Low | Low | Low | Medium |
| 660 | Exelon | West Cooper BGE-PEPCO | 12/1/2030 | $ 1,105.62 | $ 1,060.63 | Low | Medium-High | Low | Low | Low | Medium |
| 548 | LS Power | RTEP Window 3 Solution (East) | 6/1/2030 | $ 495.83 | $ 609.44 | Medium | Medium | Low | Medium | Medium-High | Medium-High |
| 637 | PSEG | Proposal D-Conastone-Doubs 500kV | 6/1/2027 | $ 684.22 | $ 676.36 | Low | Low | Medium | Medium | High | Low |
| 741 | PSEG | Proposal G - Peach Bottom-New Brandon Shores 500kV; Peach Bottom-Doubs 500kV | 6/1/2028 | $ 1,065.32 | $ 1,178.75 | Low | Low | Medium-High | High | High | Low |
| 487 | Transource | Maryland & Pennsylvania Baseline Reliability Solution | 3/1/2027 | $ 492.75 | $ 503.43 | Low | Medium | Low | Low | Medium | Medium |
| 374 | PPL | Otter Creek - Conastone 500 and 230 kV DCT Line | 5/1/2027 | $ 154.21 | $ 162.69 | Low | Medium-High | Low | Low | Medium | Medium |
| 948 | NextEra | New 500/230kV Bartholow substation, new 500/230kV North Delta substation, new 230kV Grisham switchyard, new 500/230kV Goram substation, and Keeney to Waugh Chapel tie-in | 6/1/2028 | $ 5,381.25 | $ 6,265.88 | Medium | Medium | High | High | High | Low |

## West Cluster Constructability Matrix

| West Cluster Projects – Selected for Detailed Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PJM Proposal ID | Proposing Entity | Project Title | Proposed In-Service Date | Proposal Costs ($M) | Independent Costs ($M) | Cost Estimate Risks | Cost Containment Risks | Schedule Risks | Constructability Risks | Use of Existing ROW & Brownfield | Outage Coordination Risks |
| 837 | POTOED - FirstEnergy | Data Center Reinforcement Proposal #1 (West) | 6/1/2030 | $ 2,788.40 | $ 2,642.05 | Low | High | Medium | Medium-High | High | Low |
| 548 | LS Power | RTEP Window 3 Solution (West) | 6/1/2030 | $ 972.71 | $ 876.03 | Low | Medium | Medium | Medium-High | Medium-High | Medium |
| 853 | NextEra | 502 Junction - Black Oak - Woodside - Gant, Woodside SVC + Cap Banks | 6/1/2027 | $ 683.55 | $ 1,195.24 | High | Medium | Medium-High | Medium-High | High | Medium |
| 904 | AEP - Transource | Joshua Falls - Yeat 765kV Greenfield Line and Substation | 12/1/2029 | $ 1,048.10 | $ 1,122.40 | Low | Medium | Medium-High | Medium | High | Low |

## South Cluster Constructability Matrix

| South Cluster Projects – Selected for Detailed Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PJM Proposal ID | Proposing Entity | Project Title | Proposed In-Service Date | Proposal Costs ($M) | Independent Costs ($M) | Cost Estimate Risks | Cost Containment Risks | Schedule Risks | Constructability Risks | Use of Existing ROW & Brownfield | Outage Coordination Risks |
| 516 | Dominion | Interregional solution- Aspen-Doubs Second 500 kV Line | 12/1/2027 | $ 61.72 | $ 77.95 | Medium-High | High | Low | Low | Low | Medium |
| 711 | Dominion | Regional Solution - 500 kV North Anna-Wishing Star Upgrades | 12/1/2027 | $ 1,227.84 | $ 1,284.62 | Low | High | Medium | Low | Low | Medium |
| 548 | LS Power | RTEP Window 3 Solution (South Components) | 6/1/2030 | $ 628.56 | $ 617.00 | Low | Medium | Medium-High | Medium-High | Medium-High | Medium |
| 325 | PSEG | Proposal E - Brambleton-Hinsons Ford Rd 500kV | 6/1/2027 | $ 267.38 | $ 275.56 | Low | Low | High | High | High | Low |
| 837 | POTOED - FirstEnergy | Data Center Reinforcement Proposal #1 (South) | 6/1/2030 | $ 203.38 | $ 209.16 | Low | High | Low | Low | Low | Medium |
| 663 | NextEra | Front Royal - Racefield, Warrenton - Rixlew, Warrenton - Hourglass, Mars - Ocean Court - Davis Drive | 6/1/2027 | $ 284.17 | $ 514.17 | High | Medium | High | High | High | Low |

## Northern VA Data Center Cluster Constructability Matrix

| Northern VA Data Center Cluster Projects – Selected for Detailed Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PJM Proposal ID | Proposing Entity | Project Title | Proposed In-Service Date | Proposal Costs ($M) | Independent Costs ($M) | Cost Estimate Risks | Cost Containment Risks | Schedule Risks | Constructability Risks | Use of Existing ROW & Brownfield | Outage Coordination Risks |
| 692 | Dominion | Data Center Alley Local solution - New 500 kV/230 kV Aspen-Golden & Golden-Mars lines | 12/1/2027 | $ 1,058.45 | $ 1,098.96 | Low | High | Medium | Medium | High | Low |
| 858 | AEP - Transource | Stork - Flys 500kV Greenfield Line and Substations | 12/1/2027 | $ 510.44 | $ 516.60 | Low | Medium | Medium-High | High | High | Low |
| 548 | LS Power | RTEP Window 3 Solution (Dominion Components) | 6/1/2030 | $ 283.78 | $ 307.52 | Low | Medium | Medium-High | High | Medium-High | Low |

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## DOCUMENT REVISION HISTORY

11/17/2023 - V1: Original version posted

12/01/2023 – V2: Version 2 incorporating stakeholder feedback posted

# Reliability Analysis Report

## 2022 RTEP Window 3

December 8, 2023 – R3

For Public Use

*The information contained herein is based on information provided in project proposals submitted to PJM by third parties through its 2022 RTEP Window 3. PJM analyzed such information for the purpose of identifying potential solutions for the 2022 RTEP Window 3. Any decision made using this information should be based upon independent review and analysis and shall not form the basis of any claim against PJM.*

*This maps contained in this report are only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.*

# CONTENTS

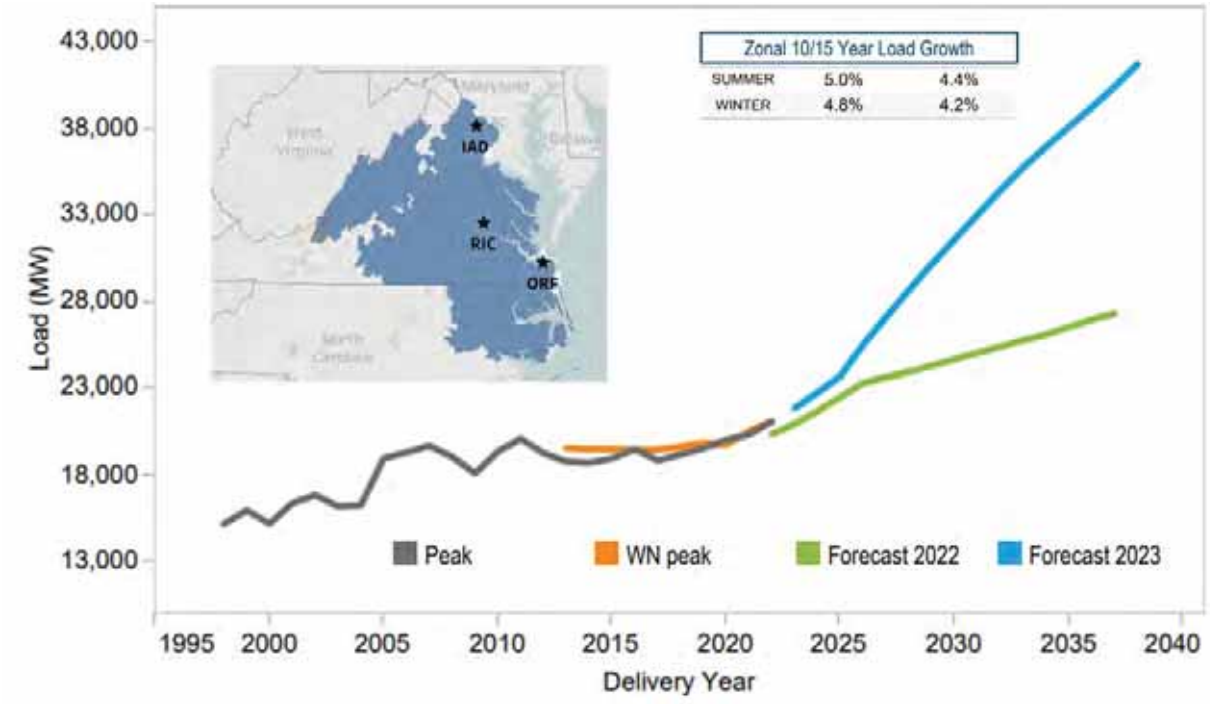
# 2022 RTEP Window 3 Reliability Analysis

## Background

In early 2022, PJM shared its 2022 load forecast, which indicated high data center load growth activity, particularly in northern Virginia. In July 2022, PJM directed an immediate need transmission enhancement project to enable the integration of the forecasted data center load up to and including year 2025. Since then, data center loads within northern Virginia have been increasing at an unprecedented rate, and new data center load is being proposed in Maryland near the Doubs substation. As shown in Table 1, the recorded actual summer peak in 2022 was 21,156 MW while the 2022 forecast called for 20,424 MW. In an effort to stay ahead of these rapid increases, PJM continued its consultation efforts with Transmission and Distribution Owners in the area to refine its forecast and further enhance its need assessment.

PJM began receiving near and long term forecast input from Dominion, First Energy and NOVEC for data center load growth projections up to and including 2038 (15-year planning horizon). The PJM 2023 forecast calls for between 4.2% and 5.0% annual load growth in the Dominion area over the next 10- to 15-year time frame as shown in Figure 1 below. The Load Forecast information was refined and modeled at a bus/substation level for the 2028 and 2030 study years, and PJM reassessed the transmission development needs in the area based on the refined forecast information and localized allocation of load.

Figure 1. Dominion 2023 Summer Peak Load Forecast




The data center load growth rate (currently concentrating in areas of northern Virginia) continues to increase. FirstEnergy's APS zone (just north of Virginia) is also experiencing data center load development, driving high flows within the northern Virginia transmission system, into the data center concentrated load pocket. The 2027 and 2027/28 study cases summer zonal load for Dominion and First Energy is provided in Table 1.

There are regional flows from the following:

- West and East toward Doubs-Goose Creek
- South into and out of Bristers toward Loudon

Major voltage support needs within Dominion and APS will be required. Some of the voltage violations are observed under N-0 conditions (fictitious MVARs were modeled in order to solve the case), and heavy regional transfers will require additional reinforcements to support the regional transfers.

Table 1. 2027/28 Case Summer Zonal Load for Dominion and FirstEnergy

| | Summer Zonal Load (MW) | |
|---|---|---|
| Study Case | Dominion/NOVEC | FirstEnergy (APS) |
| 2022 Peak | 20,424 (forecast)/21,156 (actual) | 8,675 (forecast)/8,412 (actual) |
| 2027 RTEP | 23,681 | 8,780 |
| 2027 Baseline | 26,393 | 9,607 |
| 2027 High Load Growth | 28,893 | 10,559 |
| 2028 RTEP (2023 Load Forecast) | 28,705 | 9,568 |
| Data Center Component Load (modeled in cases) | ~5,700 | ~1,500 |

## Case Development

### *2027*

The 2022 RTEP Window 3 cases are based upon the 2022 RTEP, five-year out 2027 case with the following included:

- 2027 Dominion immediate need solution b3718
- 33 Dominion supplemental projects presented through the M-3 process from January to September of 2022
- Bus level data center load additions
- Summer, winter and light load cases were developed for baseline and high load growth scenarios

The immediate need baseline project, b3718, builds a new 500/230 kV substation called Wishing Star near Brambleton substation and installs one 500/230 kV 1440 MVA transformer at the substation. A new 500/230 kV substation called Mars will be built near Dulles International Airport, and one 500/230 kV 1440 MVA transformer will be installed at the substation. The 500 kV line No. 546 (Brambleton-Mosby) and 500 kV line No. 590 (Brambleton-Mosby) will be cut and extended to the proposed Wishing Star substation, and lines will terminate in a 500 kV breaker and a half configuration.

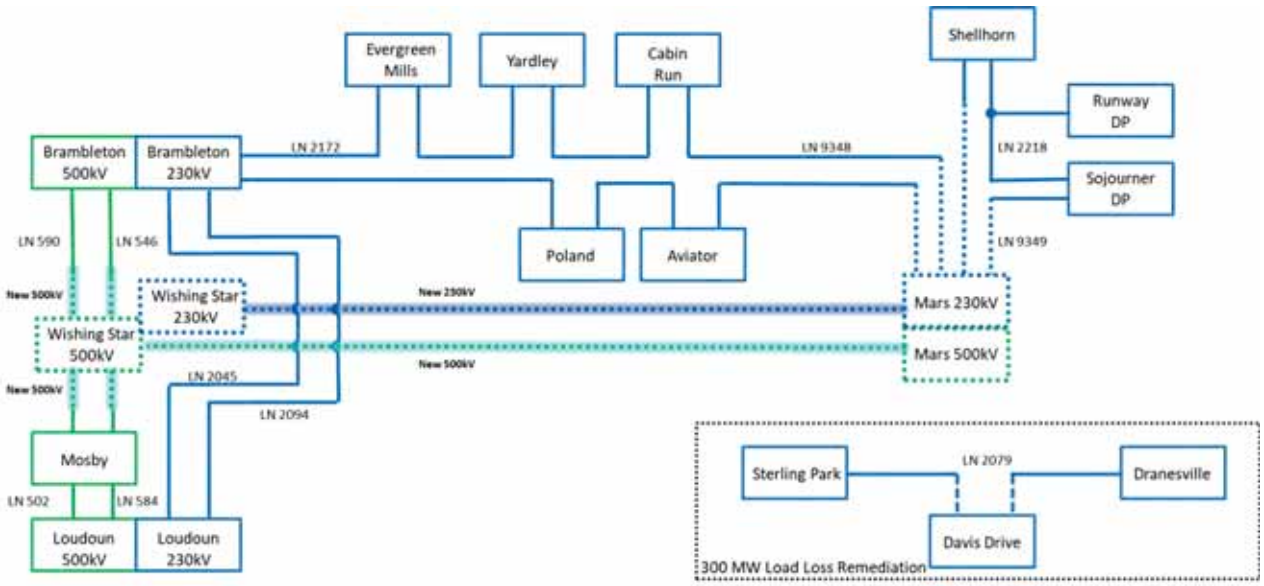
The project will reconductor the approximate mileage of the following lines:

- 0.62 miles of 230 kV line No. 2214 (Buttermilk-Roundtable)
- 1.52 miles of 230 kV line No. 2031 (Enterprise-Greenway-Roundtable)

- 0.64 miles of 230 kV line No. 2186 (Enterprise-Shellhorn)
- 2.17 miles of 230 kV line No. 2188 (Lockridge-Greenway-Shellhorn)
- 0.84 miles of 230 kV line No. 2223 (Lockridge-Roundtable)
- 3.98 miles of 230 kV line No. 2218 (Sojourner-Runway-Shellhorn)
- 1.61 miles of 230 kV line No. 9349 (Sojourner-Mars)

The project will also upgrade four 500 kV breakers to 63 kA on either end of 500 kV line No. 584 (Loudoun-Mosby circuit No. 1) and four 500 kV breakers to 63 kA on either end of 500 kV line No. 502 (Loudoun-Mosby circuit No. 2), cut and loop the 230 kV line No. 2079 (Sterling Park-Dranesville) into the Davis Drive substation and install two GIS 230 kV breakers. Figure 2 below shows a high-level illustration of the project scope. The PJM Board approved cost for this project is $627.62 million. This project is identified as immediate need, with a required in-service date of June 2025. The projected in-service date for all project components is December 2026. The local transmission owner, Dominion, was designated to complete this work.

Figure 2. Dominion Immediate Need Solution b3718




## *2028*

In addition to the data center load growth currently forecasted by 2027/2028 in Dominion (northern Virginia) and APS (Doubs) zones, there are a number of additional drivers necessitating the need for transmission development. Over the past two years, there has been approximately 11,100 MW of announced generator deactivations to the west and south of Conastone, about 5,300 MW of which occurred after the Window 3 2027 case was created. The replacement generation is coming from the region to the east of Peach Bottom as well as west of Doubs to meet projected load growth.

PJM has also implemented a new block dispatch procedure in the 2023 RTEP that more accurately reflects real-time operations dispatch and no longer tries to maintain historical intraregional transfer levels. The old dispatch procedure would have dispatched most of the generators in the Dominion zone at 100% or higher to maintain historical regional interchange. The 2028 case is subject to new generator deliverability testing requirements. After observing initial

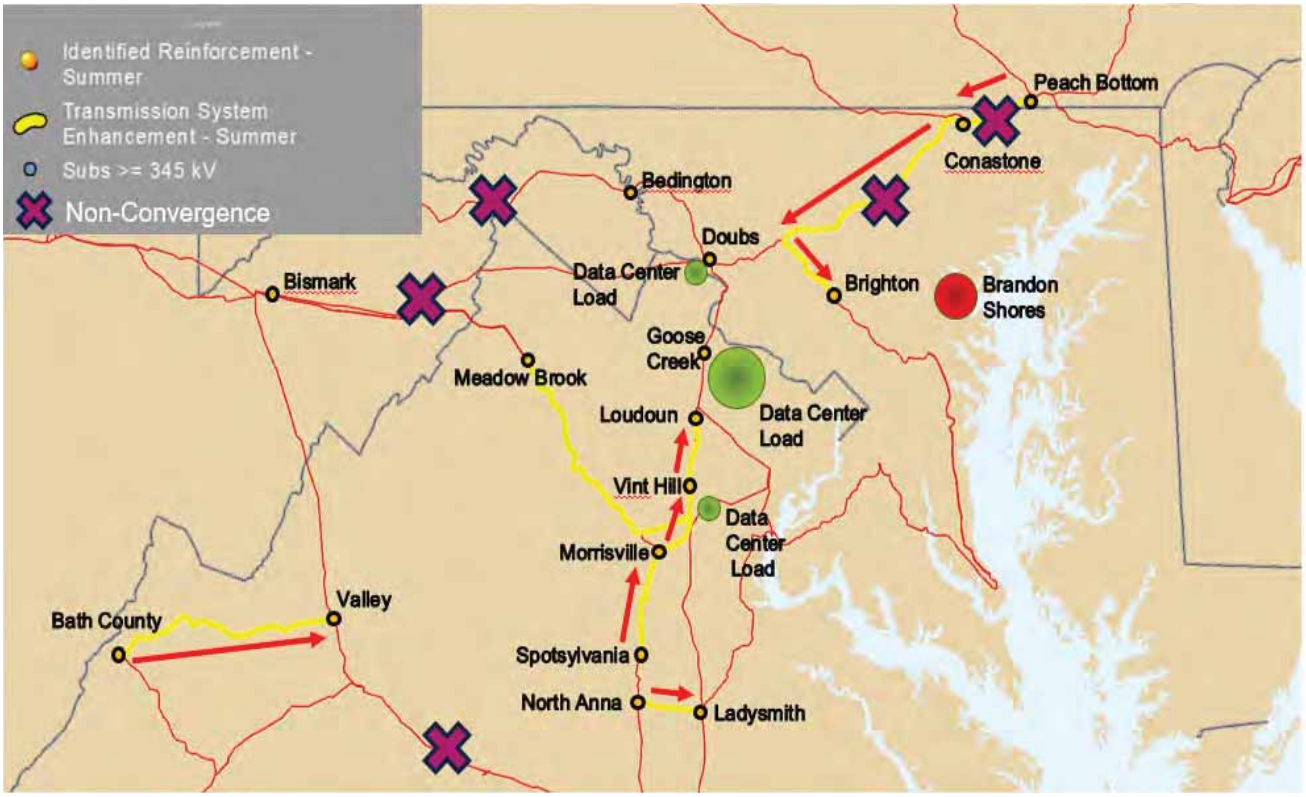
2028 analysis results, which showed an increased number and severity of overloads, PJM determined it would be prudent to utilize the 2028 cases to evaluate the proposals for robustness.

## Window Objective

The objective of the 2022 RTEP Window 3 is to develop robust, holistic and expandable solutions that address the 2027/28 baseline violations as illustrated in Map 1 associated with:

- Local Constraints: Resulting from directly serving the data center loads in APS and Dominion zones through the respective 230 kV networks and into the points of delivery:
  - Goose Creek-Ashburn-Mars-Wishing Star and Brambleton
- Regional Constraints: Resulting from imports into load center areas (500 kV primarily):
  - Doubs-Goose Creek
  - Front Royal-Morrisville-Vint Hill-Loudoun/Mosby
  - Meadow Brook-Loudoun/Mosby
  - Morrisville-Bristers-Ox
  - Peach Bottom-Conastone-Brighton-Doubs
- Reactive Power Needs: Needed reactive power MVAR reinforcements, both static and dynamic as deemed necessary, to address the reactive power needs of the system for the 2027/28 baseline scenario
- Cummulative Impact of Generation Changes and Deactivations:
  - 11,100 MW of announced deactivations to the west and south of Conastone
  - Approximately 5,300 MW occurring after the 2022 RTEP 2027 case was created
  - The vast majority of the new generation with signed ISAs has been solar, which has low availability during the winter period.
  - The replacement generation is coming from the region to the east of Peach Bottom as well as west of Doubs to meet projected load growth.
  - PJM has implemented a new block dispatch procedure.
  - The old dispatch procedure in the past (including that implemented in the 2027 study cases) maintained historical intraregional transfers, dispatching most of the generators in the Dominion zone at 100%.
- Adherance to All Applicable Criteria: The recommended solution must adhere to all applicable planning criteria, including PJM, NERC, SERC, RFC and local Transmission Owner FERC 715 criteria.

Map 1. 2022 RTEP Window 3 Map of Regional/Local Needs




## Reliability Solutions and Initial Screening

PJM received 72 proposals from ten different entities as part of this window (Table 2). Of the ten proposing entities, six were incumbent Transmission Owners (TOs) and four were non-incumbent entities. PJM received 22 proposals that are upgrades, and received 50 greenfield proposals. The total cost of all proposals, not all of which are required, add up to approximately $54.4 billion. The proposals include:

- 230 kV, 500 kV and 765 kV developments
- HVDC developments
- Underground 500 kV AC cable developments
- 500 kV GIS substations
- Double circuit 500 kV proposals

## *Proposal Clusters/Groupings*

The below Map 2 shows the regional nature of the proposals, concentrating in four clusters: West, South, East, and Northern Virginia data center areas. Each cluster included proposals by different entities in the same need area and/or addressed the same local/regional needs.

Map 2. Regional Clusters

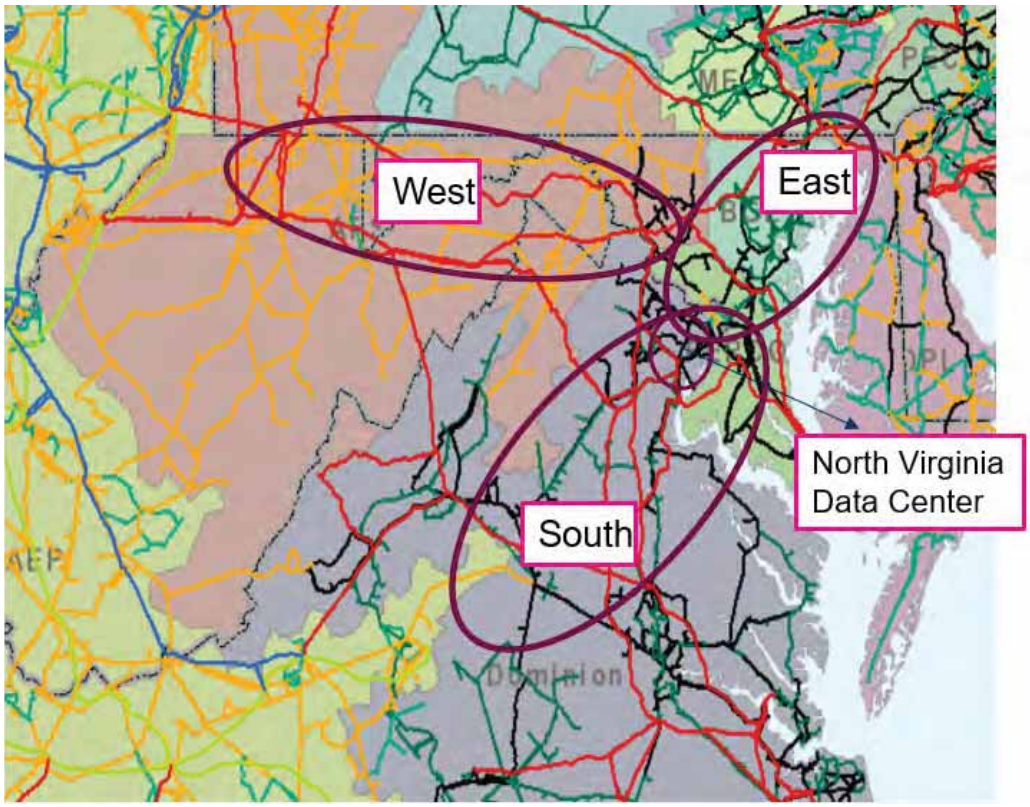



Table 2. 2022 RTEP Window 3 Submitted Proposals

| # | ID | Proposing Entity | Focus Area | Project Title | Submitted Cost ($M) |
|---|---|---|---|---|---|
| 1 | 9 | AEP | Local AEP | Scottsville-Bremo Sag Study | $1.27 |
| 2 | 55 | | | Boxwood-Scottsville 138 kV Rebuild | $104.88 |
| 3 | 181 | | | Boxwood-Scottsville 138 kV Sag Study | $4.26 |
| 4 | 196 | | | Glen Lyn-Peters Mountain Rebuild | $21.89 |
| 5 | 202 | | | Cloverdale Transformer Addition | $57.29 |
| 6 | 234 | | | Glen Lyn-Peters Mountain Sag Study | $0.80 |
| 7 | 410 | | | Cloverdale Breaker Reconfiguration | $11.59 |
| 8 | 477 | | | Fieldale-Franklin Rebuild | $74.89 |
| 9 | 524 | | | Opossum Creek and New London Reactors | $8.86 |
| 10 | 537 | | | Fieldale-Franklin Sag Study | $30.19 |
| 11 | 629 | | | Scottsville-Bremo Rebuild | $31.31 |
| 12 | 856 | | | Leesville-Altavista Rebuild | $28.85 |
| 13 | 487 | AEP - Transource | Combo | Maryland & Pennsylvania Baseline Reliability Solution | $492.75 |
| 14 | 858 | | South | Stork-Flys 500 kV Greenfield Line and Substations | $510.44 |
| 15 | 904 | | Combo | Joshua Falls-Yeat 765 kV Greenfield Line and Substation | $1,048.10 |
| 16 | 977 | | South | Yeat 500/230 kV Greenfield Station | $232.14 |
| 17 | 30 | Dominion | Local DOM | Charlottesville-Hollymead Line No. 2054 Rebuild | $159.87 |

| # | ID | Proposing Entity | Focus Area | Project Title | Submitted Cost ($M) |
|---|---|---|---|---|---|
| 18 | 74 | Dominion | Local DOM | Line No. 2090 (Ladysmith CT-Fredericksburg) Rebuild | $57.34 |
| 19 | 129 | | South | Dominion Aggregate 500 kV Proposal | $3,035.05 |
| 20 | 211 | | Local DOM | Hollymead-Gordonsville Line No. 2135 Rebuild | $54.85 |
| 21 | 231 | | | Reactive Power VAR Reinforcements | $155.82 |
| 22 | 516 | | East | Interregional solution- Aspen-Doubs Second 500 kV Line | $61.72 |
| 23 | 671 | | South | Line No. 541 (Front Royal to Morrisville) Rebuild | $299.03 |
| 24 | 692 | | South | Data Center Alley Local solution-New 500 kV/230 kV Aspen-Golden & Golden-Mars lines | $1,058.45 |
| 25 | 704 | | Local DOM | Hollymead-Gordonsville Line No. 2135 Rebuild | $36.89 |
| 26 | 711 | | South | Regional Solution-500 kV North Anna-Wishing Star Upgrades | $1,227.84 |
| 27 | 731 | | Local DOM | Locks Substation 230/115 kV Transformer Upgrade | $7.14 |
| 28 | 923 | | South | Second 500 kV line from Lexington to Dooms | $232.18 |
| 29 | 967 | | Local DOM | Charlottesville-Hollymead Line No. 2054 Rebuild | $183.48 |
| 30 | 548 | LSPower | Scenario | RTEP Window 3 Solution | $2,404.48 |
| 31 | 28 | NextEra | East/West | Hunterstown-Doubs-Goose Creek, Black Oak-Pike-Goose Creek, Pike SVC + Cap Banks | $884.05 |
| 32 | 116 | | | Hunterstown-Doubs-Gant Solution | $478.87 |
| 33 | 175 | | Scenario | Combination of PEBO 215A + WOP 1F + SOP 8E | $6,265.95* |
| 34 | 217 | | East | North Delta-Conastone Solution | $155.99 |
| 35 | 255 | | West | Hunterstown-Doubs-Gant Solution | $411.61 |
| 36 | 279 | | | Black Oak-Woodside-Goose Creek, Woodside SVC + Cap Banks Solution | $429.18 |
| 37 | 347 | | | Black Oak-Woodside-Gant, Woodside SVC + Cap Banks | $483.83 |
| 38 | 385 | | East | New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation | $1,140.73 |
| 39 | 419 | | East/West | Hunterstown-Doubs-Audobon-Goose Creek | $548.75 |
| 40 | 445 | | East | Muddy Creek/Delta-Conastone/Hunterstown-Doubs-Goose Creek Solution | $637.80 |
| 41 | 530 | | | Muddy Creek/North Delta-Conastone Solution | $166.74 |
| 42 | 564 | | | New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation | $876.88 |
| 43 | 577 | | South | Front Royal-Racefield, Warrenton-Wheeler, North Anna-Lady Smith | $258.38 |
| 44 | 598 | | Scenario | Combination of PEBO 220 + WOP 1F + SOP 8E | $2,036.47 |
| 45 | 631 | | East | Muddy Creek/North Delta-Conastone Solution | $184.47 |
| 46 | 642 | | West | 502 Junction-Black Oak-Woodside-Gant, Woodside SVC + Cap Banks, Gant-Farmwell, Cochran Tap-Round Table | $747.31 |
| 47 | 663 | | South | Front Royal-Racefield, Warrenton-Rixlew, Warrenton-Hourglass, Mars-Ocean Court-Davis Drive | $284.17 |
| 48 | 676 | NextEra | West | Black Oak-Stonewall-Gant, Stonewall SVC + Cap Banks, Gant-Farmwell, Cochran Tap-Round Table Solution | $552.49 |
| 49 | 685 | | | Ft. Martin-Black Oak-Woodside, Woodside SVC + Cap Banks Solution | $609.78 |
| 50 | 719 | | | Ft. Martin-Black Oak-Pike, Pike SVC + Cap Banks Solution | $600.90 |

| # | ID | Proposing Entity | Focus Area | Project Title | Submitted Cost ($M) |
|---|---|---|---|---|---|
| 51 | 728 | | | Barnhart Substation, Bartholow Substation, Barnhart-Bartholow-Goose Creek solution | $385.36 |
| 52 | 766 | | South | Front Royal-Racefield, Warrenton-Wheeler | $239.59 |
| 53 | 846 | | West | Hunterstown-Doubs-Goose Creek, Black Oak-Woodside-Goose Creek, Stonewall SVC + Cap Banks | $892.94 |
| 54 | 853 | | | 502 Junction-Black Oak-Woodside-Gant, Woodside SVC + Cap Banks | $683.55 |
| 55 | 948 | | East | New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation, and Keeney to Waugh Chapel tie-in. | $5,381.25* |
| 56 | 951 | | West | Black Oak-Gore-Goose Creek, Pike SVC + Cap Bank Solution | $419.86 |
| 57 | 344 | PECO | East | PECO Expansion Plan for DOM Window 2023 | $302.86 |
| 58 | 600 | | Local Other | Exelon Replacement Upgrades | $423.79 |
| 59 | 660 | PEPCO | East | West Cooper BGE-PEPCO | $1,105.62 |
| 60 | 691 | | | Mid-Atlantic Power Pathway (MAPP) | $1,990.28 |
| 61 | 23 | POTOED - FirstEnergy | Combo | Data Center Reinforcement Proposal No. 2 | $3,503.86 |
| 62 | 837 | | | Data Center Reinforcement Proposal No. 1 | $2,991.77 |
| 63 | 374 | PPL | East | Otter Creek-Conastone 500 and 230 kV DCT Line | $154.21 |
| 64 | 606 | | Local Other | Juniata-Lewistown 230 kV No. 2 line | $141.16 |
| 65 | 24 | PSEG | East | Proposal A-North Delta-New Raphael-Waugh Chapel 500 kV | $739.40 |
| 66 | 125 | | Local Other | Proposal B-North Delta-Northeast 230 kV | $313.34 |
| 67 | 229 | | East | Proposal C-Hunterstown-New Green Valley 500 kV | $529.11 |
| 68 | 325 | | Combo | Proposal E-Brambleton-Hinsons Ford Rd 500 kV | $944.05 |
| 69 | 637 | | East | Proposal D-Conastone-Doubs 500 kV | $684.22 |
| 70 | 741 | | | Proposal G-Peach Bottom-New Brandon Shores 500 kV; Peach Bottom-Doubs 500 kV | $1,065.32 |
| 71 | 808 | | | Proposal F-Peach Bottom-New Raphael-Waugh Chapel 500 kV; Peach Bottom-Doubs 500 kV | $1,150.80 |
| 72 | 962 | | | Proposal H-Peach Bottom-Doubs 500 kV (Circuits No. 1 and No. 2) | $977.71 |
| | | | | Total: | $54,408.06 |

**The proposal cost was increase due to cost revision provided by proposing entity from approximately $1.6 billion to $5.4 billion.*

## *Proposal Screening*

PJM performed a generator deliverability screening of all proposals on the 2027 cases to obtain a preliminary understanding of performance. It is important to note that many of the proposals are not intended to be standalone projects, as they are intended to be combined with other proposals in order to address flowgate violations. Table 3 and Table 4 summarize the performance evaluation results of all 72 submitted proposals. The tables summarize the intended flowgates by each proposal as specified in the proposing entity submission, the remediated flowgates as confirmed by PJM testing, the total addressed/unaddressed flowgates out of all window flowgates and whether the proposal, on its own, introduces any new flowgates. Where a high number of unaddressed flowgates are shown in the

Table 3, such as for some of Dominion and NextEra proposals, the specific proposals are either combined with other entitys' proposals and/or part of a larger scenario proposal.

Table 3. 2027 Proposal Summary by Number of Flowgates (FG)

| # | ID | Proposing Entity | Focus Area | Project Intended FG | Remediated FG Intended | Unaddressed FG Intended | Addressed FG Posted (out of 527) | Unaddressed FG Posted (out of 527) | New FG Attributed to Project |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 9 | AEP | Local AEP | 0 | 0 | 0 | 36 | 491 | 13 |
| 2 | 55 | | | 16 | 16 | 0 | 61 | 466 | 17 |
| 3 | 181 | | | 16 | 14 | 2 | 55 | 472 | 6 |
| 4 | 196 | | | 1 | 1 | 0 | 44 | 483 | 17 |
| 5 | 202 | | | 1 | 1 | 0 | 43 | 484 | 11 |
| 6 | 234 | | | 1 | 1 | 0 | 43 | 484 | 10 |
| 7 | 410 | | | 1 | 1 | 0 | 180 | 347 | 79 |
| 8 | 477 | | | 2 | 2 | 0 | 176 | 351 | 81 |
| 9 | 524 | | | 2 | 2 | 0 | 176 | 351 | 82 |
| 10 | 537 | | | 2 | 2 | 0 | 169 | 358 | 20 |
| 11 | 629 | | | 0 | 0 | 0 | 175 | 352 | 83 |
| 12 | 856 | | | 2 | 1 | 1 | 175 | 352 | 87 |
| 13 | 30 | Dominion | Local DOM | 3 | 3 | 0 | 47 | 480 | 22 |
| 14 | 74[1] | | | 108 | 4 | 104 | 44 | 483 | 7 |
| 15 | 129[1] | | South | 117 | 84 | 33 | 149 | 378 | 46 |
| 16 | 211[1] | | Local DOM | 113 | 7 | 106 | 52 | 475 | 11 |
| 17 | 231[1] | | | 108 | 11 | 97 | 58 | 469 | 16 |
| 18 | 516 | | PB-C | 15 | 15 | 0 | 195 | 332 | 25 |
| 19 | 671 | | Local DOM | 0 | 0 | 0 | 43 | 484 | 8 |
| 20 | 692 | | South | 62 | 62 | 0 | 127 | 400 | 11 |
| 21 | 704 | | Local DOM | 2 | 2 | 0 | 49 | 478 | 7 |
| 22 | 711 | | South | 35 | 33 | 2 | 127 | 400 | 143 |
| 23 | 731[1] | | Local DOM | 108 | 4 | 104 | 47 | 480 | 7 |
| 24 | 923 | | South | 3 | 3 | 0 | 49 | 478 | 11 |
| 25 | 967[1] | | Local DOM | 114 | 7 | 107 | 47 | 480 | 22 |
| 26 | 600 | Exelon | Local Other | 126 | 124 | 2 | 287 | 240 | 81 |
| 27/28 | 660/344 | | PB-C | 96 | 96 | 0 | 309 | 218 | 91 |
| 29 | 23[1] | FE (POTOMAC) | Combo | 501 | 419 | 82 | 433 | 94 | 35 |
| 30 | 837[1] | | | 501 | 421 | 80 | 434 | 93 | 21 |
| 31 | 548 | LS Power | Scenario | 515 | 509 | 6 | 518 | 9 | 32 |
| 32 | 28[1] | NextEra | West | 339 | 263 | 76 | 306 | 221 | 102 |
| 33 | 116[1] | | | 294 | 246 | 48 | 275 | 252 | 66 |
| 34 | 217[1] | | PB-C | 170 | 139 | 31 | 244 | 283 | 82 |
| 35 | 255[1] | | West | 298 | 189 | 109 | 249 | 278 | 86 |

[1] These proposals are designed to work in tandem with other proposal components submitted by the same proposing entity. The performance of these proposals is further judged through the scenario analysis exercise instead of individually only

| # | ID | Proposing Entity | Focus Area | Project Intended FG | Remediated FG Intended | Unaddressed FG Intended | Addressed FG Posted (out of 527) | Unaddressed FG Posted (out of 527) | New FG Attributed to Project |
|---|---|---|---|---|---|---|---|---|---|
| 36 | 279[1] | | | 260 | 170 | 90 | 239 | 288 | 102 |
| 37 | 347[1] | | | 228 | 165 | 63 | 237 | 290 | 105 |
| 38 | 385 | | PB-C | 378 | 372 | 6 | 500 | 27 | 313 |
| 39 | 419[1] | | West | 492 | 242 | 250 | 272 | 255 | 81 |
| 40 | 445[1] | | PB-C | 318 | 268 | 50 | 306 | 221 | 105 |
| 41 | 530 | | | 1 | 1 | 0 | 236 | 291 | 86 |
| 42 | 564[1] | | | 375 | 333 | 42 | 355 | 172 | 38 |
| 43 | 577[1] | | South | 127 | 75 | 52 | 163 | 364 | 208 |
| 44 | 598 | | Scenario | 634 | 630 | 4 | 510 | 17 | 10 |
| 45 | 631[1] | | PB-C | 181 | 150 | 31 | 248 | 279 | 93 |
| 46 | 642[1] | | West | 353 | 257 | 96 | 303 | 224 | 176 |
| 47 | 663[1] | | South | 170 | 100 | 70 | 166 | 361 | 211 |
| 48 | 676[1] | | West | 253 | 189 | 64 | 277 | 250 | 93 |
| 49 | 685[1] | | | 299 | 210 | 89 | 265 | 262 | 227 |
| 50 | 719[1] | | | 297 | 197 | 100 | 252 | 275 | 231 |
| 51 | 728[1] | | | 494 | 189 | 305 | 206 | 321 | 153 |
| 52 | 766[1] | | South | 127 | 74 | 53 | 160 | 367 | 208 |
| 53 | 846[1] | | West | 344 | 270 | 74 | 314 | 213 | 102 |
| 54 | 853[1] | | | 301 | 210 | 91 | 266 | 261 | 99 |
| 55 | 948[1] | | PB-C | 382 | 341 | 41 | 365 | 162 | 31 |
| 56 | 951[1] | | West | 220 | 162 | 58 | 231 | 296 | 111 |
| 57 | 175 | | Scenario | 466 | 463 | 3 | 510 | 17 | 11 |
| 58 | 374 | PPL | PB-C | 8 | 8 | 0 | 142 | 385 | 27 |
| 59 | 606[1] | | Local Other | 14 | 10 | 4 | 46 | 481 | 17 |
| 60 | 24 | PSEG | PB-C | 158 | 148 | 10 | 286 | 241 | 76 |
| 61 | 125 | | Local Other | 111 | 110 | 1 | 268 | 259 | 71 |
| 62 | 229[1] | | PB-C | 191 | 177 | 14 | 295 | 232 | 93 |
| 63 | 325[1] | | Combo | 192 | 168 | 24 | 304 | 223 | 81 |
| 64 | 637 | | PB-C | 161 | 148 | 13 | 281 | 246 | 101 |
| 65 | 741 | | | 194 | 184 | 10 | 290 | 237 | 88 |
| 66 | 808 | | | 198 | 188 | 10 | 327 | 200 | 79 |
| 67 | 962 | | | 181 | 164 | 17 | 283 | 244 | 97 |
| 68 | 487 | TRANSRC | Combo | 317 | 307 | 10 | 438 | 89 | 5 |
| 69 | 858 | | South | 63 | 61 | 2 | 169 | 358 | 18 |
| 70 | 904 | | Combo | 148 | 142 | 6 | 295 | 232 | 39 |
| 71 | 977 | | South | 26 | 26 | 0 | 196 | 331 | 26 |

*NOTE: Proposal 691 case did not converge, so no results are shown.*

[1] These proposals are designed to work in tandem with other proposal components submitted by the same proposing entity. The performance of these proposals is further judged through the scenario analysis exercise instead of individually only

Table 4. 2027 Proposal Summary by Number of Facilities

| # | ID | Proposing Entity | Focus Area | No Longer Overloaded (out of 146) | Remaining Overloads (out of 146) | New Overloads |
|---|---|---|---|---|---|---|
| 1 | 9 | AEP | Local AEP | 15 | 131 | 1 |
| 2 | 55 | | | 20 | 126 | 1 |
| 3 | 181 | | | 19 | 127 | 0 |
| 4 | 196 | | | 16 | 130 | 0 |
| 5 | 202 | | | 16 | 130 | 0 |
| 6 | 234 | | | 16 | 130 | 0 |
| 7 | 410 | | | 45 | 101 | 10 |
| 8 | 477 | | | 45 | 101 | 9 |
| 9 | 524 | | | 44 | 102 | 10 |
| 10 | 537 | | | 48 | 98 | 0 |
| 11 | 629 | | | 44 | 102 | 11 |
| 12 | 856 | | | 42 | 104 | 10 |
| 13 | 30 | Dominion | Local DOM | 19 | 127 | 0 |
| 14 | 74 | | | 17 | 129 | 0 |
| 15 | 129 | | South | 43 | 103 | 6 |
| 16 | 211 | | Local DOM | 17 | 129 | 0 |
| 17 | 231 | | | 15 | 131 | 1 |
| 18 | 516 | | PB-C | 65 | 81 | 3 |
| 19 | 671 | | Local DOM | 18 | 128 | 0 |
| 20 | 692 | | South | 37 | 109 | 2 |
| 21 | 704 | | Local DOM | 17 | 129 | 0 |
| 22 | 711 | | South | 39 | 107 | 7 |
| 23 | 731 | | Local DOM | 16 | 130 | 0 |
| 24 | 923 | | South | 18 | 128 | 0 |
| 25 | 967 | | Local DOM | 19 | 127 | 0 |
| 26 | 600 | Exelon | Local Other | 63 | 83 | 11 |
| 27/28 | 660/344 | | PB-C | 60 | 86 | 22 |
| 29 | 23 | FE (POTOMAC) | Combo | 97 | 49 | 6 |
| 30 | 837 | | | 100 | 46 | 3 |
| 31 | 548 | LS Power | Scenario | 114 | 32 | 11 |
| 32 | 28 | NextEra | West | 52 | 94 | 16 |
| 33 | 116 | | | 50 | 96 | 13 |
| 34 | 175 | | Scenario | 117 | 29 | 4 |
| 35 | 217 | | PB-C | 54 | 92 | 10 |
| 36 | 255 | | West | 44 | 102 | 16 |
| 37 | 279 | | | 41 | 105 | 7 |
| 38 | 347 | | | 41 | 105 | 7 |
| 39 | 385 | | PB-C | 81 | 65 | 13 |

| # | ID | Proposing Entity | Focus Area | No Longer Overloaded (out of 146) | Remaining Overloads (out of 146) | New Overloads |
|---|---|---|---|---|---|---|
| 40 | 419 | | West | 55 | 91 | 18 |
| 41 | 445 | | PB-C | 58 | 88 | 21 |
| 42 | 530 | | | 53 | 93 | 12 |
| 43 | 564 | | | 81 | 65 | 13 |
| 44 | 577 | | South | 32 | 114 | 25 |
| 45 | 598 | | Scenario | 117 | 29 | 3 |
| 46 | 631 | | PB-C | 54 | 92 | 16 |
| 47 | 642 | | West | 64 | 82 | 17 |
| 48 | 663 | | South | 38 | 108 | 26 |
| 49 | 676 | | West | 56 | 90 | 5 |
| 50 | 685 | | | 45 | 101 | 25 |
| 51 | 719 | | | 43 | 103 | 21 |
| 52 | 728 | | | 40 | 106 | 23 |
| 53 | 766 | | South | 33 | 113 | 26 |
| 54 | 846 | | West | 49 | 97 | 16 |
| 55 | 853 | | | 49 | 97 | 9 |
| 56 | 948 | | PB-C | 80 | 66 | 10 |
| 57 | 951 | | West | 36 | 110 | 7 |
| 58 | 374 | PPL | PB-C | 32 | 114 | 1 |
| 59 | 606 | | Local Other | 16 | 130 | 1 |
| 60 | 24 | PSEG | PB-C | 53 | 93 | 16 |
| 61 | 125 | | Local Other | 59 | 87 | 12 |
| 62 | 229 | | PB-C | 58 | 88 | 22 |
| 63 | 325 | | Combo | 52 | 94 | 19 |
| 64 | 637 | | PB-C | 51 | 95 | 18 |
| 65 | 741 | | | 58 | 88 | 18 |
| 66 | 808 | | | 70 | 76 | 16 |
| 67 | 962 | PSEG | PB-C | 56 | 90 | 19 |
| 68 | 487 | TRANSRC | Combo | 100 | 46 | 0 |
| 69 | 858 | | South | 56 | 90 | 0 |
| 70 | 904 | | Combo | 69 | 77 | 2 |
| 71 | 977 | | South | 49 | 97 | 1 |

*NOTE: Proposal 691 case did not converge, so no results are shown.*

The proposals submitted by AEP were intended to address local AEP flowgates posted with the window and were not included in the cluster evaluations. The proposals were evaluated in the 2027 and 2028 cases and addressed the posted flowgate violations.

## *Regional Proposal Components*

The first step to scenario development was to cluster the 500 kV and above proposal components to determine the more efficient or cost-effective combination of backbone solution components. Table 5 through Table 8 organize the backbone proposal components into regional clusters.

Table 5. East Cluster

| Proposal ID | Proposing Entity | List Components |
|---|---|---|
| 344/660-1 | Exelon | Peach Bottom North-Graceton New 500 kV<br>West Cooper-Peach Bottom South New 500 kV Line<br>West Cooper-High Ridge 500 kV<br>Rebuild 5012 500 kV (will be looped in to West Cooper and Gracetone) |
| 344/660-2 | | West Cooper-Peach Bottom South New 500 kV Line<br>West Cooper-High Ridge 500 kV<br>Rebuild 5012 500 kV (will be looped in to West Cooper) |
| 344/660-3 | | Peach Bottom North-Graceton New 500 kV<br>West Cooper-Peach Bottom South New 500 kV Line<br>Rebuild 5012 500 kV (will be looped in to West Cooper and Gracetone) |
| 691 | | 230 mile, 500 kV AC/400 kV DC (Possum Pt-Burches Hill-Cheltenham-Chalk Pt. Mission to Salem 500 kV)<br>Hallowing (HVDC)-Mission (HVDC) |
| 548 | LS Power | Conastone-North Delta 500 kV |
| | | Huntersdown-Doubs 500 kV |
| 217 | NextEra | North Delta-Conastone 500 kV |
| 385/564 | | New Otter Creek-Bartholow (Conastone-Brighton tap, Doubs-Brighton Tap) 500 kV |
| 385/564 | | North Delta-Conastone 500 kV |
| 530 | | North Delta-Conastone 500 kV |
| 948 | NextEra | New Otter Creek-Bartholow (Conastone-Brighton tap, Doubs-Brighton Tap) 500 kV |
| 948 | | North Delta-Conastone 500 kV |
| 374 | PPL | Otter Creek-Conastone 500 and 230 kV DCT Line |
| 229 | PSEG | Hunterstown-Green Valley 500 kV |
| 24 | | N. Delta-New Raphael-W. Chapel 500 kV |
| 325 | | N. Delta-New Raphael-W. Chapel 500 kV |
| 637 | | Conastone-Doubs 500 kV |
| 741 | | Peach Bottom-Brandon Shore 500 kV |
| 741 | | Peach Bottom-Doubs 500 kV |
| 808 | | Peach Bottom-Raphael-W. Chapel 500 kV |
| 808 | | Peach Bottom-Doubs 500 kV |
| 962 | | Peach Bottom-Doubs 500 kV (two lines) |

Table 6. West Cluster

| Proposal ID | Proposing Entity | List Components |
|---|---|---|
| 23 | FE | Fort Martin-Doubs 500 No. 1 & 2 |
| 23 | | Meadow Brook-Doubs 500 kV |
| 23 | | Meadow Brook-Pruntytown 500 kV |
| 837 | | Fort Martin-Doubs 500 No. 1 |
| 837 | | Meadow Brook-Doubs 500 kV |
| 837 | | Meadow Brook-Pruntytown 500 kV |
| 548 | LS Power | 502 Junction-Black Oak-Doubs 500 kV |
| 279 | NextEra | Black Oak-Stonewall-Goose Creek 500 kV |
| 28 | | Black Oak-Gore-Goose Creek 500 kV |
| 347 | | Black Oak-Stonewall-Goose Creek 500 kV |
| 642 | | Build new 500 kV line from 502 Junction to Black Oak to Stonewall to new Belmont/Gant 500 kV |
| 676 | | Black Oak-Stonewall-Goose Creek 500 kV |
| 685 | | Build new 500 kV line from Fort Martin to Black Oak to Stone Wall to Goose Creek |
| 719 | | Fort Martin to Black Oak to Gore to Goose Creek 500 kV |
| 846 | | Black Oak-Stonewall-Goose Creek 500 kV |
| 853 | | Build new 500 kV line from 502 Junction to Black Oak to Stonewall to new Belmont/Gant 500 kV |
| 951 | | Black Oak-Gore-Goose Creek 500 kV |
| 116 | | Hunterstown-Doubs 500 kV |
| 255 | | Hunterstown-Doubs 500 kV |
| 28 | | Hunterstown-Doubs 500 kV |
| 419 | | Hunterstown-Doubs 500 kV |
| 445 | | Hunterstown-Doubs 500 kV |
| 116 | | Hunterstown-Doubs 500 kV |
| 255 | | Hunterstown-Doubs 500 kV |

Table 7. South Cluster

| Proposal ID | Proposing Entity | List Components |
|---|---|---|
| 711 | Dominion | New 500 kV Line (North Anna-Spotsylvania) |
| 711 | | New 500 kV Line (Spotsylvania to Vint Hill) |
| 711 | | New 500 kV Line (Vint Hill to Wishing Star) |
| 923 | | Second 500 kV line from Lexington to Dooms |
| 548 | LS Power | Front Royal-VintHill 500 kV |
| 577 | NextEra | Front Royal to New Wishing Star sub 500 kV |
| 663 | | Front Royal to New Wishing Star sub 500 kV |
| 766 | | Front Royal to New Wishing Star sub 500 kV |
| 325 | PSEG | Brambleton-Hinsons Ford 500 kV |

| Proposal ID | Proposing Entity | List Components |
|---|---|---|
| 904 | TRANSRC | Joshua Falls to Yeat 765 kV |

Table 8. Northern Virginia Data Center Cluster

| Proposal ID | Proposing Entity | List Components |
|---|---|---|
| 516 | Dominion | Aspen-Doubs Second 500 kV Line \| Line No. 514 (Goose Creek-Doubs) Rebuild |
| 692 | | Aspen-Golden 500 kV Line Build |
| 692 | | New Mars-Golden 500 kV |
| 692 | | Aspen to Goose Creek 500 kV |
| 23 | FE | Aspen-Doubs Second 500 kV Line \| Line No. 514 (Goose Creek-Doubs) Rebuild |
| 837 | | Aspen-Doubs Second 500 kV Line \| Line No. 514 (Goose Creek-Doubs) Rebuild |
| 548 | LS Power | Doubs-Goose Creek 500 kV |
| 548 | | Goose Creek-Beaumeade 500 kV |
| 116 | NextEra | Doubs-Gant (new Belmont) 500 kV |
| 255 | | Doubs-Gant (new Belmont) 500 kV |
| 28 | | Doubs-Goose Greek 500 kV |
| 419 | | Doubs-Beaumeade-Goose Creek 500 kV |
| 445 | | Doubs -Goose Creek 500 kV |
| 846 | | Doubs-Goose Greek 500 kV |
| 858 | TRANSRC | Stork-Flys 500 kV Underground Line |

## Window 3 Evaluations Process

### *Consultation Meetings With Proposing Entities*

PJM held two rounds of meetings with each of the proposing entities, and the discussions focused on gaining clarity on proposed developments, assumptions, rationale of proposed alternatives and variations. The first round of meetings were conducted in June/July of 2023, and the second round was initiated in late July and concluded mid-August. The latter half of the discussions focused on outage scheduling, routing, risk and cost assumptions and considerations. In addition to the primary two consultation rounds, several additional consultation meetings were organized by PJM with short-listed proposing entities to assist with refining and finalizing the 2022 Window 3 selected proposal list.

### *Scenario Development*

PJM developed scenarios, which were combinations of proposals and/or components from different proposals, addressing all areas of need and evaluated them against the 2027 and 2028 2022 Window 3 base cases. Over 30 scenarios were analyzed for the 2027 model, and over 100 scenarios were developed and analyzed for the 2028 model. Certain scenarios were full combination scenarios submitted by the proposing entities, such as those

submitted by the incumbent Transmission Owners, or other entities including NextEra, LS Power and Transource. PJM also optimized scenarios using components from incumbent and non-incumbent proposing entities. Several scenarios were found adequate to address the needs present in the 2027 analysis; however, the 2028 evaluations show the need for more robust reinforcements in the Eastern cluster and introduced changes to solutions in the Southern cluster. The Western cluster needs are less sensitive, though still impacted by the robustness test. A number of proposals that were developed by proposing entities to address the 2027 needs specifically did not offer the needed scalability and robustness to address the needs posed by the 2028 system conditions. Please refer to the scenario list and abbreviated description provided in Appendix B.

The scenarios were evaluated based on the following principles:

- Performance
  - Meeting the system needs of 2027 and being flexible to address 2028 needs
- Scalability
  - Scenario/development longevity – system robustness and utilization
- Impact
  - Utilization of existing right of way (ROW) where possible and efficient.
- Validated Cost
  - Cost evaluation using third-party benchmarking metrics
- Risks
  - Triggering additional costs:
    - Substation rebuilds due to extreme short-circuit levels
  - Avoid extended critical outages (Peach Bottom/Conastone rebuilds)
  - Imposing high permitting
  - Inability to meeting in-service date
- Efficiencies
  - Avoidance of redundant capital investment including recognizing synergies with EOL facilities and overlaps of previously approved (or imminent) supplemental/baseline upgrades

The scenarios were developed and tested to first address the regional needs and then were refined through new scenarios to address local needs. Scenarios were further refined using more effective proposal components as demonstrated through their performance in the analysis.

## *2027 Reliability Evaluation Summary*

As described earlier on in this report, initial screening was performed on all submitted individual proposals for 2027. These proposals included proposed upgrades at voltage levels of 230 kV to 765 kV. Some of the proposals attempted to address all four cluster needs and were evaluated as standalone scenarios. PJM also developed a scenario by combining the incumbent Transmission Owner proposals, along with further refined scenarios that

utilized select components from various proposals. The 2027 reliability analysis results indicated that all submitted combination proposals could address the 2027 needs to a varying degree. In order to test the robustness of the proposal, PJM evaluated the scenarios on the 2028 cases.

This section outlines the key needs identified as part of the PJM 2022 RTEP Window 3, together with a brief summary of how each of the key proposals addressed those needs in the 2027 study base case scenario.

### Eastern Quadrant:

For the eastern quadrant, all submitted proposals acknowledged the need to reinforce the Peach Bottom to Doubs 500 kV transmission corridor via various 230 kV and 500 kV proposals. Generally, all combination proposals submitted by proposing entities addressed the reliability evaluation tests including Gen Deliverability and N-1 analysis with varying degrees. Some of the proposals that did not consider the robustness evaluation requirement part of the PJM 2022 RTEP Window 3 Problem Statement were not designed to handle the higher power transfer demands from the East toward West and hence offered little room beyond meeting the 2027 needs. These proposals are primarily LS Power proposal 548 and Transource combined proposal. Both LS Power and Transource indicated that their proposed solutions were neither designed considering the 2028 robustness and needs base case scenarios nor tested against the 2028 cases.

Exelon proposal 344/660, PSEG proposal 229, 637, 741 ,808, Nextera proposal 217, 385, 445, 728, 948, PPL proposal 374 and Ls Power proposal 548 all proposed 500 kV transmission line developments to address the debottlenecking need of the Peach Bottom to Conastone corridor as well as provide additional supply into the northern Virginia system.

### Western Quadrant:

In the west, three proposing entities (First Energy, Nextera and LS Power) offered 500 kV transmission developments to address the higher APS to northern Virginia (West to East) transfer capability needs. One entity (Transource) proposed a 765 kV development. All of these developments proved adequate, from a technical transfer capability perspective, in addressing the identified needs in the western quadrant either in combination or individually.

It is to be noted that although the proposed 765 kV development by Transource has merits from diversifying the West-East transfer path over a wider geographic area, it does pose its own routing, siting and construction risks that may delay meeting the needs in the area in 2027 or as close to that timeline as possible.

Other smaller proposal components, such as the Front Royal to Wishing Star/Loudon area 500 kV developments by Nextera (proposal numbers: 766, 577, 663), offer limited transfer enhancements once the needed bulk transmission reinforcements are in place. These developments, as outlined in the PJM constructability evaluation report pose much higher elevated construction risk and when compared to the limited incremental transfer capability offered were dropped from further consideration.

### Southern Quadrant:

The 2027 analysis indicated that the proposed 500 kV line rebuilds in the existing 500 kV corridor currently running between Front Royal and Vint Hill are effective in addressing the identified overloads under the 2027 scenario. LS Power also proposed to build a new, greenfield 500 kV line along that corridor to enhance its transfer capability, which was proven also effective technically. It is to be noted, however, that the 2022 RTEP Window 3, 2027 basecase scenario adopted the older PJM generation dispatch and deliverability rules (in effect at the time) where each load zone tends to hold its import interchange with the rest of the PJM system constant at historical levels. With the much higher and material load increase forecasted in Dominion and APS (up to 7,500 MW), this is difficult to

justify and would require the local generation within Dominion to be dispatched up or close to their maximum capability. This higher Dominion dispatch affects the flows along the 500 kV corridor between North Anna and Morrisville 500 kV substations. With a more reasonable dispatch pattern, according to PJM's new block dispatch methodology, the higher South-to-North flow will drop in the 2028 robustness test scenarios, as further highlighted in the following section.

## *2027/28 Reliability Evaluation Summary*

The 2028 case for the 2023 RTEP was still under development when the 2022 Window 3 opened, and once preliminary study results were available, PJM shared the results with stakeholders at the April 2023 special TEAC.

The 2028 evaluation indicated the need for further regional transfer reinforcements, beyond those offered through the 2027 and changes to a number of needs, particularly within the southern region due to:

- Major deactivation requests in the study area (e.g., Brandon Shores, among others)
- Higher regional transfers as a result of the new block dispatch and generator deliverability test

For this reason, PJM utilized the 2027/28 cases to further assess the robustness of the proposals. The LS Power (proposal 548), NextEra (proposal 598) and Transource (proposal combo) combination proposals did not prove effective in the 2027/28 initial testing. However, PJM further tested the components of LS Power and Transource proposals in developing additional scenarios. NextEra proposed a standalone add-on component upgrade to its 2027 combination proposal (proposal 598) to address 2028 needs through proposal No. 175. PJM evaluations showed that the NextEra proposal 175 and the incumbent Transmission Owners (Exelon, FirstEnergy and Dominion) combination proposal scenarios showed promising performance, and thus were used as starting points for further scenario development and assessments.

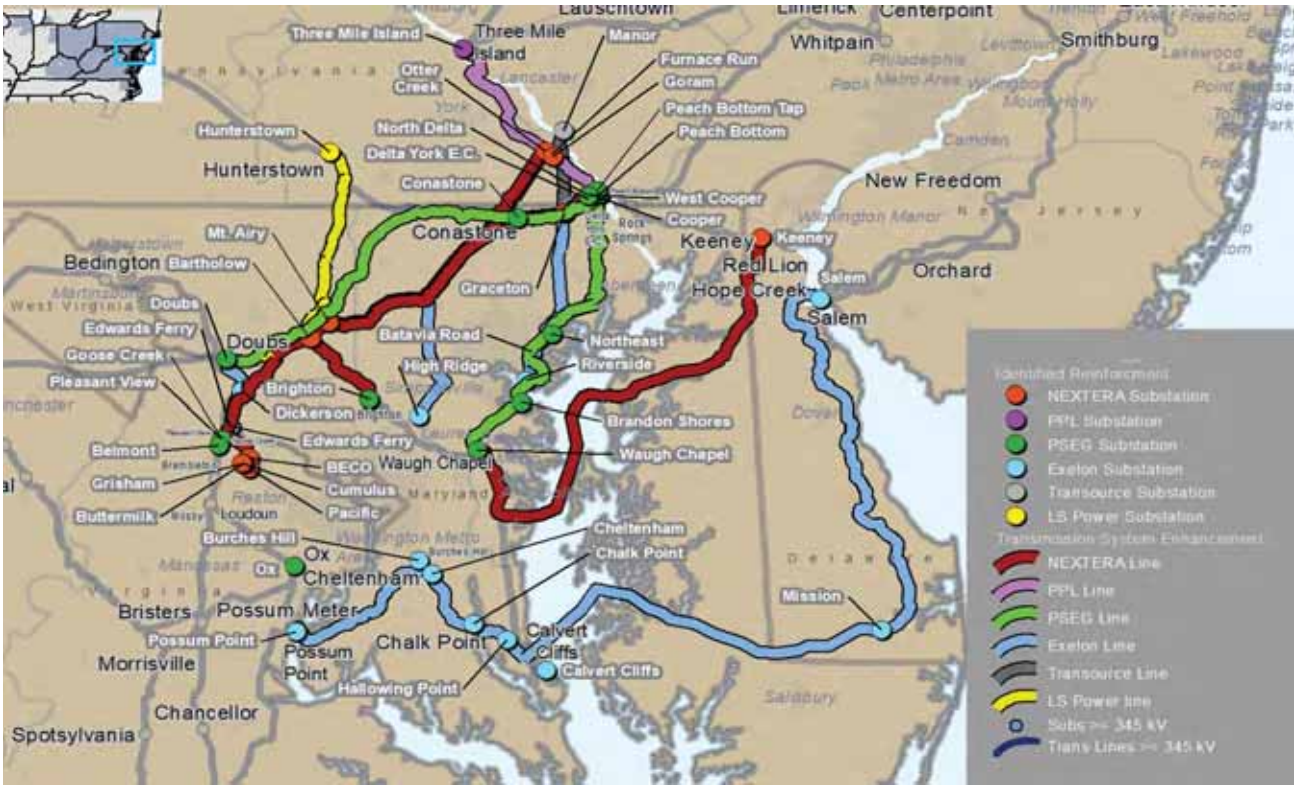
PJM evaluated every proposal individually, as well as various combinations of the proposals and components to identify the most effective solution. Based on different combinations of scenarios performed, PJM identified the need for three regional/local transmission solutions in the East cluster, and results are reflected in the short-listed scenarios.

### East Proposal Cluster

Six proposing entities submitted over 15 proposals to address the East cluster violations, as illustrated in Map 3. During the window evaluations, PJM confirmed the need for regional and local reinforcements into the BGE system, along with regional reinforcements between Peach Bottom and northern Virginia.

PJM evaluated every proposal individually, as well as various combinations of the proposals and components to identify the more efficient or cost-effective solution. Based on different combinations of scenarios performed, PJM identified the need for three regional/local transmission solutions in the East cluster, which are reflected in the short-listed scenarios.

Map 3. East Proposal Cluster Map




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

Listed below are groups of solutions evaluated as potential solutions to address the BGE local as well as regional transfers:

Solutions evaluated to address BGE local/regional

- North Delta-High Ridge 500 kV (proposal ID 344/660):

Approximately a 67-mile AC overhead line proposed by Exelon, the incumbent Transmission Owner. One hundred percent of the line will utilize existing ROW. The solution addresses all of the BGE violations and a majority of the violations due to transfer limitations. The proposed cost is approximately $550 million.

- Peach Bottom/N. Delta-Raphael-Waugh Chapel 500 kV (Proposal ID 808):

Approximately a 72-mile AC overhead line proposed by PSEG. The line would be greenfield and require new ROW (a portion of the circuit will parallel existing ROW). The solution will require additional upgrade(s), and there are potential short-circuit issues at Peach Bottom substation that will require rebuilding of the substation. The proposed cost is approximately $511 million in addition to any substation components included in the proposal.

- Peach Bottom-Brandon Shore 500 kV (Proposal ID 741):

Approximately a 56-mile AC overhead line proposed by PSEG. The line would be greenfield and require new ROW, majority of which will parallel existing ROW. The solution is comparable to the Exelon solution; however, there are potential short-circuit issues at Peach Bottom substation that will require rebuilding of the substation. The proposed cost is approximately $434 million in addition to any substation components included in the proposal.

- Keeney-Waugh Chapel 230 kV double circuit (Proposal ID 948):

Approximately a 73-mile AC overhead line, along with 31 miles of submarine cable, solution proposed by NextEra. The line would be greenfield and require new ROW (approximately 15% of the length would parallel existing ROW). Not only would the solution require additional upgrades to address the BGE local and regional needs, it has a proposed cost of over $4 billion.

Solutions evaluated to address BGE local area solutions (focused on Brandon Shores deactivation)

- Graceton-Batavia double circuit 230 kV (Proposal ID 344/660):

Approximately a 29-mile AC overhead line proposed by Exelon, the incumbent Transmission Owner. The solution will be adjacent to an existing circuit, will utilize an existing ROW, and addresses the majority of the local needs. The proposed cost is approximately $195 million.

- Peach Bottom/N. Delta-Raphael-Waugh Chapel 500 kV *(Proposal ID 808)*:

The same notes as described above in the "BGE Local/Regional Solutions" section for the same line would apply.

- Peach Bottom-Brandon Shore 500 kV (Proposal ID 741):

The same notes as described above in the "BGE Local/Regional Solutions" section for the same line would apply.

- Keeney-Waugh Chapel 230 kV double circuit (Proposal ID 948):

The same notes as described above in the "BGE Local/Regional Solutions" section for the same line would apply.

Listed below are solutions evaluated by PJM to address the regional transfer needs, mainly related to transfer to northern Virginia/APS areas:

Proposals evaluated to address regional transfer

- Peach Bottom-Graceton-Conastone/N. Delta 500 kV upgrade (Proposal ID 344/660):

A solution proposed by both Exelon and Transource that builds a new 500 kV substation (N. Delta) in the Peach Bottom area and reconfigures the Peach Bottom substation to avoid short-circuit issues that require the Peach Bottom station rebuild. The project includes a new Peach Bottom-Graceton 500 kV, Peach Bottom-N. Delta 500 kV, and N. Delta-High Ridge 500 kV lines, resulting in approximately 75 miles of new transmission that utilizes the existing ROW for the majority of the length, rebuilding of an existing 500 kV line from Peach Bottom-Conastone.

- Peach Bottom-Doubs 500 kV (Proposal ID 741/808):

Approximately 87 miles AC overhead greenfield line proposed by PSEG. This solution does not address the Peach Bottom short-circuit issue along with space constraints at the substation.

- Conastone-Doubs 500 kV (Proposal ID 637):

Approximately 69 miles AC overhead greenfield with small portion paralleling an existing line proposed by PSEG. The project along with the PPL-proposed project 374 provides the needed transfer capability into the northern Virginia area.

- Otter Creek-Conastone 500 kV (Proposal ID 374):

Approximately 17 miles AC overhead line proposed by PPL. The line will expand existing ROW to build the line. The Otter Creek-Conastone 500 kV line will tie in to the PSEG proposed Conastone-Doubs, bypassing the Conastone substation.

- Hunterstown-Green Valley 500 kV (Proposal ID 229):

Approximately a 40 miles AC overhead greenfield line proposed by PSEG. The Hunterstown termination causes 500 kV overloads in the Peach Bottom area. The proposal also results in short-circuit issues at Conastone substation, requiring a substation rebuild.

- Hunterstown-Doubs-Goose Creek 500 kV (Proposal ID 548/846):

This path is proposed by NextEra and LS Power. The NextEra proposal includes approximately 71 miles AC overhead greenfield line from Hunterstown-Doubs 500 kV, with 25% of the new ROW paralleling existing ROW. The Doubs-Groose Creek 500 kV section would be approximately 19 miles of greenfield line, 20% of which will be underground. The LS Power proposal includes approximately a 66-mile AC overhead Hunterstown-Doubs 500 kV line, of which, 20 miles would utilize existing ROW. The Doubs-Groose Creek 500 kV section would be approximately 18 miles, of which eight miles would utilize existing ROW. The lines out of the Hunterstown-Doubs cause violations on the PECO and BGE system requiring additional upgrades.

- Otter Creek-T-Point 500 kV (Proposal ID 948):

Approximately a 61-mile AC overhead greenfield line paralleling existing ROW proposed by NextEra. The solution results in short-circuit issues at Conastone substation requiring rebuild of the station.

- Barnhart (Hunterstown-Conastone Tap)-T-Point 500 kV *(Proposal ID 728)*:

Approximately a 37 mile AC overhead greenfield line, 5% of which is paralleling existing ROW, proposed by NextEra. The solution results in short-circuit issues at Conastone substation requiring rebuild of the station.

- N. Delta-Conastone 500 kV (Proposal ID 217/385/530/564/548):

This path is proposed by NextEra and LS Power, both of which are approximately 15 miles. The majority of the ROW parallels existing ROW or utilizes existing ROW. Exelon who is the owner of the ROW is utilizing the same ROW in their proposal.

- T-Point-Data Center Alley 230 kV (Proposal ID 728):

Approximately a 35-mile two greenfield single 230 kV circuits proposed by NextEra. Of the total length, 95% is AC overhead, and the remaining 5% would be underground. The 230 kV system can't be built without the 500 kV T-Point, which will cause a short-circuit issue at Conastone substation requiring the Conastone station rebuild.

- Transource 230 kV development between Peach Bottom and Conastone (Proposal ID 487–IEC East):

Scope includes Transource's 500/230 kV developments between Peach Bottom and Conastone. The project doesn't address the BGE local need.

Proposals evaluated to address PA/MD tie lines

- Transource 230 kV development between New Rice-Ringgold (Proposal ID 487- IEC West):

Scope includes Transource's new 500/230 kV Rice substation (tie into Vinco-Hunterstown 500 kV circuit) and approximately 29 miles of new double circuit 230 kV AC overhead greenfield transmission line between Rice and Ringgold (FE station).

- First Energy new Hunterstown-Carroll 230 kV (Proposal ID 837)

The project includes approximately 24 miles of rebuilding an existing Hunterstown-Carroll 115/138 circuit to 230 kV double circuit construction.

## West Proposal Cluster

Four proposing entities submitted solutions to address the West cluster violations, as illustrated in Map 4. All proposals approached the West needs through new 500 kV or 765 kV lines.

### Regional Solutions

- 502 Junction-Black Oak-Stonewall-New Belmont (Gant) 500 kV: (NextEra)

Approximately 67 miles of one 500 kV line on existing or parallel to existing ROW to Black Oak 500 kV substation. The next portion of the line will be approximately 53 miles long terminating at Stonewall substation to existing or parallel to existing ROW. PJM's analysis did not show additional benefits of looping the line into Black Oak 500 kV substation. The 500 kV line will continue east for roughly 22 miles on existing or parallel to existing ROW before turning south for 25 miles as greenfield development to be terminated at New Belmont/Gant 500 kV substation.

- Fort Martin-Doubs 500 kV double/single circuits: (FE)

Construct approximately 158 miles of new 500 kV (double/single) line(s) from Fort Martin 500 kV substation to Doubs 500 kV substation. The new transmission line will require installation of new 500 kV breakers at Doubs and Fort Martin 500 kV substation and the expansion of Doubs 500 kV substation.

- Pruntytown-Mt. Storm and Meadow Brook-Doubs 500 kV: (FE)

- Construct approximately 50 miles of new 500 kV line from Pruntytown 500 kV substation to structure No. 5 of on the Meadow Brook to Mount Storm 500 kV line located adjacent to Mt. Storm 500 kV substation. Cut the existing Meadow Brook 500 kV to Mount Storm 500 kV line from the Mount Storm line terminal, and connect the new 500 kV line from Pruntytown 500 kV substation. The new transmission line will require expansion of Pruntytown 500 kV substation.

- Constuct approximately 55 miles of new 500 kV line from Meadowbrook 500 kV substation to Doubs 500 kV substation. Reterminate existing Meadow Brook to Loudon 500 kV line and existing Meadow Brook to Front Royal 500 kV line. The new transmission line will require installation of new 500 kV breakers at Doubs and Meadow Brook 500 kV substation and the expansion of Doubs 500 kV substation.

- 502 Junction-Black Oak-Doubs 500 kV: (LS Power)

Construct approximately 73 miles of new 500 kV line from 502 Junction 500 kV substation to Black Oak 500 kV substation. Construct approximately 72 miles of new 500 kV line from Black Oak 500 kV substation to Doubs 500 kV substation. Approximately 52 miles of the 72-mile line will be built by rebuilding the existing 138 kV circuit to a double 500/138 kV circuit.

- Joshua Falls-Yeat 765 kV: (Transource)

Construct approximately 135 miles of new 765 kV line from existing Joshua Falls 765 kV substation to a new Yeat 765 kV substation. The new transmission line will require installation of new 765 kV breakers at Joshua Falls 765 kV substation.

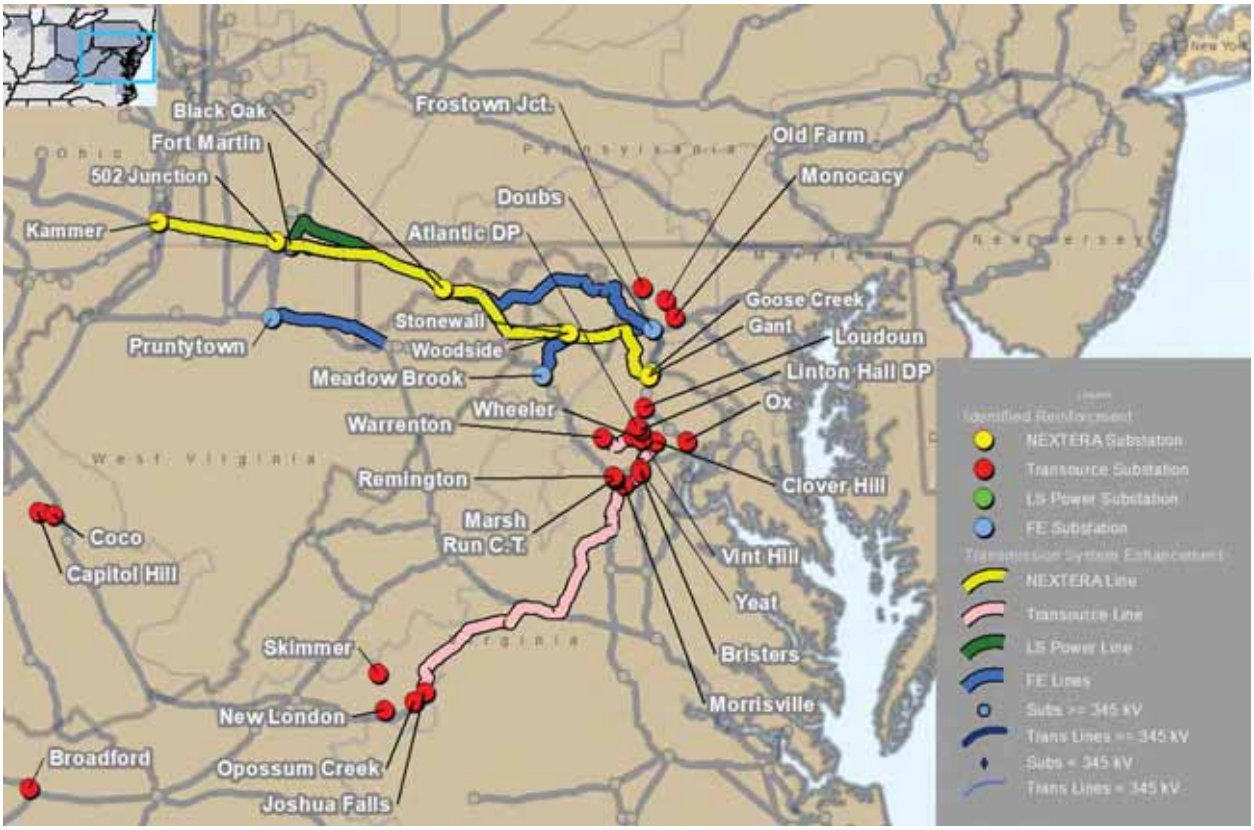
The above-proposed 500 kV solutions, regardless of proposing entity, overlapped in terms of proposed ROW with the exception of First Energy's proposal of new line from Pruntytown-Mt. Storm and Meadow Brook-Doubs. PJM also tested less effective/efficient solutions, two examples of which are provided below:

- Front Royal-New Wishing Star 500 kV: (NextEra)

- Black Oak-Goose Creek 500 kV: (NextEra)

PJM evaluated every proposal individually, as well as various combinations of the proposals and components to identify the most effective solution. Based on different combinations of scenarios performed, PJM identified that with adequate reinforcements in the East (three lines), only one 500 kV or 765 kV line with dedicated dynamic VAR support would be required. For the 500 kV reinforcement options terminating at Doubs, additional transfer capability would be required into Goose Creek (Northern VA area).

Map 4. West Proposal Cluster Map




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## South Proposal Cluster

Four proposing entities submitted solutions to address the South cluster violations, as illustrated in Map 5. All proposals approached the South needs primarily through new 500 kV lines.

### Regional Solutions

- Front Royal-New Wishing Star (Racefield) 500 kV: (NextEra)

Approximately a 48-mile AC overhead line proposed by NextEra with about 70% greenfield ROW, 25% adjacent to road ROW and 5% an expansion of existing transmission ROW. This solution is the most direct route, from west to east, into the Loudoun area and is similar in nature to the originally proposed Trail project (Meadow Brook-Loudoun). The Trail project was a 500 kV line proposed by Dominion and Allegheny Power, through their subsidiary TrAILCo. It began in western Pennsylvania, crossed through West Virginia, and into Loudoun County, Virginia. Due to the amount of opposition at the time, the line took a much longer route heading south toward Morrisville before heading back up to Loudoun. PJM performed sensitives with and without the new Front Royal-New Wishing Star 500 kV line and did not see a substantial impact on solved violations. PJM believes obtaining new ROW will be difficult following the TrAILCo project.

- Front Royal-Vint Hill 500 kV: (NextEra)

Approximately a 64-mile AC overhead greenfield line proposed by LS Power. The line primarily parallels existing ROW along Front Royal-Morrisville and Meadow Brook-Vint Hill (previously Loudoun).

- Hinsons Ford Rd-Brambleton 500 kV: (PSEG)

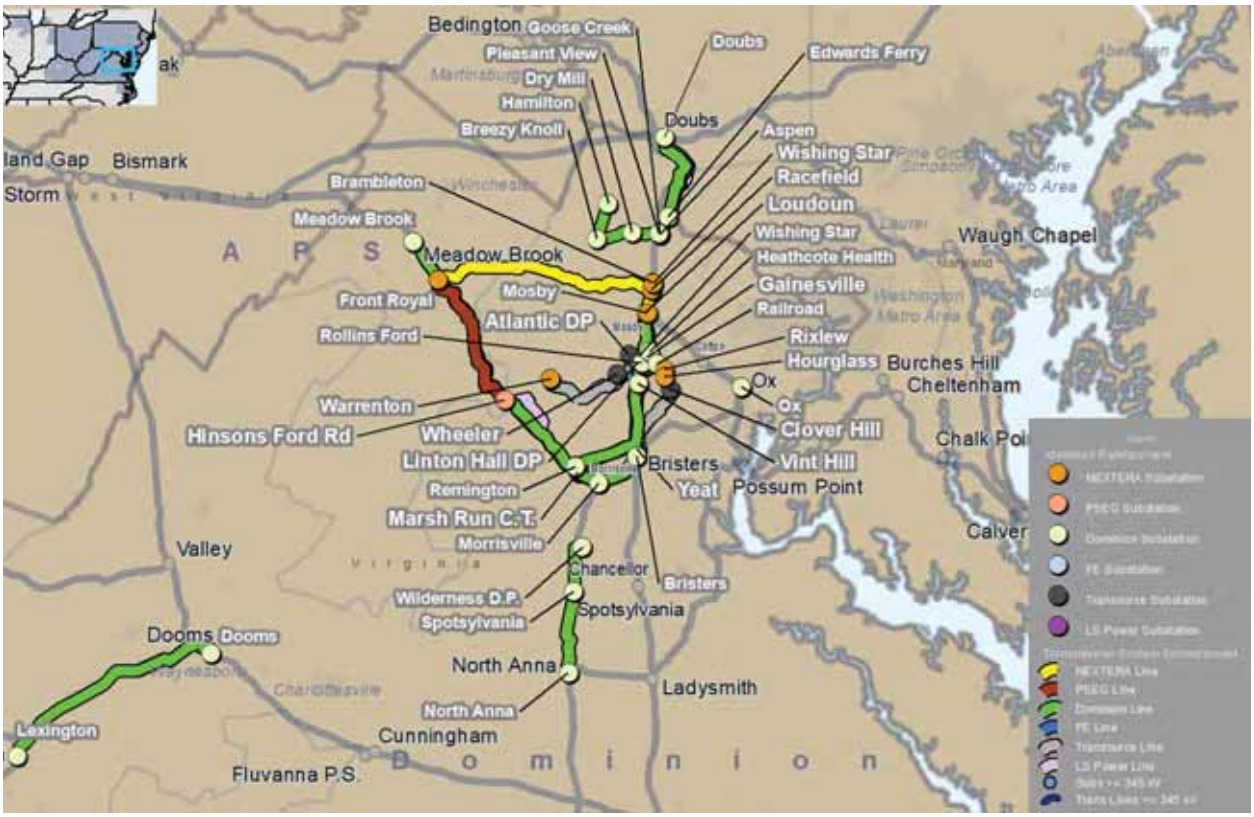
Approximately 34-mile AC overhead greenfield line proposed by PSEG. The proposal shows some similarities to the two above proposals by NextEra and LS Power. While not going directly from west to east or travels as far south to Morrisville, the line would cut across to Brambleton/Loudon area.

- North Anna-Wishing Star 500 kV: (Dominion)

The Dominion solution brings a 500 kV line from North Anna all the way up to Wishing Star connecting to Spotsylvania and Vint Hill along the way. In order to fit the additional 500 kV line in their existing corridor, Dominion would wreck and rebuild structures from Morrisville to Wishing Star, which will impact two 500 kV and two 230 kV lines. The North Anna-Spotsylvania section is approximately a 14 mile, the Spotsylvania-Vint Hill section is approximately 38 miles and the Vint Hill-Wishing Star section is approximately 17 miles, all of which would be new AC overhead lines using existing ROW. However, PJM observed that some violations seen in the 2027 results are not present in 2028, likely due to the assumption and methodology changes, and so it may not be necessary to go as far south as North Anna, but rather start at Morrisville instead.

PJM evaluated every proposal individually, as well as various combinations of the proposals and components to identify the most effective solution.

Map 5. South Proposal Cluster Map




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Northern Virginia Data Center Cluster

Three proposing entities submitted solutions to address the Northern VA data center cluster violations, as illustrated in Map 6. Proposals approached the data center needs primarily either through underground 500 kV cables or an overhead 500 kV and 230 kV line.

### Data Center Alley Solutions

- Goose Creek-Beaumeade 500 kV underground (LS Power) – 2308/3596 MVA for SN/SE

Approximately a 5-mile greenfield underground double circuit cable proposed by LS Power. The proposal would expand Dominion's existing Goose Creek and Beaumeade substations to accommodate the new line. LS Power proposes to follow the W&OD Trail in which Dominion currently owns the ROW.

- Stork-Flys 500 kV underground:

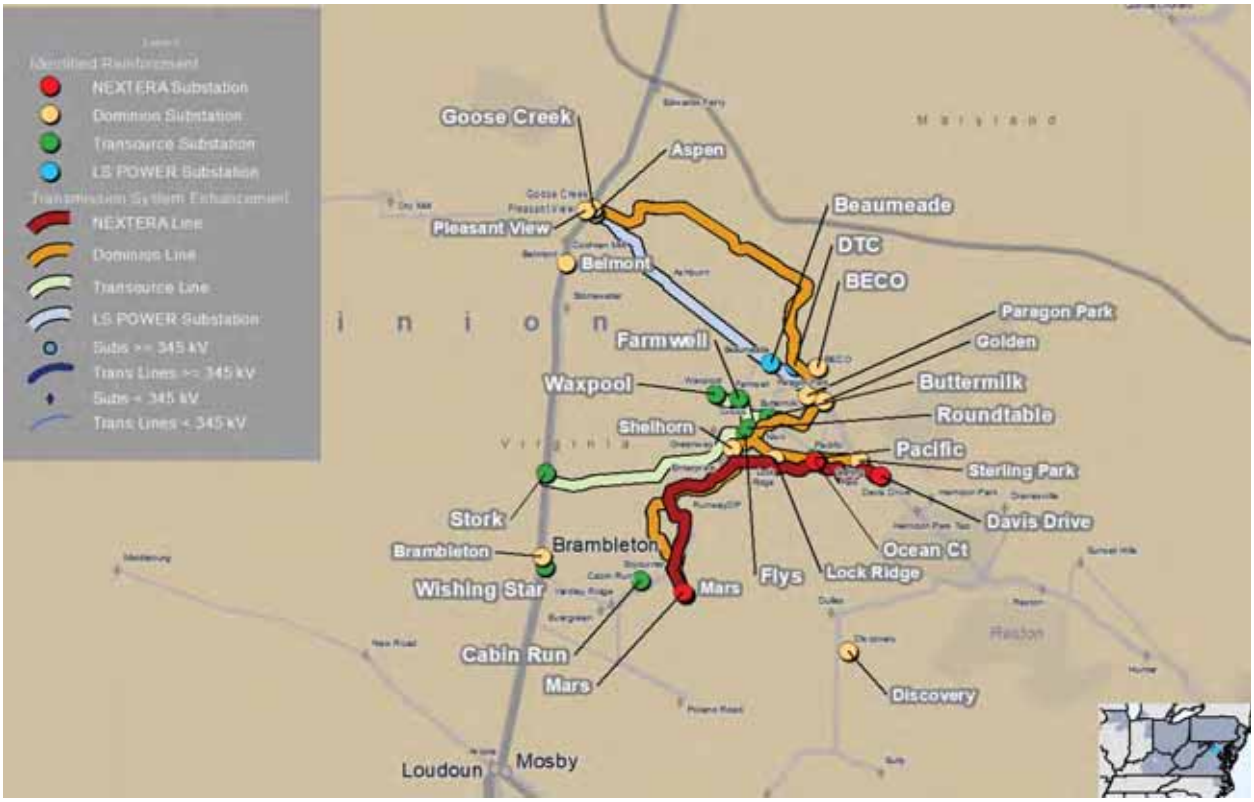
Approximately a 5-mile greenfield underground cable proposed by Transource. The line would be built along the center median of a road. The summer normal and emergency ratings would be 3302/3302 MVA (SN/SE)

- Aspen-Golden-Mars 500/230 kV overhead (Dominion) – 4357/4357 MVA for SN/SE

The proposal builds a new Aspen substation adjacent to Goose Creek, along with another new substation called Golden southeast of Aspen. The new line would start at Aspen, move southeast toward Golden, and then eventually close the 500 kV ring around the data center area to Mars. The Aspen-Golden section of the line would be approximately 8.5 miles, and the Golden-Mars section would be approximately 8.3 miles, both of which would be 500 kV AC overhead with 230 kV underneath. The project cost is approximately $1 billion.

PJM evaluated every proposal individually, as well as various combinations of the proposals and components to identify the most effective solution. All three proposals have comparable performance in terms of solving the violations in the Data Center Alley area.

Map 6. Northern VA Data Center (Data Center Alley) Proposal Cluster Map




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Short-Circuit Analysis

Drivers for the 2022 Window 3 are reliability violations stemming from load flow analysis, not short-circuit analysis. Short-circuit analysis followed a screening process to support the 2022 Window 3 evaluation of proposals. The short-circuit screening identified potential additional scope attributed to overduty breakers, and potential switchyard rebuilds. Short-circuit analysis was applied holistically, where the scenario under study was comprised of one or more proposals, designed to address all Window violations at once which ensures accounting for all short-circuit contributions by all proposed solution facilities of each scenario.

The screening process considered 11 separate TO breaker sets[2] using the window posted 2027 baseline case, then analyzed the proposals and scenarios using a single Aspen OSF (Options Settings File) based on PECO's study parameters. Short-circuit screening was performed on all scenarios deemed promising based on power flow analysis results and on the final selected proposals base case.

As part of the scenario screening process, breakers identified as overduty attributed to the scenario under study were reviewed. For proposals that included breaker replacements, those breakers were reviewed for adequacy of their proposed interrupting capability. The study also identified breakers that became overdutied as a consequence of the scenario under study, but were not addressed in the individual proposals received by PJM. If replacing the consequential overduty breaker with a breaker having a greater interrupting capability could remediate the overduty condition, then the cost of the breaker replacement was factored into the overall scenario cost.

However, in some scenarios, the identified fault level increase was quite high, exceeding the ratings of the substation ground grid and other fault-sensitive facilities within the substation. In these situations, simply upsizing the breaker does not fully address the high fault level violation. For example, at the Conastone 500 kV yard, excessively high fault level would require the entire substation to be rebuilt.

The Peach Bottom 500 kV North and South yards were also monitored closely. Remediation of excessively high fault levels could require a long duration outage of the 500 kV Peach Bottom switchyards, which may impact the availability and operability of the Peach Bottom nuclear plant during the rebuild if so required. Scenarios that created excessively high fault levels at either Conastone or Peach Bottom were hence flagged, and impacts to both cost and schedule factors were given due consideration when evaluation feasibility of proposed solutions.

The 2022 Window 3 selected scenario underwent a subsequent short-circuit analysis more rigorous than the short-circuit screening. An Aspen Breaker Duty Report, using the native TO Option Settings File, was generated for each TO area where overduty breakers were identified in the initial screening. Results were shared with the impacted TOs for validation and breaker replacement cost estimation.

Objectives of the short-circuit analysis were achieved with the 2022 Window 3 selected scenario. Neither the Conastone nor Peach Bottom substations were impacted for excessively high fault levels that exceed the existing short-circuit capability reported by the transmission owner. There were, however, 36 breakers identified as overdutied, which were not included in the submitted proposals. These breakers are located in APS and Dominion substations at nominal voltages of 138kV, 230 kV and 500 kV. Costs to remediate these overduty breakers are incorporated into the selected scenario cost estimate.

[2] AE-DPL, AEP, APS, ATSI, FirstEnergy(JCPL-MetEd-Penelec), BGE, DOM, PECO, PEPCO, PPL, PSEG

Table 9. Identified Circuit Breaker Upgrades/Replacements (beyond those proposed by proposing entities)

| TO Area | Substation | kV | BREAKER (Qty) |
|---|---|---|---|
| APS | Double Toll Gate | 138 | 1 |
| | Doubs | 500 | 1 |
| DOM | Ashburn | 230 | 1 |
| | Beaumeade | 230 | 1 |
| | Beco | 230 | 2 |
| | Belmont | 230 | 1 |
| | Brambleton | 230 | 6 |
| | Gainesville | 230 | 1 |
| | Loudon | 230 | 2 |
| | Ox | 230 | 7 |
| | Paragon Park | 230 | 4 |
| | Reston | 230 | 1 |
| | Stonewater | 230 | 4 |
| | Waxpool | 230 | 4 |

## Load Deliverability Analysis

Load Deliverability is one of the studies conducted in evaluating the 2022 Window 3 proposals. PJM performed the load deliverability analysis to determine the increased CETL (Capacity Emergency Transfer Limit) enabled by the proposed proposals individually and in combination within a specific scenario. The CETL Calculation focused on specific LDAs based on the potential impact of the 2022 Window 3 proposals on the transfer limit to the LDAs. PJM selected APS, BGE, Dominion and SWMAAC LDAs for evaluation.

The load deliverability analysis was performed according to PJM Manual 14B requirements.[3] The study was conducted using the 2023 series RTEP 2028 base case, with 2022 Window 3 scenario solutions applied.

PJM conducted the CETL test on the short-list scenarios and observed the following:

- The APS CETL/CETO margin is well above 115% for all scenarios and the CETL value is comparable.

The NextEra Proposal 175:

- The CETL/CETO for the SWMAAC is <115%, while the CETL/CETO for BGE barely meeting 100%.

PJM Combined Proposal 500 kV or 765 kV Option:

- The CETL/CETO margin for BGE, SWMAAC and Dominion LDA are well above 115%.

PJM examined the Dominion CETL for different components related to the West 500 kV proposals, including the First Energy proposed ID 837 solution. The analysis has identified the need to terminate the West solution into the Dominion Data Center vicinity, as such the NextEra proposal ID 853 option yielded higher CETL.

The CETL study result also revealed the addition of the Otter Creek-Doubs 500 kV line increases the Dominion CETL by ≈20%.

[3] PJM Manual 14B: PJM Region Transmission Planning Process: https://www.pjm.com/~/media/documents/manuals/m14b.ashx

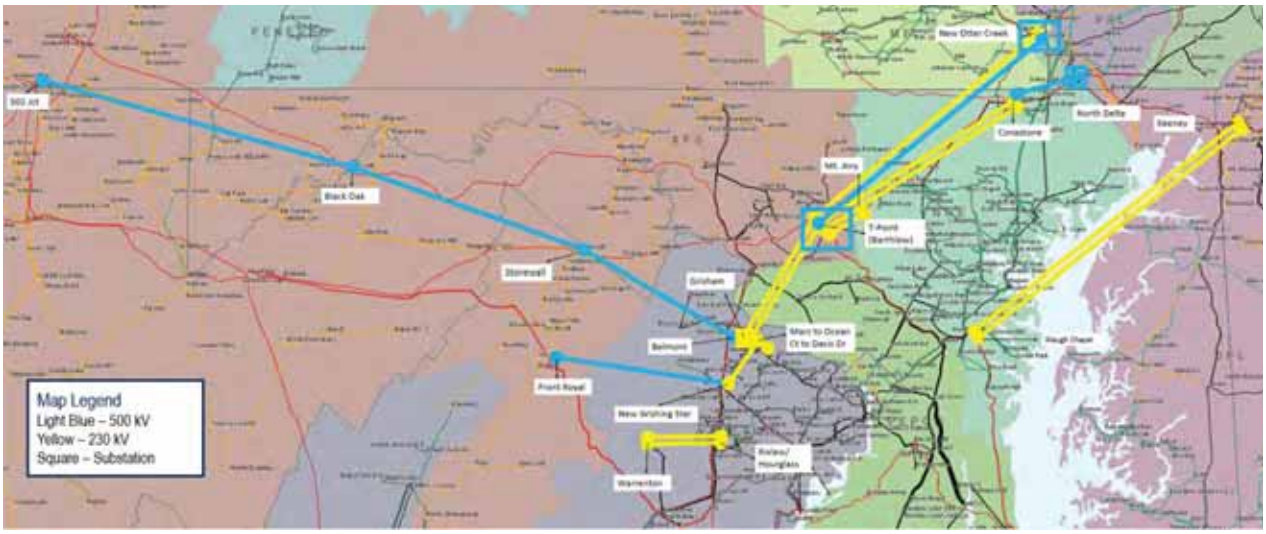
## Selection of Short-Listed Scenarios and Proposal Components

Scenarios listed below represent the initial short list of scenarios presented at the October 3, 2023, TEAC. The merits and shortcomings of each are further detailed along with a very high-level point-to-point illustration of the project components on the associated maps.

### *NextEra Proposal 175*

The simplified map illustration below in Map 7 summarizes the high-level scope of the NextEra proposal 175 designed to address 2028 needs. The proposal from an analytical perspective appears to address the needs identified on the system; however, the majority of the lines are greenfield, some of which cross sensitive areas such as Front Royale-Wishing Star in the West and the Chesapeake Bay crossing in the South. The proposal as a whole, while theoretically may appear acceptable, results in a considerably higher-risk profile and does not have significant cost difference to the two scenarios that PJM built using a combination of proposal and components.

Map 7. NextEra Proposal 175



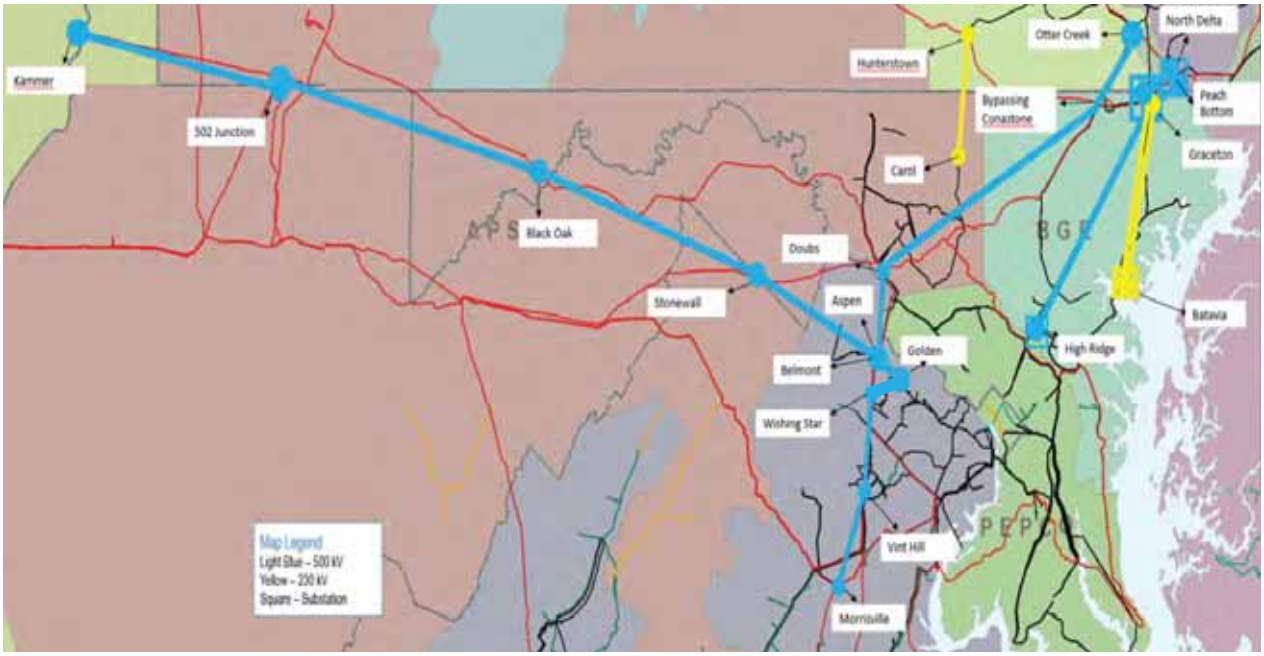

*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

### *PJM Combination – 500 kV Scenario*

The simplified map illustration below in Map 8 summarizes the high-level scenario designed by PJM to address 2028 needs. The scenario includes proposal components from both incumbent Transmission Owners (Dominion, Exelon, FirstEnergy and PPL) and non-incumbent entities (NextEra and PSEG). The scenario attempts to address the reliability needs with less impact on sensitive geographic areas at a comparable cost. The scenario results in overall lower land and social impacts due to the number of circuits proposed at the appropriate voltage level, including two 500 kV lines in the East and only a single 500 kV line in the West, combined with Dominion local solutions. This scenario includes a non-incumbent 500 kV component in the East that establishes a new 500 kV path between MAAC and the northern Virginia/West area. It is important to note that some of these proposed components were very similar. For example, for the 500 kV reinforcements identified in the West, FirstEnergy, NextEra and LS Power proposed very similar proposals. What is selected in this scenario is NextEra's proposal between 502 Junction to Black Oak to Stonewall to directly into Data Center Alley. This proposal adds one additional 500 kV line between the

APS system and Dominion while also following very similar ROW adjacent to existing facilities. PJM refined this short-listed scenario further in order to come up with the final recommended solution.

Map 8. PJM Combination – 500 kV Scenario

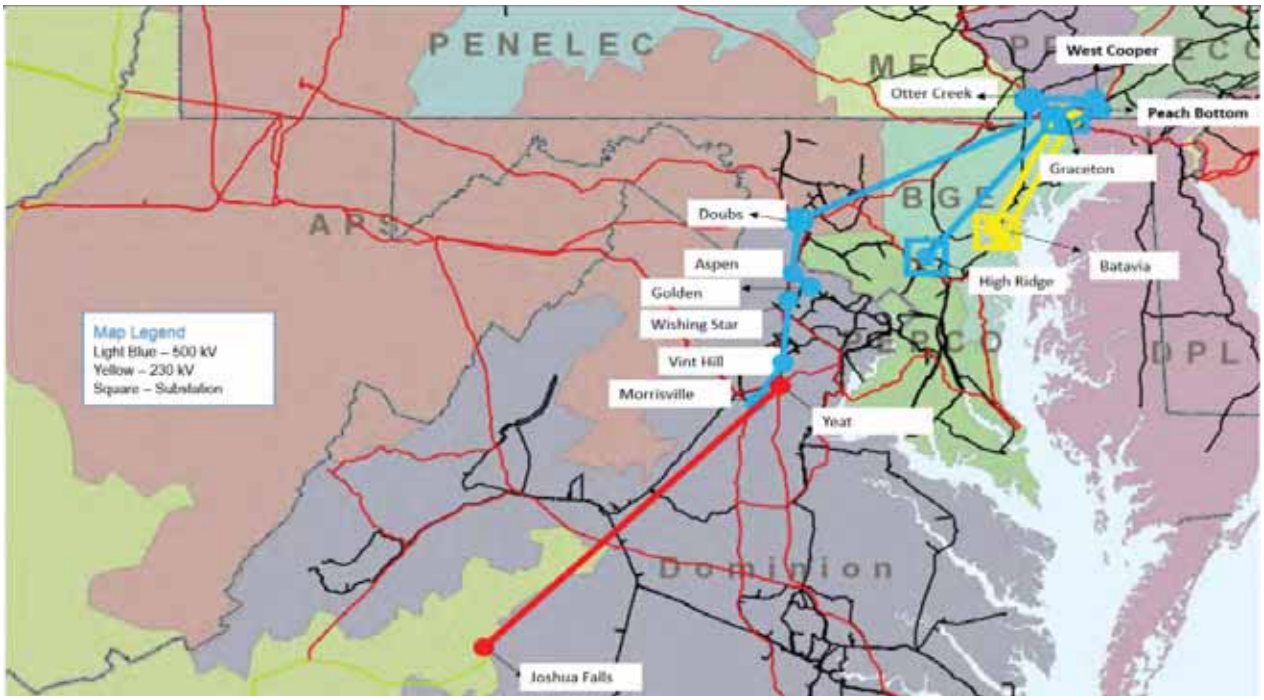



*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## *PJM Combination – 765 kV Scenario*

The simplified map illustration below in Map 9 summarizes the high-level scenario designed by PJM to address 2028 needs. The scenario primarily replaces the 500 kV developments in the northern West cluster with a 765 kV proposed development by Transource in the South/West. The proposal is performs comparably to meet the system needs, but offers more flexibility to meet needs further in the South as the load growth will likely shift southward in future years. It also provides balanced supply between North and South supply direction rather than concentrating the supply from the North. The 765 kV development also reduces the flow on the four existing 500 kV lines in APS running west-to-east. The main risk for this scenario is the timeline to construct the 765 kV circuit.

Map 9. PJM Combination – 765 kV Scenario




*NOTE: This map is only intended to illustrate the general electrical connectivity of the projects and should **not** be relied upon for exact geographical substation locations or line routes.*

## Final Reliability Analysis and Recommended Solution

While PJM provided a short list of scenarios at the October 3, 2023, TEAC meeting, PJM since then further refined the 500 kV scenario and presented the recommended solution for 2022 Window 3 at the October 31, 2023, and December 5, 2023, TEAC meetings. This section summarizes the selected set of proposals and associated rationale to address the reliability needs for the 2022 RTEP Window 3. Table 10 at the end of this section provides summary of evaluation rationale, relevant study scenarios supporting the selection as well as a high-level summary of the scenario build up and analysis.

### Eastern Quadrant

As discussed earlier, the eastern quadrant needs primarily focus on; (1) enhancing the east to west bulk power transfers, (2) support the load deliverability and reliability needs for the BGE system and (3) support the additional load demands of the APS and northern Virginia transmission systems where a large amount of load growth is being forecasted.

All three shortlisted scenarios, discussed in the preceding section address this need. However, PJM selected the eastern cluster proposals part of the PJM 500 kV combination scenario to be the most effective and efficient solutions to address those needs for the following reasons;

1. Both the PJM developed 500 kV and 765 kV shortlisted combination scenarios have the same eastern quadrant solutions (cluster).
2. The PJM 500 kV combination scenario offers the needed reliability reinforcements with the least amount of infrastructure development and with much higher reliability margin compared to the NextEra proposal which is both of higher cost and involves developing a significantly higher amount of facilities.
3. The PJM 500 kV combination proposal offers full utilization of existing right of ways, debottlenecking the historically constrained Peach Bottom – Conastone 500 kV transmission corridor.
4. Addresses the load deliverability needs into the BGE system which is further exacerbated by the deactivation of key power plant(s) in the BGE zone. The NextEra proposal fails the load deliverability test for the 2027/28 year while the PJM 500 kV proposal combination meets the reliability needs with a healthy margin to spare following the deactivation of the Brandon Shores plant.

### Western Quadrant

The western quadrant reinforcements are critical due to the high demand for west to east power flow and into the APS and northern Virginia networks. This transmission corridor extending from the Kammer 765 kV substation in the West towards the eastern edge of the APS system (Doubs) and the northern edge of the Dominion transmission network (Goose Creek area) was experiencing voltage collapse conditions under the higher transfer demands represented in both the 2027 and 2027/28 scenarios.

Again all shortlisted scenarios address the need for the west to east transfer, either through a single 500 kV (in the north) or 765 kV (in the south) transmission path developments.

The NextEra proposed 500 kV transmission development between 502 Junction in the west towards Stonewall and then terminating into the planned Aspen 500 kV development offers the needed reliability reinforcement to serve both the West to east transfer need and also provide a third 500 kV supply source into the northern Dominion load center region.

The 765 kV development proposed by Transource imposed higher schedule and constructability risk due to its predominantly greenfield nature which will impose an avoidable reliability and operational risks in the northern Virginia and APS areas if the schedule of the project is delayed.

### Southern Quadrant

PJM selected the southern cluster part of the PJM 500 kV combination scenario to be the more effective and cost efficient solution to the needs in the southern quadrant. This solution predominantly utilizes the existing 500 kV corridor while meets the reliability and load deliverability needs for the system.

This proposed selection avoids introduced multiple and unnecessary green field developments that may not be effective in the longer term and do not contribute to reinforce the greater 500 kV transmission corridor extending between the Goose Creek area in northern Virginia and the existing Morrisville substation further to the south within the Dominion footprint.

### Dominion Quadrant

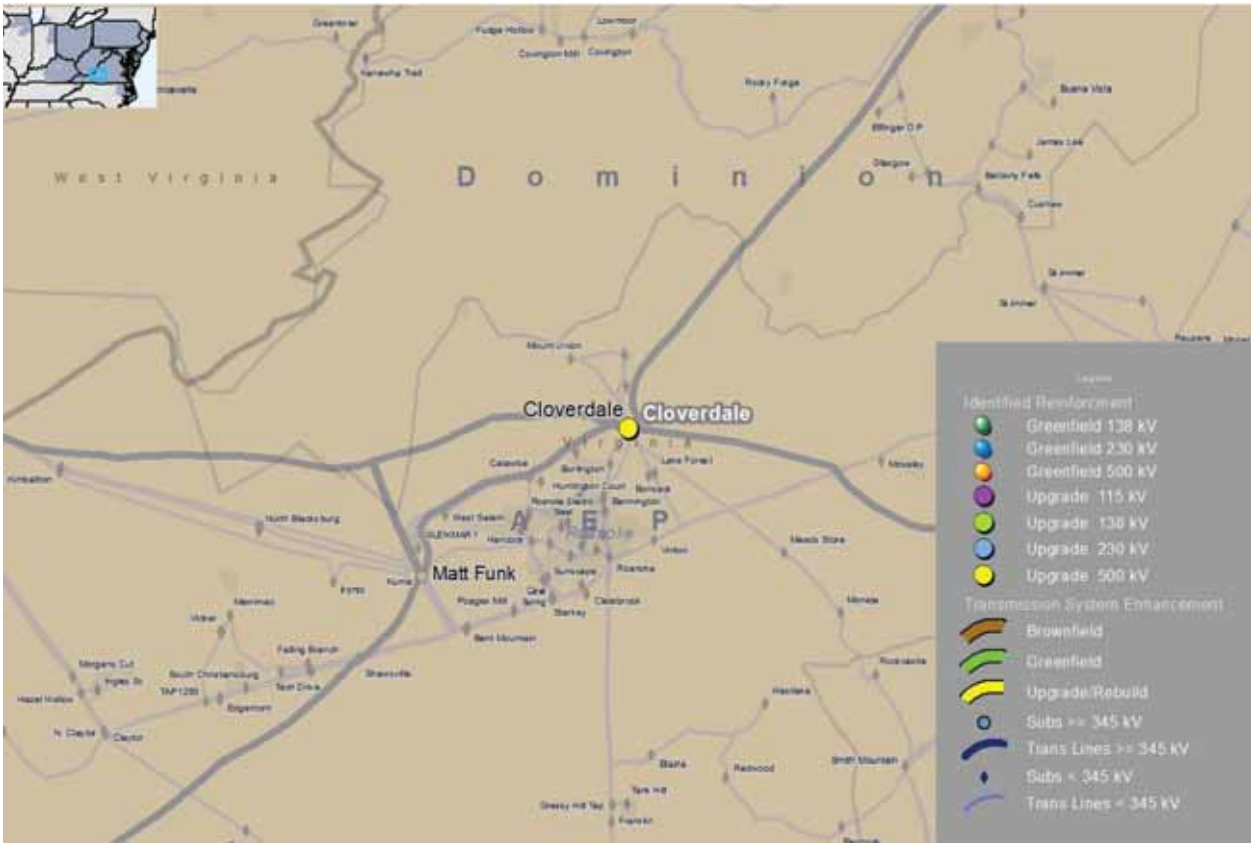
PJM selected the Dominion/northern Virginia cluster of its shortlisted 500 kV combination solution to be the more cost effective and efficient solutions to address the needed reliability needs in northern Virginia. The selected solutions offer the needed local transmission system reinforcement to support the local data center load concentration in northern Virginia and establishes a robust, high capacity overhead transmission line reinforcement through the data center load area. This allows for easy access to integrate load as demand increases and also offers reinforcement to the 500 kV path between Goose Creek and Loundon/Brambelton substations that is currently served via a single 500 kV circuit.

The total cost estimate for the recommended solution is approximately $5,142.98 million. The following sections summarize the selected project components by cluster:

## AEP Local

PJM recommends proposal 410 by AEP to address the AEP local area needs. The project will establish a new 500 kV breaker position for the low side of the existing 765/500 kV transformer at Cloverdale station. The new position will be between two new 500 kV circuit breakers located in a new breaker string, electrically converting the 500 kV yard to “double-bus double-breaker” configuration. The estimated cost is $11.59 million, and the required in-service date is June 2027 with a projected in-service date of October 2026. The local transmission owner, AEP will be designated to complete this work.

Map 10. AEP Local Area Improvements




## South

PJM recommends a revised scope of proposal 711, proposal 967, proposal 211, proposal 731, partial scope of proposal 74 and proposal 231 proposed by Dominion to address the South cluster needs. There are also a number of additional upgrades identified by PJM.

The revised scope of proposal 711 includes a new Morrisville-Vint Hill-Wishing Star 500 kV line (approximately 36.3 miles) while maximizing the use of existing ROW within this corridor. The project scope also includes wrecking and rebuilding both the 500/230 kV double circuit towers (horizontal, stacked layout) in the Morrisville-Loudoun-Brambleton corridor to free up space for the new single 500 kV monopole within the same corridor. Below is a list of line rebuilds:

- 500 kV Line No. 545 (Bristers-Morrisville) rebuild
- 500 kV Line No. 569 (Loudoun-Morrisville) rebuild
- 500 kV Line No. 535 (Vint Hill-Loudoun) resag/rebuild
- 500 kV Line No. 546 (Mosby-Wishing Star) rebuild
- 500 kV Line No. 590 (Mosby-Wishing Star) rebuild
- 230 kV Line No. 2030 (Gainesville-Loudoun) rebuild

- 230 kV Line No. 2045 (Loudoun-Brambleton) rebuild
- 230 kV Line No. 2094 & 2227 (Brambleton-Racefield-Loudoun) rebuild
- 230 kV Line No. 2101 (Bristers-Vint Hill) rebuild
- 230 kV Line No. 2114 (Remington CT-Rollin Ford) rebuild
- 230 kV Line No. 2140 (Loudoun-Heathcote) rebuild
- 230 kV Line No. 2151 (Railroad DP-Gainesville) rebuild
- 230 kV Line No. 2163 (Vint Hill-Liberty) rebuild
- 230 kV Line No. 2176 (Heathcote-Gainesville) rebuild
- 230 kV Line No. 2222 (Rollins Ford-Gainesville) rebuild
- 115 kV Line No. 183 (Bristers-Ox) rebuild

The project includes substation upgrades at the following substations:

- Bristers: Upgrade and install equipment at Bristers substation to support the new conductor 5000A rating for 500 kV Line No. 545.
- Brambleton: Upgrade and install equipment at Brambleton substation to support the new conductor termination. All terminal equipment for 230 kV Lines No. 2045 & No. 2094 to be rated for 4000A continuous current rating.
- Dawkins Branch: Revise relay settings at 230 kV Dawkins Branch.
- Gainesville: Upgrade and install equipment at Gainesville substation to support the new conductor termination. All terminal equipment for 230 kV Line No. 2030 to be rated for 4000A continuous current rating.
- Heathcote: Revise relay settings at 230 kV Heathcote.
- Loudoun: Upgrade and install equipment at Loudoun substation to support the new conductor 5000A rating for line 569 (500 kV), 2030 (230 kV), 2045 (230 kV), and 2094 (230 kV).
- Mint Springs: Revise relay settings at 230 kV Mint Springs.
- Morrisville: Upgrade and install equipment at Morrisville substation to support the new 500 kV conductor termination. All terminal equipment to be rated for 5000A for 500 kV Line No. 545 & No. 569. Upgrade 500 kV bus 2 to 5000A.
- Mosby: Upgrade and install equipment at Mosby substation to upgrade terminal equipment to be rated for 5000A for line 546 and line 590.
- North Star: Revise relay settings at 230 kV North Star.
- Racefield: Revise relay settings at 230 kV Racefield.
- Railroad: Revise relay settings at 230 kV Railroad.
- Vint Hill: Install terminal equipment at Vint Hill substation to support a 500 kV 5000A line to Spotsylvania. Update relay settings for 230 kV Lines No. 2101, No. 2163, and 500 kV Line No. 535.

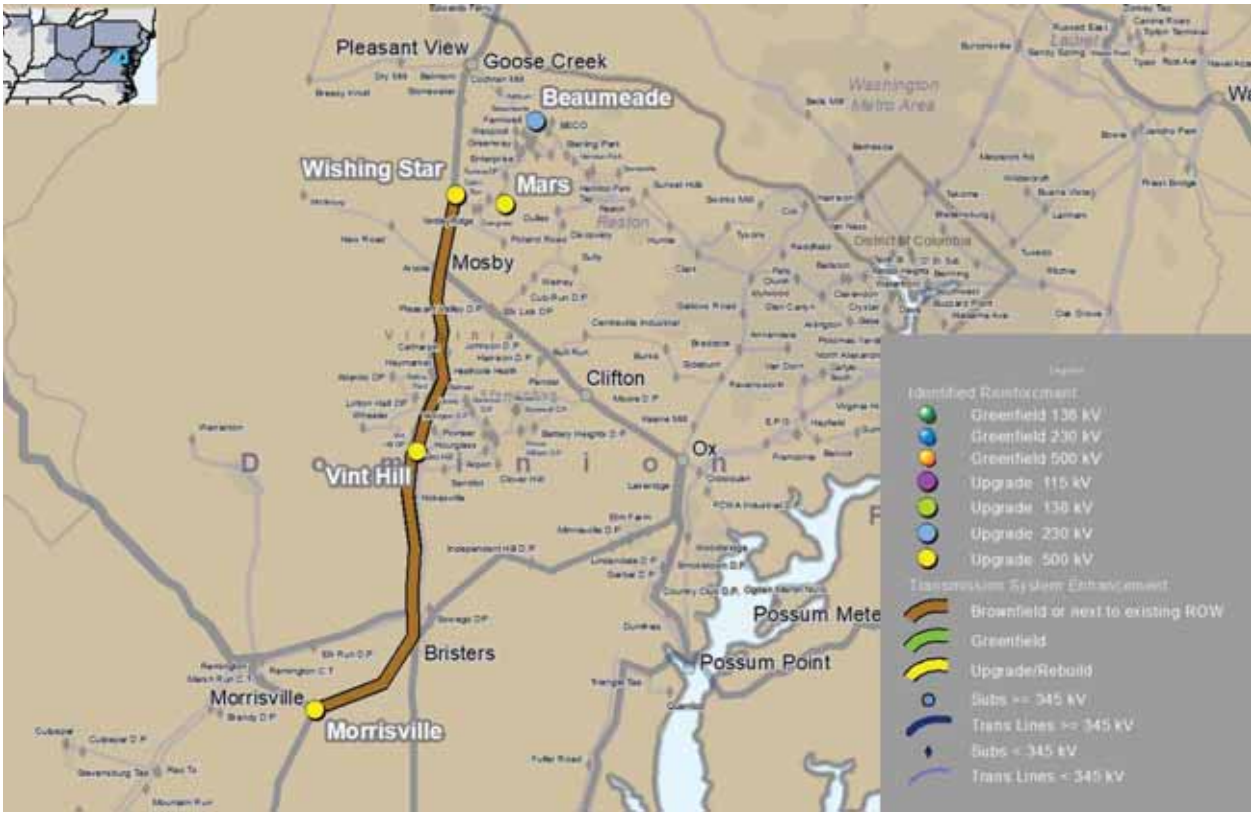
- Wishing Star: Install terminal equipment at Wishing Star substation to support a 500 kV 5000A line to Vint Hill. It also provides for new relay settings for 500 kV lines 546 and 590.
- Youngs Branch: Revise relay settings at 230 kV Youngs Branch

Breaker upgrades will also be required as follows:

- Replace 4 overdutied 230 kV breakers at Loudoun substation with 80 kA breakers.
- Replace 1 overdutied 500 kV breaker at Ox Substation with a 63 kA breaker.

The estimated cost is $842.19 million, and the required in-service date is June 2027 with a projected in-service date of June 2028. The local transmission owner, Dominion, will be designated to complete this work.

Map 11. South Area Improvements – Revised Scope of Proposal 711

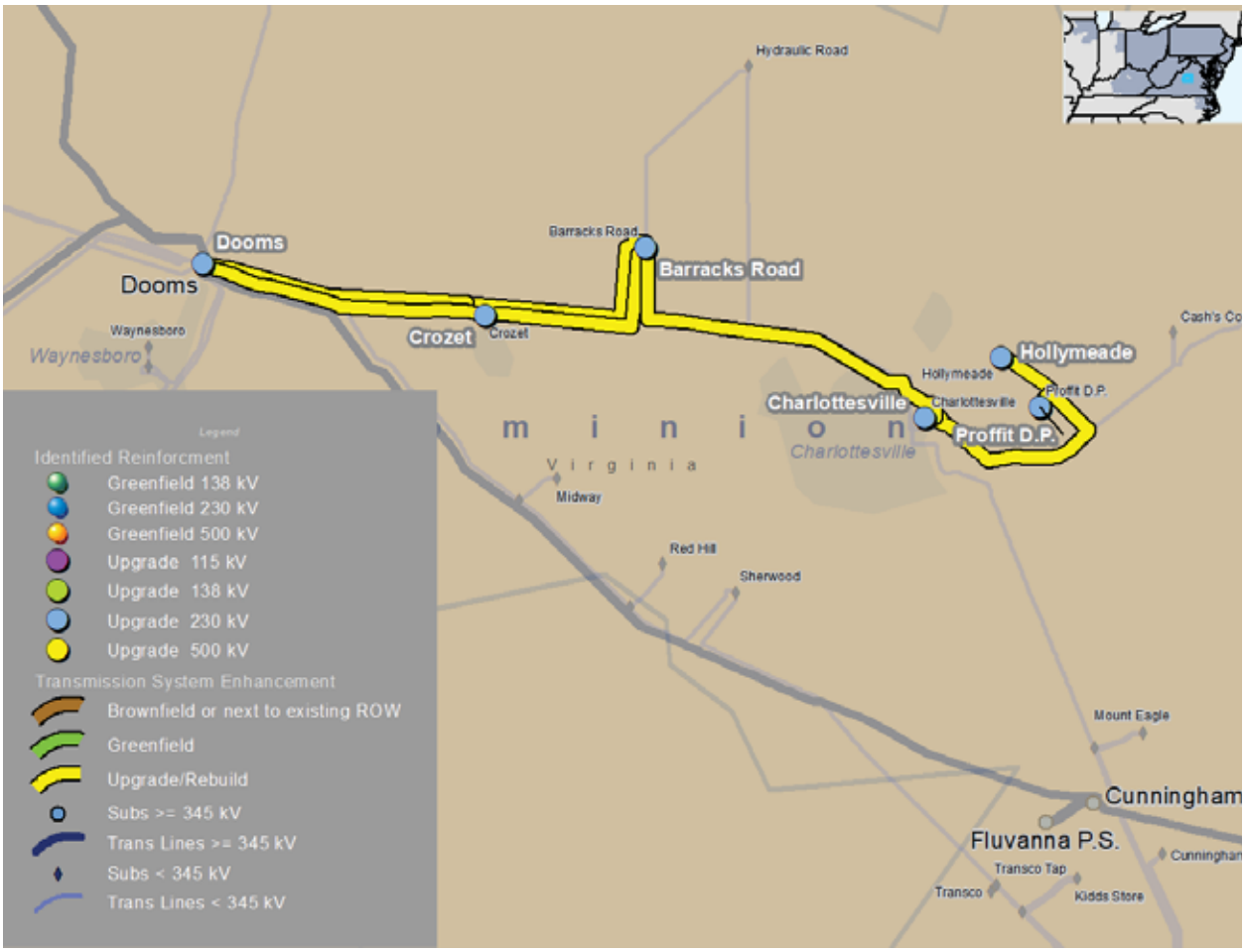



Proposal 967 includes the following 230 kV line rebuilds, along with relay resets/revisions at Hollymeade, Proffit, Barracks Road and Crozet substations:

- Line No. 2054 (Charlottesville-Proffit DP) rebuild using double circuit capable 500/230 kV poles (the 500 kV circuit will not be wired as part of this project)
- Line No. 233 (Charlottesville-Hydraulic Rd-Barracks Road-Crozet-Dooms) rebuild
- Line No. 291 (Charlottesville-Barracks Road-Crozet-Dooms) rebuild

Terminal equipment upgrades will also be required at Charlottesville substation for the Line No. 2054, Line No. 233 & Line No. 291 rebuilds, Hydraulic Road for the Line No. 233 & Line No. 291 rebuilds and Dooms substation for the Line No. 233 & No. 291 rebuilds. The estimated cost is $183.49 million, and the required in-service date is June 2027 with a projected in-service date of June 2028. The local transmission owner, Dominion, will be designated to complete this work.

Map 12. South Area Improvements – Proposal 967

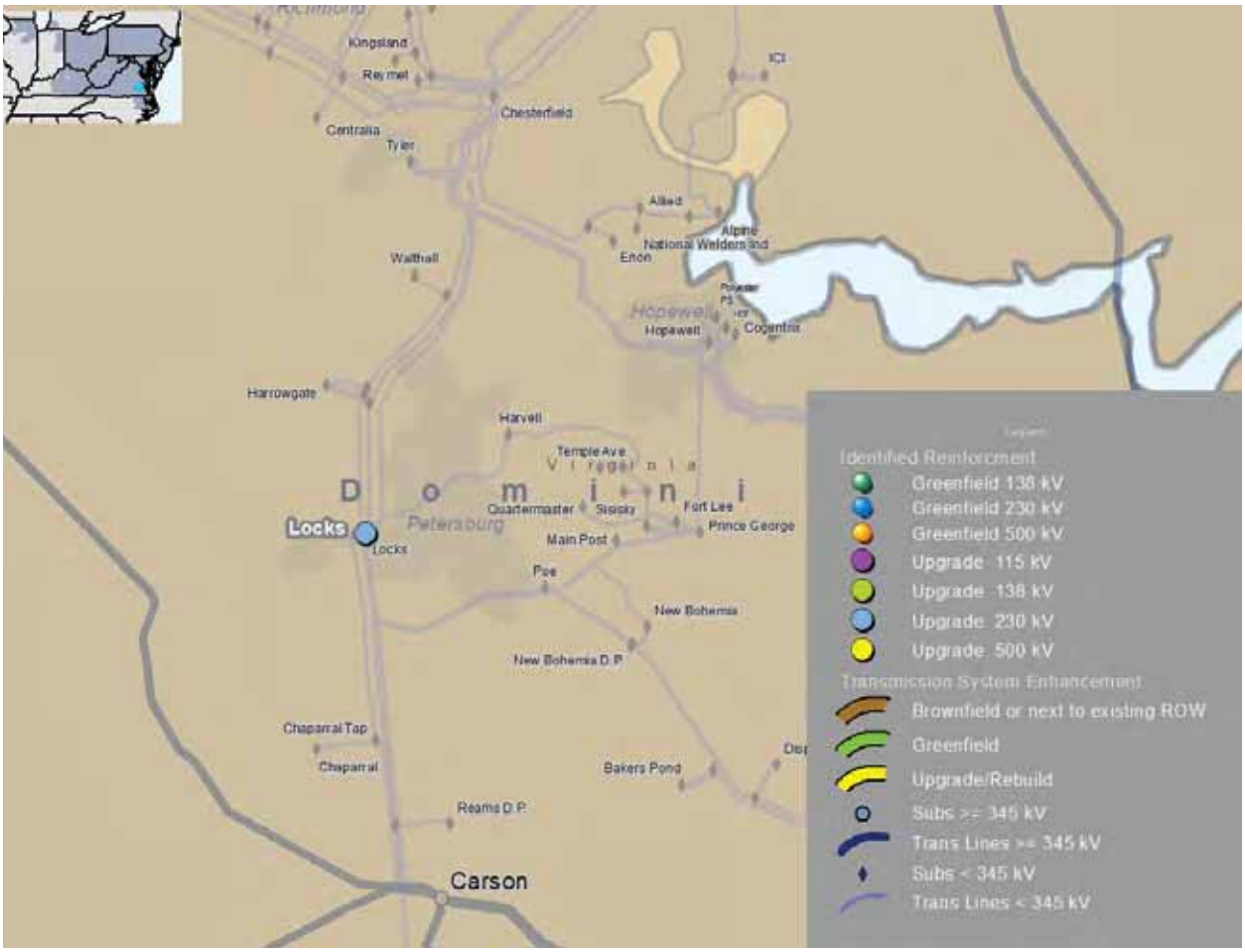



Proposal 211 includes the rebuild of line No. 2135, Hollymeade-Gordonsville 230 kV, using double circuit capable 500/230 kV poles (the 500 kV circuit will not be wired as part of this project). Terminal equipment will also be upgraded at the Hollymeade, Gordonsville and Cash's Corner 230 kV substations. The estimated cost is $54.85 million, and the required in-service date is June 2027 with a projected in-service date of June 2028. The local transmission owner, Dominion, will be designated to complete this work.

Map 13. South Area Improvements – Proposal 211

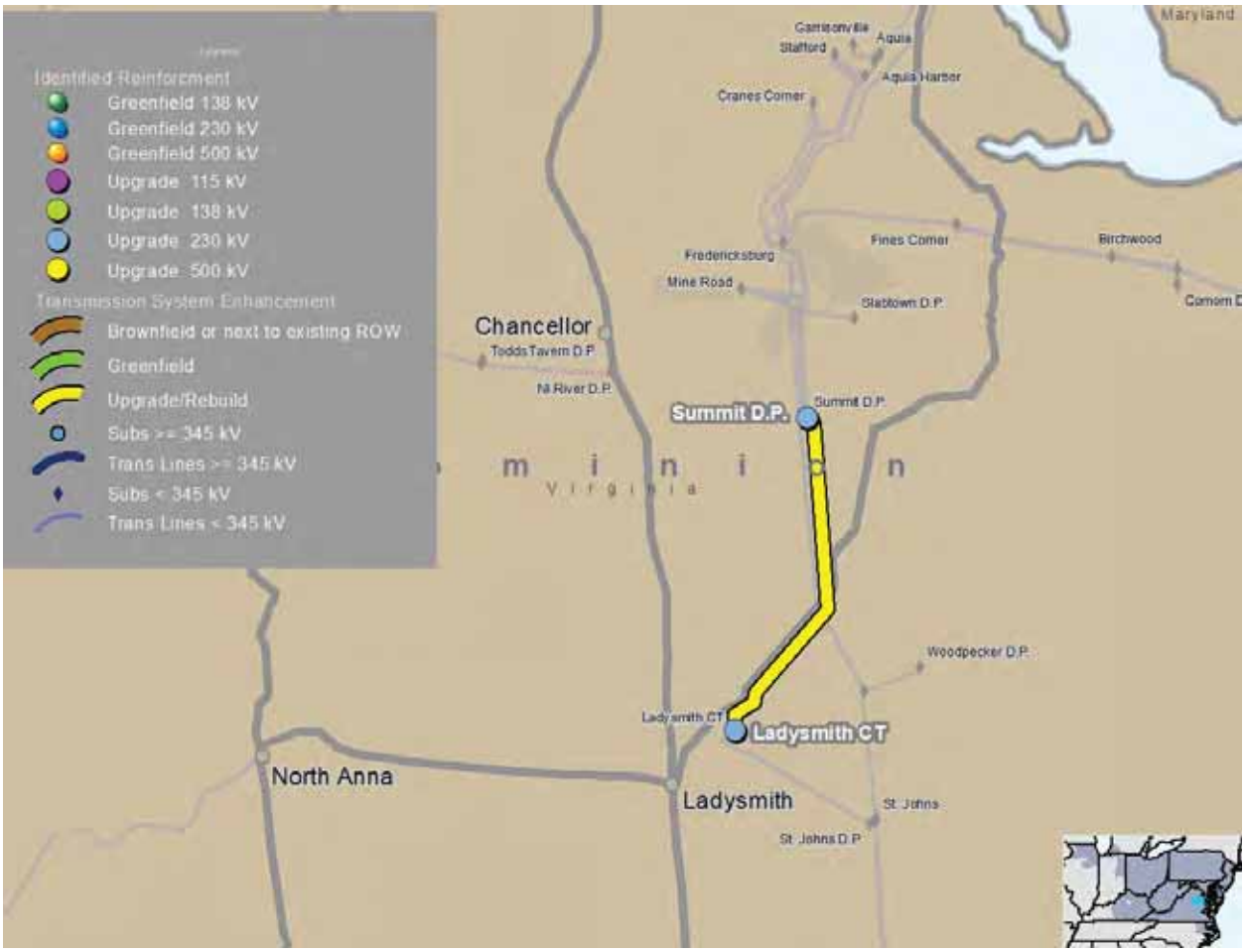

Proposal 731 replaces the single unit Locks 230/115 kV 168 MVA transformer TX No. 7 with a new single unit transformer with a rating of 224 MVA. The leads line at the 115 kV level would also be upgraded to 2000A. The estimated cost is $7.14 million, and the required in-service date is June 2027 with a projected in-service date of June 2028. The local transmission owner, Dominion, will be designated to complete this work.

Map 14. South Area Improvements – Proposal 731




The partial scope of proposal 74 includes the wreck and rebuild of line No. 2090, Ladysmith CT-Summit D.P. 230 kV segment as a double circuit 230 kV line; however, only one circuit will be wired at this stage. Circuit breaker leads, switches and line leads will be upgraded at Ladysmith CT 230 kV substation. The estimated cost is $36.50 million, and the required in-service date is June 2027 with a projected in-service date of December 2027. The local transmission owner, Dominion, will be designated to complete this work.

Map 15. South Area Improvements – Partial Scope of Proposal 74

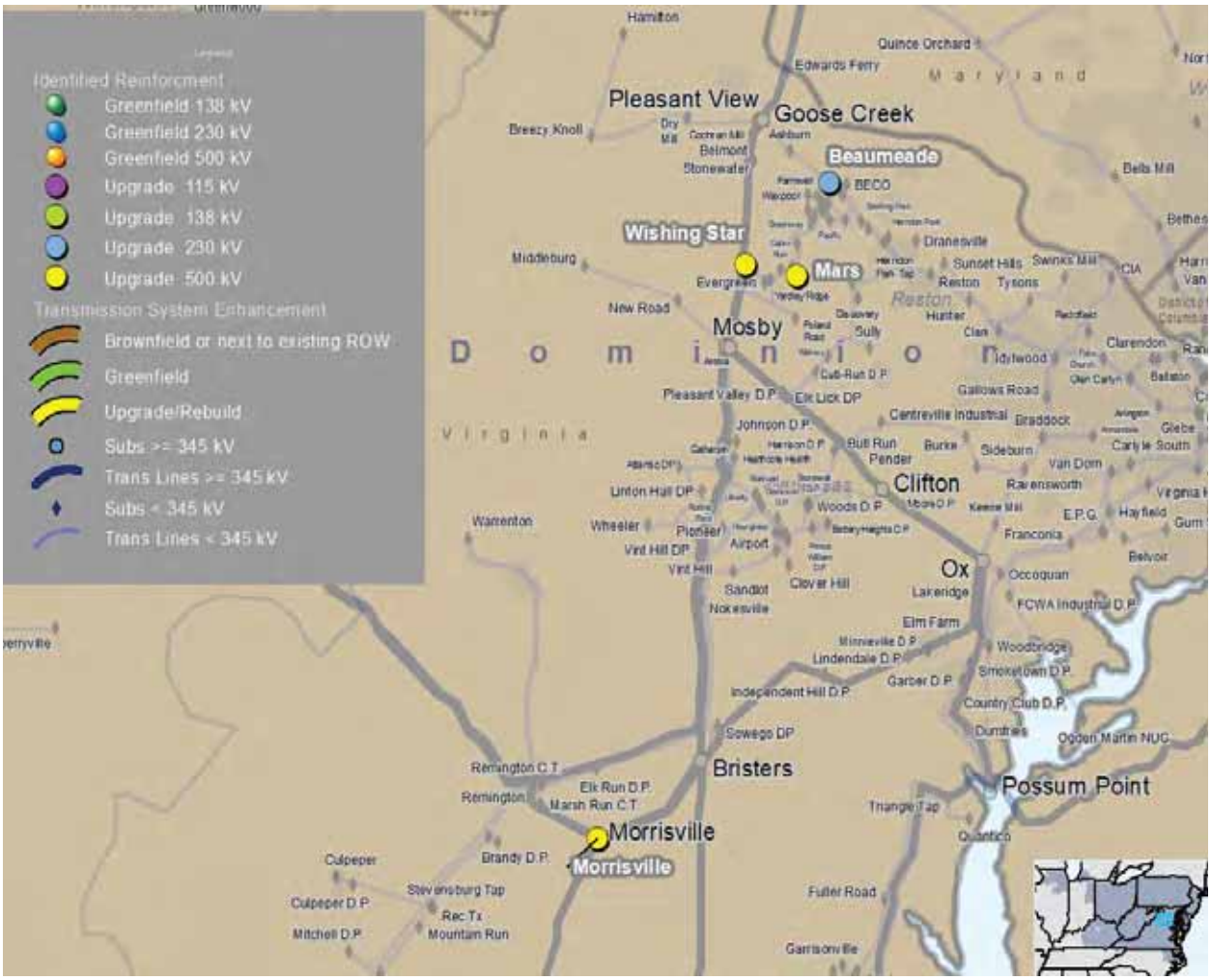



Proposal 231 entails the installation of 230 kV and 500 kV shunt cap banks (static devices) as well as STATCOMs (dynamic devices) and associated equipment to address the reactive power needs of the system. Below is the list of the devices:

- One 500 kV, 150 MVAR shunt capacitor bank and associated equipment at Morrisville substation
- One 230 kV, 150 MVAR shunt capacitor bank and one 500 kV, 293.8 MVAR shunt capacitor bank and associated equipment at Wishing Star substation
- One 500 kV, 300 MVAR static synchronous compensator (STATCOM) and one 230 kV, 150 MVAR shunt capacitor bank and associated equipment at Mars substation
- One 230 kV, 300 MVAR static synchronous compensator (STATCOM) and associated equipment at Beaumeade substation

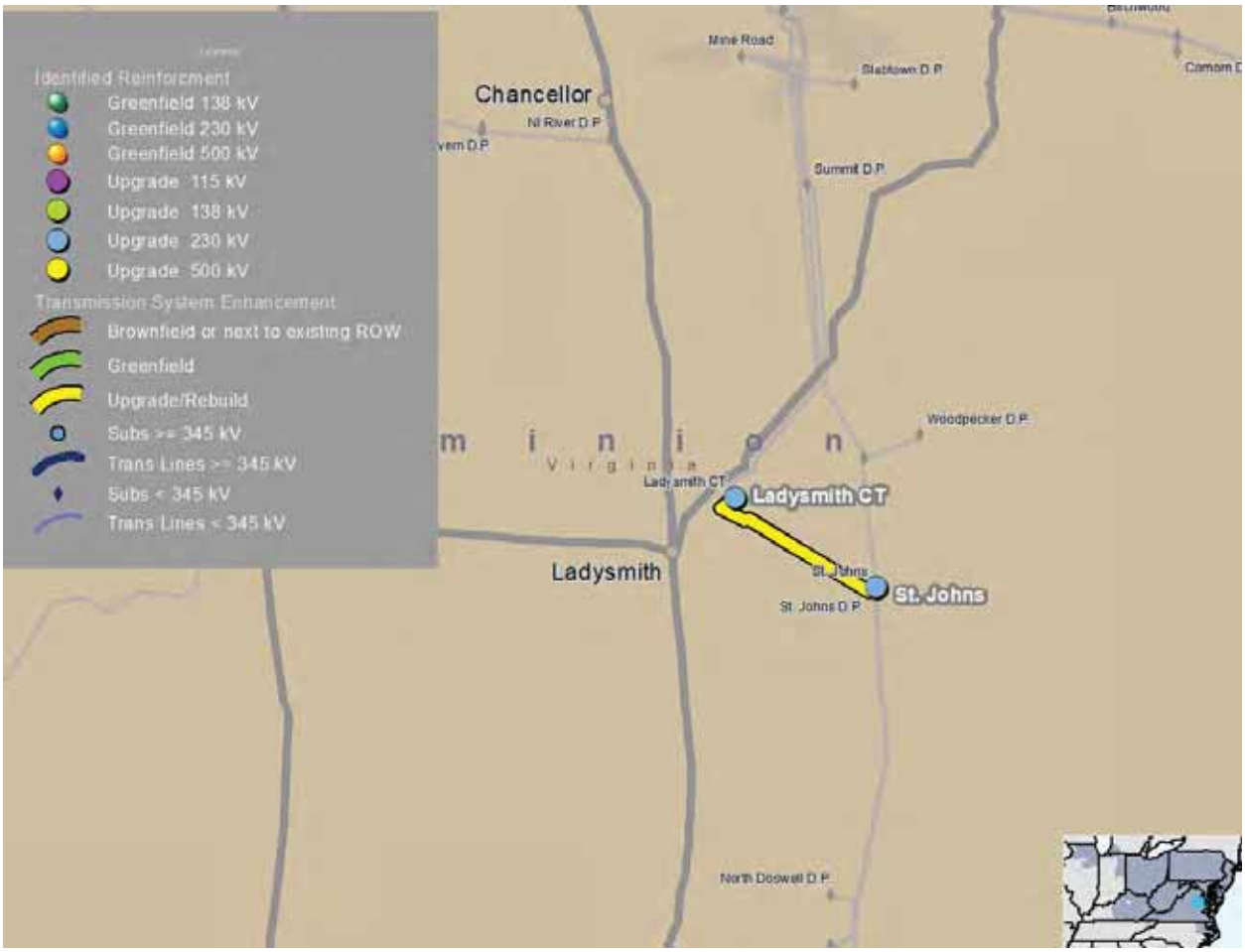
The estimated cost is $103.79 million, and the required in-service date is June 2027 with a projected in-service date of December 2027. The local transmission owner, Dominion, will be designated to complete this work.

Map 16. South Area Improvements – Proposal 231




In addition to the proposals identified above, there are a number of required upgrades identified by PJM. The recommended solution will uprate 12.44 miles of 230 kV circuit 256 from St. Johns to Ladysmith CT. Approximately 7.14 miles of the line from St. Johns substation to structure 256/108 is supported by a mix of single circuit wood and steel H-frames installed in 1991. This portion of the line will be rebuilt with a mix of light duty steel DOM pole tangent H-frames and engineered steel three-pole dead-end angle structures. The proposed conductor for the rebuilt line will be 2-768 ACSS "Maumee" with dual 48 fiber DNO-11410 for shielding. The remaining 5.3 miles of the line from structure 256/107 to Ladysmith CT is supported on double circuit lattice towers installed in 2010–2011. This portion of the line will be reconductored with proposed 2-768 ACSS "Maumee" conductor, and the existing structures and shield wire will remain. Transmission line switch 25666 will be upgraded to 4000A at St. Johns substation. Terminal equipment at remote end substations will be upgraded to 4000A continuous current rating to support new conductor ratings. The estimated cost is $37.89 million, with a required and projected in-service date is June 2028. The local transmission owner, Dominion, will be designated to complete this work.

Map 17. South Area Improvements – PJM Identified Upgrades




Overall, the total cost estimate for the recommended south area improvements is approximately $1,265.85 million.

## Northern Virginia Data Center

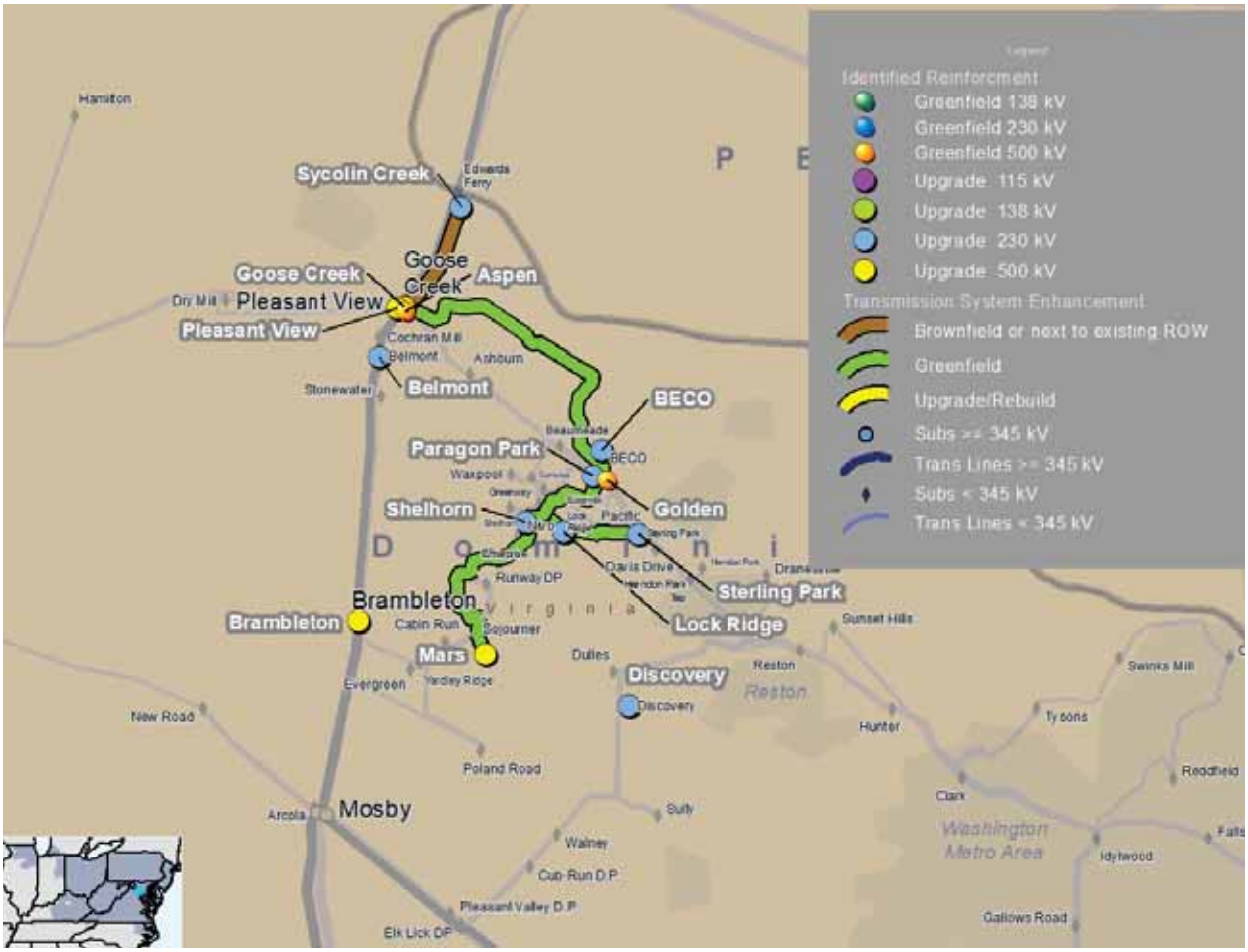
PJM recommends proposal 692 and 516 proposed by Dominion, proposal 344/660 proposed by Exelon and proposal 837 proposed by FirstEnergy to address the northern Virginia data center cluster needs. There are also a number of additional upgrades identified by PJM.

Proposal 692 includes the construction of two new 500/230 kV substations, Aspen and Golden. The Aspen substation will be tapping the 500 kV line No. 558. New double circuit 500/230 kV lines from Aspen to Golden substation will be constructed, where the 230 kV line will connect Aspen-Sycolin Creek-Golden. Similarly, the proposal also includes construction of new double circuit 500/230 kV lines from Golden to Mars, where the 230 kV line will connect Golden-Lockridge-Mars. The project will build a new Aspen-Goose Creek 500 kV line, and install a second 500/230 kV 1440 MVA transformer at the Mars substation. The existing double circuit Golden-Paragon Park 230 kV lines (lines No. 2150 and 2081) will be upgraded, along with the existing single circuit Paragon Park-BECO 230 kV line (line No. 2207). The latter 230 kV line will require a minimum normal summer rating of 1573 MVA, and equipment at each substation will be upgraded to support the new conductor rating of 4000A. The relay settings at Golden substation will be reset, and the overdutied breakers at Belmont, BECO, Beaumeade, Pleasant View, Shellhorn and Discovery will be replaced. The estimated cost is $1,025.06 million, and the required in-service date is

June 2027 with a projected in-service date of June 2028. The local transmission owner, Dominion, will be designated to complete this work.

In addition to the scope identified above, there are a couple of reconductors that will be needed. Specifically, 1.47 miles of the Sterling Park-Golden 230 kV double circuit lines (line No. 2081 and 2150), and 0.67 miles of the Davis Drive-Sterling Park 230 kV double circuit lines (lines No. 2194 and 9231) will need to be reconductored. The estimated cost is $13.5 million, and the required in-service date is June 2027 with a projected in-service date of June 2028. The local transmission owner, Dominion, will be designated to complete this work.

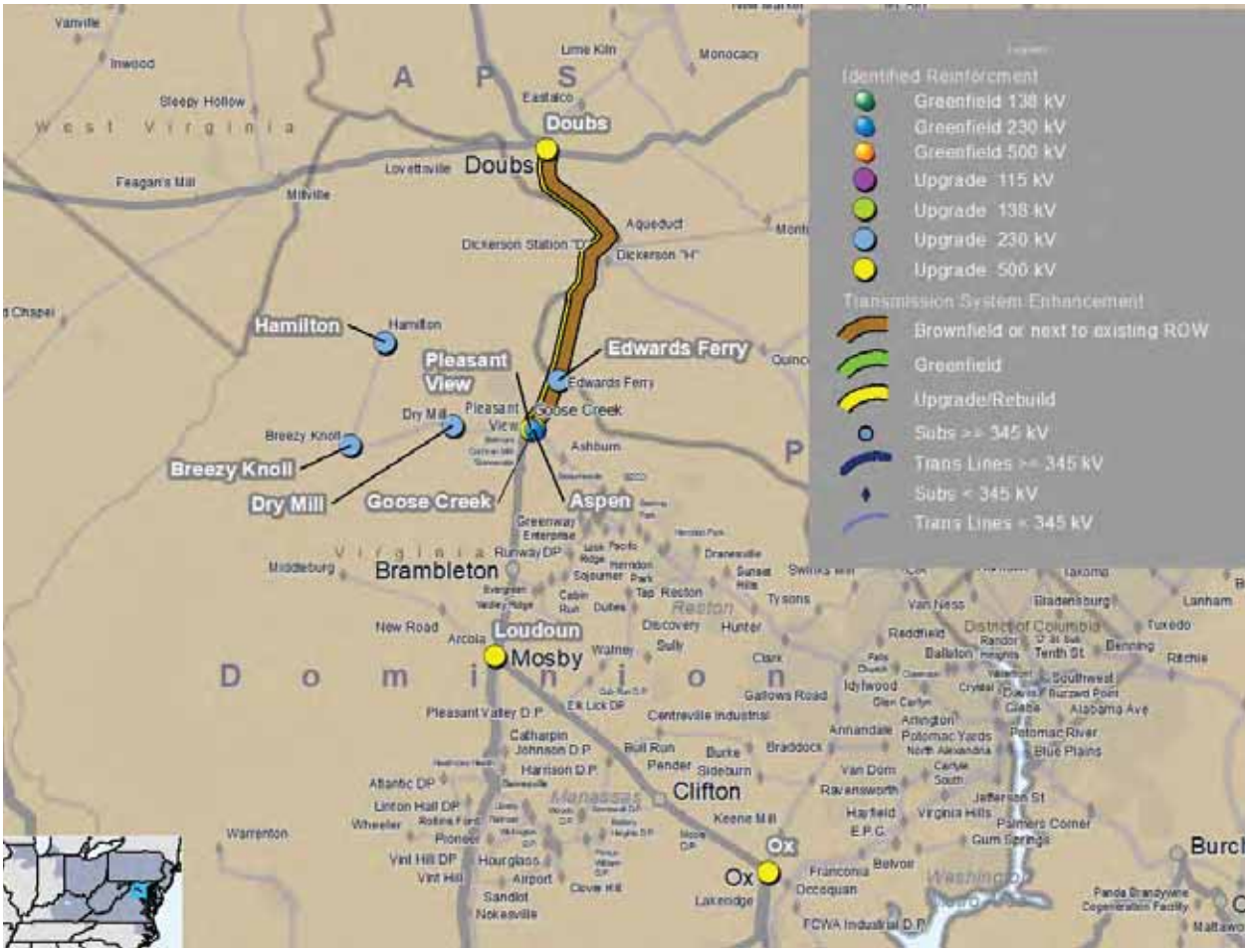
Map 18. Data Center Area Improvements – Proposal 692 and Additional Reconductors




Proposal 516 includes the rebuild of Doubs-Goose Creek 500 kV (line No. 514) using double circuit 500/230 kV towers on foundations. This scope covers line construction between Goose Creek and the Doubs Interconnection point, which is south of the Potomac River. The proposal also constructs a new 500 kV line between Doubs and the new Aspen substation, including line construction between Aspen and the Doubs Interconnection point, which is south of the Potomac River. The Pleasant View-Dickerson 230 kV line (line No. 203), from Pleasant View substation and structure 203/15 within the existing ROW, will be rebuilt using double circuit 500/230 kV towers on foundations. Approximately 1 mile of 230 kV line No. 2098 between Pleasant View and Structure 2098/9, where line No. 2098 turns toward Hamilton Substation, will be wrecked and rebuilt. The one-mile portion will share the new double circuit 500/230 kV towers with line No. 514, which is being rebuilt as part of the project. Relays will be reset or revised at Breezy, Dry Mill and Hamilton 230 kV substations. The terminal equipment at Goose Creek, Pleasant View and

Edwards Ferry 230 kV substations will be upgraded, and overdutied breakers will be replaced at the Loudon, Ox and Pleasant View 500 kV substations. The estimated cost is $78.4 million, and the required in-service date is June 2027 with a projected in-service date of December 2027. The local transmission owner, Dominion, will be designated to complete this work.

Map 19. Data Center Area Improvements – Proposal 516

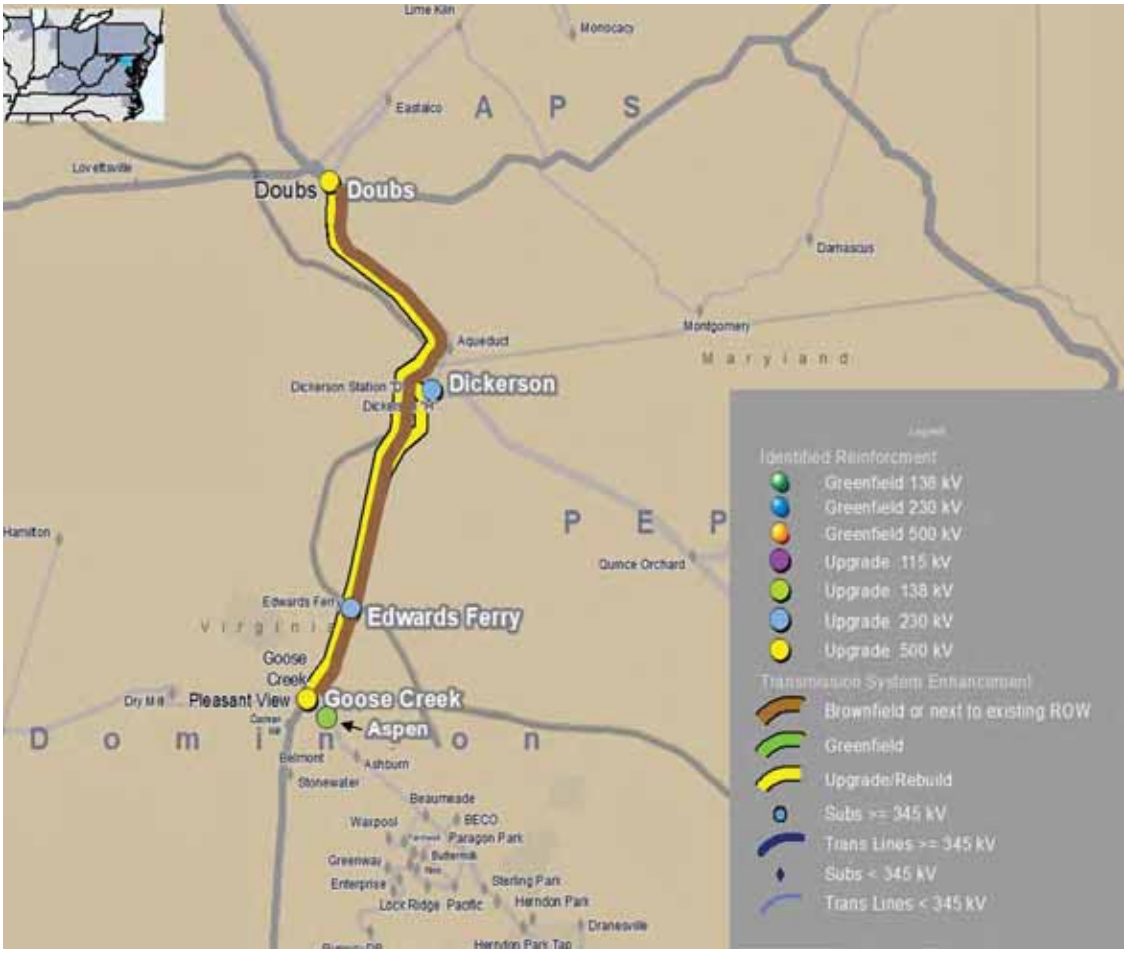



The recommended scope from proposal 344/660 by Exelon includes rebuilding 7.26 miles of existing 230 kV circuit from Dickerson Station H to Ed's Ferry area to accommodate the new 500 kV circuit between Doubs and Goose Creek. The new structure will carry both 500 kV and the 230 kV from Dickerson Station H to Ed's Ferry circuits. The Dickerson H 230 kV substation will be reconfigured and terminal equipment upgraded. The Exelon portion of the new Doubs-Goose Creek 500 kV scope utilizes existing Exelon ROW. The estimated cost is $66.38 million, and the required in-service date is June 2027 with a projected in-service date between 2028 and 2030. The local transmission owner, Exelon, will be designated to complete this work.

Proposal 837 from FirstEnergy includes the rebuild of the Doubs-Goose Creek 500 kV (line No. 514). The proposal also builds a new Doubs-Aspen 500 kV line (the Aspen substation is part of Dominion's proposal 692 detailed above). The Doubs – Dickerson 230kV line will be rebuilt. The Doubs-Aqueduct and Aqueduct-Dickerson 230 kV lines will be rebuilt and attached on the same structures as those for the Doubs-Aspen 500 kV line. At Doubs substation, the rebuilt Doubs-Goose Creek 500 kV line will be reterminated in its existing bay, and the new Doubs-Aspen 500 kV line will be terminated in the open bay at Doubs. Additionally, three circuit breakers, terminal

equipment including disconnect switches, CTs and substation conductor, and relaying will be replaced at the Doubs 500 kV substation. The estimated cost is $234.96 million, and the required in-service date is June 2027 with a projected in-service date of June 2030. The local transmission owner, FirstEnergy, will be designated to complete this work.

Map 20. Data Center Area Improvements – Proposals 344/660 and 837




Overall, the total cost estimate for the recommended northern Virginia data center area improvements is approximately $1,418.3 million.

## East

PJM recommends proposal 344/660 by Exelon, proposal 374 by PPL, proposal 637 by PSEG and proposal 837 by FirstEnergy to address the East cluster needs.

PJM is sought to utilize and incorporate already Board-approved NJ SAA project scope at North Delta substation, and adjusted the Exelon proposal 344/660 scope accordingly. The recommended solution expands the North Delta 500 kV substation (scope beyond that proposed under Brandon Shore deactivation) to accommodate the termination of the new 500 kV lines as well as reconfiguration of the Peach Bottom substation. The North Delta 500 kV substation expansion will include a four bay breaker and a half configuration. The proposal includes building a High Ridge 500 kV substation, which will cut into the Brighton-Waugh Chapel 500 kV line. The High Ridge 500 kV substation will include

three bay breaker and a half configuration with two 500/230 kV transformers, and terminal equipment will require replacement at both Brighton and Waugh Chapel 500 kV substations.

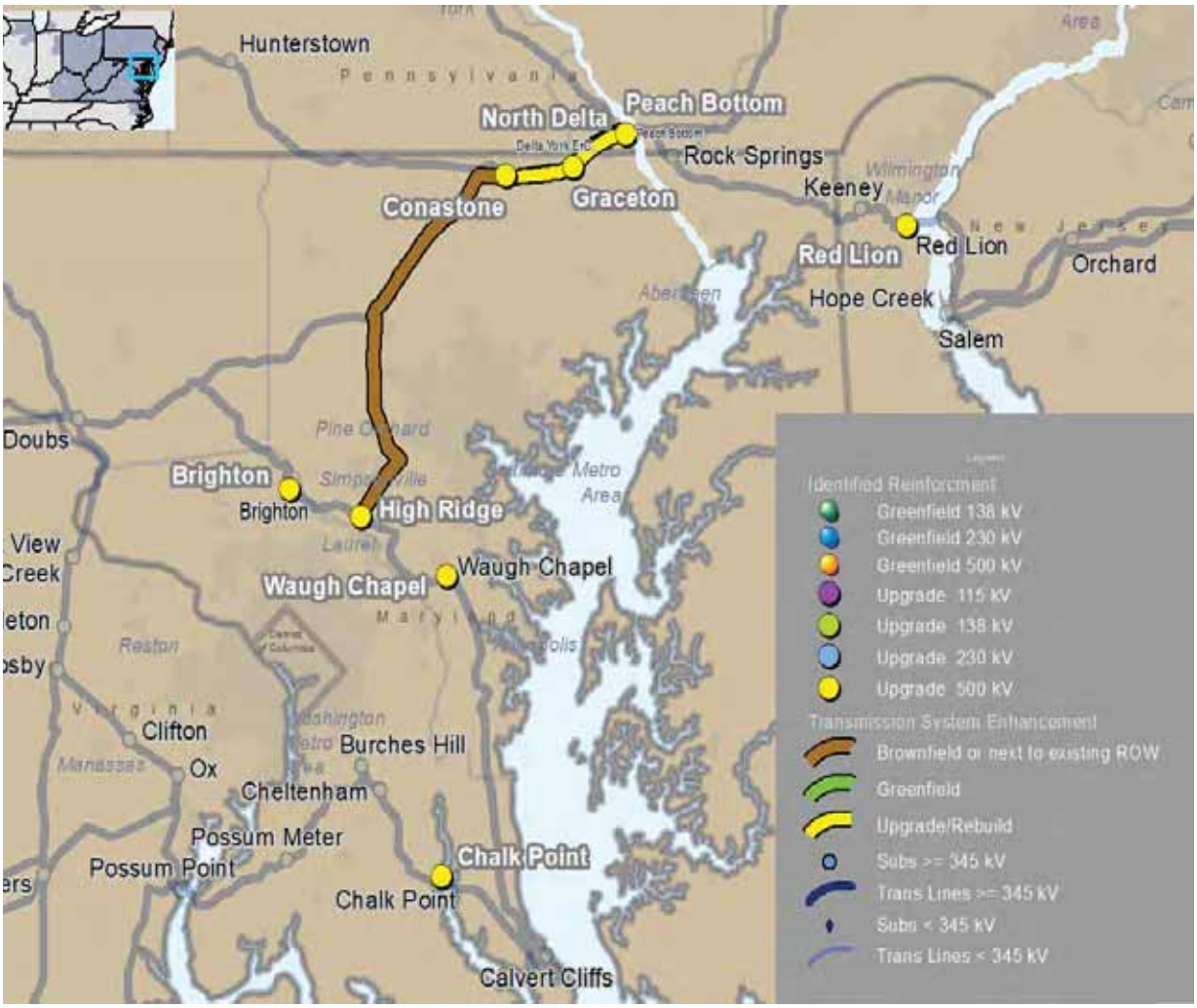
The proposal builds a new Peach Bottom South-North Delta 500 kV line by cutting into Peach Bottom tie No. 1 and extending the line to North Delta, which entails approximately 1.25 miles new ROW. The existing Peach Bottom-Conastone 500 kV line (5012L) will be rebuilt on single circuit structures within existing ROW and cut into North Delta 500 kV and Gracetone 500 kV stations. Furthermore, the proposal builds a new North Delta-High Ridge 500 kV line, which will extend approximately 65 miles.

In addition to the regional proposal scope described above, there following Exelon proposal components would be required:

- Conastone-Brighton 500 kV (5011 circuit) – Replace terminal equipment limitations at both Conastone and Brighton 500 kV
- Brighton-Waugh Chapel 500 kV (5053) – Replace terminal equipment limitations at Brighton 500 kV
- Chalk Point-Cheltanham 500 kV (5073) – Replace relay at Chalk Point 500 kV
- Conastone-Peach Bottom 500 kV (5012 circuit) – Upgrade two existing 500 kV breakers at Conastone from 4000A to 5000A
- Peach Bottom 500 kV – Reconfigure and upgrade several terminal/substation equipment at both North and South Peach Bottom 500 kV substations
- Red Lion-Hope Creek 500 kV – Replace terminal equipment at Red Lion

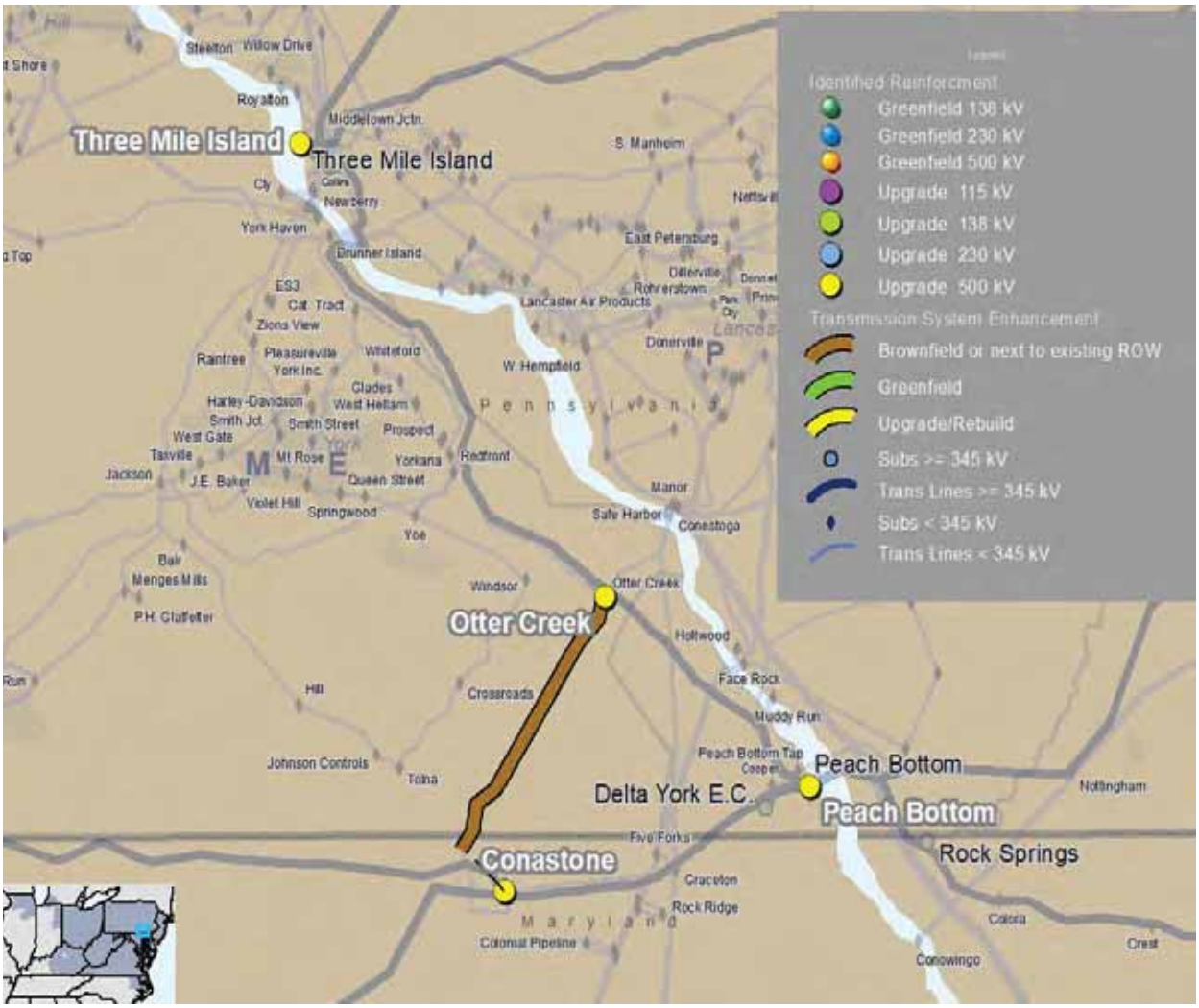
The estimated cost for the work described above is $708.77 million, and the required in-service date is June 2027 with a projected in-service date between 2028 and 2030. The local transmission owners, Exelon, will be designated to complete this work.

Map 21. East Area Improvements – Proposal 344/660



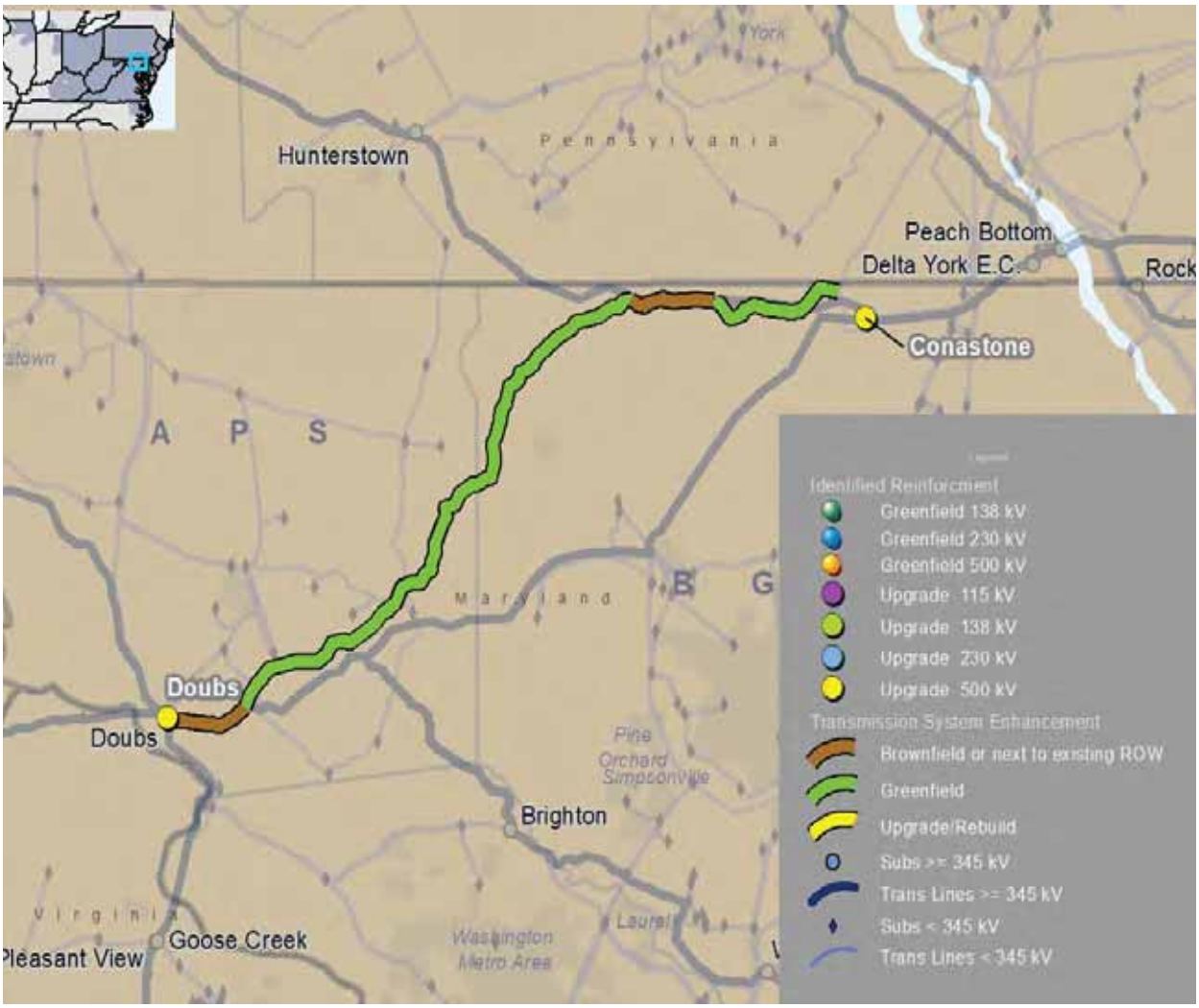

Proposal 374 by PPL includes building a new Otter Creek 500 kV switching station, with two bay three-breaker configuration, that cuts into the Peach Bottom-TMI 500 kV line. An approximately 17-mile new 500 kV line from Otter Creek toward the Conastone station fence (Conastone demarcation point) would be built, and the existing Otter Creek-Conastone 230 kV line would be rebuild to become a double circuit 500 and 230 kV line. Additionally, terminal equipment will be upgraded at the Peach Bottom and TMI 500 kV substations. The estimated cost is $134.2 million, with a required and projected in-service date of June 2027. The local transmission owners, PPL and BGE, will be designated to complete this work.

Map 22. East Area Improvements – Proposal 374




Proposal 637 by PSEG includes an approximately 40-mile new 500 kV line from the Conastone demarcation point (with the PPL Otter Creek line) to Doubs substation. The Conastone substation is referenced for this demarcation point only for general reference and does not have to necessarily be in the area of the Conastone substation. The new 500 kV line will tie into the PPL-proposed Otter Creek-Conastone 500 kV, bypassing the actual Conastone substation. The Doubs 500 kV substation will be reconfigured and terminal equipment upgraded to terminate the new line. The estimated cost is $447.5 million, with a required and projected in-service date of June 2027. The proposing entity, PSEG, will be designated to complete this work.

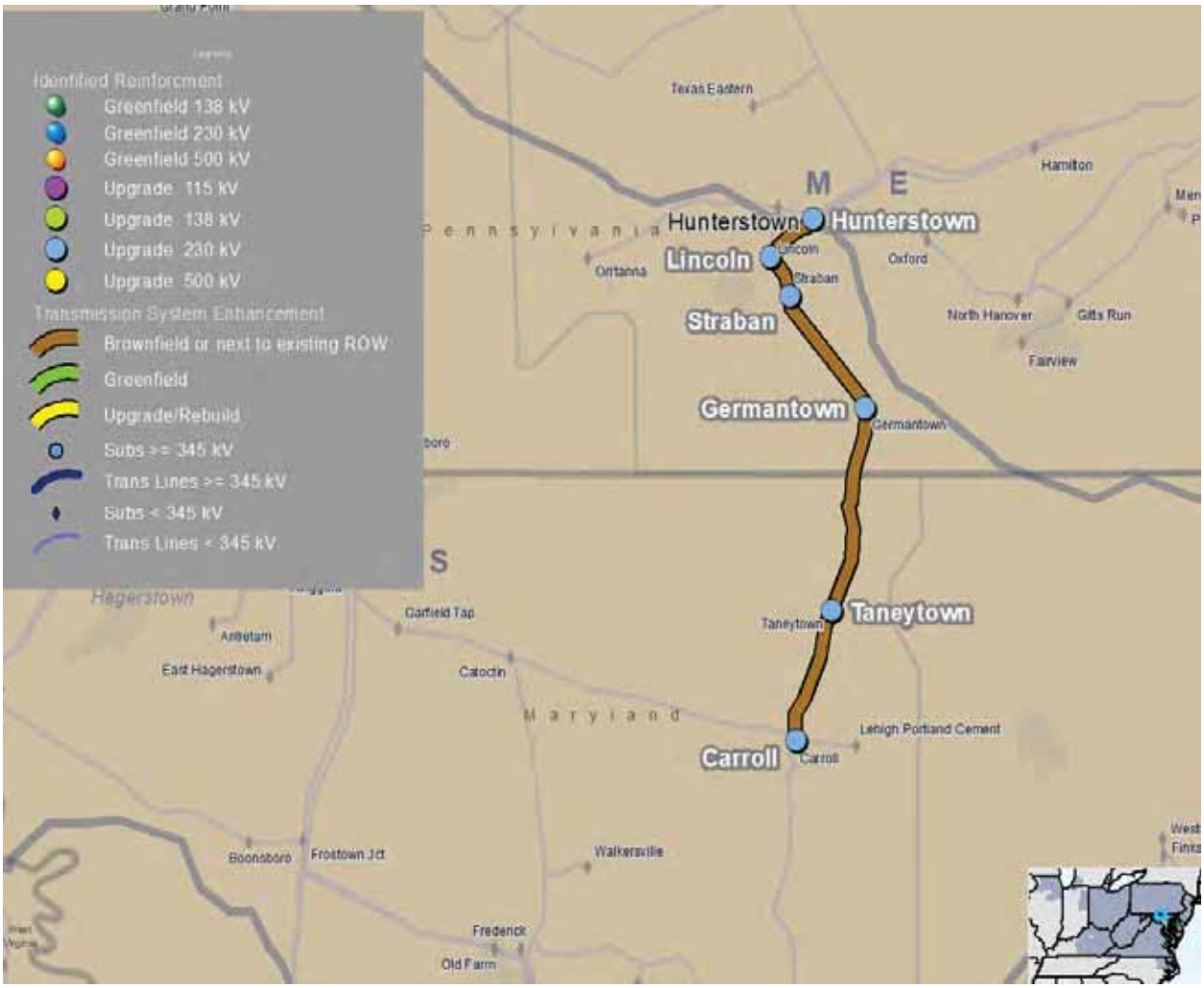
Map 23. East Area Improvements – Proposal 637




Proposal 837 by FirstEnergy builds a new Hunterstown-Carroll 230 kV line in addition to rebuilding the existing 115/138 kV corridor as double circuit using 230 kV construction standards.

In addition to the Hunterstown-Carroll 230 kV line scope, there are a few PJM identified upgrades that will be needed. Specifically, the Lincoln-Orrtanna 115 kV line will be reconductored, and the line trap at the Grand Point 138 kV substation for the Fayetteville-Grand Point 138 kV line will be replaced. The proposal also includes the replacement of the line trap, substation conductor, breaker, relaying and CTs at Ringgold 138 kV substation for the Reid-Ringgold 138 kV line. Furthermore, with this additional scope, the baseline project b3768, which rebuilds/reconductors the Germantown-Lincoln 115 kV line ($17.36 million) is not required and the baseline project would be canceled. The total estimated cost of the proposal 837 scope of work and the additional PJM identified upgrades is $152.65 million, and the required in-service date is June 2027 with a projected in-service date between 2028 and 2030. The local transmission owner, FirstEnergy, will be designated to complete this work.

Map 24. East Area Improvements – Proposal 837




Overall, the total cost estimate for the recommended East area improvements is approximately $1,443.12 million.

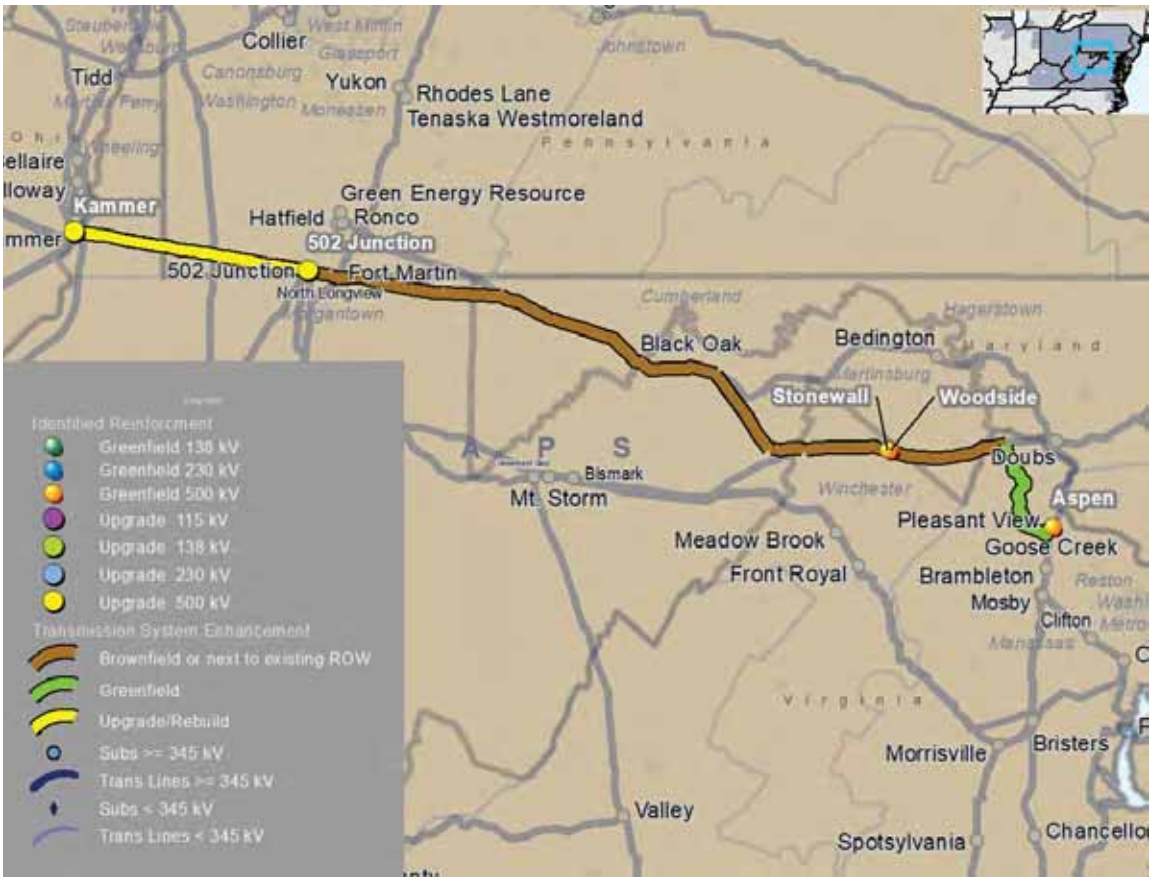
## West

PJM recommends a modified scope of proposal 853 proposed by NextEra to address the West cluster needs. The recommended scope includes a new 500 kV line from the existing 502 Junction substation to a Woodside 500 kV substation, noting that the line will bypass the Black Oak substation. The existing First Energy substation, primarily 502 Jct 500 kV and Stonewall 138 kV will be upgraded by adding additional bay position via new breakers. The Woodside 500 kV substation will be a breaker and half configuration built adjacent to the existing Stonewall 138 kV substation, and loop in the Bismark-Doubs 500 kV line. The substation will include two 500/138 kV transformers, and two 150 MVAR capacitor banks as well as one +500/-300 MVAR STATCOM. Furthermore, the project will also build a new 500 kV line from the Woodside substation to the new Aspen substation (part of Northern Virginia Data Center cluster recommended solution). Aspen substation work will be required to terminate the Woodside-Aspen 500 kV line. The 500 kV line to be built east and west of existing Stonewall 138 kV will be assigned to First Energy's on existing ROW with 500 kV overbuilt. First Energy will be assigned roughly 36 miles of the 500 kV overbuilt.

The recommended solution also includes a LIDAR sag study to assess the summer emergency rating and any needed upgrades on the Kammer-502 Junction 500 kV line to adequately increase the line rating.

The estimated cost of work assigned to FE is $392.55 million. The estimated cost of work assigned to NextEra is $512.61 million and the estimated cost of work assigned to Dominion is $35.59 million. The estimated cost of work assigned to AEP is $0.1 million. The required in-service date is June 2027 with a projected in-service date between 2027 and 2030. The proposing entity, NextEra, along with the local transmission owners, FirstEnergy, Dominion and AEP, will be designated to complete this work. Overall, the total cost estimate for the recommended West area improvements is approximately $940.85 million.

Map 25. West Area Improvements – Modified Proposal 853




## Short Circuit

Stemming from PJM's short-circuit analysis, PJM recommends the replacement of 36 circuit breakers, as detailed in the Short-Circuit Analysis section of this report. The total cost estimate to for the breaker replacements is approximately $63.27 million.

Table 10. Rationale – All Clusters

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 9 | AEP | Local AEP | Scottsville-Bremo Sag Study | $1.27 | Yes | Yes | No | Not required to meet the 2022W3 needs with the selected PJM 500 kV solutions (that address the primary need drivers for the window) | N/A | |
| 2 | 23 | POTOED – FirstEnergy | West | Data Center Reinforcement Proposal No. 2<br>• 2 - 500 kV circuits from Fort Martin-Doubs<br>• 1 - 500 kV circuit from Prutnytown-Meadow Brook-Doubs<br>• Second 500 kV from Doubs-Aspen and Rebuild the existing Doubs-Goose Creek 500 kV<br>• Rebuild Hunterstown-Caroll 115/138 kV line for 230 kV double circuit construction | $3,503.86 | Yes | No | Yes *(partial)* | • Proposal attempts to address the west-east transfer needs and voltage collapse concerns along the transfer path<br>• PJM analysis indicated that the system reliability benefits more from spreading the reinforcements for transfer between the East and West corridors instead of just the Western corridor<br>• All options provide injections into Doubs; however, no solutions offered to debottleneck the Doubs-Goose Creek corridor<br>• Currently there is no need for 2x500 kV double circuit development along the West-East corridor<br>• Only 1x500 kV is required part of the PJM selected solution<br>• Cost is higher than similar 500 kV proposals by other entities that provide stronger cost containment provisions<br>• Proposal utilizes existing ROWs for parts of the projects including the new Doubs-Aspen 500 kV and Huntertown-Caroll 230 kV, which both components are in the list of PJM selected projects | • 0F<br>• 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0M | • 0N<br>• 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |
| 3 | 24 | PSEG | EAST | Proposal A - North Delta-New Raphael-Waugh Chapel 500 kV | $739.40 | Yes | Yes | No | Selected proposal meets needed system performance with less impact (Green Field vs Brownfield and Timeline/construction risk considerations) | OS-REV | |

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| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 28 | NextEra | East/ West/ Northern Virginia | Hunterstown-Doubs-Goose Creek, Black Oak-Pike-Goose Creek, Pike SVC + Cap Banks | $884.05 | Yes | No | No | The proposed 500 kV line is similar in length to the PJM selected 500 kV line from Otter Creek to Doubs, which is more effective in meeting the reliability need | 0H/0H2 |
| 5 | 30 | Dominion | South | Charlottesville-Hollymead Line No. 2054 Rebuild | $159.87 | Yes | Yes | No | Dominion proposal No. 967 chosen over proposal No. 30. Both proposals include a wreck and rebuild of 230 kV Line No. 2054. However, proposal No. 30 utilizes double-circuit capable 230 kV poles, whereas proposal No. 967 utilizes double-circuit capable 500/230 kV poles. | 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown - Carrol Rebuild / 0E11-7-B + Hunterstown - Carrol Rebuild + IEC West<br>• 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |
| 6 | 55 | AEP | Local AEP | Boxwood-Scottsville 138 kV Rebuild | $104.88 | Yes | Yes | No | Not required to meet the 2022W3 needs with the selected PJM 500kV solutions (that address the primary need drivers for the window) | N/A |
| 7 | 74 | Dominion | South | Line No. 2090 (Ladysmith CT-Fredericksburg) Rebuild | $57.34 | Yes | Yes | Yes *(partial)* | Required for reliability needs. Most efficient or cost-effective solution | 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown - Carrol Rebuild / 0E11-7-B + Hunterstown - Carrol Rebuild + IEC West / 0E11-7-B Final<br>• 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 116 | NextEra | East/ Northern Virginia | Hunterstown-Doubs-Gant Solution, two new 230 kV line from new Belmont to Farmwell and Roundtable substation to feed data center alley | $478.87 | Yes | No | No | The proposed 500 kV line is similar in length to the PJM selected 500 kV line from Otter Creek to Doubs, which is more effective in meeting the reliability need | 0H/0H2 |
| 9 | 125 | PSEG | EAST | Proposal B - North Delta-Northeast 230 kV | $313.34 | Yes | No | No | Not required to meet the 2022W3 needs (inferior to selected solutions) with the selected PJM 500 kV solutions (that address the primary need drivers for the window) | N/A |
| 10 | 129 | Dominion | Northern Virginia/ South | Dominion Aggregate 500 kV Proposal | $3,035.05 | Yes | Yes | Yes *(Partial)* | Offers robust solution to serve the data center loads in the Dominion zone (northern Virginia) and also offers parallel 500 kV path to the single 500 kV line between Goose Creek and Wishing Star | • 1A / 1B / 1C / 1C-1<br>• 0E Series<br>• 0F<br>• 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |
| 11 | 175 | NextEra | ALL | Combination of PEBO 215A + WOP 1F + SOP 8E | $6,265.95 | Yes | Yes | No | • Solution (as one package) is more expensive, less effective and less efficient than selected proposal.<br>• The combination solutions fails the load deliverability test in BGE and SW-MAAC<br>• The combination proposal, particularly in the Eastern cluster introduces significant additional number of 230 kV circuits, while this elected proposal addresses those needs via 2x500 kV circuits predominantly along existing ROWs | • 0B / 0B2 / 0B3<br>• 0O / 0O2 / 0O3<br>• 0R / 0R2 |
| 12 | 181 | AEP | Local AEP | Boxwood-Scottsville 138 kV Sag Study | $4.26 | Yes | Yes | No | Not required to meet the 2022W3 needs with the selected PJM 500 kV solutions (that address the primary need drivers for the window) | N/A |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 196 | AEP | Local AEP | Glen Lyn-Peters Mountain Rebuild | $21.89 | Yes | Yes | No | Not required to meet the 2022W3 needs with the selected PJM 500 kV solutions (that address the primary need drivers for the window) | N/A |
| 14 | 202 | AEP | Local AEP | Cloverdale Transformer Addition | $57.29 | Yes | Yes | No | Much higher cost comparing to Proposal 410 | N/A |
| 15 | 211 | Dominion | South | Hollymead-Gordonsville Line No. 2135 Rebuild | $54.85 | Yes | Yes | Yes | Required for reliability needs. Considers future load growth in Culpeper and Louisa area by supporting 500 kV developments with double-circuit capable 500/230 kV poles. | • 0E11-7-B Final<br>• 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |
| 16 | 217 | NextEra | East | North Delta-Conastone Solution | $155.99 | Yes | Yes | No | Solution offered part of an alternate more efficient and cost-effective proposal while utilizing existing ROW and with limited impacts | • 2 / 2A / 2B / 2C / 2D / 2E / 2F<br>• QT1 / QT3 |
| 17 | 229 | PSEG | East | Proposal C - Hunterstown-New Green Valley 500 kV | $529.11 | Yes | No | No | Hunterstown supply into the northern Virginia system is inferior to supplying the northern Virginian system from the Peach Bottom area | 0E2 |
| 18 | 231 | Dominion | Northern Virginia/ South | Reactive Power VAR Reinforcements | $155.82 | Yes | Yes | Yes *(partial)* | Required for reliability needs. Most efficient or cost-effective solution | 0E11-7 / 0E11-7-A / 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown -Carrol Rebuild / 0E11-7-B + Hunterstown -Carrol Rebuild + IEC West / 0E11-7-B Final / 0E11-8 / 0E11-9 / 0E11-10 / 0E11-10-A / 0E11-11 / 0E11-12 |
| 19 | 234 | AEP | Local AEP | Glen Lyn-Peters Mountain Sag Study | $0.80 | Yes | Yes | No | Not required to meet the 2022W3 needs with the selected PJM 500 kV solutions (that address the primary need drivers for the window) | N/A |
| 20 | 255 | NextEra | East/ Northern Virginia | Hunterstown-Doubs-Gant Solution | $411.61 | Yes | No | No | The proposed 500 kV line is similar in length to the PJM selected 500 kV line from Otter Creek to Doubs, which is more effective in meeting the reliability need | 0H/0H2 |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 21 | 279 | NextEra | West/ Northern Virginia | Black Oak-Woodside-Goose Creek, Woodside SVC + Cap Banks Solution | $429.18 | Yes | No | No | Does not provide the needed supply source into the Dominion northern Virginia transmission system (Load Centers) | 0E11-12 |
| 22 | 325 | PSEG | East/ South | Proposal E - Brambleton-Hinsons Ford Rd 500 kV, North Delta-New Raphael Road-Waugh Chapel 500 KV | $944.05 | Yes | No | No | Limited overall effectiveness of solution to meet the needs if bulk transfer solutions are adequately addressed.<br>Line has high greenfield construction risk and high project delay risk are identified | 2D |
| 23 | 344 | PECO | East | PECO Expansion Plan for DOM Window 2023 | $302.86 | Yes | Yes | Yes | • Meets performance requirements and efficiently utilizes existing ROW<br>• Most efficient or cost-effective<br>• Provides solid robust performance to meet the needs in the PB-Conastone and BGE areas | • 1A<br>• 1B<br>• 0E Series<br>• 0F<br>• 0G<br>• 0H / 0H2<br>• 0H2<br>• 0I<br>• 0J / 0J-2/ 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S<br>• 2 / 2A / 2B / 2C / 2D / 2E |
| 24 | 347 | NextEra | West/ Northern Virginia | Black Oak-Woodside-Gant, Woodside SVC + Cap Banks | $483.83 | Yes | No | No | Does not provide the needed supply source into the Dominion northern Virginia transmission system (Load Centers) | 0E11-3 / 0E11-4 / 0E11-5 / 0E11-6 / 0E11-7 / 0E11-7-A / 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown -Carrol Rebuild / 0E11-7-B + Hunterstown -Carrol Rebuild + IEC West / 0E11-7-B Final / 0E11-8 / 0E11-9 / 0E11-10 / 0E11-11 / 0E11-12 |
| 25 | 374 | PPL | East | Otter Creek-Conastone 500 and 230 kV DCT Line | $154.21 | Yes | Yes | Yes | • Most cost-effective or efficient solution to achieve additional East-West bulk transfer reinforcements and also assist with clearing capacity along the PB-Conastone corridor<br>• Line supports the BGE/PEPCO system under outage conditions, Load Deliverability and needed supply source capability into northern Virginia/APS | 0E Series (except for 0E2 / 0E3 / 0E6 / 0E6-1 / 0E7) |

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| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 26 | 385 | NextEra | East/ Northern Virginia | New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation | $1,140.73 | Yes | Yes | No | • New substation (Barthlow) not needed part of the selected solution set<br>• Major substation with 12 - 230 and 500 kV lines terminating into it that could be eliminated<br>• No need for a new North Delta substation (one already approved and well-ahead through process)<br>• Grisham and Goran substations are both new proposed substation, which are both avoided under the PJM selected proposal | • 0O<br>• 0R |
| 27 | 410 | AEP | Local AEP | Cloverdale Breaker Reconfiguration | $11.59 | Yes | Yes | Yes | Required part of the PJM 500 kV selected solution for 2022W3 | 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown - Carrol Rebuild / 0E11-7-B + Hunterstown - Carrol Rebuild + IEC West / 0E11-7-B Final / 0E11-10 / 0E11-10-A / 0E11-11 |
| 28 | 419 | NextEra | East/ Northern Virginia | Hunterstown-Doubs-Audobon-Goose Creek | $548.75 | Yes | No | No | The proposed 500 kV line is similar in length to the PJM selected 500 kV line from Otter Creek to Doubs, which is more effective in meeting the reliability need | 0H/0H2 |
| 29 | 445 | NextEra | East | Muddy Creek / Delta-Conastone / Hunterstown-Doubs-Goose Creek Solution | $637.80 | Yes | Yes | No | • Similar 500 kV solution that is planned for construction efficiently and effectively along existing ROW is part of the PJM selected proposal<br>• The selected PJM proposal achieves the needed transfer capability East-West with less impact (fewer lines and much less new substations) | • 2E<br>• 0H / 0H2 |
| 30 | 477 | AEP | Local AEP | Fieldale-Franklin Rebuild | $74.89 | Yes | Yes | No | Not required to meet the 2022W3 needs with the selected PJM 500 kV solutions (that address the primary need drivers for the window) | N/A |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 21 | 487 | AEP - Transource | East | Maryland & Pennsylvania Baseline Reliability Solution | $492.75 | Yes | No | No | • Does not meet the 2027/28 needs<br>• Solution designed predominantly to address the 2027 case needs only<br>• More cost-effective and efficient solutions were offered part of the 2022W3 RTEP<br>• The solutions are less effective than those selected by PJM<br>• Proposal does not offer solutions to the BGE local needs and fails the load deliverability test/needs<br>• Solution is predominantly greenfield | • 1C / 1C-1<br>• 0A<br>• 0E5<br>• 0E8-2<br>• 0E11-7-B+IEC West<br>• 0E11-7-B + Hunterstown-Carrol Rebuild + IEC West<br>• 0E11-8<br>• 0E11-11<br>• 0P / 0P2 |
| 32 | 516 | Dominion | Northern Virginia | Aspen-Doubs Second 500 kV Line | $61.72 | Yes | Yes | Yes | Provides a second 500 kV line into the Load Center area in Dominion and utilizes existing/advacent ROW across the Potomac river | • 1A / 1B / 1C / 1C-1<br>• 2 / 2A / 2B / 2C / 2D / 2E / 2F<br>• 0E Series<br>• 0F<br>• 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 /0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>0S |
| 33 | 524 | AEP | Local AEP | Opossum Creek and New London Reactors | $8.86 | Yes | Yes | No | Not required to meet the 2022W3 needs with the selected PJM 500 kV solutions (that address the primary need drivers for the window) | N/A |
| 34 | 530 | NextEra | East | Muddy Creek / North Delta-Conastone Solution | $166.74 | Yes | Yes | No | Same as for proposal 38 | 2 / 2A / 2B / 2C / 2D / 2E / 2F |
| 35 | 537 | AEP | Local AEP | Fieldale-Franklin Sag Study | $30.19 | Yes | Yes | No | Not required to meet the 2022W3 needs with the selected PJM 500 kV solutions (that address the primary need drivers for the window) | N/A |

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| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | 548 | LSPower | ALL | RTEP Window 3 Solution | $2,404.48 | Yes | No | No | • Does not meet the 2027/28 needs<br>• Solution designed predominantly to address the 2027 case needs only<br>• The western 500 kV solution does terminate at the existing Doubs substation and does not offer an outlet capacity from Doubs into the Goose Creek area<br>• More cost-effective and efficient solutions were presented part of the 2022W3 RTEP<br>• The eastern cluster solutions are less effective than those selected by PJM<br>• Proposal does not offer solutions to the BGE local needs and fails the load deliverability test/needs<br>• High constructability risk (ROW owned by Dominion) for the 500 kV UG line portion of proposal from Goose Creek to Beaumeade and technically inferior to the PJM selected 500 kV development in the area. | • 2B<br>• 2C<br>• 0E11-9 |
| 37 | 564 | NextEra | East/ Northern Virginia | New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation | $876.88 | Yes | Yes | No | • New substation (Barthlow) not needed part of the selected solution set<br>• Major substation with 12x230 and 500 kV lines terminating into it that could be eleminated by PJM selected 500 kV solutions<br>• No need for a new North Delta substation (one already approved and well-ahead through process)<br>• Grisham and Goran substations are both new proposed substation, which are both avoided under the PJM selected proposal | 0O and 0R |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 38 | 577 | NextEra | South | Front Royal-Racefield, Warrenton-Wheeler, North Anna-Lady Smith | $258.38 | Yes | Yes | No | Not required with the development of the needed 500 kV selected proposal by PJM, particularly the third 500 kV feed into Aspen and the looped 500 kV development in Dominion (Aspen-Golden-Mars). Avoids highly sensitive, high risk greenfield ROW | 0B |
| 39 | 598 | NextEra | ALL | Combination of PEBO 220 + WOP 1F + SOP 8E | $2,036.47 | Yes | No | No | • Solution does not meet the 2027/28 needs and robustness test.<br>• Proposals relies heavily on 230 kV developments which introduces significant impacts in the East that could be effectively and mitigated by just 2x500 kV developments in the same area, predominantly on existing ROWs<br>• For this combination proposal to meet the 2027/28 needs, an expensive ~4Bn additional 2x230 kV circuits are required across the Chesapeake bay<br>• Even with the above development, the solution fails the Load Deliverability test in BGE and SW-MAAC | 0C |
| 40 | 600 | PECO | East | Exelon Replacement Upgrades | $423.79 | No | No | No | The proposal is upgrades to an existing Exelon system and is not enough to address the violations identified in the 2022 Window 3 | N/A |
| 41 | 606 | PPL | Local Other | Juniata-Lewistown 230 kV No. 2 line | $141.16 | Yes | Yes | No | Not required to meet the 2022W3 needs with the selected PJM 500 kV solutions (that address the primary need drivers for the window) | N/A |
| 42 | 629 | AEP | Local AEP | Scottsville-Bremo Rebuild | $31.31 | Yes | Yes | No | Not required to meet the 2022W3 needs with the selected PJM 500 kV solutions (that address the primary need drivers for the window) | N/A |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 43 | 631 | NextEra | East | Muddy Creek / North Delta-Conastone Solution | $184.47 | Yes | Yes | No | Same as for proposal 38 | 2 / 2A / 2B / 2C / 2D / 2E / 2F |
| 44 | 637 | PSEG | East | Proposal D-Conastone-Doubs 500 kV | $684.22 | Yes | Yes | Yes | Addresses the reliability needs effectively and efficiently (in combination with PPL's proposal 374) | • 0E Series (except for 0E2 / 0E3 / 0E6 / 0E6-1 / 0E7)<br>• 0K<br>• 0O<br>• 0R |
| 45 | 642 | NextEra | West/ Northern Virginia | 502 Junction-Black Oak-Woodside-Gant, Woodside SVC + Cap Banks, Gant-Farmwell, Cochran Tap-Round Table | $747.31 | Yes | No | No | The Gant-Farmwell and Cochran Tap-Round Table are, not as robust as the selected 500 kV loop established by the selected DOM proposal between Aspen, Golden and Mars | 0E11-3 / 0E11-4 / 0E11-5 / 0E11-6 / 0E11-7 / 0E11-7-A / 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown -Carrol Rebuild / 0E11-7-B + Hunterstown -Carrol Rebuild + IEC West / 0E11-7-B Final / 0E11-8 / 0E11-9 / 0E11-10 / 0E11-11 / 0E11-12 |
| 46 | 660 | PEPCO | East | West Cooper BGE-PEPCO | $1,105.62 | Yes | Yes | Yes | • Meets performance requirements and efficiently utilizes existing ROW<br>• Most efficient or cost-effective<br>• provides solid robust performance to meet the needs in the PB-Conastone and BGE areas | • 1A<br>• 1B<br>• 0E Series<br>• 0F<br>• 0G<br>• 0H / 0H2<br>• 0H2<br>• 0I<br>• 0J / 0J-2/ 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S<br>• 2 / 2A / 2B / 2C / 2D / 2E |
| 47 | 663 | NextEra | Northern Virginia/ South | Front Royal-Racefield, Warrenton-Rixlew, Warrenton-Hourglass, Mars-Ocean Court-Davis Drive | $284.17 | Yes | Yes | No | Not required with the development of the needed 500 kV selected proposal by PJM, particularly the 3rd 500 kV feed into Aspen and the looped 500 kV development in Dominion (Aspen-Golden-Mars). Avoids highly sensitive, high risk greenfield ROW | 0L |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 48 | 671 | Dominion | West/ South | Lines No. 541 (Front Royal to Morrisville) Rebuild | $299.03 | Yes | Yes | No | Not required with the PJM selected 500 kV solution. | • 2 / 2A / 2B / 2E<br>• 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3 | • 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3 | • 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |
| 49 | 676 | NextEra | West/ Northern Virginia | Black Oak-Stonewall-Gant, Stonewall SVC + Cap Banks, Gant-Farmwell, Cochran Tap-Round Table Solution | $552.49 | Yes | No | No | Not as robust as the selected 500 kV loop established by the selected DOM proposal between Aspen, Golden and Mars | 0E11-3 / 0E11-4 / 0E11-5 / 0E11-6 / 0E11-7 / 0E11-7-A / 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown -Carrol Rebuild / 0E11-7-B + Hunterstown -Carrol Rebuild + IEC West / 0E11-7-B Final / 0E11-8 / 0E11-9 / 0E11-10 / 0E11-11 / 0E11-12 | | |
| 50 | 685 | NextEra | West | Ft. Martin-Black Oak-Woodside, Woodside SVC + Cap Banks Solution | $609.78 | Yes | No | No | Does not provide the needed supply source into the Dominion northern Virginia transmission system (Load Centers) | 0E11-3 / 0E11-4 / 0E11-5 / 0E11-6 / 0E11-7 / 0E11-7-A / 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown -Carrol Rebuild / 0E11-7-B + Hunterstown -Carrol Rebuild + IEC West / 0E11-7-B Final / 0E11-8 / 0E11-9 / 0E11-10 / 0E11-11 / 0E11-12 | | |
| 51 | 691 | PEPCO | East | Mid-Atlantic Power Pathway (MAPP) | $1,990.28 | No | No | No | Project not considered due to supply chain and long lead times requirements | N/A | | |
| 52 | 692 | Dominion | Northern Virginia | Data Center Alley Local solution-New 500 kV/230 kV Aspen-Golden & Golden-Mars lines | $1,058.45 | Yes | Yes | Yes | Required for reliability needs. Most efficient or cost-effective solution. Offers robust solution to serve the data center loads in the dominion zone (northern Virginia) and also offers parallel 500 kV path to the single 500 kV line between Goose Creek and Wishing Star | • 1A / 1B / 1C / 1C-1<br>• 2 / 2C / 2D / 2E / 2F<br>• 0E Series<br>• 0F<br>• 0G<br>• 0H / 0H2 | • 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N | • 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 53 | 704 | Dominion | South | Hollymead-Gordonsville Line No. 2135 Rebuild | $36.89 | Yes | Yes | No | Dominion proposal No. 211 chosen over proposal No. 704. Both proposals include a wreck and rebuild of 230 kV Line No. 2135. However proposal No. 704 utilizes double-circuit capable 230 kV poles, whereas proposal No. 211 utilizes double-circuit capable 500/230 kV poles. | • 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown - Carrol Rebuild / 0E11-7-B + Hunterstown -Carrol Rebuild + IEC West<br>• 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |
| 54 | 711 | Dominion | South | Regional Solution - 500 kV North Anna-Wishing Star Upgrades | $1,227.84 | Yes | Yes | Yes *(Partial)* | Offers robust solution to serve the data center loads in the dominion zone (northern Virginia). Proposal utilizes efficiently the existing ROW between Morrisville and Wishing Star. Segment between Morssisville and North Anna eliminated by PJM 500 kV solution. | • 1A / 1B / 1C / 1C-1<br>• 0E Series<br>• 0F<br>• 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |
| 55 | 719 | NextEra | West | Ft. Martin-Black Oak-Pike, Pike SVC + Cap Banks Solution | $600.90 | Yes | No | No | Does not provide the needed supply source into the Dominion northern Virginia transmission system (Load Centers) | 0E11-3 / 0E11-4 / 0E11-5 / 0E11-6 / 0E11-7 / 0E11-7-A / 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown -Carrol Rebuild / 0E11-7-B + Hunterstown -Carrol Rebuild + IEC West / 0E11-7-B Final / 0E11-8 / 0E11-9 / 0E11-10 / 0E11-11 / 0E11-12 |

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| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 56 | 728 | NextEra | East/ Northern Virginia | Barnhart Substation, Bartholow Substation, Barnhart-Bartholow-Goose Creek solution | $385.36 | Yes | No | No | • Does not provide the needed supply source into the Dominion northern Virginia transmission system (Load Centers)<br>• Barthlow substation deemed not required with the PJM selected proposal, which has much less overall impact (many 500 and 230 kV greenefield lines compared to just 2x500 kV lines under PJM proposal and without Barthlow sub) | 0E2 |
| 57 | 731 | Dominion | South | Locks Substation 230/115 kV Transformer Upgrade | $7.14 | Yes | Yes | Yes | Required for reliability needs. Most efficient or cost-effective solution | 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown - Carrol Rebuild / 0E11-7-B + Hunterstown - Carrol Rebuild + IEC West / 0E11-7-B Final<br>• 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |
| 58 | 741 | PSEG | East | Proposal G - Peach Bottom-New Brandon Shores 500 kV; Peach Bottom-Doubs 500 kV | $1,065.32 | Yes | Yes | No | • Selected incumbent proposal addresses the needs for bulk transfers between Peach Bottom and Conastone (in combination with other proposals) predominantly using existing ROW in the PB-Conastone corridor<br>• PSEG proposal to develop a line from Conastone to Doubs has already been selected part of Proposal No. 637 - in combination with PPL proposal 374 | • 0E4-1-2 / 0E11-7-B Final<br>• 0Q |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 59 | 766 | NextEra | South | Front Royal-Racefield, Warrenton-Wheeler | $239.59 | Yes | Yes | No | Not required with the development of the needed 500 kV selected proposal by PJM, particularly the 3rd 500 kV feed into Aspen and the looped 500 kV development in Dominion (Aspen-Golden-Mars). Avoids highly sensitive, high risk greenfield ROW | QT3 |
| 60 | 808 | PSEG | East | Proposal F - Peach Bottom-New Raphael-Waugh Chapel 500 kV; Peach Bottom-Doubs 500 kV | $1,150.80 | Yes | Yes | No | Immediate need proposal to address the Peach Bottom deactivation needs in BGE has a much lower risk of construction, more cost-effective and efficient solution | • 0E4-1-1 / 0E13 / 0E13-1<br>• 0S |
| 61 | 837 | POTOED - FirstEnergy | East/ West/ Northern Virginia | Data Center Reinforcement Proposal No. 1<br>• 1 - 500 kV circuits from Fort Martin-Doubs<br>• 1 - 500 kV circuit from Prutnytown-Meadow Brook-Doubs<br>• Second 500 kV from Doubs-Aspen and Rebuild the existing Doubs-Goose Creek 500 kV<br>• Rebuild Hunterstown-Caroll 115/138 kV line for 230 kV double circuit construction | $2,991.77 | Yes | No | Yes *(partial)* | • Proposal attempts to address the west-east transfer needs and voltage collapse concerns along the transfer path<br>• PJM analysis indicated that the system reliability benefits more from spreading the reinforcements for transfer between the East and West corridors instead of just the Western corridor<br>• All options provide injections into Doubs, however, no solutions offered to debottleneck the Doubs-Goose Creek corridor<br>• Currently there is no need for 2x500 kV double circuit development along the West-East corridor<br>• only 1x500kV is required part of the PJM selected solution<br>• Cost is higher than similar 500 kV proposals by other entities that provide stronger cost containment provisions<br>• Proposal utilizes existing ROWs for parts of the projects including the new Doubs-Aspen 500 kV and Huntertown-Caroll 230 kV, which | • 1A / 1B / 1C / 1C-1<br>• 2 / 2A / 2B / 2C / 2D / 2E / 2F<br>• 0E Series (except for 0E8-2 / 0E11-3 / 0E11-5 / 0E11-6)<br>• 0L |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | both components are in the list of PJM selected projects | |
| 62 | 846 | NextEra | East/ West/ Northern Virginia | Hunterstown-Doubs-Goose Creek, Black Oak-Woodside-Goose Creek, Stonewall SVC + Cap Banks | $892.94 | Yes | No | No | • The proposed 500 kV line is similar in length to the PJM selected 500 kV line from Otter Creek to Doubs, which is more effective in meeting the reliability need<br>• PJM selected 500 kV combination is more effective in meeting the reliability need | 0H/0H2 |
| 63 | 853 | NextEra | West/ Northern Virginia | 502 Junction-Black Oak-Woodside-Gant, Woodside SVC + Cap Banks | $683.55 | Yes | Yes | Yes *(partial)* | • Effective solution to address the reliability needs for West to East transfers and offers a 3rd 500 kV supply line to the load center in Dominion<br>• The selected component is modified to bypass the Black Oak and terminate at Aspen (original proposal terminate at Gant) | 0E11-3 / 0E11-4 / 0E11-5 / 0E11-6 / 0E11-7 / 0E11-7-A / 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown -Carrol Rebuild / 0E11-7-B + Hunterstown -Carrol Rebuild + IEC West / 0E11-7-B Final / 0E11-8 / 0E11-9 / 0E11-10 / 0E11-11 / 0E11-12 |
| 64 | 856 | AEP | Local AEP | Leesville-Altavista Rebuild | $28.85 | Yes | Yes | No | Not required to meet the 2022W3 needs with the selected PJM 500kV solutions (that address the primary need drivers for the window) | N/A |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 65 | 858 | AEP - Transource | Northern Virginia | Stork-Flys 500 kV Greenfield Line and Substations | $510.44 | Yes | Yes | No | High constructability risk (proposes use of Loudoun County roadways which was deemed high concern by VDOT officials) and technically inferior to the PJM selected 500 kV development in the area. | • 2A<br>• 0A<br>• 0M |
| 66 | 904 | AEP - Transource | West/ South | Joshua Falls-Yeat 765 kV Greenfield Line and Substation | $1,048.10 | Yes | Yes | No | Project proposes new, greenfield 765 kV development close to 135 miles long. Introduces high risk to area reliability due to delayed project construction and in service year risk. PJM selected 500 kV solution addresses the need cost-effective and efficiently. The 765 kV solution could be pursued part of the longer term solutions in the area depending on how load and generation materialize. | • 2F<br>• 0A<br>• 0E8 / 0E8-1/ 0E8-1-1 / 0E8-2 / 0E8-2-1 / 0E8-2-2 / 0E11-4 / 0E11-5 / 0E11-7-B + Yeat / 0E11-10-A / 0E11-11 |
| 67 | 923 | Dominion | South | Second 500 kV line from Lexington to Dooms | $232.18 | Yes | Yes | No | Not required under the 2027/28 analysis scenario | • 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: 2027 Model | Meet Reliability Needs In: 2028 Model | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| 68 | 948 | NextEra | East/ Northern Virginia | New 500/230 kV Bartholow substation, new 500/230 kV North Delta substation, new 230 kV Grisham switchyard, new 500/230 kV Goram substation, and Keeney to Waugh Chapel tie-in. | $5,381.25 * | Yes | Yes | No | • New substation (Barthlow) not needed part of the selected solution set<br>• Major substation with 12x230 and 500kV lines terminating into it that could be eliminated by PJM selected 500 kV solutions<br>• No need for a new North Delta substation (one already approved and well-ahead through process)<br>• Grisham and Goran substations are both new proposed substation, which are both avoided under the PJM selected proposal<br>• The proposal includes expensive ~4Bn and high constructability/schedule risk additional 2x230 kV circuits across the Chesapeake bay | • 0E4-1-3<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0B |
| 69 | 951 | NextEra | West/ Northern Virginia | Black Oak-Gore-Goose Creek, Pike SVC + Cap Bank Solution | $419.86 | Yes | No | No | Does not provide the needed supply source into the Dominion northern Virginia transmission system (Load Centers) | 0E11-3 / 0E11-4 / 0E11-5 / 0E11-6 / 0E11-7 / 0E11-7-A / 0E11-7-B / 0E11-7-B + Yeat / 0E11-7-B +IEC West / 0E11-7-B + Hunterstown -Carrol Rebuild / 0E11-7-B + Hunterstown -Carrol Rebuild + IEC West / 0E11-7-B Final / 0E11-8 / 0E11-9 / 0E11-10 / 0E11-11 / 0E11-12 |
| 70 | 962 | PSEG | East | Proposal H - Peach Bottom-Doubs 500 kV (Circuits No. 1 and No. 2) | $977.71 | Yes | Yes | No | See comments associated with Proposal No. 741 | N/A |
| 71 | 967 | Dominion | South | Charlottesville-Hollymead Line No. 2054 Rebuild | $183.48 | Yes | Yes | Yes *(partial)* | Required for reliability needs. Considers future load growth in Culpeper and Louisa area by supporting 500 kV developments with double-circuit capable 500/230 kV poles. | • 0E11-7-B Final<br>• 0G<br>• 0H / 0H2<br>• 0I<br>• 0J / 0J-2 / 0J-3<br>• 0K<br>• 0L<br>• 0M<br>• 0N<br>• 0O / 0O2 / 0O3<br>• 0P / 0P2 / 0P NGME<br>• 0Q / 0Q2 / 0Q3 / 0Q4<br>• 0R / 0R2<br>• 0S |

| # | Proposal ID | Proposing Entity | Focus Area (s) | Project Title | Submitted Cost ($M) | Meet Reliability Needs In: | | Selected Y/N | Rationale | Applicable Scenarios |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2027 Model | 2028 Model | | | |
| 72 | 977 | AEP - Transource | South | Yeat 500/230 kV Greenfield Station | $232.14 | Yes | Yes | No | Project proposes new, greenfield 765 kV development close to 135 miles long. Introduces high risk to area reliability due to delayed project construction and in service year risk. PJM selected 500 kV solution addresses the need cost-effective and efficiently. The 765 kV solution could be pursued part of the longer term solutions in the area depending on how load and generation materialize. | • 0A<br>• 0E6 / 0E6-1 / 0E7 |

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## Critical Substation Planning Analysis

The Critical Substation Planning Analysis (CSPA)[4] was created as an extension of the PJM Transmission Owners' Attachment M-4 process. The purpose of the CSPA is to conduct additional screening as part of a five-year annual PJM RTEP cycle to ensure no new CIP-14 facilities is introduced to the PJM system as the transmission network evolves.

PJM CSPA evaluates system reinforcements, consistent with RTEP CSPA methodology as described in Section 2.9 of Manual 14B. CSPA is performed to identify Instability, Uncontrolled Separation, or Cascading resulting in one or more of the following outcomes due to the loss of all voltage levels 69 kV and above at a single transmission facility that meet the NERC CIP-14 substation criteria.

- Loss of load approaching 1000 MW
- Three levels of facility trips
- Case non-convergence issue in steady-state or dynamic analysis covering both angular and voltage stability tests

For 2022 Window 3, PJM conducted CSPA for proposals in 12 scenarios based on PJM RTEP 2028 summer peak case. No new critical substation was identified due to selected system upgrades in 2020 Window 3.

## Power System Stability Analysis

The 2022 Window 3 needs are predominantly driven by steady state (both thermal and voltage) reliability violations. However, PJM conducted stability analysis to ensure the final recommended solution meet all applicable planning stability criteria (PJM, NERC, and Local Transmission Owner criteria) with the PJM-selected reinforcements capturing the impact of the load increase, change in generation resource mix and dispatch pattern. The dynamic performance of PJM system with the final selected solution was analyzed from three key stability aspects: transient (angle) stability, small signal (damping) stability and transient voltage stability.

Critical system conditions for stability analysis on the PJM system are generally characterized by light load and peak load conditions. In this stability study, PJM RTEP 2028 summer peak and light load dynamics cases were used. The assumptions used for generation dispatch can be critical to the stability results. PJM followed PJM's stability dispatch methodology to create conservative system conditions for stability analysis. Dynamic models of the proposed STATCOMs at Stonewall, Mars, Beaumeade, Granite and Brighton stations were properly incorporated in the study dynamics cases.

PJM selected more than 70 critical NERC Planning events (P1, P4, P6 and P7) at 22 key substations associated with the final solution from East, West, South and Northern Virginia data center loads areas. The critical contingencies were selected based on system topology, loading interruption size by contingency events, and the size of dynamic reactive devices, as well as past study experiences and engineering judgement. PSS/E, which is well-accepted

[4] *See* PJM Manual 14B, section 2.9

power system analysis software, was used as a stability simulation tool. The findings from the stability study are summarized as follows:

- No potential stability criteria violations were identified.
- There are no transient (angle) stability issues at major generation stations including Peach Bottom, Limerick and North Anna nuclear plants.
- PJM system demonstrated acceptable damping performance after system disturbances by the contingencies.
- No transient voltage recovery performance issue around major load centers was identified.

# Appendix A: Scope of Final Reliability Analysis

PJM seeks technical solutions, also called proposals, to resolve potential reliability criteria violations on facilities identified below in accordance with all applicable planning criteria (PJM, NERC, SERC, RFC and Local Transmission Owner criteria).

## Criterion Applied by PJM for this Proposal Window

- 2027–28 Summer
- Baseline Thermal and Voltage N-1 Contingency Analysis
- Generator Deliverability and Common Mode Reliability Analysis
- N-1-1 Thermal and Voltage Analysis and Voltage Collapse
- Load Deliverability Thermal and Voltage Analysis
- Dynamic Stability Assessment
- 2027–28 Winter
- Baseline Thermal and Voltage N-1 Contingency Analysis
- Generator Deliverability and Common Mode Reliability Analysis
- N-1-1 Thermal and Voltage Analysis and Voltage Collapse
- Load Deliverability Thermal and Voltage Analysis
- Dynamic Stability Assessment
- 2027–28 Light Load
- Baseline Thermal and Voltage N-1 Contingency Analysis
- Generator Deliverability and Common Mode Reliability Analysis

# Appendix B: Window 3 Scenarios and Screening Performance

Listed below are high-level descriptions and screening performance of some of the major scenarios.

## Scenario 1A

### Scenario Components

Primary Incumbent TOs Proposals – regional components

- Exelon: 2022-W3-344/660
- Rebuild 5012 500 kV ( will be looped in to West Cooper and Gracetone)
- West Cooper-Peach Bottom South New 500 kV Line
- West Cooper-High Ridge 500 kV
- FE: 2022-W3-837
- Fort Martin-Doubs 500 No. 1
- DOM: 2022-W3-711
- New 500 kV Line (North Anna-Spotsylvania)
- New 500 kV Line (Spotsylvania to Vint Hill)
- New 500 kV Line (Vint Hill to Wishing Star)
- DOM/FE: 2022-W3-516/837
- Aspen-Doubs Second 500 kV Line
- Line No. 514 (Goose Creek-Doubs) Rebuild
- DOM: 2022-W3-692 (include 230 kV)
- Aspen-Golden 500 kV Line Build
- New Mars-Golden 500 kV
- Aspen to Goose Creek 500 kV

### 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 34 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 1 |
| 138 kV Overloads | 20 |
| 115 kV Overloads | 6 |

### 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 74 |
| 500 kV Overloads | 14 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 27 |
| 138 kV Overloads | 14 |
| 115 kV Overloads | 10 |

# Scenario 1B

## Scenario Components

Primary Incumbent TOs Proposals – No Dominion South – regional components

- Exelon: 2022-W3-344/660
- Rebuild 5012 500 kV ( will be looped in to West Cooper and Gracetone)
- West Cooper-Peach Bottom South New 500 kV Line
- West Cooper-High Ridge 500 kV
- FE: 2022-W3-837
- Fort Martin-Doubs 500 No. 1
- DOM/FE: 2022-W3-516/837
- Aspen-Doubs Second 500 kV Line
- Line No. 514 (Goose Creek-Doubs) Rebuild
- DOM: 2022-W3-692 (include 230 kV)
- Aspen-Golden 500 kV Line Build
- New Mars-Golden 500 kV
- Aspen to Goose Creek 500 kV

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 54 |
| 500 kV Overloads | 10 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 6 |
| 138 kV Overloads | 26 |
| 115 kV Overloads | 5 |

# Scenario 1C

## Scenario Components

Primary Incumbent TOs Proposals – regional components – use TRANSRC ID 487 east component (IEC-East)

- Transource: 2022-W3-487 IEC-East
- Furnace Run 500/230 kV station
- Furnace Run-Conastone 230 kV
- Furnace Run-Gracetone 230 kV
- FE: 2022-W3-837
- Fort Martin-Doubs 500 No. 1
- DOM: 2022-W3-711
- New 500 kV Line (North Anna-Spotsylvania)
- New 500 kV Line (Spotsylvania to Vint Hill)
- New 500 kV Line (Vint Hill to Wishing Star)
- DOM/FE: 2022-W3-516/837
- Aspen-Doubs Second 500 kV Line
- Line No. 514 (Goose Creek-Doubs) Rebuild
- DOM: 2022-W3-692 (include 230 kV)
- Aspen-Golden 500 kV Line Build
- New Mars-Golden 500 kV
- Aspen to Goose Creek 500 kV

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 49 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 5 |
| 138 kV Overloads | 25 |
| 115 kV Overloads | 11 |

# Scenario 1C-1

## Scenario Components

Primary Incumbent TOs Proposals – regional components – use TRANSRC ID 487 east component (IEC-East) + b3737

- Transource: 2022-W3-487 IEC-East
- Furnace Run 500/230 kV station
- Furnace Run-Conastone 230 kV
- Furnace Run-Gracetone 230 kV
- B3737
- North Delta 500/230 and N. Delta-Graceton 230 kV
- FE: 2022-W3-837
- Fort Martin-Doubs 500 No. 1
- DOM: 2022-W3-711
- New 500 kV Line (North Anna-Spotsylvania)
- New 500 kV Line (Spotsylvania to Vint Hill)
- New 500 kV Line (Vint Hill to Wishing Star)
- DOM/FE: 2022-W3-516/837
- Aspen-Doubs Second 500 kV Line
- Line No. 514 (Goose Creek-Doubs) Rebuild
- DOM: 2022-W3-692 (include 230 kV)
- Aspen-Golden 500 kV Line Build
- New Mars-Golden 500 kV
- Aspen to Goose Creek 500 kV

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 40 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 2 |
| 138 kV Overloads | 23 |
| 115 kV Overloads | 10 |

# Scenario 2

## Scenario Components

Primary Incumbent TOs Proposals – regional components – Upgrade F Royal-Morsvl + NextEra - ND – Conastone + Full DOM local

- NEET: 2022-W3-530
- North Delta-Conastone 500 kV
- FE: 2022-W3-837
- Fort Martin-Doubs 500 No. 1
- DOM: 2022-W3-671
- Line No. 541 (Front Royal to Morrisville) Rebuild
- DOM/FE: 2022-W3-516/837
- Aspen-Doubs Second 500 kV Line
- Line No. 514 (Goose Creek-Doubs) Rebuild
- DOM: 2022-W3-692 (include 230 kV)
- Aspen-Golden 500 kV Line Build
- New Mars-Golden 500 kV
- Aspen to Goose Creek 500 kV

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 88 |
| 500 kV Overloads | 17 |
| 345 kV Overloads | 1 |
| 230 kV Overloads | 16 |
| 138 kV Overloads | 32 |
| 115 kV Overloads | 12 |

# Scenario 2A

## Scenario Components

Primary Incumbent TOs Proposals – regional components – Upgrade F Royal-Morsvl + NextEra - ND – Conastone + TRANSC - 500 kV UG

- NEET: 2022-W3-530
- North Delta-Conastone 500 kV
- FE: 2022-W3-837
- Fort Martin-Doubs 500 No. 1
- DOM: 2022-W3-671
- Line No. 541 (Front Royal to Morrisville) Rebuild
- DOM/FE: 2022-W3-516/837
- Aspen-Doubs Second 500 kV Line
- Line No. 514 (Goose Creek-Doubs) Rebuild
- Transource: 2022-W3-858
- Stork-Flys 500 kV Underground Line

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 83 |
| 500 kV Overloads | 14 |
| 345 kV Overloads | 1 |
| 230 kV Overloads | 17 |
| 138 kV Overloads | 32 |
| 115 kV Overloads | 11 |

# Scenario 2B

## Scenario Components

Primary Incumbent TOs Proposals – regional components – Upgrade F Royal-Morsvl + NextEra - ND – Conastone + LSP - 500 kV UG

- NEET: 2022-W3-530
- North Delta-Conastone 500 kV
- FE: 2022-W3-837
- Fort Martin-Doubs 500 No. 1
- DOM: 2022-W3-671
- Line No. 541 (Front Royal to Morrisville) Rebuild
- DOM/FE: 2022-W3-516/837
- Aspen-Doubs Second 500 kV Line
- Line No. 514 (Goose Creek-Doubs) Rebuild
- LS Power: 2022-W3-548
- Goose Creek-Beaumeade 500 kV

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 96 |
| 500 kV Overloads | 17 |
| 345 kV Overloads | 1 |
| 230 kV Overloads | 24 |
| 138 kV Overloads | 32 |
| 115 kV Overloads | 12 |

# Scenario 2C

## Scenario Components

Primary Incumbent TOs Proposals – regional components – NextEra - ND – Conastone + LSP - West 500 kV FRoyl-Vhill

- NEET: 2022-W3-530
- North Delta-Conastone 500 kV
- FE: 2022-W3-837
- Fort Martin-Doubs 500 No. 1
- LS Power: 2022-W3-548
- Front Royal –VintHill 500 kV
- DOM/FE: 2022-W3-516/837
- Aspen-Doubs Second 500 kV Line
- Line No. 514 (Goose Creek-Doubs) Rebuild
- DOM: 2022-W3-692 (include 230 kV)
- Aspen-Golden 500 kV Line Build
- New Mars-Golden 500 kV
- Aspen to Goose Creek 500 kV

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 48 |
| 500 kV Overloads | 6 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 1 |
| 138 kV Overloads | 25 |
| 115 kV Overloads | 11 |

# Scenario 2D

## Scenario Components

Primary Incumbent TOs Proposals – regional components – NextEra - ND – Conastone + PSEG Bramb-HinsonsF 500 kV

- NEET: 2022-W3-530
- North Delta-Conastone 500 kV
- FE: 2022-W3-837
- Fort Martin-Doubs 500 No. 1
- PSEG: 2022-W3-325
- Brambleton-Hinsons Ford 500 kV
- DOM/FE: 2022-W3-516/837
- Aspen-Doubs Second 500 kV Line
- Line No. 514 (Goose Creek-Doubs) Rebuild
- DOM: 2022-W3-692 (include 230 kV)
- Aspen-Golden 500 kV Line Build
- New Mars-Golden 500 kV
- Aspen to Goose Creek 500 kV

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 49 |
| 500 kV Overloads | 6 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 2 |
| 138 kV Overloads | 25 |
| 115 kV Overloads | 11 |

# Scenario 2E

## Scenario Components

Primary Incumbent TOs Proposals – regional components – NextEra - ND – Conastone + Hunt-Doubs 500 kV

- NEET: 2022-W3-530
- North Delta-Conastone 500 kV
- NEET: 2022-W3-445
- Hunterstown -Doubs 500 kV
- DOM: 2022-W3-671
- Line No. 541 (Front Royal to Morrisville) Rebuild
- DOM/FE: 2022-W3-516/837
- Aspen-Doubs Second 500 kV Line
- Line No. 514 (Goose Creek-Doubs) Rebuild
- DOM: 2022-W3-692 (include 230 kV)
- Aspen-Golden 500 kV Line Build
- New Mars-Golden 500 kV
- Aspen to Goose Creek 500 kV

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 84 |
| 500 kV Overloads | 14 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 22 |
| 138 kV Overloads | 34 |
| 115 kV Overloads | 6 |

# Scenario 2F

## Scenario Components

Primary Incumbent TOs Proposals – regional components – TRASRC - 765 kV + NextEra - ND – Conastone + Full DOM local

- NEET: 2022-W3-530
- North Delta-Conastone 500 kV
- Transource: 2022-W3-904
- Joshua Falls to Yeat 765 kV
- DOM/FE: 2022-W3-516/837
- Aspen-Doubs Second 500 kV Line
- Line No. 514 (Goose Creek-Doubs) Rebuild
- DOM: 2022-W3-692 (include 230 kV)
- Aspen-Golden 500 kV Line Build
- New Mars-Golden 500 kV
- Aspen to Goose Creek 500 kV

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 78 |
| 500 kV Overloads | 10 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 10 |
| 138 kV Overloads | 33 |
| 115 kV Overloads | 11 |

# Scenario 0A

## Scenario Components

- Transource: 2022-W3-487
- Transource: 2022-W3-904
- Transource: 2022-W3-977
- Transource: 2022-W3-858

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 18 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 1 |
| 230 kV Overloads | 4 |
| 138 kV Overloads | 8 |
| 115 kV Overloads | 1 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 113 |
| 500 kV Overloads | 13 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 47 |
| 138 kV Overloads | 11 |
| 115 kV Overloads | 27 |

# Scenario 0B

## Scenario Components

- NEET: 2022-W3-175

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 23 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 2 |
| 138 kV Overloads | 13 |
| 115 kV Overloads | 2 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 28 |
| 500 kV Overloads | 4 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 9 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 4 |

## 7,500 MW OSW Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 52 |
| 500 kV Overloads | 9 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 24 |
| 138 kV Overloads | 4 |
| 115 kV Overloads | 4 |

## 11,000 MW OSW Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 74 |
| 500 kV Overloads | 12 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 31 |
| 138 kV Overloads | 4 |
| 115 kV Overloads | 4 |

# Scenario 0B2

## Scenario Components

- NEET: 2022-W3-175
- Removal of two 230 kV line from Warrenton-Rixlew/Hourglass, 500 kV line from Front Royal-New Wishing Star

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 28 |
| 500 kV Overloads | 3 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 10 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 4 |

# Scenario 0B3

## 2028 Scenario Components

- NEET: 2022-W3-175
- Removal of two 230 kV line from Warrenton-Rixlew/Hourglass, 500 kV line from Front Royal-New Wishing Star
- Removal of Keeney to Waugh Chapel 230 kV circuit 1 and 2

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 40 |
| 500 kV Overloads | 6 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 20 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 7 |

# Scenario 0C

## Scenario Components

- NEET: 2022-W3-598

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 23 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 2 |
| 138 kV Overloads | 13 |
| 115 kV Overloads | 2 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 39 |
| 500 kV Overloads | 6 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 17 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 6 |

# Scenario 0D

## Scenario Components

- LS Power: 2022-W3-548

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 21 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 2 |
| 138 kV Overloads | 11 |
| 115 kV Overloads | 2 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 93 |
| 500 kV Overloads | 17 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 38 |
| 138 kV Overloads | 6 |
| 115 kV Overloads | 21 |

# Scenario 0E

## Scenario Components

1A_ALL

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837
- DOM: 2022-W3-711
- DOM/FE: 2022-W3-516/837
- DOM: 2022-W3-692

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 24 |
| 500 kV Overloads | 0 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 1 |
| 138 kV Overloads | 16 |
| 115 kV Overloads | 3 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 57 |
| 500 kV Overloads | 13 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 26 |
| 138 kV Overloads | 4 |
| 115 kV Overloads | 6 |

# Scenario 0E1

## Scenario Components

0E + PPL (374) + PSEG (637 component 5 and 8) → It will 0E +PPL (Otter to Conastone 500 kV) + PSEG (Conastone to Doubs 500 kV)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837
- DOM: 2022-W3-711
- DOM/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8

### 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 22 |
| 500 kV Overloads | 0 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 1 |
| 138 kV Overloads | 15 |
| 115 kV Overloads | 2 |

### 7,500 MW OSW Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 57 |
| 500 kV Overloads | 10 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 33 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 4 |

### 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 33 |
| 500 kV Overloads | 3 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 19 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 4 |

### 11,000 MW OSW Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 80 |
| 500 kV Overloads | 15 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 41 |
| 138 kV Overloads | 8 |
| 115 kV Overloads | 5 |

# Scenario 0E2

## Scenario Components

0E + PSEG (229 component 8&9) → It will be 0E + PSEG (Hunterstown to Green Valley 500 kV)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837
- DOM: 2022-W3-711
- DOM/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PSEG: 2022-W3-229 – only component 8&9

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 53 |
| 500 kV Overloads | 16 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 27 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 3 |

# Scenario 0E3

## Scenario Components

0E Modified (500 kV Morrisville Start)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837
- DOM: 2022-W3-711 Modified
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 57 |
| 500 kV Overloads | 13 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 27 |
| 138 kV Overloads | 4 |
| 115 kV Overloads | 6 |

# Scenario 0E4

## Scenario Components

0E1 + T-Point (loop Conastone-Brighton, Brighton-Doubs and Conastone-Doubs 500 kV)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837
- DOM: 2022-W3-711
- DOM/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374 – (Otter Creek-Conastone 500 kV)
- PSEG: 2022-W3-637 – only component 5&8 (Conastone-Doubs 500 kV new line)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 35 |
| 500 kV Overloads | 5 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 19 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 4 |

# Scenario 0E4-1

## Scenario Components

0E4 and bypass the Otter Creek-Conastone-T-Point at Conastone (the new line will be Otter Creek-T-Point 500 kV)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374 –(Otter Creek-Conastone 500 kV)
- PSEG: 2022-W3-637 – only component 5&8 (Conastone-Doubs 500 kV new line)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 34 |
| 500 kV Overloads | 4 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 19 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 4 |

# Scenario 0E4-1-1

## Scenario Components

0E4-1 and replace Cooper-High Ridge 500 kV with Peach Bottom-Waugh Chapel 500 kV

- Exelon: 2022-W3-344/660 – Remove component 3&7 (Remove Cooper-High Ridge 500 kV and High Ridge 500/230 kV transformers)
- FE: 2022-W3-837
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374 –(Otter Creek-Conastone 500 kV)
- PSEG: 2022-W3-637 – only component 5&8 (Conastone-Doubs 500 kV new line)
- PSEG: 2022-W3-808 – Add Peach Bottom-Waugh Chapel 500 kV – exclude/bypass Raphael 500 kV bus

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 38 |
| 500 kV Overloads | 5 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 22 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 4 |

# Scenario 0E4-1-2

## Scenario Components

0E4-1 and replace Cooper-High Ridge 500 kV with Peach Bottom-Brandon Shore 500 kV

- Exelon: 2022-W3-344/660 – Remove component 3&7 (Remove Cooper-High Ridge 500 kV and High Ridge 500/230 kV transformers)
- FE: 2022-W3-837
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374 –(Otter Creek-Conastone 500 kV)
- PSEG: 2022-W3-637 – only component 5&8 (Conastone-Doubs 500 kV new line)
- PSEG: 2022-W3-741 – Add Peach Bottom-Brandon Shore 500 kV

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 39 |
| 500 kV Overloads | 6 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 21 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 5 |

# Scenario 0E4-1-3

## Scenario Components

0E4-1 and replace Cooper-High Ridge 500 kV with Keeney-Waugh 230 kV double circuit

- Exelon: 2022-W3-344/660 – Remove component 3&7 (Remove Cooper-High Ridge 500 kV and High Ridge 500/230 kV transformers)
- FE: 2022-W3-837
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374 (Otter Creek-Conastone 500 kV)
- PSEG: 2022-W3-637 – only component 5&8 (Conastone-Doubs 500 kV new line)
- NextEra: 2022-W3-948 – Add Keeney-Waugh 230 kV double circuit

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 39 |
| 500 kV Overloads | 6 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 18 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 5 |

# Scenario 0E5

## Scenario Components

0E1 – FE 837 (component C18-30) + TRANSRC 487 (Component IEC-West)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374 – (Otter Creek-Conastone 500 kV)
- PSEG: 2022-W3-637 – only component 5&8 (Conastone-Doubs 500 kV new line)
- Remove FE: 2022-W3-837 component C18-30_MAIT_Germantown-Carroll
- Add TRANSRC: 2022-W3-487 component IEC-West

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 33 |
| 500 kV Overloads | 4 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 21 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 2 |

# Scenario 0E6

## Scenario Components

0E3 (500 kV Morrisville Start) - remove part of FE 837(Fort Martin-Doubs 500 kV) + Add Part of 977 (Yeat sub and Joshua-Yeat 765 kV line)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837 Modified (remove Fort Martin-Doubs 500 kV)
- DOM: 2022-W3-711 Modified
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- Transource: 2022-W3-977 (only add Yeat sub and Joshua-Yeat 765 kV line)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 55 |
| 500 kV Overloads | 11 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 23 |
| 138 kV Overloads | 9 |
| 115 kV Overloads | 6 |

# Scenario 0E6-1

## Scenario Components

0E6_Remove Prnty-Mt. Storm & Meadow Brook-Doubs

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837 Modified (remove Fort Martin-Doubs 500 kV)
- DOM: 2022-W3-711 Modified
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- Transource: 2022-W3-977 (only add Yeat sub and Joshua-Yeat 765 kV line)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 66 |
| 500 kV Overloads | 11 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 23 |
| 138 kV Overloads | 17 |
| 115 kV Overloads | 7 |

# Scenario 0E7

## Scenario Components

0E6 - remove all FE 837

- Exelon: 2022-W3-344/660
- DOM: 2022-W3-711 Modified
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- Transource: 2022-W3-977 (only add Yeat sub and Joshua-Yeat 765 kV line)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 75 |
| 500 kV Overloads | 12 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 22 |
| 138 kV Overloads | 20 |
| 115 kV Overloads | 10 |

# Scenario 0E8

## Scenario Components

0E1 + Removal of remove Doubs-Fort Martin No. 1 500 kV & Pruntytown-Mt. Storm 500 kV & Meadowbrook-Doubs 500 kV lines and add Joshua Falls to Yeat 765 kV line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837 – Removal of Doubs-Fort Martin No. 1 500 kV & Pruntytown-Mt. Storm 500 kV & Meadowbrook-Doubs 500 kV line(s)
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- Transource: 2022-W3-904-Joshua Falls (AEP) to Yeat (Transource) 765 kV

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 40 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 17 |
| 138 kV Overloads | 11 |
| 115 kV Overloads | 5 |

# Scenario 0E8-1

## Scenario Components

0E1 + Removal of remove Doubs-Fort Martin No. 1 500 kV & Pruntytown-Mt. Storm 500 kV & Meadowbrook-Doubs 500 kV lines and add Joshua Falls to Yeat 765 kV line + Removal of North Anna to Morrisville 500 kV line + Removal of Golden-Mars 500 kV line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837 – Removal of Doubs-Fort Martin No. 1 500 kV & Pruntytown-Mt. Storm 500 kV & Meadowbrook-Doubs 500 kV line(s)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- Transource: 2022-W3-904 – Joshua Falls (AEP) to Yeat (Transource) 765 kV

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 38 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 15 |
| 138 kV Overloads | 11 |
| 115 kV Overloads | 5 |

# Scenario 0E8-1-1

## Scenario Components

0E8-1 + Remove Golden-Mars 230 kV side line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837 – Removal of Doubs-Fort Martin No. 1 500 kV & Pruntytown-Mt. Storm 500 kV & Meadowbrook-Doubs 500 kV line(s)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- Transource: 2022-W3-904 – Joshua Falls (AEP) to Yeat (Transource) 765 kV

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 39 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 16 |
| 138 kV Overloads | 11 |
| 115 kV Overloads | 5 |

# Scenario 0E8-2

## Scenario Components

0E8-1 + Remove the rest of the FE837 + Add Transouce 487 (Component IEC-West only)

- Exelon: 2022-W3-344/660
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- Transource: 2022-W3-904 – only Joshua Falls (AEP) to Yeat (Transource) 765 kV
- Transource: 2022-W3-487 (Component IEC-West only)

### 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 29 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 1 |
| 230 kV Overloads | 2 |
| 138 kV Overloads | 17 |
| 115 kV Overloads | 2 |

### 7,500 MW OSW Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 57 |
| 500 kV Overloads | 9 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 31 |
| 138 kV Overloads | 7 |
| 115 kV Overloads | 2 |

### 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 31 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 16 |
| 138 kV Overloads | 6 |
| 115 kV Overloads | 2 |

### 11,000 MW OSW Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 75 |
| 500 kV Overloads | 12 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 38 |
| 138 kV Overloads | 11 |
| 115 kV Overloads | 2 |

# Scenario 0E8-2-1

## Scenario Components

0E8-2 + Remove Golden-Mars 230 kV side line

- Exelon: 2022-W3-344/660
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- Transource: 2022-W3-904 – only Joshua Falls (AEP) to Yeat (Transource) 765 kV
- Transource: 2022-W3-487 (Component IEC-West only)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 32 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 17 |
| 138 kV Overloads | 6 |
| 115 kV Overloads | 2 |

# Scenario 0E8-2-2

## Scenario Components

0E8-2-1 + Remove uprate on 500 kV Line Meadow Brook-Vint Hill

- Exelon: 2022-W3-344/660
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- Transource: 2022-W3-904 – only Joshua Falls (AEP) to Yeat (Transource) 765 kV
- Transource: 2022-W3-487 (Component IEC-West only)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 32 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 17 |
| 138 kV Overloads | 6 |
| 115 kV Overloads | 2 |

# Scenario 0E9

## Scenario Components

0E1 + Modified DOM_711 (500 kV Morrisville Start) + Modified DOM_692 (Remove Golden-2-Mars Extension)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837
- DOM: 2022-W3-711 Modified (500 kV Morrisville Start)
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 Modified (Remove Golden-2-Mars Extension)
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 35 |
| 500 kV Overloads | 3 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 20 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 5 |

# Scenario 0E10

## Scenario Components

0E1 modified (the Otter Creek-Conastone-Doubs 500 kV circuit will bypass the Conastone station and will be Otter Creek-Doubs 500 kV)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 37 |
| 500 kV Overloads | 4 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 21 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 5 |

# Scenario 0E11

## Scenario Components

0E1 + Removal of remove Doubs-Fort Martin No. 1 500 kV line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837 – Removal of Doubs-Fort Martin No. 1 500 kV line
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 46 |
| 500 kV Overloads | 4 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 23 |
| 138 kV Overloads | 7 |
| 115 kV Overloads | 5 |

# Scenario 0E11-1

## Scenario Components

0E1 + Removal of remove Doubs-Fort Martin No. 1 500 kV line + Removal of North Anna to Morrisville 500 kV line+ Removal of Golden-Mars 500 kV line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837 – Removal of Doubs-Fort Martin No. 1 500 kV line
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 45 |
| 500 kV Overloads | 4 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 23 |
| 138 kV Overloads | 7 |
| 115 kV Overloads | 5 |

# Scenario 0E11-1-1

## Scenario Components

0E11-1 + Remove Golden-Mars 230 kV side line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837 – Removal of Doubs-Fort Martin No. 1 500 kV line
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 46 |
| 500 kV Overloads | 4 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 24 |
| 138 kV Overloads | 7 |
| 115 kV Overloads | 5 |

# Scenario 0E11-2

## Scenario Components

0E11-1-1 + Remove Pruntytown to Mt.Storm and Meadow Brook to Doubs 500 kV line & Add Fort Martin to Doubs 500 kV line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837 – Remove Pruntytown to Mt.Storm and Meadow Brook to Doubs 500 kV lines, Add Fort Martin to Doubs 500 kV line
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 38 |
| 500 kV Overloads | 6 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 19 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 5 |

# Scenario 0E11-3

## Scenario Components

0E11-1-1 + Remove all FE 2022-W3 -837 + Add NextEra 2022-W3-853

- Exelon: 2022-W3-344/660
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- NextEra: 2022-W3-853

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 37 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 19 |
| 138 kV Overloads | 4 |
| 115 kV Overloads | 7 |

# Scenario 0E11-4

## Scenario Components

0E11-3 + Add Joshua Falls-Yeat 765 kV line

- Exelon: 2022-W3-344/660
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- NextEra: 2022-W3-853
- Transource: 2022-W3-904 – only Joshua Falls (AEP) to Yeat (Transource) 765 kV & Yeat 765/500 kV substation

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 31 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 14 |
| 138 kV Overloads | 7 |
| 115 kV Overloads | 5 |

# Scenario 0E11-5

## Scenario Components

0E11-4 + Remove uprate on 500 kV Line Meadow Brook-Vint Hill

- Exelon: 2022-W3-344/660
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- NextEra: 2022-W3-853
- Transource: 2022-W3-904 – only Joshua Falls (AEP) to Yeat (Transource) 765 kV & Yeat 765/500 kV substation

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 31 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 14 |
| 138 kV Overloads | 7 |
| 115 kV Overloads | 5 |

# Scenario 0E11-6

## Scenario Components

0E11-3 + Remove Otter Creek-Conastone-Doubs 500 kV

- Exelon: 2022-W3-344/660
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- NextEra: 2022-W3-853

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 60 |
| 500 kV Overloads | 11 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 27 |
| 138 kV Overloads | 7 |
| 115 kV Overloads | 9 |

# Scenario 0E11-7

## Scenario Components

0E11-3+ (bypass Conastone for the Otter Creek-Doubs line) +/- reactive

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- NextEra: 2022-W3-853
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 33 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 18 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 6 |

# Scenario 0E11-7-A

## Scenario Components

0E11-7 with full proposal 692 modeled

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- NextEra: 2022-W3-853
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 33 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 18 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 6 |

# Scenario 0E11-7-B

## Scenario Components

0E11-7-A + bypass Black Oak + AEP 410 (cloverdale breaker) + DOM additional_Post Fixes

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- NextEra: 2022-W3-853 (Bypass Black Oak)
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar
- AEP: 2022-W3-410
- DOM Additional:
- 2022-W3-30: Line No. 2054 (Charlottesville to Hollymead) Rebuild (Option 1) (exclude DNH portion for now)
- 2022-W3-704: Line No. 2135 (Holly Meade to Gordonsville) Rebuild (Option 1)
- 2022-W3-731: Locks Substation 230/115 kV Transformer Upgrade
- 2022-W3-74: Line No. 2090 (Ladysmith to Fredericksburg) Rebuild
- Post Fixes:
  - Line No. 256 Rebuild St. Johns-Ladysmith CT
  - Sterling Park-Golden
  - Davis Drive-Sterling Park

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 26 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 12 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 6 |

## 2030 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 60 |
| 500 kV Overloads | 12 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 22 |
| 138 kV Overloads | 11 |
| 115 kV Overloads | 9 |

# Scenario 0E11-7-B + Yeat

## Scenario Components

0E11-7-B + YEAT 765 kV line

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- NextEra: 2022-W3-853 (Bypass Black Oak)
- Transource: 2022-W3-904 (only include Yeat sub and Joshua Falls-Yeat 765 kV line)
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar
- AEP: 2022-W3-410
- DOM Additional:
- 2022-W3-30: Line No. 2054 (Charlottesville to Hollymead) Rebuild (Option 1) (exclude DNH portion for now)
- 2022-W3-704: Line No. 2135 (Holly Meade to Gordonsville) Rebuild (Option 1)
- 2022-W3-731: Locks Substation 230/115 kV Transformer Upgrade
- 2022-W3-74: Line No. 2090 (Ladysmith to Fredericksburg) Rebuild
- Post Fixes:
  - Line No. 256 Rebuild St. Johns-Ladysmith CT
  - Sterling Park-Golden
  - Davis Drive-Sterling Park

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 25 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 9 |
| 138 kV Overloads | 6 |
| 115 kV Overloads | 5 |

## 2030 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 50 |
| 500 kV Overloads | 9 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 15 |
| 138 kV Overloads | 12 |
| 115 kV Overloads | 7 |

# Scenario 0E11-7-B + IEC West

## Scenario Components

0E11-7-B + IEC West

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- NextEra: 2022-W3-853 (Bypass Black Oak)
- Transource: 2022-W3-487(only include IEC West)
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar
- AEP: 2022-W3-410
- DOM Additional:
- 2022-W3-30: Line No. 2054 (Charlottesville to Hollymead) Rebuild (Option 1) (exclude DNH portion for now)
- 2022-W3-704: Line No. 2135 (Holly Meade to Gordonsville) Rebuild (Option 1)
- 2022-W3-731: Locks Substation 230/115 kV Transformer Upgrade
- 2022-W3-74: Line No. 2090 (Ladysmith to Fredericksburg) Rebuild
- Post Fixes:
  - Line No. 256 Rebuild St. Johns-Ladysmith CT
  - Sterling Park-Golden
  - Davis Drive-Sterling Park

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 21 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 14 |
| 138 kV Overloads | 0 |
| 115 kV Overloads | 2 |

# Scenario 0E11-7-B + Hunterstown-Carrol Rebuild

## Scenario Components

0E11-7-B + Hunterstown -Carrol Rebuild

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- NextEra: 2022-W3-853 (Bypass Black Oak)
- FE: 2022-W3-837 (only include Hunterstown-Carrol Rebuild (C18-30), but UPDATED idv from FE)
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar
- AEP: 2022-W3-410
- DOM Additional:
- 2022-W3-30: Line No. 2054 (Charlottesville to Hollymead) Rebuild (Option 1) (exclude DNH portion for now)
- 2022-W3-704: Line No. 2135 (Holly Meade to Gordonsville) Rebuild (Option 1)
- 2022-W3-731: Locks Substation 230/115 kV Transformer Upgrade
- 2022-W3-74: Line No. 2090 (Ladysmith to Fredericksburg) Rebuild
- Post Fixes:
  - Line No. 256 Rebuild St. Johns-Ladysmith CT
  - Sterling Park-Golden
  - Davis Drive-Sterling Park

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 25 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 16 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 3 |

# Scenario 0E11-7-B + Hunterstown-Carrol Rebuild + IEC West

## Scenario Components

0E11-7-B + Hunterstown-Carrol Rebuild + IEC West

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- NextEra: 2022-W3-853 (Bypass Black Oak)
- Transource: 2022-W3-487(only include IEC West)
- FE: 2022-W3-837 (only include Hunterstown-Carrol Rebuild (C18-30) – the idv in the proposal was wrong, use updated idvs PJM sent later)
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar
- AEP: 2022-W3-410
- DOM Additional:
- 2022-W3-30: Line No. 2054 (Charlottesville to Hollymead) Rebuild (Option 1) (exclude DNH portion for now)
- 2022-W3-704: Line No. 2135 (Holly Meade to Gordonsville) Rebuild (Option 1)
- 2022-W3-731: Locks Substation 230/115 kV Transformer Upgrade
- 2022-W3-74: Line No. 2090 (Ladysmith to Fredericksburg) Rebuild
- Post Fixes:
  - Line No. 256 Rebuild St. Johns-Ladysmith CT
  - Sterling Park-Golden
  - Davis Drive-Sterling Park

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 22 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 15 |
| 138 kV Overloads | 0 |
| 115 kV Overloads | 2 |

# Scenario 0E11-7-B Final

## Scenario Components

- Exelon: 2022-W3-344/660
- DOM: 2022-W3-711 (Remove North Anna to Morrisville 500 kV line)
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374 and PSEG: 2022-W3-637 (only component 5&8) – Bypass Conastone
- NextEra: 2022-W3-853 (bypass Black Oak, end at Aspen)
- DOM: 2022-W3-231 (Partial)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom
- AEP: 2022-W3-410
- FE: 2022-W3-837 (Partial): Hunterstown-Carrol rebuild (use the updated idv PJM sent later)
- DOM: 2022-W3-731
- DOM: 2022-W3-211
- DOM: 2022-W3-967 (Partial)
- Entire Line No. 2054 (Charlottesville to Hollymead) Rebuild, Entire Line No. 291 Rebuild and Portion of Line No. 233 rebuild
- 230 kV Line No. 2054
- 6CHARLVL (314749) – 6PROFFIT (314772) ckt 1
- 230 kV Line No. 233
- 6BARRCK2 (314742) – 6CROZET1 (314751) ckt 1
- 230 kV Line No. 291
- 6CROZET2 (314752) – 6DOOMS (314794) ckt 1
- 6BARRCK1 (314741) – 6CROZET2 (314752) ckt 1
- 6BARRCK1 (314741) – 6CHARLVL (314749) ckt 1
- DOM: 2022-W3-74 (Partial)
- 6SUMMIT (313837) – 6LDYSMITH CT (314197) ckt 1
- Sterling Park-Golden Rebuild ($7.97M)
- Davis Drive-Sterling Park Rebuild ($5.5M)
- Red Lion-Hope Creek 500 kV line terminal equipment upgrade
- Peach Bottom terminal equipment upgrades
- Carrol-Mt Airy 230 kV Terminal Equipment upgrades
- Reconductor the Lincoln-Orrtanna 115 kV line
- FAYETT-GRANDP 138 kV line terminal equipment upgrades

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 21 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 13 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 2 |

# Scenario 0E11-8

## Scenario Components

0E11-7+ IEC West (Transource 487)

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- NextEra: 2022-W3-853
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar
- Transourse: 2022-W3-487 (Only include the IEC West)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 31 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 22 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 2 |

# Scenario 0E11-9

## Scenario Components

0E11-7+ Modified West line ( part of 853 + Part of 548)

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- LS Power: 2022-W3-548 (only include 502 J- Black Oak-Doubs 500 kV line but bypass Black Oak), connect with the Doubs-Apsen 500 kV line in 516 and bypass Doubs
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- NextEra: 2022-W3-853 (Only include Stonewall tap-Belmont tap 500 kV line, including the Stonewall and Belmont sub)
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 36 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 20 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 6 |

# Scenario 0E11-10

## Scenario Components

0E11-7+ Replace the NEET 853 with Transource 765 kV line

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- FE: 2022-W3-837 (Only include Bedington SVC, no lines)
- Transource: 2022-W3-904 (only include Yeat sub and Joshua Falls-Yeat 765 kV line)
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar (part of Brandon Shores deactivation)
- AEP: AEP: 2022-W3-410

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 42 |
| 500 kV Overloads | 3 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 13 |
| 138 kV Overloads | 13 |
| 115 kV Overloads | 7 |

# Scenario 0E11-10-A

## Scenario Components

0E11-10 with full proposal 692 modeled

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- FE: 2022-W3-837 (Only include Bedington SVC, no lines)
- Transource: 2022-W3-904 (only include Yeat sub and Joshua Falls-Yeat 765 kV line)
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar (part of Brandon Shores deactivation)
- AEP: AEP: 2022-W3-410

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 42 |
| 500 kV Overloads | 3 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 13 |
| 138 kV Overloads | 13 |
| 115 kV Overloads | 7 |

# Scenario 0E11-11

## Scenario Components

0E10 + IEC West (Transource 487)

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- FE: 2022-W3-837 (Only include Bedington SVC, no lines)
- Transource: 2022-W3-904 (only include Yeat sub and Joshua Falls-Yeat 765 kV line)
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar (part of Brandon Shores deactivation)
- AEP: AEP: 2022-W3-410
- Transource: 2022-W3-487 (IEC West Only)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 34 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 18 |
| 138 kV Overloads | 6 |
| 115 kV Overloads | 2 |

# Scenario 0E11-12

## Scenario Components

0E11-7 + Remove 853 + Add 279

- Exelon: 2022-W3-344/660 (remove the 500 kV cap banks at Gracetone and Conastone)
- DOM: 2022-W3-711 – Remove North Anna to Morrisville 500 kV line + Remove uprate on 500 kV Line Meadow Brook-Vint Hill
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-Mars 500 kV line & Remove Golden-Mars 230 kV side line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8 – bypass Conastone
- NextEra: 2022-W3-279
- DOM: 2022-W3-231 (only include the components below)
- 150 MVARs at Morrsivlle 500 kV,
- 293 MVARs at Wishing Star 500 kV
- 150 MVARs at Mars 230 kV
- 150 MVARs at Wishing Star 230 kV
- 300 MVARs STATCOM at Mars 500 kV
- 300 MVARs STATCOM at Beaumeade 230 kV
- Granite Statcom: +/- 350 MVar

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 42 |
| 500 kV Overloads | 5 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 18 |
| 138 kV Overloads | 8 |
| 115 kV Overloads | 6 |

# Scenario 0E12

## Scenario Components

(0E1 + Addition of one additional 500 kV line between Doubs and Aspen + Remove Golden-Mars 500 kV + Remove North Anna-Morrisville 500 kV) or (0E9 + Additional one 500 kV line from Doubs to Aspen)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837
- DOM: 2022-W3-711 – Remove North Anna-Morrisville 500 kV line
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692 – Remove Golden-March 500 kV line
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- Additional one 500 kV line from Doubs to Aspen

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 33 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 20 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 4 |

# Scenario 0E13

## Scenario Components

0E1 + Remove Exelon 344 component 4&5 + add PSEG 808 (Peach Bottom-Raphael-W. Chapel 500 kV)

- Exelon: 2022-W3-344/660 – Remove component 4&5
- FE: 2022-W3-837
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- PSEG: 2022-W3-808 – add the Peach Bottom-Raphael Rd-W. chapel 500 kV component

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 30 |
| 500 kV Overloads | 4 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 17 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 4 |

# Scenario 0E13-1

## Scenario Components

0E13 + Remove Graceton 500/230 kV transformers

- Exelon: 2022-W3-344/660 – Remove component 4&5 and Graceton 500/230 kV transformers
- FE: 2022-W3-837
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/837
- DOM: 2022-W3-692
- PPL: 2022-W3-374
- PSEG: 2022-W3-637 – only component 5&8
- PSEG: 2022-W3-808 – add the Peach Bottom-Raphael Rd-W. chapel 500 kV component

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 32 |
| 500 kV Overloads | 4 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 19 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 4 |

# Scenario 0F

## Scenario Components

1A-Alter_ALL

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 22 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 1 |
| 138 kV Overloads | 13 |
| 115 kV Overloads | 3 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 55 |
| 500 kV Overloads | 13 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 25 |
| 138 kV Overloads | 4 |
| 115 kV Overloads | 5 |

# Scenario 0G

## Scenario Components

1A-Alter_ALL (Full DOM proposals)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 18 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 0 |
| 138 kV Overloads | 11 |
| 115 kV Overloads | 3 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 50 |
| 500 kV Overloads | 13 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 22 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 5 |

# Scenario 0H

## Scenario Components

1A-Alter_ALL (Full DOM proposals) _Hunterstown-Doubs-Goose Creek

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- NEET: part of 2022-W3-445 (Hunterstown-Doubs-Goose Creek 500 kV part)

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 15 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 0 |
| 138 kV Overloads | 9 |
| 115 kV Overloads | 2 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 44 |
| 500 kV Overloads | 14 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 21 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 2 |

# Scenario 0H2

## Scenario Components

0G (1A-Alter_ALL (Full DOM proposals) _Hunterstown-Doubs-Goose Creek) + Remove Fort Martin-Doubs ckt 2 and Hunterstown-Carroll 230 kV line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23 (Remove Fort Martin-Doubs ckt 2 and Hunterstown-Carroll 230 kV line)
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- NEET: part of 2022-W3-445 (Hunterstown-Doubs-Goose Creek 500 kV part)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 45 |
| 500 kV Overloads | 14 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 19 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 5 |

# Scenario 0I

## Scenario Components

1A-Alter_ALL (Full DOM proposals) _T-Point substation

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- NEET: Part of 2022-W3-948 (T-Point sub, just the Tap, no lines)

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 21 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 0 |
| 138 kV Overloads | 14 |
| 115 kV Overloads | 3 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 47 |
| 500 kV Overloads | 14 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 19 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 5 |

# Scenario 0J

## Scenario Components

1A-Alter_ALL (Full DOM proposals) _T-Point substation + two T-Point-Doubs or Goose Creek 230 kV lines

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- NEET: Part of 2022-W3-948 (T-Point sub, just the Tap, two 230 kV line from T- Point-Doubs or Goose Creek)

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 21 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 1 |
| 138 kV Overloads | 13 |
| 115 kV Overloads | 3 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 49 |
| 500 kV Overloads | 16 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 20 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 5 |

# Scenario 0J-2

## Scenario Components

1A-Alter_ALL (Full DOM proposals) _T-Point substation + T-Point-Doubs 500 kV lines

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- NEET: Part of 2022-W3-948 (T-Point sub, just the Tap, T- Point-Doubs 500 kV line)

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 21 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 0 |
| 138 kV Overloads | 14 |
| 115 kV Overloads | 3 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 48 |
| 500 kV Overloads | 17 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 18 |
| 138 kV Overloads | 2 |
| 115 kV Overloads | 5 |

# Scenario 0J-3

## Scenario Components

1A-Alter_ALL (Full DOM proposals) _ 0J-2 with REMOVING West Cooper-High Ridge 500 kV line

- Exelon: 2022-W3-344/660 (Remove West Cooper-High Ridge 500 kV line)
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- NEET: Part of 2022-W3-948 (T-Point sub, just the Tap) + T- Point-Doubs 500 kV line

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 25 |
| 500 kV Overloads | 2 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 1 |
| 138 kV Overloads | 14 |
| 115 kV Overloads | 4 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 82 |
| 500 kV Overloads | 17 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 29 |
| 138 kV Overloads | 6 |
| 115 kV Overloads | 16 |

# Scenario 0K

## Scenario Components

1A-Alter_ALL (Full DOM proposals) _ Conastone-Doubs 500 kV line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- PSEG: Part of 2022-W3-637 (Conastone-Doubs 500 kV line)

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 19 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 0 |
| 138 kV Overloads | 12 |
| 115 kV Overloads | 3 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 45 |
| 500 kV Overloads | 16 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 18 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 4 |

# Scenario 0L

## Scenario Components

1A-Alter_ALL (Full DOM proposals)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-837 (not include Meadow Brook-Doubs line)
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- NEET: 663 (Add Front Royal-New Wishing Star 500 kV line)

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 20 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 0 |
| 138 kV Overloads | 13 |
| 115 kV Overloads | 3 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 49 |
| 500 kV Overloads | 13 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 21 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 5 |

# Scenario 0M

## Scenario Components

1A-Alter_ALL (Full DOM proposals) _ 500 kV Stork-Flys UG Line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711 (Regional Solution South)
- DOM/FE: 2022-W3-516/23 (DOM/FE Interregional Solution)
- TRANSRC: 2022-W3-858 (500 kV Stork-Flys UG Line)
- DOM: 2022-W3-923 (500 kV Dooms-Lexington)
- DOM: 2022-W3-671 (Front Royale-Morrisville)
- DOM: 2022-W3-731 (Locks TX Upgrade)
- DOM: 2022-W3-704/211 (Hollymeade-Gordonsville)
- DOM: 2022-W3-30/967 (Charlottesville-Hollymeade-Dooms)
- DOM: 2022-W3-74 (Ladysmith-Fredericksburg)

*Note: Grab Aspen bus + 2nd 500 kV line from Aspen to Goose Creek from 2022-W3-692*

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 20 |
| 500 kV Overloads | 0 |
| 345 kV Overloads | 1 |
| 230 kV Overloads | 2 |
| 138 kV Overloads | 13 |
| 115 kV Overloads | 2 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 49 |
| 500 kV Overloads | 14 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 18 |
| 138 kV Overloads | 4 |
| 115 kV Overloads | 5 |

# Scenario 0N

## Scenario Components

1A-Alter_ALL (Full DOM proposals)_500 kV Goose Creek-Beaumeade UG Line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711 (Regional Solution South)
- DOM/FE: 2022-W3-516/23 (DOM/FE Interregional Solution)
- LSPower: 2022-W3-548 (500 kV Goose Creek-Beaumeade UG Line + Loop 230 kV Beaumeade - DTC through BECO)
- DOM: 2022-W3-923 (500 kV Dooms-Lexington)
- DOM: 2022-W3-671 (Front Royale-Morrisville)
- DOM: 2022-W3-731 (Locks TX Upgrade)
- DOM: 2022-W3-704/211 (Hollymeade-Gordonsville)
- DOM: 2022-W3-30/967 (Charlottesville-Hollymeade-Dooms)
- DOM: 2022-W3-74 (Ladysmith-Fredericksburg)

*Note: Grab Aspen bus + 2nd 500 kV line from Aspen to Goose Creek from 2022-W3-692*

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 25 |
| 500 kV Overloads | 0 |
| 345 kV Overloads | 1 |
| 230 kV Overloads | 0 |
| 138 kV Overloads | 18 |
| 115 kV Overloads | 4 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 52 |
| 500 kV Overloads | 13 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 24 |
| 138 kV Overloads | 4 |
| 115 kV Overloads | 5 |

# Scenario 0O

## Scenario Components

1A-Alter_OK+ Conastone-Doubs 500 kV line loop in T-Point + Otter Creek-T-Point 500 kV

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- PSEG: Part of 2022-W3-637 (Conastone-Doubs 500 kV line) and loop in T-Point
- NEET: part of 175 (Otter Creek-T-Point)

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 19 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 0 |
| 138 kV Overloads | 13 |
| 115 kV Overloads | 2 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 31 |
| 500 kV Overloads | 8 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 15 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 2 |

# Scenario 0O2

## Scenario Components

1A-Alter_OK+ Otter Creek-T-Point 500 kV

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- NEET: part of 175 (Otter Creek-T-Point)

## 2027 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 18 |
| 500 kV Overloads | 1 |
| 345 kV Overloads | 2 |
| 230 kV Overloads | 0 |
| 138 kV Overloads | 11 |
| 115 kV Overloads | 3 |

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 34 |
| 500 kV Overloads | 7 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 17 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 4 |

# Scenario 0O3

## Scenario Components

0O2 (1A-Alter_OK+ Otter Creek-T-Point-Doubs 500 kV) + Remove Fort Martin-Doubs ckt 2 and Hunterstown-Carroll 230 kV line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23 – Remove Fort Martin-Doubs ckt 2 and Hunterstown-Carroll 230 kV line
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- NEET: part of 175 (Otter Creek - T-Point-Doubs)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 34 |
| 500 kV Overloads | 6 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 16 |
| 138 kV Overloads | 3 |
| 115 kV Overloads | 5 |

# Scenario 0P

## Scenario Components

(OG + updated 9A)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- Transource: part of 2022-W3-487 (IEC)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 35 |
| 500 kV Overloads | 4 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 24 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 3 |

# Scenario 0P2

## Scenario Components

(OG + updated 9A East)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- Transource: part of 2022-W3-487 (IEC East only)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 44 |
| 500 kV Overloads | 5 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 24 |
| 138 kV Overloads | 4 |
| 115 kV Overloads | 5 |

# Scenario 0P NGME

## Scenario Components

1A-Alter_ALL (Full DOM proposals) _ Remove Golden-2-Mars Extension

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711 (Regional Solution South)
- DOM/FE: 2022-W3-516/23 (DOM/FE Interregional Solution)
- DOM: 2022-W3-692 (DC Alley Solution) – Remove Golden-2-Mars Extension
- DOM: 2022-W3-923 (500 kV Dooms-Lexington)
- DOM: 2022-W3-671 (Front Royale-Morrisville)
- DOM: 2022-W3-731 (Locks TX Upgrade)
- DOM: 2022-W3-704/211 (Hollymeade-Gordonsville)
- DOM: 2022-W3-30/967 (Charlottesville-Hollymeade-Dooms)
- DOM: 2022-W3-74 (Ladysmith-Fredericksburg)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 53 |
| 500 kV Overloads | 13 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 23 |
| 138 kV Overloads | 4 |
| 115 kV Overloads | 5 |

# Scenario 0Q

## Scenario Components

0G remove Graceton-High Ridge 500 kV line + Peach Bottom -Brandon Shore 500 kV line (Part of 741)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- Remove Graceton-High Ridge 500 kV line
- Add Peach Bottom -Brandon Shore 500 kV line (Part of 741)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 67 |
| 500 kV Overloads | 15 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 29 |
| 138 kV Overloads | 6 |
| 115 kV Overloads | 8 |

# Scenario 0Q2

## Scenario Components

0G [1A-Alter_ALL (Full DOM proposals)] + Remove Pruntytown-Mt Storm, Fort Martin-Doubs ckt 2 and Hunterstown-Carroll 230 kV line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23 – Remove Pruntytown-Mt Storm, Fort Martin-Doubs ckt 2 and Hunterstown-Carroll 230 kV line
- DOM: 2022-W3-711 (Regional Solution South)
- DOM/FE: 2022-W3-516/23 (DOM/FE Interregional Solution)
- DOM: 2022-W3-692 (DC Alley Solution) – Remove Golden-2-Mars Extension
- DOM: 2022-W3-923 (500 kV Dooms-Lexington)
- DOM: 2022-W3-671 (Front Royale-Morrisville)
- DOM: 2022-W3-731 (Locks TX Upgrade)
- DOM: 2022-W3-704/211 (Hollymeade-Gordonsville)
- DOM: 2022-W3-30/967 (Charlottesville-Hollymeade-Dooms)
- DOM: 2022-W3-74 (Ladysmith-Fredericksburg)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 83 |
| 500 kV Overloads | 15 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 26 |
| 138 kV Overloads | 26 |
| 115 kV Overloads | 10 |

# Scenario 0Q3

## Scenario Components

0G [1A-Alter_ALL (Full DOM proposals)] + Remove Fort Martin-Doubs ckt 2 and Hunterstown-Carroll 230 kV line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23 – Remove Fort Martin-Doubs ckt 2 and Hunterstown-Carroll 230 kV line
- DOM: 2022-W3-711 (Regional Solution South)
- DOM/FE: 2022-W3-516/23 (DOM/FE Interregional Solution)
- DOM: 2022-W3-692 (DC Alley Solution) – Remove Golden-2-Mars Extension
- DOM: 2022-W3-923 (500 kV Dooms-Lexington)
- DOM: 2022-W3-671 (Front Royale-Morrisville)
- DOM: 2022-W3-731 (Locks TX Upgrade)
- DOM: 2022-W3-704/211 (Hollymeade-Gordonsville)
- DOM: 2022-W3-30/967 (Charlottesville-Hollymeade-Dooms)
- DOM: 2022-W3-74 (Ladysmith-Fredericksburg)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 60 |
| 500 kV Overloads | 14 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 25 |
| 138 kV Overloads | 7 |
| 115 kV Overloads | 9 |

# Scenario 0Q4

## Scenario Components

0G (1A-Alter_ALL (Full DOM proposals))_ Remove Fort Martin-Doubs ckt 1 and 2 and Hunterstown-Carroll 230 kV line

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23 – Remove Fort Martin-Doubs ckt 1 and 2 and Hunterstown-Carroll 230 kV line
- DOM: 2022-W3-711 (Regional Solution South)
- DOM/FE: 2022-W3-516/23 (DOM/FE Interregional Solution)
- DOM: 2022-W3-692 (DC Alley Solution) – Remove Golden-2-Mars Extension
- DOM: 2022-W3-923 (500 kV Dooms-Lexington)
- DOM: 2022-W3-671 (Front Royale-Morrisville)
- DOM: 2022-W3-731 (Locks TX Upgrade)
- DOM: 2022-W3-704/211 (Hollymeade-Gordonsville)
- DOM: 2022-W3-30/967 (Charlottesville-Hollymeade-Dooms)
- DOM: 2022-W3-74 (Ladysmith-Fredericksburg)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 72 |
| 500 kV Overloads | 14 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 27 |
| 138 kV Overloads | 16 |
| 115 kV Overloads | 10 |

# Scenario 0R

## Scenario Components

1A-Alter_OK+ Conastone-Doubs 500 kV line loop in T-Point + Otter Creek-T-Point 500 kV

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- PSEG: Part of 2022-W3-637 (Conastone-Doubs 500 kV line) and loop in T-Point
- NEET: part of 175 (Otter Creek-T-Point)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 30 |
| 500 kV Overloads | 8 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 14 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 2 |

# Scenario 0R2

## Scenario Components

1A-Alter_OK+ Otter Creek-T-Point 500 kV

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- NEET: part of 175 (Otter Creek-T-Point)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 34 |
| 500 kV Overloads | 7 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 17 |
| 138 kV Overloads | 1 |
| 115 kV Overloads | 4 |

# Scenario 0S

## Scenario Components

0G + remove Graceton-High Ridge 500 kV line + Remove High Ridge 500/230 station + Add Peach Bottom-New Raphael-Waugh Chapel 500 kV line and Raphael 500/230 station (Part of 808)

- Exelon: 2022-W3-344/660
- FE: 2022-W3-23
- DOM: 2022-W3-711
- Dom/FE: 2022-W3-516/23
- DOM: 2022-W3-692
- DOM: 2022-W3-923
- DOM: 2022-W3-671
- DOM: 2022-W3-731
- DOM: 2022-W3-704
- DOM: 2022-W3-211
- DOM: 2022-W3-30
- DOM: 2022-W3-967
- DOM: 2022-W3-74
- Remove Graceton-High Ridge 500 kV line and Remove High Ridge 500/230 kV station
- PSEG: 2022-W3-808 Part (Add Peach Bottom-New Raphael-Waugh Chapel 500 kV line and Raphael 500/230 station)

## 2028 Screening Performance

| Overload | Number of Overloads |
|---|---|
| Total Overloads | 55 |
| 500 kV Overloads | 14 |
| 345 kV Overloads | 0 |
| 230 kV Overloads | 26 |
| 138 kV Overloads | 4 |
| 115 kV Overloads | 5 |

## Document Revision History

10/17/2023 – R1: original version posted

11/30/2023 – R2:

- Update to cost estimates included in the "Final Reliability Analysis and Recommended Solution" section, reflecting latest estimates received.
- Correction to Map 5 - South Proposal Cluster Map.

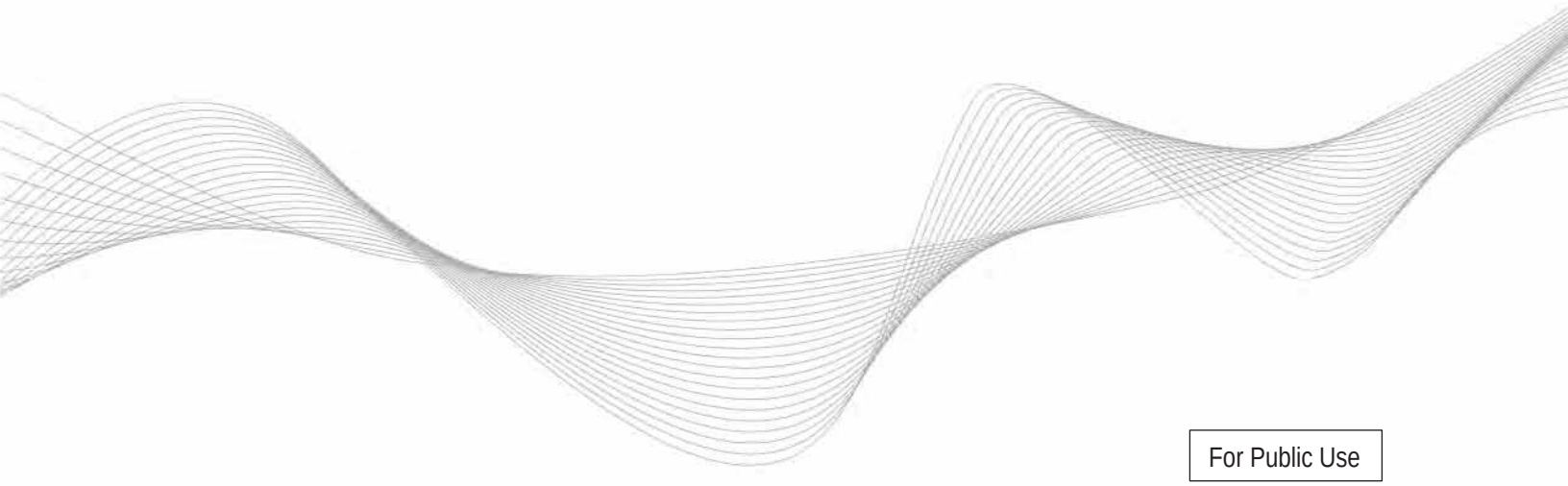
12/8/2023 – R3:

- Update to cost estimates included in the "Final Reliability Analysis and Recommended Solution" section, reflecting latest estimates received consistent with Dec. 5, 2023 TEAC.
- Corrected footnote in Table 3.
- Clarification of sentences on pages 20, 22 and 23.

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

PJM Staff White Paper

PJM Interconnection
December 2023



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## Contents

# I. Executive Summary

On October 3, 2023, the PJM Board of Managers approved changes to the Regional Transmission Expansion Plan (RTEP), totaling a net increase of $0.69 million for baseline projects to resolve baseline reliability criteria violations and address changes to existing projects.

Since then, PJM has identified new baseline reliability criteria violations, and the transmission system enhancements needed to solve them, at an estimated cost of $5,142.98 million. Scope changes to existing projects will result in a net decrease of $32.17 million, and cancellation of existing projects will result in a net decrease of $24.96 million. This yields an overall RTEP net increase of $5,085.85 million, for which PJM recommended Board approval. PJM is also providing the annual update of RTEP generation and merchant transmission network upgrades in this white paper. PJM has identified $179.58 million in new network upgrades. Additionally, $41.45 million in previously identified network upgrades will be cancelled as a result of updates to analysis performed for project withdrawals in the New Services Queue. This yields an overall RTEP net increase of $138.13 million, for which PJM recommended Board approval. Altogether, the changes result in an overall RTEP net increase of approximately $5,223.98 million. With these changes, RTEP projects will total approximately $48,258.8 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 December 11, 2023, 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 transmission enhancement costs are allocated to PJM responsible customers.

# III. Baseline Reliability 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).

- Baseline project b3800 – 2022 RTEP Window 3 Recommended Solution: $5,142.98 million

A detailed description of the above project that PJM recommended to the Board is detailed in the 2022 RTEP Window 3 Reliability Analysis Report and the 2022 RTEP Window 3 Constructability & Financial Analysis Report.

# IV. Changes to Previously Approved Projects

### *Scope/Cost Changes*

The following scope/cost modifications were recommended:

#### NJ Offshore Wind State Agreement Approach (SAA) Project: b3737.47

The recommended solution for 2022 Window 3 includes the scope change to expand the North Delta 500 kV substation to a four bay breaker and half configuration, which will allow for the termination of six 500 kV lines and one 500/230 kV transformer. The original estimate cost for the Transource-proposed North Delta substation was $76.27 million, and the new expanded scope will be approximately $104.1 million.

The net cost increase for the New Jersey SAA project is $27.83 million.

#### Brandon Shores Deactivation Project: b3780

The recommended solution for 2022 Window 3 includes the scope change to the immediate need project stemming from the Brandon Shores deactivation request. The revised scope modifies the planned North Delta 500/230 kV substation, which will cut into Peach Bottom-Delta/Calpine 500 kV line. This scope of work is related to the above b3737.47 project scope from the NJ OSW SAA project, as the b3780 deactivation project initially proposed the construction of a 500/230 kV West Cooper substation (b3780.3) in lieu of the North Delta substation. The recommended solution cancels the b3780.3 West Cooper substation scope, resulting in a net decrease of $60 million.

- All of the scope/cost changes described in this section yield a net RTEP decrease of $32.17 million.

### *Cancellations*

The following scope/cost modifications were recommended:

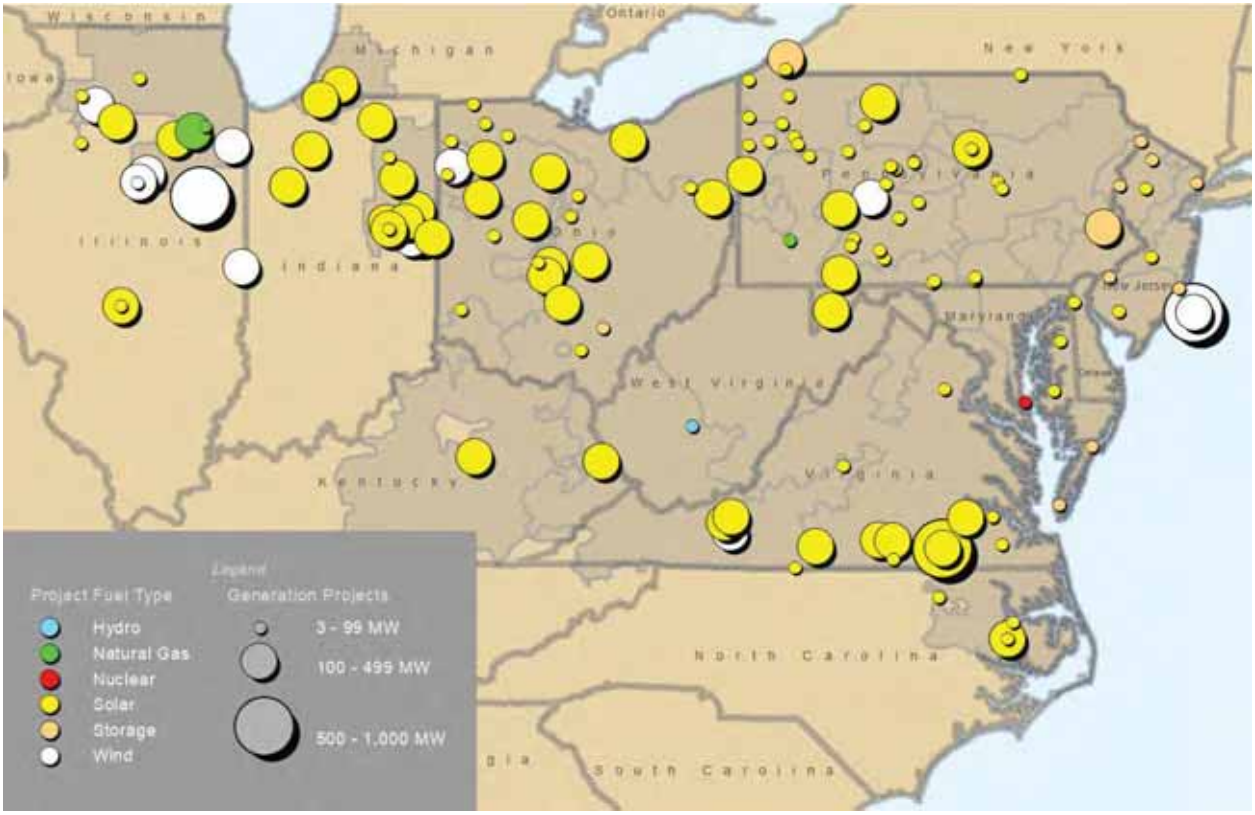
- Project b3768 (rebuild/reconductor the Germantown-Lincoln 115 kV line) is no longer required with the recommended 2022 Window 3 solution and yields a net decrease of $17.36 million.
- Project b3247 (Dominion portion of Doubs-Goose Creek 500 kV rebuild for End of Life “EOL”) is no longer required as the recommended 2022 Window 3 solution replaces this scope of work, and yields a net decrease of $7.6 million.
    - Note: The related supplemental project s2386, which includes the FirstEnergy (APS) portion of the Doubs-Goose Creek 500 kV EOL rebuild, is being converted to a baseline and is included in the recommended 2022 Window 3 solution.
- All of the cancellations described in this section yield a net RTEP decrease of $24.96 million.

# V. Interconnection Queue Projects

Throughout 2023, PJM has continued to study new service customer requests that are submitted into our interconnection queue. These studies evaluate the impact of the new service request and include an evaluation of new generation interconnections, increases in generation at existing stations, long-term firm transmission service requests and merchant transmission interconnection requests.

These studies were last reviewed with the Board Reliability Committee in December of 2022. Since that time, PJM has completed 151 System Impact Studies, and 166 service requests have withdrawn. New projects with signed ISAs, project scope changes and project cancellations have resulted in a net increase of $138.13 million for network upgrades. The map below shows the locations of the new units associated with the completed interconnection System Impact Studies along with the fuel type and relative size. A listing of the projects with recently completed impact studies is provided in Attachment C to this white paper. A listing of the network upgrades associated with these projects is shown in Attachment D to this report. The cost for the network upgrades associated with these interconnection projects is the responsibility of the developer.

Map 1. Completed Interconnection System Impact Studies



## VI. Review by the Transmission Expansion Advisory Committee (TEAC)

Project needs and recommended solutions as discussed in this report were reviewed with stakeholders during 2023, most recently at the October 31, 2023, and December 5, 2023, TEAC meetings. Written comments were requested to be submitted to PJM to communicate any concerns with project recommendations. All correspondence addressed to the PJM Board are available at the Board communications page[1].

## VII. 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 (Tariff). 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 no later than 30 days following approval by the Board.

## VIII. Board Approval

The PJM Reliability and Security Committee is requested to endorse the additions and changes to the RTEP proposed in this white paper and to recommend to the full Board for approval the new projects and changes to the existing RTEP projects as detailed in this white paper. On December 11, 2023, the Board approved the addition of RTEP baseline projects as well as other changes to the RTEP as summarized in this paper.

[1] https://www.pjm.com/about-pjm/who-we-are/pjm-board/public-disclosures

## Attachment A – Reliability Project Single-Zone Allocations

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required IS Date |
|---|---|---|---|---|---|
| b3800.9 | Rebuild the existing Hunterstown-Carroll 115/138 kV Corridor as Double Circuit using 230 kV construction standards. New circuit will be operated at 230 kV. Existing circuit to remain at 115/138 kV. | $0.00 | APS | N/A, upgrade ID is for tracking only, no cost | 6/1/2027 |
| b3800.10 | Rebuild the Germantown-Lincoln 115 kV line for 230 kV double circuit construction. | $30.10 | ME | ME (100.00%) | 6/1/2027 |
| b3800.11 | Rebuild the Hunterstown-Lincoln 115 kV line for 230 kV double circuit construction. | $11.48 | ME | ME (100.00%) | 6/1/2027 |
| b3800.12 | Rebuild the Germantown-Carroll 138 kV line for 230 kV double circuit construction (MAIT). | $12.16 | ME | ME (100.00%) | 6/1/2027 |
| b3800.19 | Reconductor Lincoln-Orrtanna 115 kV line. | $10.98 | ME | ME (100.00%) | 6/1/2027 |
| b3800.20 | Fayetteville-Grand Point 138 kV – Replace line trap at Grand Point 138 kV. | $0.40 | APS | APS (100.00%) | 6/1/2027 |
| b3800.21 | Reid-Ringgold 138 kV – Replace line trap, substation conductor, breaker, relaying and CTs at Ringgold. | $3.80 | APS | APS (100.00%) | 6/1/2027 |
| b3800.22 | Install DTT relaying at Straban substation. | $0.67 | ME | ME (100.00%) | 6/1/2027 |
| b3800.23 | Revise Relay Settings at Lincoln substation. | $0.31 | ME | ME (100.00%) | 6/1/2027 |
| b3800.24 | Revise Relay Settings at Germantown substation. | $0.47 | ME | ME (100.00%) | 6/1/2027 |
| b3800.25 | Taneytown substation terminal upgrade. | $0.53 | APS | APS (100.00%) | 6/1/2027 |
| b3800.26 | Build High Ridge 500 kV substation - Three bay breaker and half configuration. | $0.00 | BGE | N/A, upgrade ID is for tracking only, no cost | 6/1/2027 |
| b3800.109 | Termination work for two 500/138 kV transformer at Woodside 500 kV substation | $1.35 | NEET | APS (100.00%) | 6/1/2027 |
| b3800.110 | Two 500/138 kV transformers at Woodside 500 kV substation. | $33.68 | NEET | APS (100.00%) | 6/1/2027 |
| b3800.111 | Construct the Woodside-Stonewall 138 kV No. 1 line. | $6.28 | APS | APS (100.00%) | 6/1/2027 |
| b3800.112 | Construct the Woodside-Stonewall 138 kV No. 2 line. | $6.31 | APS | APS (100.00%) | 6/1/2027 |
| b3800.114 | Stonewall 138 kV substation two 138kV breaker expansion. | $8.30 | APS | APS (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required IS Date |
|---|---|---|---|---|---|
| b3800.125 | Rebuild the Doubs-Dickerson 230 kV line. This will be underbuilt on the new Doubs-Goose Creek 500 kV line.<br>APS Portion | $13.04 | APS | PEPCO (100.00%) | 6/1/2027 |
| b3800.126 | Rebuild the Doubs-Aqueduct 230 kV line. This will be underbuilt on the new Doubs-Aspen 500 kV line.<br>APS Portion | $11.35 | APS | PEPCO (100.00%) | 6/1/2027 |
| b3800.127 | Rebuild the Dickerson-Aqueduct 230 kV line. This will be underbuilt on the new Doubs-Aspen 500 kV line.<br>APS Portion | $6.80 | APS | PEPCO (100.00%) | 6/1/2027 |
| b3800.201 | Install two 500-230 kV transformer banks at Golden substation. | $70.00 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.203 | Install a 2nd 500-230 kV 1440MVA transformer at Mars substation. | $42.19 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.204 | Reconductor 0.5 mile section of 230 kV line No. 2150 Golden-Paragon Park Circuit 1 to achieve a summer rating of 1573 MVA. | $1.44 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.205 | Reconductor 0.5 mile section of 230 kV line No. 2081 Golden-Paragon Park Circuit 2 to achieve a summer rating of 1573 MVA. | $1.44 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.206 | Upgrade Paragon Park substation line conductors to 4000A continuous current rating for 230 kV lines No. 2081 & line No. 2150. | $0.09 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.207 | Reconductor 230 kV line No. 2207 Paragon Park-Beco to achieve a summer rating of 1573 MVA. | $3.36 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.208 | Upgrade Paragon Park substation conductor and line leads to 4000A continuous current rating for 230 kV line No. 2207. | $0.10 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.209 | Upgrade BECO substation equipment to 4000A continuous current rating for 230 kV line No. 2207. | $1.86 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.210 | Build a new 230 kV line from Mars-Lockridge on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Mars and Lockridge. | $57.95 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.211 | Build a new 230 kV line from Lockridge-Golden on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Golden and Lockridge. | $56.93 | Dominion | Dominion (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required IS Date |
|---|---|---|---|---|---|
| b3800.215 | Cut 230 kV line No. 2150 Sterling Park-Paragon Park Circuit 1 into Golden substation and install 230 kV equipment at Golden. Upgrade relay settings at Golden substation for upgrading 230 kV line No. 2150 to 4000A continuous current rating. | $57.62 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.216 | Cut 230 kV line No. 2081 Sterling Park-Paragon Park Circuit 2 into Golden substation and install 230 kV equipment at Golden. Upgrade relay settings at Golden substation for upgrading 230 kV line No. 2081 to 4000A continuous current rating. | $57.62 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.218 | Build a new 230 kV line from Sycolin Creek-Golden on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Golden and Sycolin Creek. | $69.84 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.219 | Replace 7 overdutied 230 kV breakers at Beaumeade substation with 80 kA breakers. | $3.03 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.220 | Replace 4 overdutied 230 kV breakers at BECO substation with 80 kA breakers. | $1.81 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.221 | Replace 4 overdutied 230 kV breakers at Belmont substation with 80 kA breakers. | $1.90 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.222 | Replace 1 overdutied 230 kV breaker at Discovery substation with 80 kA breaker. | $0.49 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.223 | Replace 1 overdutied 230 kV breaker at Pleasant View substation with 80 kA breaker. | $0.51 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.224 | Replace 2 overdutied 230 kV breakers at Shellhorn substation with 80 kA breakers. | $0.93 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.226 | Change 230 kV lines No. 2081 and 2150 at Paragon Park substation destination to Golden substation and upgrade line protection relays | $0.30 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.227 | Change 230 kV lines No. 2081 and 2150 at Sterling Park substation destination to Golden substation and upgrade line protection relays. | $0.30 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.228 | Reconductor 1.47 miles of 230 kV circuits 2081 and 2150 from Sterling Park to Golden substation. Upgrade terminal equipment at Sterling Park to 4000A continuous current. | $7.97 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.229 | Reconductor 0.67 miles of 230 kV circuits 2194 and 9231 from Davis Drive to Sterling Park substation. Terminal equipment at remote end substations will be installed or upgraded to 4000A continuous current rating to support new conductor ratings. | $5.53 | Dominion | Dominion (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required IS Date |
|---|---|---|---|---|---|
| b3800.230 | Reset relays at Breezy Knoll for the revised current rating of 230 kV line No. 2098 Pleasant View-Hamilton. | $0.02 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.231 | Reset relays at Dry Mill for the revised current rating of 230 kV line No. 2098 Pleasant View-Hamilton. | $0.02 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.232 | Reset relays at Hamilton for the revised current rating of 230 kV line No. 2098 Pleasant View-Hamilton. | $0.01 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.233 | Upgrade equipment to 4000A continuous current rating at Pleasant View substation in support of 230 .kV line No. 2098 wreck and rebuild. Replace circuit breakers 274T2098 & 2098T2180 and associated disconnect switches, breaker leads, bus, and line risers to accommodate 4000A rating. | $1.81 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.234 | Wreck and rebuild approximately one mile of 230 kV line No. 2098 between Pleasant View and structure 2098/9, where line No. 2098 turn towards Hamilton substation. | $3.44 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.235 | Replace 5 overdutied 230 kV breakers at Loudoun substation with 80 kA breakers. | $2.32 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.236 | Replace 2 overdutied 500 kV breakers at Ox substation with 63kA breakers. | $2.51 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.237 | Replace 1 overdutied 500 kV breaker at Pleasant View substation with a 63kA breaker. | $1.29 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.300 | Rebuild 230 kV line No. 2135 Hollymeade Junction-Cash's Corner using double-circuit capable 500/230 kV poles. New conductor has a summer rating of 1573 MVA. (The 500 kV circuit will not be wired as part of this project). | $32.45 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.301 | Rebuild 230 kV line No. 2135 Cash's Corner-Gordonsville using double-circuit capable 500/230 kV poles. New conductor has a summer rating of 1573 MVA. (The 500 kV circuit will not be wired as part of this project). | $21.51 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.302 | Upgrade Cash's Corner switches 213576 and 213579 and line leads to 4000A continuous current rating of 230 kV line No. 2135. | $0.51 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.303 | Upgrade Gordonsville substation line leads to 4000A continuous current rating of 230 kV line No. 2135. | $0.08 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.304 | Upgrade Hollymeade substation switch 213549 and line leads to 4000A continuous current rating of 230 kV line No. 2135. | $0.30 | Dominion | Dominion (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required IS Date |
|---|---|---|---|---|---|
| b3800.305 | Install one (1) 300 MVAR Static synchronous Compensator (STATCOM) & associated equipment at Beaumeade substation. | $43.57 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.308 | Install one (1) 230 kV, 150MVAr Shunt Capacitor Bank & associated equipment at Mars substation. | $5.26 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.309 | Install one (1) 230 kV, 150MVAr Shunt Capacitor Bank & associated equipment at Wishing Star substation. | $6.09 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.316 | Rebuild approximately 6.17 miles of 230 kV line No. 2030 Gainesville-Mint Springs to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $13.98 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.317 | Rebuild approximately 1.58 miles of 230 kV line No. 2030 Mint Springs-Loudoun to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $3.59 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.318 | Rebuild approximately 4.2 miles of 230 kV line No. 2045 Loudoun-North Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $14.52 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.319 | Rebuild approximately 0.88 miles of 230 kV line No. 2045 North Star-Brambleton to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $3.04 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.320 | Rebuild approximately 1.22 miles of 230 kV line No. 2227 Brambleton-Racefield to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $4.36 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.321 | Rebuild approximately 3.69 miles of 230 kV line No. 2094 Racefield-Loudoun to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $13.20 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.322 | Rebuild approximately 9.16 miles of 230 kV line No. 2101 Bristers-Nokesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $12.99 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.323 | Rebuild approximately 2.89 miles of 230 kV line No. 2101 Nokesville-Vint Hill TP to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $4.10 | Dominion | Dominion (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required IS Date |
|---|---|---|---|---|---|
| b3800.324 | Rebuild approximately 0.33 miles of 230 kV line No. 2101 Vint Hill TP-Vint Hill to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $0.47 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.325 | Rebuild approximately 3.32 miles of 230 kV line No. 2114 Rollins Ford-Vint Hill to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $4.35 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.326 | Rebuild approximately 10.09 miles of 230 kV line No. 2114 Vint Hill-Elk Run to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $13.21 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.327 | Rebuild approximately 4.43 miles of 230 kV line No. 2140 Heathcote-Catharpin to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $10.64 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.328 | Rebuild approximately 2.88 miles of 230 kV line No. 2140 Catharpin-Loudoun to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $6.92 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.329 | Rebuild approximately 0.25 miles of 230 kV line No. 2151 Railroad DP-Gainesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $4.39 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.330 | Rebuild approximately 4.14 miles of 230 kV line No. 2163 Vint Hill-Liberty to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $17.56 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.331 | Rebuild approximately 0.48 miles of line No. 2176 Heathcote-Gainesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $8.78 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.332 | Rebuild approximately 1.11 miles of line No. 2222 Rollins Ford-Gainesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $13.17 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.333 | Rebuild approximately 1.65 miles of line No. 183 Bristers-Ox to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | $8.78 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.334 | Replace 4 overdutied 230 kV breakers at Loudoun substation with 80 kA breakers. | $1.72 | Dominion | Dominion (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required IS Date |
|---|---|---|---|---|---|
| b3800.335 | Replace 1 overdutied 500 kV breaker at Ox substation with a 63kA breaker. | $1.29 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.337 | Upgrade and install equipment at Brambleton substation to support the new conductor termination. All terminal equipment for 230 kV lines No. 2045 & No. 2094 to be rated for 4000A continuous current rating. | $4.65 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.338 | Revise relay settings at Dawkins Branch. | $0.02 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.339 | Upgrade and install equipment at Gainesville substation to support the new conductor termination. All terminal equipment for 230 kV line No. 2030 to be rated for 4000A continuous current rating. | $3.71 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.340 | Revise relay settings at Heathcote. | $0.02 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.341 | Upgrade and install equipment at Loudoun substation for 230 kV line No. 2094 Loudoun-Racefield to be rated for 4000A continuous current rating. | $2.50 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.343 | Upgrade and install equipment at Loudoun substation for 230 kV line No. 2030 Loudoun-Mint Springs to be rated for 4000A continuous current rating. | $1.00 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.342 | Upgrade and install equipment at Loudoun substation for 230 kV line No. 2045 Loudoun-North Star to be rated for 4000A continuous current rating. | $2.50 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.345 | Revise relay settings at Mint Springs. | $0.03 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.347 | Revise relay settings at North Star. | $0.03 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.348 | Revise relay settings at Racefield. | $0.03 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.349 | Revise relay settings at Railroad. | $0.02 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.351 | Update relay settings at Vint Hill for 230 kV line No. 2101 Vint Hill-Bristers. | $0.03 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.352 | Update relay settings at Vint Hill for 230 kV line No. 2163 Vint Hill-Liberty. | $0.03 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.355 | Revise relay settings at Youngs Branch. | $0.02 | Dominion | Dominion (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required IS Date |
|---|---|---|---|---|---|
| b3800.358 | Replace single unit Locks 230/115 kV 168MVA transformer TX No. 7 with new single unit transformer with a rating of 224 MVA. Lead lines at the 115 kV level will be upgraded to 2000A. | $7.14 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.359 | Wreck and rebuild line No. 2090 Ladysmith CT-Summit D.P. segment as a double circuit 230 kV line to achieve a summer rating of 1573 MVA. Only one circuit will be wired at this stage. Upgrade circuit breaker leads, switches and line leads at Ladysmith CT to 4000A | $36.50 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.360 | Rebuild 230 kV line No. 2054 Charlottesville-Proffit DP using double-circuit capable 500/230 kV poles. (The 500 kV circuit will not be wired as part of this project). | $70.14 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.361 | Rebuild 230 kV line No. 233 Charlottesville-Hydraulic Rd-Barracks Road-Crozet-Dooms. | $54.54 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.362 | Rebuild 230 kV line No. 291 segment from Charlottesville-Barracks Road. | $22.50 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.363 | Rebuild 230 kV line No. 291 segment from Barracks Road-Crozet. | $20.81 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.364 | Rebuild 230 kV line No. 291 segment Crozet-Dooms. | $11.23 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.365 | Hollymeade substation Relay Revision for 230 kV line No. 2054 Charlottesville-Hollymeade. | $0.01 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.366 | Upgrade the terminal equipment at Charlottesville to 4000A for 230 kV line No. 2054 (Charlottesville-Hollymeade). | $0.97 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.367 | Proffit DP substation Relay Revision for 230 kV line No. 2054 Charlottesville-Hollymeade | $0.02 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.368 | Barracks Rd substation Relay Reset to accommodate the rebuilt line 230 kV lines No. 233 and No. 291. | $0.03 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.369 | Crozet substation Relay Reset to accommodate the rebuilt line 230 kV lines No. 233 and No. 291. | $0.03 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.370 | Charlottesville substation Terminal Equipment Upgrade for 230 kV lines No. 233 & No. 291 Rebuild. | $1.50 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.371 | Upgrade Hydraulic Rd substation Equipment for 230 kV line No. 233 & No. 291 Rebuild. | $0.65 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.372 | Dooms substation Terminal Equipment Upgrade for 230 kV line No. 233 & No. 291 Rebuild. | $1.06 | Dominion | Dominion (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required IS Date |
|---|---|---|---|---|---|
| b3800.373 | Wreck and rebuild approximately 7.14 miles of 230 kV line No. 256 from St. Johns to structure 256/108 to achieve a summer rating of 1573 MVA. line switch 25666 at St. Johns to be upgraded to 4000A. | $21.75 | Dominion | Dominion (100.00%) | 6/1/2028 |
| b3800.374 | Reconductor approximately 5.30 miles of 230 kV line No. 256 from Ladysmith CT to structure 256/107 to achieve a summer rating of 1573 MVA. Terminal equipment at remote end substations will be upgraded to 4000A. | $16.14 | Dominion | Dominion (100.00%) | 6/1/2028 |
| b3800.401 | Replace Ashburn 230 kV breaker SC432 with a breaker rated 63 kA. | $0.79 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.402 | Replace Beaumeade 230 kV breaker 227T2152 with a breaker rated 80 kA. | $2.31 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.403 | Replace BECO 230 kV breakers 215012 and H12T2150 with breakers rated 63kA. | $4.21 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.404 | Replace Belmont 230 kV breaker 227T2180 with a breaker rated 80 kA. | $2.24 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.405 | Replace Brambleton 230 kV breakers 20102, 20602, 204502, 209402, 201T2045, 206T2094 with breakers rated 80 kA. | $9.38 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.406 | Replace Gainesville 230 kV breaker 216192 with a breaker rated 80 kA. | $3.11 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.407 | Replace Loudoun 230 kV breakers 204552, 217352 with breakers rated 80 kA. | $5.57 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.408 | Replace Ox 230 kV breakers 22042, 24342, 24842, 220T2063, 243T2097, 248T2013, H342 with breakers rated 80 kA. | $9.02 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.409 | Replace Paragon Park 230 kV breakers 208132, 215032, 2081T2206, 2150T2207 with breakers rated 80 kA. | $4.96 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.410 | Replace Reston 230 kV breaker 264T2015 with a breaker rated 63 kA. | $0.79 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.411 | Replace Stonewater 230 kV breakers 20662-1, 20662-2, 217862-1, 217862-2 with breakers rated 80 kA. | $4.95 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.412 | Replace Waxpool 230 kV breakers 214922-5, 214922-6, 216622-5, 216622-6 with breakers rated 63 kA. | $2.93 | Dominion | Dominion (100.00%) | 6/1/2027 |
| b3800.413 | Replace Double Toll Gate 138 kV breaker MDT 138 OCB with a breaker rated 40 kA. | $3.00 | APS | APS (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required IS Date |
|---|---|---|---|---|---|
| b3800.414 | Replace Doubs 500 kV breaker DL-55 522LIN with a breaker rated 60 kA. | $10.01 | APS | APS (100.00%) | 6/1/2027 |

## Attachment B – Reliability Project Multi-Zone Allocations

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.1 | Build New Otter Creek 500 kV (Collinsville) - (switching station -Two bay three breaker configuration). | $32.76 | PPL | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (13.16%) / BGE (0.71%) / Dominion (74.28%) / DPL (0.36%) / PECO (0.68%) / PEPCO (10.59%) / PPL (0.22%) | 6/1/2027 |
| b3800.2 | Break the existing TMI-Peach Bottom 500 kV line and reterminate into adjacent Otter Creek 500 kV Switchyard. | $7.03 | ME | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (13.16%) / BGE (0.71%) / Dominion (74.28%) / DPL (0.36%) / PECO (0.68%) / PEPCO (10.59%) / PPL (0.22%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.3 | New Otter Creek (Collinsville) to Doubs 500 kV line (Otter Creek 500 kV - MD Border). Rebuild and expand existing ~12 miles of Otter Creek-Conastone 230 kV line to become a double-circuit 500 and 230 kV lines. | $83.30 | PPL | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (13.16%) / BGE (0.71%) / Dominion (74.28%) / DPL (0.36%) / PECO (0.68%) / PEPCO (10.59%) / PPL (0.22%) | 6/1/2027 |
| b3800.4 | New Otter Creek to Doubs 500 kV line (MD Border-PSEG Demarcation Point). Rebuild and expand existing ~1.6 miles of Otter Creek-Conastone 230 kV line to become a double-circuit 500 and 230 kV lines. | $11.11 | BGE | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (13.16%) / BGE (0.79%) / Dominion (74.28%) / DPL (0.41%) / PECO (0.77%) / PEPCO (10.59%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.5 | Peach Bottom-TMI 500 kV - Replace terminal equipment at Peach Bottom. | $0.00 | PECO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: AEC (6.40%) / BGE (20.32%) / DPL (9.76%) / JCPL (17.57%) / Neptune (1.73%) / PECO (6.33%) / PEPCO (7.48%) / PSEG (29.15%) / RE (1.26%) | 6/1/2027 |
| b3800.6 | Peach Bottom-TMI 500 kV - Replace terminal equipment at TMI. | $0.00 | ME | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (7.41%) / BGE (15.50%) / Dominion (45.08%) / DPL (2.46%) / JCPL (0.80%) / ME (0.34%) / Neptune (0.09%) / PECO (10.72%) / PEPCO (15.72%) / PPL (0.43%) / PSEG (1.39%) / RE (0.06%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.7 | Construct 38 miles of 500 kV overhead AC line between the Conastone vicinity and the Doubs substations (BGE zone portion). | $213.20 | PSEG | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (13.16%) / BGE (0.79%) / Dominion (74.28%) / DPL (0.41%) / PECO (0.77%) / PEPCO (10.59%) | 6/1/2027 |
| b3800.8 | Reconfigure Doubs 500 kV station and upgrade terminal equipment to terminate new line. | $57.50 | APS | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (13.16%) / BGE (0.79%) / Dominion (74.28%) / DPL (0.41%) / PECO (0.77%) / PEPCO (10.59%) | 6/1/2027 |
| b3800.13 | Rebuild the Germantown-Carroll 138 kV line to 230 kV double circuit construction (APS-PE Section). | $47.31 | APS | APS (82.49%) / ME (17.51%) | 6/1/2027 |
| b3800.14 | Construct New 230 kV Hunterstown-Carroll line (MAIT section). | $17.37 | ME | APS (99.86%) / ME (0.14%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.15 | Construct New 230 kV Hunterstown-Carroll line (APS-PE Section). | $6.71 | APS | APS (99.86%) / ME (0.14%) | 6/1/2027 |
| b3800.16 | Expand Carroll 230 kV substation to ring bus. | $7.62 | APS | APS (99.86%) / ME (0.14%) | 6/1/2027 |
| b3800.17 | Network upgrade at Caroll substation. | $0.43 | APS | APS (99.86%) / ME (0.14%) | 6/1/2027 |
| b3800.18 | Add a new 230 kV Breaker at the Hunterstown 230 kV substation for the new Hunterstown-Carroll 230 kV termination. | $2.31 | ME | APS (99.86%) / ME (0.14%) | 6/1/2027 |
| b3800.27 | High Ridge 500 kV substation (cut into Brighton-Waugh Chapel 500 kV line) - Waugh Chapel side. | $33.67 | BGE | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: BGE (70.66%) / PEPCO (29.34%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.28 | High Ridge 500 kV substation (cut into Brighton-Waugh Chapel 500 kV line) -Brighton side. | $33.67 | BGE | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (0.68%) / BGE (97.41%) / Dominion (1.91%) | 6/1/2027 |
| b3800.29 | High Ridge termination for the North Delta-High Ridge 500 kV line. | $33.67 | BGE | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: BGE (2.58%) / Dominion (59.28%) / DPL (0.02%) / PEPCO (28.48%) / PSEG (9.24%) / RE (0.40%) | 6/1/2027 |
| b3800.30 | High Ridge - Install two 500/230 kV transformers. | $22.11 | BGE | BGE (62.75%) / PEPCO (37.25%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.31 | Build new North Delta-High Ridge 500 kV line. | $13.36 | PECO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (60.85%) / DPL (0.01%) / PECO (0.01%) / PEPCO (29.24%) / PSEG (9.48%) / RE (0.41%) | 6/1/2027 |
| b3800.32 | Build new North Delta-High Ridge 500 kV line. (~59 miles). | $407.11 | BGE | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: BGE (2.58%) / Dominion (59.28%) / DPL (0.02%) / PEPCO (28.48%) / PSEG (9.24%) / RE (0.40%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.33 | Replace terminal equipment limitations at Brighton 500 kV - on the existing Brighton-Waugh Chapel 500 kV (5053) or new Brighton-High Ridge 500 kV. | $4.13 | PEPCO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (0.68%) / BGE (86.77%) / Dominion (1.91%) / PEPCO (10.64%) | 6/1/2027 |
| b3800.34 | Rebuild 5012 (existing Peach Bottom-Conastone) (new Graceton-Conastone) 500 kV line on single circuit structures within existing ROW and cut into North Delta 500 kV and Gracetone 500 kV stations. | $70.00 | BGE | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: BGE (12.36%) / Dominion (24.57%) / DPL (25.17%) / JCPL (7.90%) / Neptune (0.88%) / PENELEC (1.60%) / PEPCO (12.32%) / PSEG (14.57%) / RE (0.63%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.35 | Rebuild 5012 (existing Peach Bottom-Conastone) (new North Delta-Graceton PECO) 500 kV line on single circuit structures within existing ROW and cut into North Delta 500 kV and Gracetone 500 kV stations. | $29.86 | PECO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: BGE (49.42%) / Dominion (31.22%) / DPL (0.01%) / JCPL (0.01%) / PECO (3.75%) / PEPCO (15.57%) / PSEG (0.02%) | 6/1/2027 |
| b3800.36 | Rebuild 5012 (existing Peach Bottom-Conastone) (new North Delta-Graceton BGE) 500 kV line on single circuit structures within existing ROW and cut into North Delta 500 kV and Gracetone 500 kV stations. | $10.44 | BGE | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: BGE (51.35%) / Dominion (32.44%) / DPL (0.01%) / JCPL (0.01%) / PEPCO (16.17%) / PSEG (0.02%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.37 | Replace terminal equipment limitations at Conastone 500 kV - on the (existing Peach Bottom-Conastone) or (new Graceton-Conastone) 500 kV line. | $4.93 | BGE | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: BGE (12.36%) / Dominion (24.57%) / DPL (25.17%) / JCPL (7.90%) / Neptune (0.88%) / PENELEC (1.60%) / PEPCO (12.32%) / PSEG (14.57%) / RE (0.63%) | 6/1/2027 |
| b3800.38 | Chalk Point-Cheltanham 500 kV (5073) - Replace relay at Chalk Point 500 kV. | $0.34 | PEPCO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: BGE (39.75%) / Dominion (59.03%) / PEPCO (1.22%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.39 | Red Lion-Hope Creek 500 kV - Replace terminal equipment at Red Lion. | $4.00 | DPL | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: AEC (0.02%) / BGE (22.89%) / Dominion (48.61%) / DPL (9.46%) / JCPL (0.03%) / PEPCO (18.96%) / PSEG (0.03%) | 6/1/2027 |
| b3800.40 | Conastone-Brighton 500 kV (5011 circuit) - Replace terminal equipment limitations at Brighton 500 kV. | $4.13 | PEPCO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: BGE (9.65%) / Dominion (63.04%) / DPL (0.02%) / PEPCO (27.29%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.41 | Conastone-Brighton 500 kV (5011 circuit) - Replace terminal equipment limitations at Conastone 500 kV. | $7.16 | BGE | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: BGE (9.65%) / Dominion (63.04%) / DPL (0.02%) / PEPCO (27.29%) | 6/1/2027 |
| b3800.42 | Peach Bottom North bus upgrade - Replace 11 – Instances of strain bus conductor used for breaker drops or CT drops, 7 – 500 kV disconnect switches, 7 – Free Standing CTs, 1 – 500 kV breaker, 2 – Breaker relays or meters. | $2.70 | PECO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: BGE (62.82%) / DPL (7.25%) / JCPL (0.09%) / Neptune (0.01%) / PECO (0.01%) / PEPCO (29.63%) / PSEG (0.18%) / RE (0.01%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.43 | Construct 31.5 miles of 500 kV overhead AC line between the Conastone vicinity and the Doubs substations (APS zone portion). | $176.80 | PSEG | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (13.16%) / BGE (0.79%) / Dominion (74.28%) / DPL (0.41%) / PECO (0.77%) / PEPCO (10.59%) | 6/1/2027 |
| b3800.44 | North Delta termination for the North Delta-High Ridge 500 line (PECO work). | $3.40 | PECO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (60.85%) / DPL (0.01%) / PECO (0.01%) / PEPCO (29.24%) / PSEG (9.48%) / RE (0.41%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.45 | North Delta 500 kV termination for the Rock Springs 500 kV line (5034/5014 line) (PECO work). | $10.20 | PECO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: AEC (17.65%) / BGE (4.43%) / Dominion (9.87%) / DPL (22.25%) / JCPL (3.16%) / Neptune (0.36%) / PECO (2.98%) / PENELEC (0.44%) / PEPCO (3.80%) / PPL (5.99%) / PSEG (27.86%) / RE (1.21%) | 6/1/2027 |
| b3800.46 | North Delta 500 kV termination for the new Peach Bottom-North Delta 500 kV line (PECO work). | $2.60 | PECO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: AEC (11.03%) / BGE (37.40%) / DPL (22.91%) / PEPCO (28.66%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.47 | Build new Peach Bottom South-North Delta 500 kV line – cut in to Peach Bottom tie No. 1 and extending line to North Delta (~1.25 miles new ROW). | $5.50 | PECO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: AEC (11.03%) / BGE (37.40%) / DPL (22.91%) / PEPCO (28.66%) | 6/1/2027 |
| b3800.48 | North Delta termination for the North Delta-High Ridge 500 line (Transource work). | $0.96 | Transource | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (60.85%) / DPL (0.01%) / PECO (0.01%) / PEPCO (29.24%) / PSEG (9.48%) / RE (0.41%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.49 | North Delta 500 kV termination for the Calpine generator (Calpine/Transource work). | $4.05 | Transource | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: PECO (100.00%) | 6/1/2027 |
| b3800.50 | North Delta 500 kV termination for the Rock Springs 500 kV line (5034/5014 line) (Transource work). | $0.49 | Transource | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: AEC (17.65%) / BGE (4.43%) / Dominion (9.87%) / DPL (22.25%) / JCPL (3.16%) / Neptune (0.36%) / PECO (2.98%) / PENELEC (0.44%) / PEPCO (3.80%) / PPL (5.99%) / PSEG (27.86%) / RE (1.21%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.51 | North Delta 500 kV termination for the new Peach Bottom-North Delta 500 kV line (Transource work). | $0.29 | Transource | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: AEC (11.03%) / BGE (37.40%) / DPL (22.91%) / PEPCO (28.66%) | 6/1/2027 |
| b3800.100 | Establish a new 500 kV breaker position for the low-side of the existing 765/500 kV transformer at Cloverdale Station. The new position will be between two new 500 kV circuit breakers located in a new breaker string, electrically converting the 500 kV yard to "double-bus double-breaker" configuration. | $11.59 | AEP | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: AEP (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.101 | 502 Junction substation two 500 kV circuit breaker expansion. | $30.60 | APS | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (25.59%) / BGE (9.79%) / Dominion (51.94%) / PEPCO (12.68%) | 6/1/2027 |
| b3800.102 | New 500 kV line from existing 502 Junction substation to Woodside 500 KV substation (bypass Black Oak) NEET Portion. | $315.64 | NEET | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (25.59%) / BGE (9.79%) / Dominion (51.94%) / PEPCO (12.68%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.103 | Rebuild ~16 miles of the Gore-Stonewall 138 kV line with 500 kV overbuild (502 Jct to Woodside 500 kV line section). | $151.72 | APS | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (25.59%) / BGE (9.79%) / Dominion (51.94%) / PEPCO (12.68%) | 6/1/2027 |
| b3800.104 | Rebuild ~15 miles of the Stonewall-Millville 138 kV line with 500 kV overbuild (502 Jct to Woodside 500 kV line section). | $136.93 | APS | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (9.18%) / BGE (7.21%) / Dominion (72.52%) / PEPCO (11.09%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.105 | Rebuild ~6 miles of the Millville-Doubs 138 kV line with 500 kV overbuild (502 Jct to Woodside 500 kV line section). | $52.35 | APS | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (9.18%) / BGE (7.21%) / Dominion (72.52%) / PEPCO (11.09%) | 6/1/2027 |
| b3800.106 | Woodside 500 kV substation (Except terminations, Transformer, Cap Banks and Statcom). | $43.96 | NEET | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.107 | Line Termination cost at Woodside 500 kV for 502 Jct to Woodside 500 kV line. | $0.51 | NEET | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (25.59%) / BGE (9.79%) / Dominion (51.94%) / PEPCO (12.68%) | 6/1/2027 |
| b3800.108 | Line Termination cost at Woodside 500 kV for Woodside to Aspen 500 kV line. | $0.51 | NEET | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (9.18%) / BGE (7.21%) / Dominion (72.52%) / PEPCO (11.09%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.113 | Two 150 MVAR Cap banks and one +500/-300 MVAR STATCOM at Woodside 500 kV substation. | $44.22 | NEET | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (100.00%) | 6/1/2027 |
| b3800.115 | Line work for terminating Doubs to Bismark line for Doubs side for Woodside 500 kV substation.<br>NEET Portion | $0.51 | NEET | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (27.49%) / BGE (9.83%) / Dominion (53.78%) / PEPCO (8.90%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.116 | Line work for terminating Doubs to Bismark line for Doubs side for Woodside 500 kV substation.<br>FE Portion | $0.06 | APS | Load-Ratio Share Allocation:<br>AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation:<br>APS (27.49%) / BGE (9.83%) / Dominion (53.78%) / PEPCO (8.90%) | 6/1/2027 |
| b3800.117 | Line work for terminating Doubs to Bismark line for Bismark side for Woodside 500 kV substation.<br>NEET Portion | $0.51 | NEET | Load-Ratio Share Allocation:<br>AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation:<br>APS (21.09%) / BGE (6.55%) / Dominion (64.94%) / PEPCO (7.42%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.118 | Line work for terminating Doubs to Bismark line into Woodside 500 kV substation.<br>DOM Portion | $5.10 | Dominion | Load-Ratio Share Allocation:<br>AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation:<br>APS (21.09%) / BGE (6.55%) / Dominion (64.94%) / PEPCO (7.42%) | 6/1/2027 |
| b3800.119 | New 500 kV transmission line from Woodside substation to Aspen substation (in DOM zone).<br>NEET Portion | $71.72 | NEET | Load-Ratio Share Allocation:<br>AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation:<br>APS (9.18%) / BGE (7.21%) / Dominion (72.52%) / PEPCO (11.09%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.120 | Aspen substation work to terminate new NextEra 500 kV line. Include Aspen 500 kV subsation portion build. | $30.49 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (9.18%) / BGE (7.21%) / Dominion (72.52%) / PEPCO (11.09%) | 6/1/2027 |
| b3800.121 | Kammer to 502 Junction 500 kV line: Conduct LIDAR Sag Study to assess SE rating and needed upgrades. | $0.10 | AEP | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: AEP (21.66%) / APS (0.01%) / BGE (7.14%) / DEOK (0.01%) / Dominion (62.25%) / PEPCO (8.93%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.122 | Rebuild 500 kV line No. 514 from Doubs-Goose Creek 500 kV line. The Doubs-Goose Creek 500 kV line will be rebuilt and the Doubs-Dickerson 230 kV will be relocated and underbuilt on the same structure. APS Portion | $103.27 | APS | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (0.08%) / Dominion (99.90%) / PEPCO (0.02%) | 6/1/2027 |
| b3800.123 | Doubs substation work - Re-terminate the rebuilt Doubs-Goose Creek 500 kV line in its existing bay, Terminate the new Doubs-Aspen 500 kV line in the open bay at Doubs, Replace three 500 kV breakers, Replace 500 kV terminal equipment including disconnect switches, CTs and substation conductor & Replace relaying. APS Portion | $31.70 | APS | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (0.08%) / Dominion (99.90%) / PEPCO (0.02%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.124 | New Doubs to Aspen 500 kV line - Aspen substation is not yet constructed but is a component in Dominion's proposal 2022-W3-692. The Doubs-Aqueduct and Aqueduct-Dickerson 230 kV lines will be rebuilt and attached on the same structures.<br>APS Portion | $68.80 | APS | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (0.09%) / Dominion (99.89%) / PEPCO (0.02%) | 6/1/2027 |
| b3800.200 | Build a new 500 kV line from Aspen-Golden on 500/230 kV double circuit structures with substation upgrades at Aspen and Golden. New conductor to have a minimum summer normal rating of 4357MVA. | $176.02 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (100.00%) | 6/1/2027 |
| b3800.202 | Install (1) 500-230 kV transformer bank at Aspen substation. | $42.00 | Dominion | Dominion (86.28%) / PEPCO (13.72%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.212 | Build a new 500 kV line from Mars-Golden on 500/230 kV double circuit structures with substation upgrades at Golden and Mars. New conductor to have a monimum summer normal rating of 4357 MVA. | $228.04 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (99.96%) / Dominion (0.04%) | 6/1/2027 |
| b3800.213 | Cut 500 kV line No. 558 Brambleton-Goose Creek into Aspen substation. Upgrade 500 kV terminal equipment at Aspen and Goose Creek to 5000A continuous rating current. At Goose Creek, replace circuit breakers 59582 and 55882, and associated disconnect switches, breaker leads, bus, and line risers to accommodate 5000A rating. | $50.12 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (99.39%) / Dominion (0.61%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.214 | Build a new 500 kV line from Aspen-Goose Creek to achieve a summer rating of 4357 MVA. Install new 500 kV terminal equipment at Aspen. | $38.53 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (99.39%) / Dominion (0.61%) | 6/1/2027 |
| b3800.217 | Build a new 230 kV line from Aspen-Sycolin Creek on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Golden and Sycolin Creek. | $60.42 | Dominion | Dominion (86.28%) / PEPCO (13.72%) | 6/1/2027 |
| b3800.225 | Change 500 kV line No. 558 destination at Brambleton to Aspen substation and upgrade line protection relays. | $0.23 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (5.20%) / DL (0.46%) / Dominion (91.40%) / ME (0.59%) / PEPCO (2.35%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.238 | Upgrade equipment to 4000A continuous current rating at Pleasant View substation in support of 230 kV line No. 203 rebuild. Replace circuit breakers 203T274 & L3T203 and associated disconnect switches, breaker leads, bus, and line risers to accommodate 4000A rating. | $1.81 | Dominion | APS (8.09%) / BGE (8.25%) / Dominion (64.87%) / PEPCO (18.79%) | 6/1/2027 |
| b3800.239 | Wreck and rebuild 230 kV line No. 203 between Pleasant View and structure 203/15 using double circuit 500/230 kV structures. The 500 kV line is from Aspen-Doubs. | $6.87 | Dominion | APS (8.09%) / BGE (8.25%) / Dominion (64.87%) / PEPCO (18.79%) | 6/1/2027 |
| b3800.240 | Build a new 500 kV line from Aspen-Doubs using double circuit 500/230 kV structures. The 230 kV line is from Pleasant View-structure 203/15.<br>Install terminal equipment at Aspen for a 5000A line to Doubs (First Energy). This includes GIS breakers, GIS-to-AIS transition equipment, and metering CCVTs and CTs for the tie line. | $41.68 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (0.09%) / Dominion (99.89%) / PEPCO (0.02%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.241 | Rebuild 500 kV line No. 514 from Goose Creek-Doubs using 500/230 kV double circiut structures. The new double circuit towers will accommodate 230 kV line No. 2098 between Pleasant View substation and structure 2098/9. Upgrade equipment at Goose Creek to 5000A continuous current rating in support of line No. 514 wreck and rebuild. Replace circuit breakers 514T595 & 51482 and associated disconnect switches, breaker leads, bus, and line risers to accommodate 5000A rating. | $16.11 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (0.08%) / Dominion (99.90%) / PEPCO (0.02%) | 6/1/2027 |
| b3800.242 | Upgrading switches 20366M and 20369M and line leads to 4000A continuous current rating of 230 kV line No. 203 at Edwards Ferry substation | $0.51 | Dominion | APS (11.45%) / BGE (14.14%) / Dominion (42.82%) / PEPCO (31.59%) | 6/1/2027 |
| b3800.243 | Rebuild 7.26 miles of existing 230 kV circuit from Dickerson Station H to Ed's Ferry area to accommodate the new 500 kV circuit between Doubs and Aspen. (the 500 kV portion of the work) | $37.20 | PEPCO | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (0.09%) / Dominion (99.89%) / PEPCO (0.02%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.244 | Rebuild 7.26 miles of existing 230 kV circuit from Dickerson Station H to Ed's Ferry area to accommodate the new 500 kV circuit between Doubs and Aspen. (The 230 kV portion of the project) | $18.60 | PEPCO | APS (9.78%) / BGE (12.07%) / Dominion (51.18%) / PEPCO (26.97%) | 6/1/2027 |
| b3800.245 | Reconfigure Dickerson H 230 kV substation and upgrade terminal equipment. | $10.58 | PEPCO | APS (9.78%) / BGE (12.07%) / Dominion (51.18%) / PEPCO (26.97%) | 6/1/2027 |
| b3800.306 | Install one (1) 500 kV, 150 MVAr Shunt Capacitor Bank & associated equipment at Morrisville substation. This addition will require a control house expansion to accommodate for two new panels. | $3.63 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (100.00%) | 6/1/2027 |
| b3800.307 | Install one (1) 500 kV, 300 MVAR Static synchronous Compensator (STATCOM) & associated equipment at Mars substation. | $41.27 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (100.00%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.310 | Install one 500 kV, 293.8MVAr Shunt Capacitor Bank & associated equipment at Wishing Star substation. | $3.97 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (100.00%) | 6/1/2027 |
| b3800.311 | Rebuild 500 kV line No. 545 Bristers-Morrisville as a single circuit monopole line to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. | $65.86 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (91.07%) / PEPCO (8.93%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.312 | Rebuild 500 kV line No. 569 Loudoun-Morrisville to accommodate the new 500 kV line in the existing right-of-way. New conductor to have a summer rating of 4357 MVA. | $175.62 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (11.72%) / Dominion (88.28%) | 6/1/2027 |
| b3800.313 | Rebuild approximately 10.29 miles line segment of line No. 535 (Meadow Brook to Loudoun) to accommodate the new 500 kV line in the existing ROW. | $65.86 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (13.93%) / BGE (6.86%) / Dominion (70.92%) / PEPCO (8.29%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.314 | Rebuild approximately 4.83 miles of 500 kV line No. 546 Mosby-Wishing Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. Upgrade and install equipment at Mosby substation to upgrade terminal equipment to be rated for 5000A for 500 kV lines No. 546. | $49.79 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (41.98%) / Dominion (34.03%) / PEPCO (23.99%) | 6/1/2027 |
| b3800.315 | Rebuild approximately 4.59 miles of 500 kV line No. 590 Mosby-Wishing Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. Upgrade and install equipment at Mosby substation to upgrade terminal equipment to be rated for 5000A for 500 kV lines No. 590. | $49.79 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (41.98%) / Dominion (34.03%) / PEPCO (23.99%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.336 | Upgrade and install equipment at Bristers substation to support the new conductor 5000A rating for 500 kV line No. 545. | $5.72 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: Dominion (91.07%) / PEPCO (8.93%) | 6/1/2027 |
| b3800.344 | Upgrade and install equipment at Loudoun substation to support the new conductor 5000A rating for 500 kV line No. 569 Loudoun-Morrisville. | $10.70 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (11.72%) / Dominion (88.28%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.346 | Upgrade and install equipment at Morrisville substation to support the new 500 kV conductor termination. All terminal equipment to be rated for 5000 A for 500 kV line No. 545 & No. 569. Upgrade 500 kV bus 2 to 5000 A. | $17.54 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (11.72%) / Dominion (88.28%) | 6/1/2027 |
| b3800.350 | Install terminal equipment at Vint Hill substation to support a 5000A line to Morrisville. Update relay settings for 230 kV lines No. 2101, No. 2163, and 500 kV line No. 535. | $23.64 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (9.79%) / Dominion (90.21%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.353 | Update relay settings at Vint Hill for 500 kV line No. 535 Vint Hill-Loudoun. | $0.03 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (13.93%) / BGE (6.86%) / Dominion (70.92%) / PEPCO (8.29%) | 6/1/2027 |
| b3800.354 | Install terminal equipment at Wishing Star substation to support a 5000A line to Vint Hill. Update relay settings for 500 kV lines No. 546 and No. 590. | $12.30 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (21.45%) / Dominion (78.55%) | 6/1/2027 |

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3800.356 | Build a new 500 kV line from Vint Hill to Wishing Star. The line will be supported on single circuit monopoles. New conductor to have a summer rating of 4357 MVA. Line length is approximately 16.59 miles. | $87.81 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (21.45%) / Dominion (78.55%) | 6/1/2027 |
| b3800.357 | Build a new 500 kV line from Morrisville to Vint Hill. New conductor to have a summer rating of 4357 MVA. Line length is approximately 19.71 miles. | $101.89 | Dominion | Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br><br>DFAX Allocation: APS (9.79%) / Dominion (90.21%) | 6/1/2027 |

## Attachment C – Reliability Project Multi-Driver Cost Allocations

| Upgrade ID | Description | Cost Estimate ($M) | TO | Cost Responsibility | Required In-Service Date |
|---|---|---|---|---|---|
| b3737.47 | Build New North Delta 500 kV substation (four bay breaker and half configuration) - the substation will include 12 - 500 kV breakers and one 500/230 kV transformer, will allow the termination of six - 500 kV lines. | 104.1 | Transource | Public Policy Driver: (73.27%) AEC (13.55%) / JCPL (31.74%) / PSEG (52.60%) / RE (2.11%)<br><br>Reliability Driver: (26.73%) Load-Ratio Share Allocation: AEC (1.65%) / AEP (13.68%) / APS (5.76%) / ATSI (8.04%) / BGE (4.11%) / ComEd (13.39%) / Dayton (2.12%) / DEOK (3.25%) / DL (1.71%) / Dominion (13.32%) / DPL (2.60%) / EKPC (1.89%) / JCPL (3.86%) / ME (1.90%) / NEPTUNE (0.42%) / OVEC (0.08%) / PECO (5.40%) / PENELEC (1.78%) / PEPCO (3.67%) / PPL (4.72%) / PSEG (6.39%) / RE (0.26%)<br>DFAX Allocation: PECO (100.00%) | 6/1/2029 |

Figure 1. Project Cost by Cluster

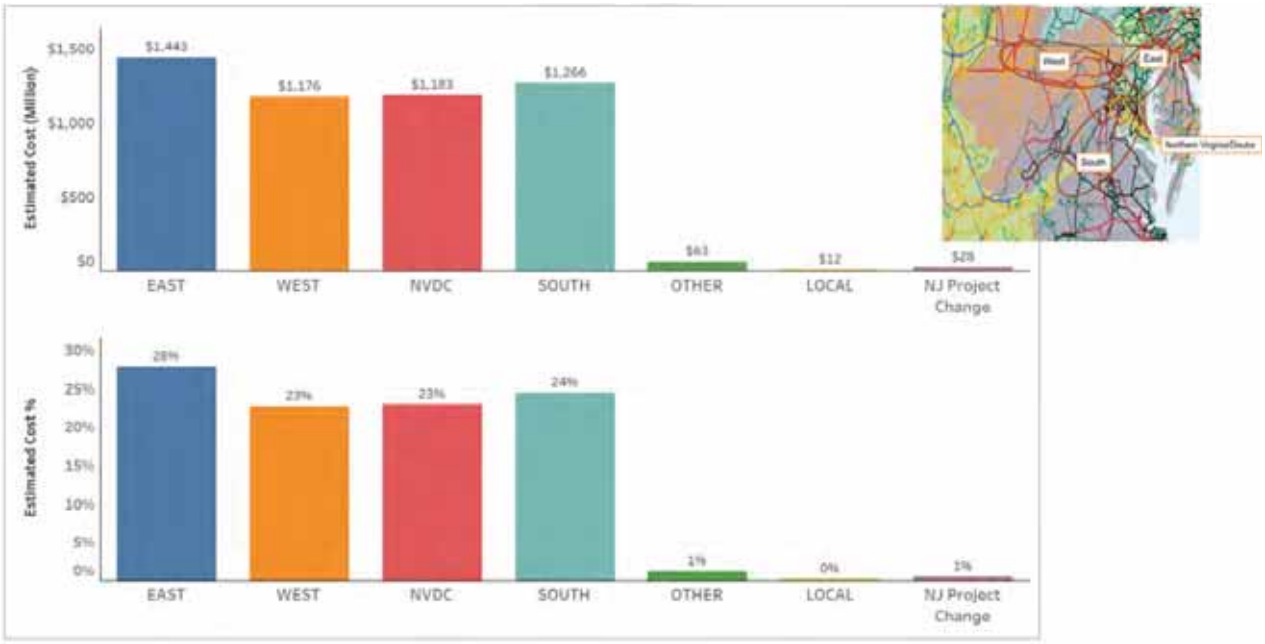
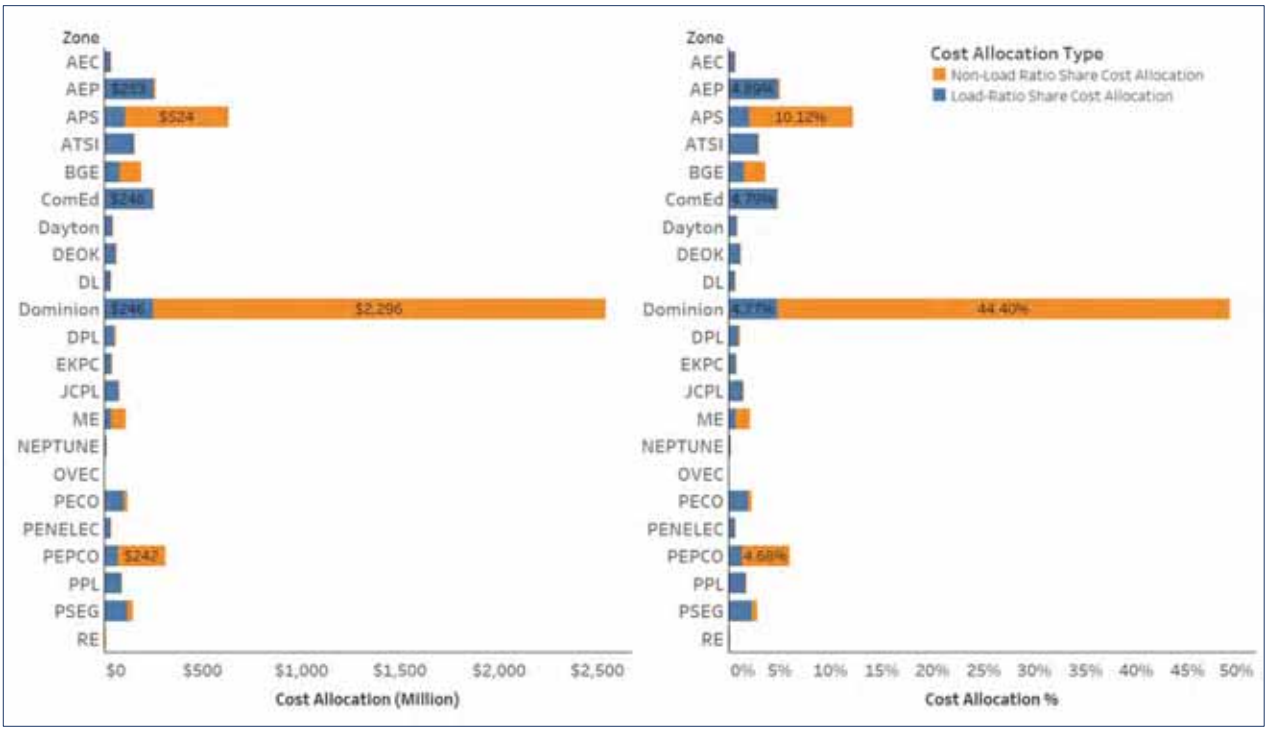



Figure 2. Project Cost by Designated Entity

Figure 3. Cost Allocation by Zone



# Attachment D – Interconnection Queue Projects With System Impact Study Reports Issued

Generation Interconnection Requests

| Queue Position | Transmission Owner | Fuel Type | MW Energy | MW Capacity |
|---|---|---|---|---|
| AD1-013 | ComEd | Solar | 40 | 15.4 |
| AD1-031 | ComEd | Solar | 70 | 26.6 |
| AD1-039 | ComEd | Natural Gas | 102.7 | 93 |
| AD1-056 | Dominion | Solar | 60 | 38.9 |
| AD1-057 | Dominion | Solar | 33 | 21.7 |
| AD1-074 | Dominion | Solar | 300 | 198.8 |
| AD1-075 | Dominion | Solar | 75 | 49.7 |
| AD1-076 | Dominion | Solar | 109 | 72.2 |
| AD1-098 | ComEd | Solar | 100 | 57.8 |
| AD1-100 | ComEd | Wind | 850 | 150 |
| AD1-102 | AEP | Wind | 180.01 | 23.4 |
| AD2-008 | Dominion | Solar | 52.1 | 16.4 |
| AD2-033 | Dominion | Solar | 130 | 78 |
| AD2-038 | ComEd | Wind | 150 | 26.4 |
| AD2-046 | Dominion | Solar | 80 | 54.8 |
| AD2-047 | ComEd | Wind | 200 | 34 |
| AD2-063 | Dominion | Solar | 149.5 | 89.7 |
| AD2-066 | ComEd | Solar | 116 | 69.6 |
| AD2-077 | PPL | Storage | 150 | 100 |
| AD2-100 | ComEd | Solar | 210 | 126 |
| AD2-131 | ComEd | Solar | 50 | 8.3 |
| AD2-134 | ComEd | Wind | 105.9 | 21.2 |
| AD2-162 | AEP | Solar | 110 | 73.81 |
| AD2-178 | AEP | Solar | 120 | 72 |
| AD2-179 | AEP | Solar | 100 | 60 |
| AD2-194 | ComEd | Natural Gas | 60 | 120 |
| AD2-214 | ComEd | Solar | 68 | 40.8 |
| AE1-001 | BGE | Nuclear | 28.1 | 7.1 |
| AE1-068 | Dominion | Solar | 500 | 322.1 |
| AE1-069 | Dominion | Solar | 400 | 254.5 |
| AE1-093 | AEP | Storage | 42 | 42 |
| AE1-107 | DPL | Solar | 53.1 | 31 |
| AE1-113 | ComEd | Wind | 300 | 66 |
| AE1-149 | Dominion | Solar | 100 | 60 |
| AE1-163 | ComEd | Wind | 350 | 49 |
| AE1-170 | AEP | Solar | 150 | 63 |

| Queue Position | Transmission Owner | Fuel Type | MW Energy | MW Capacity |
|---|---|---|---|---|
| AE1-207 | AEP | Solar | 160 | 67.2 |
| AE1-208 | AEP | Solar | 130 | 55 |
| AE1-209 | AEP | Wind | 100 | 13 |
| AE1-210 | AEP | Wind | 100 | 13 |
| AE1-227 | AEP | Solar | 49.5 | 30.69 |
| AE1-240 | AEC | Solar | 49.7 | 29 |
| AE1-245 | AEP | Wind | 150 | 19.5 |
| AE1-250 | AEP | Solar | 150 | 90 |
| AE2-020 | AEC | Offshore Wind | 604.8 | 106.44 |
| AE2-021 | AEC | Offshore Wind | 604.8 | 106.44 |
| AE2-022 | AEC | Offshore Wind | 300 | 52.8 |
| AE2-024 | JCPL | Offshore Wind | 882 | 155.23 |
| AE2-025 | JCPL | Offshore Wind | 445.2 | 78.36 |
| AE2-034 | Dominion | Solar | 60 | 42 |
| AE2-047 | AEP | Solar | 50 | 32.4 |
| AE2-072 | AEP | Solar | 150 | 90 |
| AE2-089 | AEP | Solar | 155 | 93 |
| AE2-113 | PENELEC | Solar | 120 | 61.9 |
| AE2-137 | APS | Natural Gas | 84 | 87 |
| AE2-160 | AEP | Hydro | 51 | 30 |
| AE2-166 | AEP | Solar | 90 | 54 |
| AE2-169 | AEP | Solar | 33 | 33 |
| AE2-172 | AEP | Storage | 40 | 40 |
| AE2-194 | ATSI | Solar | 145 | 84 |
| AE2-195 | AEP | Solar | 19.7 | 9 |
| AE2-214 | AEP | Solar | 200 | 120 |
| AE2-219 | AEP | Solar | 100 | 42 |
| AE2-236 | AEP | Solar | 55 | 38.5 |
| AE2-255 | ComEd | Wind | 100 | 25 |
| AE2-262 | APS | Solar | 83.6 | 50 |
| AE2-263 | APS | Solar | 78.38 | 47 |
| AE2-264 | PENELEC | Solar | 80 | 48 |
| AE2-267 | DEOK | Solar | 49 | 28.6 |
| AE2-281 | ComEd | Wind | 50 | 7 |
| AE2-298 | AEP | Solar | 49.9 | 29.9 |
| AE2-299 | PENELEC | Storage | 160 | 32 |
| AE2-302 | AEP | Solar | 49.9 | 29.94 |
| AE2-308 | EKPC | Solar; Storage | 150 | 110 |
| AE2-316 | APS | Solar | 90 | 41.2 |
| AE2-322 | AEP | Solar | 60 | 40.3 |
| AE2-323 | AEP | Solar | 100 | 67.1 |

| Queue Position | Transmission Owner | Fuel Type | MW Energy | MW Capacity |
|---|---|---|---|---|
| AF1-017 | Dominion | Solar | 20 | 7.6 |
| AF1-019 | JCPL | Storage | 20 | 0 |
| AF1-029 | AEP | Solar | 25 | 15 |
| AF1-064 | ATSI | Solar | 50 | 33.4 |
| AF1-078 | Dayton | Solar | 45 | 18.9 |
| AF1-086 | PENELEC | Wind | 109.9 | 20.54 |
| AF1-092 | AEP | Solar; Storage | 150 | 115 |
| AF1-094 | PENELEC | Solar | 20 | 12 |
| AF1-098 | PENELEC | Solar | 80 | 48 |
| AF1-104 | PENELEC | Solar; Storage | 20 | 20 |
| AF1-120 | ATSI | Solar | 40 | 26.6 |
| AF1-122 | ATSI | Solar | 64 | 26.88 |
| AF1-130 | AEP | Solar | 190 | 133.9 |
| AF1-134 | PENELEC | Solar | 20 | 12 |
| AF1-143 | PENELEC | Solar | 100 | 60 |
| AF1-153 | APS | Solar | 20 | 12 |
| AF1-158 | AEP | Solar; Storage | 150 | 90 |
| AF1-164 | AEP | Solar | 300 | 195 |
| AF1-167 | APS | Solar | 13.515 | 8.109 |
| AF1-202 | AEP | Wind | 200 | 34 |
| AF1-204 | AEP | Wind | 255 | 63.75 |
| AF1-205 | AMPT | Solar | 40 | 24 |
| AF1-207 | AEP | Solar | 180 | 34 |
| AF1-215 | AEP | Solar | 300 | 180 |
| AF1-216 | PPL | Solar | 143.11 | 85.87 |
| AF1-223 | AEP | Solar | 150 | 90 |
| AF1-225 | APS | Solar | 20 | 8.4 |
| AF1-227 | AEP | Solar | 325 | 195 |
| AF1-228 | AEP | Solar | 155 | 93 |
| AF1-229 | AEP | Solar | 120 | 72 |
| AF1-254 | APS | Solar | 20 | 12 |
| AF1-272 | PENELEC | Solar | 110 | 66 |
| AF1-279 | ATSI | Solar; Storage | 150 | 90 |
| AF1-286 | PENELEC | Solar | 13.6 | 5 |
| AF1-325 | JCPL | Storage | 20 | 0 |
| AF2-001 | PENELEC | Solar | 20 | 12 |
| AF2-002 | PENELEC | Solar | 10 | 6 |
| AF2-021 | AEC | Storage | 20 | 8 |
| AF2-024 | AEC | Storage | 24 | 9.6 |
| AF2-039 | PENELEC | Solar | 13.5 | 8.1 |

| Queue Position | Transmission Owner | Fuel Type | MW Energy | MW Capacity |
|---|---|---|---|---|
| AF2-055 | ODEC | Storage; Solar | 45 | 27 |
| AF2-061 | DPL | Storage | 40 | 40 |
| AF2-078 | AEP | Solar; Storage | 200 | 120 |
| AF2-088 | PENELEC | Solar | 6.5 | 3.9 |
| AF2-092 | PENELEC | Solar | 12 | 7.2 |
| AF2-102 | ME | Solar | 3 | 1.8 |
| AF2-119 | Dominion | Solar | 80 | 48 |
| AF2-121 | PENELEC | Solar | 20 | 12 |
| AF2-122 | AEP | Solar | 107.7 | 64.62 |
| AF2-123 | ATSI | Solar | 49 | 20.58 |
| AF2-129 | ATSI | Solar | 20 | 12 |
| AF2-134 | AEP | Solar | 100 | 60 |
| AF2-145 | PPL | Solar | 51 | 30.6 |
| AF2-150 | ATSI | Solar | 88 | 36.96 |
| AF2-165 | PENELEC | Solar | 20 | 12 |
| AF2-166 | PENELEC | Solar | 20 | 12 |
| AF2-175 | ME | Solar | 3 | 1.8 |
| AF2-221 | PENELEC | Solar | 15 | 6.3 |
| AF2-254 | JCPL | Solar | 10 | 4.2 |
| AF2-313 | DPL | Solar | 19.9 | 12.7 |
| AF2-322 | ATSI | Solar | 199.67 | 119.802 |
| AF2-325 | DPL | Solar; Storage | 10 | 4.2 |
| AF2-356 | APS | Solar | 175 | 105 |
| AF2-416 | PSEG | Storage | 10 | 10 |
| AG1-041 | PENELEC | Solar | 12 | 7.2 |
| AG1-191 | JCPL | Solar | 15.4 | 6.5 |
| AG1-193 | PENELEC | Solar | 20 | 12 |
| AG1-252 | ATSI | Solar | 3.875 | 2.3 |
| AG1-259 | PPL | Solar | 15.9 | 6.7 |
| AG1-260 | PPL | Solar | 15.9 | 6.7 |
| AG1-262 | PPL | Storage | 85 | 40 |
| AG1-293 | APS | Solar | 7.5 | 4.9 |
| AG1-301 | PENELEC | Solar | 20 | 12 |
| AG1-478 | ComEd | Solar; Storage | 19.9 | 15.9 |

## Attachment E – Interconnection Network Upgrades

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n4106 | Replace two Switches at the Clifty Creek 345 kV station. | $0.41 | 10/31/2023 |
| n4106.3 | Jefferson-Clifty 345 kV line sag study remediation is one location of grading to remediate clearance location of concern in span 1 to 2. Latest Facility Study: Extend one Tower on the Jefferson-Clifty Creek (IKEC) 345 kV Circuit. | $0.41 | 12/31/2022 |
| n5769.5 | Replace four Dumont switches on the Stillwell-Dumont 345 kV line. | $2.40 | 6/1/2020 |
| n5769.6 | Adjust Dumont relay trip limit settings on the Stillwell-Dumont 345 kV line. | $0.60 | 6/1/2020 |
| n5783 | Reconductor the AC1-078 Tap-London 138 kV line. | $3.91 | 6/1/2020 |
| n5806 | Relay Modification Work to Accommodate AD1-037. | $0.03 | 5/1/2019 |
| n5833 | Mitigate the sag on the 17ST John-St John 345 kV line. | $3.80 | 6/1/2021 |
| n5834 | Mitigate the sag on the St John-Green Acre 345 kV line. | $3.80 | 6/1/2021 |
| n5867 | Cut the East-Springfield-Tangy 138 kV line and terminate the line inside the proposed AD2-163 ring bus in an in-out configuration at East Springfield-Tangy 138 kV line. | $0.37 | 12/1/2021 |
| n5868 | Adjust remote, relaying and metering settings and replace 138 kV wave trap, line tuner and coax at Tangy 138 kV substation. | $0.12 | 12/1/2021 |
| n5869 | Adjust remote, relaying and metering settings and replace 138 kV wave trap, line tuner and coax. Also replace line and carrier relaying at East Springfield 138 kV substation. | $0.27 | 12/1/2021 |
| n5879 | Rebuild the 6705 Sharptown-AD2-088 TAP 69 kV line. | $5.93 | 6/1/2020 |
| n5880 | Rebuild the 6705 AD2-088 TAP-Laurel 69 kV line | $5.09 | 6/1/2020 |
| n5886 | Install one span of Attachment Facility line from the Point of Interconnection (POI) to the tap point at or near MAIT structure No. 838-175 of the Lyons-Moselem 69 kV line. | $0.21 | 4/1/2020 |
| n5887 | Install two switches at the tap point at or near MAIT structure No. 838-175 of the Lyons-Moselem 69 kV line. | $0.42 | 4/1/2020 |
| n5888 | Estimated installation of 700 MHz radio system (70% penetration of FE territory) at AD2-115 to support the SCADA switch installations. Assumed SCADA work is included in this cost. | $0.05 | 4/1/2020 |
| n6078 | Substation – Design, install and test/commission Multiprotocol Label Switching (MPLS) Equipment for SCADA transport. Install fiber from AD2-158 to backbone for communication transport. SCADA work at Millville and Double Toll Gate substations to support wave trap & relay installations. Estimated one in-sub fiber run from AD2-158 substation control house to Interconnection Customer built fiber run to support communications and control to generator site. | $0.67 | 9/1/2020 |
| n6079 | Project Management, Environmental, Forestry, Real Estate and Right of Way at AD2-158 interconnection substation. | $1.34 | 9/1/2020 |
| n6080 | Double Toll Gate-Millville 138 kV Line – Cut the Double Toll Gate 138 kV line and install line loop to the new AD2-158 Wheatland 138 kV Interconnection substation. | $0.75 | 9/1/2020 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n6081 | Double Toll Gate 138 kV substation – Upgrade carrier and line relaying and wave trap. | $0.55 | 9/1/2020 |
| n6082 | Millville 138 kV substation – Upgrade carrier relaying and wave trap. | $0.36 | 9/1/2020 |
| n6134 | Build a new three breaker 230 kV ring bus cutting the Clover-Sedge Hill 230 kV line. | $6.12 | 9/2/2019 |
| n6135 | Install new structures to cut and loop the line into AD1-087 switching station. | $1.28 | 9/2/2019 |
| n6136 | Protection and communication work to support interconnection of new AD1- 087 generator. | $0.16 | 9/2/2019 |
| n6197.1 | Uprate CT associated with Barren Co-Horsecave Jct 69 kV line. | $0.00 | 6/1/2022 |
| n6197.2 | Upgrade jumpers at Barren Co associated with Barren Co-Horsecave Jct 69 kV line. | $0.01 | 6/1/2022 |
| n6198.2 | Uprate high side and two lowside CTs associated with Barren Co 161/69 kV Auto to a minimum of 230 MVA summer LTE. | $0.00 | 6/1/2022 |
| n6220 | Install a second, back-to-back breaker between existing line positions No. 254 and No. 2141 at the Lakeview substation. | $1.96 | 12/31/2017 |
| n6232 | Upgrade the existing 500 MCM Cu bus jumpers to 750 MCM Cu. New rating after the upgrade will be 148 MVA. | $0.25 | 12/31/2023 |
| n6235 | Build a three-breaker ring bus at the new AC1-043 substation. | $5.47 | 10/2/2019 |
| n6237 | Modify protection and communication work to support interconnection of new AC1-105 generator. | $0.18 | 10/2/2019 |
| n6239 | Install metering and overhead conductors from the POI to the interconnection switching substation AC2-088/AD1-136. | $0.42 | 6/30/2020 |
| n6274 | Install an Attachment facility line from the AC1-074 interconnection substation to the first structure located outside of the switchyard. Also, install revenue metering. | $0.35 | 6/1/2019 |
| n6275 | Install a new loop-in tap line will be constructed from EKPC's existing Jacksonville to Renaker 138 kV transmission line to the new switching station. | $0.52 | 6/1/2019 |
| n6279.2 | Perform a sag study on the Desoto-Jay 138 kV line. | $0.05 | 12/31/2022 |
| n6285 | Modify breaker failure scheme to incorporate "A-Contact" logic to 138 kV blue bus to reduce total clearing times at TSS111 Electric Junction to 9 cycles for fault on 345/138 kV transformer 81. | $0.14 | 8/28/2023 |
| n6331 | Modify protection and communication work to support interconnection of new AC1-222 generator. | $0.18 | 1/31/2019 |
| n6332 | Build new structures to cut and loop the line No. 1016 into AC1-222 115 kV substation. | $0.68 | 1/31/2019 |
| n6333 | Build a three breaker 115 kV substation at the AC1-222 facility. | $5.10 | 1/31/2019 |
| n6355 | Modify protection and communication work to support interconnection of new AC1-221 generator. | $0.07 | 9/30/2018 |
| n6356 | Build new structures to cut and loop the line No. 1016 into AC1-221 230 kV substation. | $0.61 | 9/30/2018 |
| n6357 | Build a three breaker 230 kV substation at the AC1-221 facility. | $5.80 | 9/30/2018 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n6383 | A Sag Study will be required on the 20 miles section of ACSR ~ 477 ~ 26/7 ~ HAWK conductor section 2 line to mitigate the overload. New Ratings after the sag study S/N: 185MVA S/E: 257MVA. Depending on the sag study results, cost for this upgrade is expected to be between $80,000 (no remediation required just sag study) and $30 million (complete line reconductor/rebuild required). | $0.08 | 10/1/2024 |
| n6457.1 | The sag study was completed under AE1-130 project and determined that no violations occur on this line when operating at Maximum Operating Temperature. No work required on the circuit at this time. | $0.00 | 9/1/2024 |
| n6463.2 | Upgrade bus and jumpers associated with Boone 138 kV bus using 2- 500 MCM 37 CU conductor or equivalent on the Boone Co-Longbranch 138 kV line. | $0.17 | 6/1/2022 |
| n6463.5 | Boone Co-Longbranch 138 kV line: Replace the 750 MCM copper substation bus and jumpers at the Longbranch substation with bundled 500 MCM copper or equivalent equipment. | $0.19 | 1/31/2022 |
| n6476 | Perform a sag study on the 11.7-mile single circuit line between Fostoria Central and South Berwick. | $0.07 | 6/1/2022 |
| n6494 | Increase the maximum operating temperature of the 266 MCM ACSR conductor in the Edmonton/JB Galloway Jct-Knob Lick 69 kV line section to 176 degrees F (5.7 miles). | $0.31 | 12/31/2023 |
| n6494.1 | Increase MOT (maximum operating temperature) of 266 MCM ACSR conductor to 212 degrees on the EDM-JBGAL J-Knob Lick 69 kV line. | $0.29 | 12/31/2022 |
| n6526.2 | Sag Study will be required on ACSR ~ 954 ~ 45/7, 18.3 miles line between South Berwick and Galion. The cost is expected to be 73,200. New Ratings after sag study: S/N: 1409 MVA S/E: 1887 MVA. Rebuild/Reconductor cost: $ 36.6 million. | $0.73 | 9/25/2024 |
| n6538.1 | Replace five substation conductor 2156 ACSR 84/19 Std at E Lima. | $0.50 | 6/1/2023 |
| n6538.2 | Sag study is required on four-mile single circuit line between Fremont Center and Fremont with 1033 ACSR. The cost is expected to be around $20,000.The Rating after the sag study S/N: 1409MVA S/E: 1887MVA. Rebuild/Reconductor cost : $8 million. | $0.02 | 6/1/2023 |
| n6538.3 | Replace substation conductor 2870 MCM ACSR at E Lima. | $0.10 | 12/1/2022 |
| n6632 | New 138 kV substation with a three-position ring bus for AB2-036 interconnection. | $5.44 | 8/31/2024 |
| n6634.10 | Telecom upgrades at Highland 138 kV | $0.01 | 2/16/2017 |
| n6634.11 | Warren 138 kV station: Replace the wave trap on the feeder to Clinton County 138 kV station and make necessary relay settings changes. | $0.12 | 2/16/2017 |
| n6634.12 | Clinton County 138 kV station: Replace the wave trap on the high side of TB1. | $0.10 | 2/16/2017 |
| n6634.6 | Install 138 kV Revenue Meter, generator lead transmission line span from the new Spickard 138 kV station to the Point of Interconnection, and extend dual fiber-optic from the Point of Interconnection to the new Spickard 138 kV station control house. | $0.57 | 2/16/2017 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n6634.7 | Install new Spickard 138 kV three-breaker ring bus station along the Hillsboro-Clinton County 138 kV line, installation of associated protection and control equipment, line risers, switches, jumpers and supervisory control and data acquisition (SCADA) equipment. | $4.92 | 2/16/2017 |
| n6634.8 | Modify Hillsboro-Clinton County 138 kV T-Line and Fiber Cut In for AC2- 061 interconnection. | $0.96 | 2/16/2017 |
| n6634.9 | Upgrade line protection and fiber connectivity at Hillsboro 138 kV station for AC2-061 interconnection. | $0.28 | 2/16/2017 |
| n6648 | Build a three breaker 115 kV substation at the AC1-143 facility. | $5.30 | 6/30/2018 |
| n6649 | Build new structures to cut and loop the transmission line into AC1-143 115 kV substation. | $1.80 | 6/30/2018 |
| n6650 | Modify protection and communication work to support interconnection of new AC1-143 generator. | $0.15 | 6/30/2018 |
| n6688 | Attachment Facilities: Construct 69 kV Tap line, MOLBAB Switch, Poles, structure and foundations for AE1-226 interconnection. | $0.84 | 9/30/2020 |
| n6689 | Modifications to the Face Rock-Kinzer 69 kV line to tie in the AE1-226 Attachment Facilities. | $0.09 | 9/30/2020 |
| n6690 | Relay Modification Scope of Work at Face Rock substation. | $0.20 | 9/30/2020 |
| n6759.1 | Perform a sag study on the Deaborn-Pierce 345 kV line | $0.13 | 12/31/2021 |
| n6764 | Build a three breaker 115 kV substation at the AE1-084 facility. | $5.60 | 11/30/2020 |
| n6765 | Build new structures to cut and loop the transmission line into AE1-084 115 kV substation. | $0.80 | 11/30/2020 |
| n6766 | Modify protection and communication work to support interconnection of new AE1-084 generator. | $0.27 | 11/30/2020 |
| n6770 | Build a three breaker 230 kV substation at the AC2-165 facility. | $6.30 | 10/1/2019 |
| n6771 | Build new structures to cut and loop the transmission line into the Powhatan 230 kV substation. | $1.00 | 10/1/2019 |
| n6772 | Modify protection and communication work to support interconnection of new Powhatan generator. | $0.19 | 10/1/2019 |
| n6929 | Construct new substation for AF2-349 interconnection. | $15.00 | 12/26/2022 |
| n6930 | Cut circuit and loop into new AF2-349 substation. | $3.70 | 12/26/2022 |
| n6931 | Install communications equipment at new AF2-349 substation. | $2.90 | 12/26/2022 |
| n6932 | Update relays at Cherry Valley TSS 156 for AF2-349 interconnection. | $0.19 | 12/26/2022 |
| n6933 | Update relays at Silver Lake TSS 138 for AF2-349 interconnection. | $0.19 | 12/26/2022 |
| n7267 | Extend the Burlington 26 kV P-120 circuit to the Point of Interconnection (POI) and install revenue grade metering. | $0.34 | 12/28/2022 |
| n7279 | Old Chapel 138 kV substation – Modify substation nameplates and high-voltage circuit diagram. | $0.06 | 9/1/2020 |
| n7280 | Exit Span and 1st Structure to Gen Lead Line at Adam 138 kV. | $0.59 | 4/16/2016 |
| n7281 | Extend fiber-optic cables from the point of transition into the Adams 138 kV control house. | $0.12 | 4/16/2016 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n7289 | Expand the Lockwood Road 138 kV substation: Install two additional 138 kV circuit breakers. Installation of associated protection and control equipment, 138 kV line risers and SCADA. | $1.60 | 9/28/2017 |
| n7297 | Install one New 138 kV Circuit Breaker, Associated Equipment, Update Protective Relay Settings at the Kirk 138 kV station. | $1.00 | 2/28/2020 |
| n7298 | Install three Dead End Structures, three Spans of Conductor, OPGW and Alumoweld Shield Wires from the Kirk 138 kV station to the Point of Interconnection. | $1.65 | 2/28/2020 |
| n7299 | Install Revenue Metering at Kirk 138 substation. | $0.31 | 2/28/2020 |
| n7300 | Install two Fiber-Optic Cable Paths from the Kirk 138 kV station to the Fiber-Optic Cable Points of Interconnection. | $0.27 | 2/28/2020 |
| n7349 | Engineering and construction oversight for a new three-breaker ring bus on the Greene-Clark 138 kV line for the AD1-140 interconnection. Includes review of drawings, nameplates and relay settings for FirstEnergy standards. Includes Project Management, Environmental and Right of Way. | $0.72 | 5/29/2020 |
| n7350 | AD1-140 Supervisory Control and Data Acquisition (SCADA): Design, install and test/commission Multiprotocol Label Switching (MPLS) equipment for SCADA transport. | $0.20 | 5/29/2020 |
| n7351 | Fiber Communication: ADSS fiber run from AD1-140 Interconnection Switchyard control house to Greene-East Springfield line fiber and to developer built fiber run to support communications and control to the generator site. | $0.08 | 5/29/2020 |
| n7352 | AD1-140 Clark-Green 138 kV Line Loop: Loop the Clark-Greene 138 kV circuit into the new AD1-140 Interconnection Switchyard. The proposed location of the new ring bus is near structure No. 5604. Includes project management, environmental, forestry, real estate and right-of-way. | $0.41 | 5/29/2020 |
| n7353 | Clark 138 kV substation: Install two 138 kV wave traps and tuners. Update Relay Settings. | $0.13 | 5/29/2020 |
| n7384 | Install 345 kV metering at the Marysville 345 kV station. Construct line from the Marysville 345 kV station to the Point of Interconnection. Install dual fiber telecommunications from the Marysville 345 kV station to the Customer Facility collector station. | $1.46 | 3/20/2018 |
| n7385 | Modify and expand the existing Marysville 345 kV station including one 345 kV circuit breaker installation. | $1.27 | 3/20/2018 |
| n7422 | Construct line No. 2 between Morrisville substation and AE1-044 Transition station. | $1.71 | 11/2/2020 |
| n7433 | Construct a new three circuit breaker 345 kV station, Chenoweth, physically configured and operated as a ring bus | $10.47 | 6/1/2022 |
| n7434 | Install 345 kV Revenue Meter, Generator lead first span exiting the POI station, including the first structure outside the fence at the new AE2-148 switching station | $1.60 | 6/1/2022 |
| n7435 | Install a cut in at Beatty Road-Greene 345 kV. | $1.43 | 6/1/2022 |
| n7436 | Upgrade line protection and controls at the Beatty Road 345 kV station. | $0.60 | 6/1/2022 |
| n7449 | Install new 345 kV three-breaker ring bus station along the Olive-Reynolds 345 kV line. | $0.35 | 5/31/2021 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n7450 | Install three Structures, two Spans of Conductor, Connect Ora Ora 345 kV station to Existing Transmission Circuit | $1.19 | 5/31/2021 |
| n7451 | Replace Protective Relays at Olive 345 kV station. | $0.61 | 5/31/2021 |
| n7469 | Install 345 kV metering at the Gunn Road 345 kV station. Construct line from the Gunn Road 345 kV station to the Point of Interconnection. Install dual fiber telecommunications from the Gunn Road 345 kV station to the Customer Facility collector station. | $1.44 | 9/30/2019 |
| n7475 | Install a new 138 kV circuit breaker, physical structures, protection and control equipment, communications equipment and associated facilities at the Eldean 138 kV substation. | $0.85 | 12/31/2021 |
| n7492 | Install 138 kV metering at the Inez 138 kV station. Construct generator lead transmission line from the Inez 138 kV station to the Point of Interconnection. Install dual fiber telecommunications from the Inez 138 kV station to the Customer Facility collector station. | $0.88 | 9/18/2019 |
| n7493 | Expand Inez 138 kV station, including the addition of a new string and two 138 kV circuit breakers, installation of associated protection and control equipment, 138 kV line risers, switches, jumpers and supervisory control and data acquisition (SCADA) equipment. | $1.53 | 9/18/2019 |
| n7751 | Replace 1600A Switches at Sorenson 345 kV. | $0.10 | 12/31/2021 |
| n7753 | Upgrade circuit breaker and associated Current Transformers and Switches from 2000A to 3000A at Mt. Pleasant substation | $0.40 | 12/31/2021 |
| n7754.1 | Replace 5 substation conductor 2000 AAC 91 Str. at Danville2 138 kV station. | $0.00 | 11/30/2022 |
| n7754.2 | Replace 3 Sub conductor 2000 AAC 91 Str. at East Danville 138 kV station. | $0.00 | 11/30/2022 |
| n7847 | EKPC to install necessary equipment (a 69 kV isolation switch structure and associated switch, plus interconnection metering, fiber-optic connection and telecommunications equipment, circuit breaker and associated switches, and relay panel) at the new Eighty Eight 69 kV Switching station to accept the IC generator lead line/bus. | $1.03 | 2/14/2019 |
| n7848 | Construct a new 69 kV switching station built to 161 kV standards (Eighty Eight Switching) to facilitate connection of the Glover Creek Solar generation project | $3.74 | 12/31/2022 |
| n7849 | Construct facilities (~175 feet) to loop the existing Patton Road Junction-Summer Shade 69 kV line section into the new Eighty Eight Switching substation. | $0.56 | 12/31/2022 |
| n7850 | Modify relay settings at Fox Hollow substation for existing line to Eighty Eight Switching station. | $0.05 | 12/31/2022 |
| n7851 | Modify relay settings at Summer Shade substation for existing line to Eighty Eight Switching substation | $0.05 | 12/31/2022 |
| n7852 | install OPGW in the Summer Shade-Eighty Eight 69 kV line section (1.7 miles). | $0.50 | 12/31/2022 |
| n7853.1 | Re-arrange line No. 1012 to loop into and out of the new three breaker AD2- 063 115 kV switching station. A new three-breaker ring bus substation will be installed between structures 2068/446 and 2068/447. | $1.20 | 12/31/2024 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n7853.2 | Build a three breaker AD1-152 230 kV switching station. | $7.60 | 12/31/2024 |
| n7853.3 | Remote protection and communications work at Clover 230 kV substation. | $0.06 | 12/31/2024 |
| n7853.4 | Remote drawing work at Sedge Hill 230 kV substation. | $0.02 | 12/31/2024 |
| n7965 | Millville-Old Chapel 138 kV Line: Loop the Millville-Old Chapel 138 kV line into new AE2-226 interconnection substation. | $1.02 | 12/1/2022 |
| n7966 | Double Toll Gate 138 kV: Adjust relay settings and update drawings and nameplates. | $0.05 | 12/1/2022 |
| n7967 | Old Chapel 138 kV: Modify SCADA RTU and update drawings and nameplates. | $0.05 | 12/1/2022 |
| n7968 | Wheatland 138 kV (AD2-158 Interconnect): Upgrade relaying as needed to accommodate the new AE2-226 generation queue project interconnection of 99 MW MFO. | $0.36 | 12/1/2022 |
| n7969 | AE2-226 Interconnect: Construct new Kabletown 138 kV substation as a 3- breaker ring bus looping in and out the Old Chapel-Millville 138 kV line. | $6.88 | 12/1/2022 |
| n7970 | Kabletown 138 kV substation Fiber Installation: Install fiber from Kabletown substation to AD2-158 Interconnection for communication transport. | $0.16 | 12/1/2022 |
| n7971 | SCADA/Fiber Communication: Design, install and test/commission MPLS Equipment at Kabletown 138 kV for SCADA transport. | $0.25 | 12/1/2022 |
| n7991 | Install 69 kV Revenue Meter, generator lead transmission line span from the new 69 kV station to the Point of Interconnection, including the first structure outside the new 69 kV station, and extend fiber-optic from the Point of Interconnection to the new 69 kV station control house. | $0.69 | 10/31/2016 |
| n7992 | Expand the Platter Creek 69 kV station, including the addition of one 69 kV circuit breaker, installation of associated protection and control equipment, 69 kV line risers, and supervisory control and data acquisition (SCADA) equipment. | $0.68 | 10/31/2016 |
| n8004 | Install new 138 kV three-breaker ring bus station along the Grandview- Clifftop 138 kV line, installation of associated protection and control equipment, 138 kV line risers, and supervisory control and data acquisition (SCADA) equipment. | $3.88 | 9/25/2018 |
| n8005 | Modify Grandview-Clifftop 138 kV T-Line Cut In. | $1.22 | 9/25/2018 |
| n8006 | Upgrade line protection and controls at the Grandview 138 kV station | $0.30 | 9/25/2018 |
| n8018 | AE2-256 substation 230 kV: Design, install and test/commission MPLS Equipment for SCADA transport. | $0.29 | 6/30/2022 |
| n8019 | North Lebanon substation 230 kV: Replace CVT & line/carrier Relaying | $0.67 | 6/30/2022 |
| n8020 | Copperstone-North Lebanon 230 kV: Loop the 1094-1(Copperstone- North Lebanon) 230 kV line into a new substation, approximately 7.5 miles from the North Lebanon substation. | $2.33 | 6/30/2022 |
| n8021 | North Hershey-North Temple 230 kV: Install one steel pole strain structure on the existing North Hershey-North Temple 230 kV line to avoid clearance violations to new loop structures on the 1094-1 (Copperstone-North Lebanon) 230 kV line. | $1.04 | 6/30/2022 |
| n8022 | Copperstone substation (PPL 230 kV): Replace CVT & line/carrier Relaying. | $0.52 | 6/30/2022 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n8029.1 | Attachment facility line and Revenue Metering Installation at the new AF1- 202 345 kV switching station. | $1.08 | 12/31/2022 |
| n8029.2 | Construct a new three breaker 345 kV Switching station for AF1-202 interconnection. | $17.44 | 12/31/2022 |
| n8029.3 | Construct a new loop-in tap line at the Keyston-Desoto 345 kV line for AF1-202 interconnection. | $1.21 | 12/31/2022 |
| n8029.4 | Modify relay settings at Desoto 345 kV substation | $0.05 | 12/31/2021 |
| n8031.1 | New 138 kV switching station (Wapahani switching station) to interconnect AD1-128 customer facility. | $5.37 | 10/31/2021 |
| n8031.2 | Loop-in tap line to new AD1-128 switching station from College Corner-Desota 138 kV line. | $0.93 | 10/31/2021 |
| n8035.1 | Install 69 kV Revenue Meter, generator lead transmission line spans from the Buckskin 69 kV station to the Point of Interconnection, including the first two structures outside the Buckskin 69 kV station, and extend dual fiber-optic from the Point of Interconnection to the Buckskin 69 kV station control house. | $1.02 | 2/16/2017 |
| n8035.2 | Expand the Buckskin 69 kV station, including the addition of one 69 kV circuit breaker, installation of associated protection and control equipment, 69 kV line risers, and supervisory control and data acquisition (SCADA) equipment. | $0.71 | 2/16/2017 |
| n8035.3 | Buckskin-Highland 69 kV T-Line Re-termination. External station associated work, including two structures, including one double circuit structure. | $0.82 | 2/16/2017 |
| n8059.1 | Construct one 69 kV generator lead transmission line from the Steubenville 69 kV station to the Point of Interconnection, install 69 kV revenue meter, extend dual fiber-optic cable from the Point of Interconnection to the Steubenville 69 kV station control house. Expand the Steubenville 69 kV station, including the addition of one 69 kV circuit breaker, installation of associated protection and control equipment, line risers, switches, jumpers and SCADA. | $1.57 | 11/7/2017 |
| n8059.2 | Install one additional 69 kV circuit breaker on the 69 kV side of the Steubenville 138/69/12 kV autotransformer. | $0.37 | 11/7/2017 |
| n8072.1 | Design, install and test/commission MPLS Equipment for SCADA transport at the new AE2-345 substation. | $0.26 | 4/9/2019 |
| n8072.2 | SCADA/Fiber Communication: Install fiber from AE2-345 Interconnection to Hunterstown for relaying communication and MPLS transport. | $1.07 | 4/9/2019 |
| n8072.3 | Gardners-Hunterstown 115 kV Line Loop: Loop existing L991 Gardners-Hunterstown 115 kV line into the new three-breaker Ring Bus approximately 4.2 miles from the Hunterstown substation. | $0.77 | 4/9/2019 |
| n8072.4 | Gardeners 115 kV: Modify drawings, relay settings and nameplates for line name change. | $0.10 | 4/9/2019 |
| n8072.5 | Hunterstown 115 kV: Modify drawings, relay settings and nameplates for line name change. | $0.10 | 4/9/2019 |
| n8072.6 | AE2-345 option to build: FirstEnergy Work at new station built by developer (Security & Network). | $1.57 | 4/9/2019 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n8075.1 | Construct a new switching station (North Taylor County switching station) to interconnect AF1-083 customer facility. | $3.95 | 12/31/2022 |
| n8075.2 | Loop-in tap line to new AF1-083 switching station from Green County-Marion County 161 kV line. | $0.34 | 12/31/2022 |
| n8075.3 | Modify relay settings at Green County 161 kV substation. | $0.01 | 12/31/2022 |
| n8075.4 | Modify relay settings at Marion County 161 kV substation. | $0.01 | 12/31/2022 |
| n8075.5 | Install OPGW at Green County-North Taylor Switching station. | $0.90 | 12/31/2022 |
| n8083.1 | Construct a new Switching station for AF2-205 interconnection | $5.41 | 12/31/2022 |
| n8083.2 | Transmission line cut-in of Swingle 345 kV switching station & update remote end protection settings. | $0.71 | 12/31/2022 |
| n8083.3 | Install two fiber-optic connections at Swingle-Tatertown 345 kV transmission line. | $0.56 | 12/31/2022 |
| n8097.1 | AE2-001: Tap the existing Nittany-Zion 46 kV line and install 2 main line switches and 1 tap switch to interconnect queue project AE2-001. Tap and CTs/PTs mounted in the customer's station. | $0.16 | 6/30/2025 |
| n8097.2 | Nittany 46 kV: Replace Stone Junction 46 kV line relaying at Nittany for AE2-001 interconnection. | $0.26 | 6/30/2025 |
| n8097.3 | Pleasant Gap 46 kV: Replace Stone Junction 46 kV line relaying at Pleasant Gap for AE2-001 interconnection | $0.26 | 6/30/2025 |
| n8097.4 | Milesburg 46 kV: Replace Stone Junction 46 kV line relaying at Milesburg for AE2-001 interconnection. | $0.26 | 6/30/2025 |
| n8098.1 | East Fayette 138 kV: To connect the AE2-282 solar project with the Toledo Edison transmission system, a new line position will be established within the East Fayette 138 kV substation by adding a new 138 kV circuit breaker and related equipment. A circuit breaker, 3 CCVTs, 1 138 kV Tubular Steel H- frame Dead End, and a relaying panel will be installed to accommodate the new line terminal. | $1.03 | 9/15/2021 |
| n8098.2 | East Fayette 138 kV: Estimated SCADA work at East Fayette substation to support breaker installation, relay installation and updated relay setting. Estimated in-sub fiber run from East Fayette control house to developer ran fiber build for communications to AE2-282 Generator. | $0.06 | 9/15/2021 |
| n8113 | The Contingency driving this upgrade/overload is DVP_P7-1: LN 25-2034-A which is the tower failure of the Dominion 115 kV line No. 25 Trowbridge-Everett and 230 kV line No. 2034 who share a common tower. Dominion new proposal is to resolve the overload by splitting line No. 25 off of line No. 2034, which eliminate the tower contingency. | $4.74 | 12/31/2022 |
| n8118 | AE2-256 substation: Construct a new three-breaker ring bus on the 230 kV (1094) line between Copperstone and North Lebanon. Includes Project Management, Environmental, Forestry, Real Estate and Right of Way. | $6.14 | 6/30/2022 |
| n8119 | AE2-256 substation: Estimated in-sub fiber run to customer built fiber run outside AE2-256 substation. Estimated SCADA work at North Lebanon substation to support relay installation and updated relay settings. | $0.05 | 6/30/2022 |
| n8151.1 | The Hackettstown to Pohatcong 34.5 kV line will be tapped to accommodate the AF1-328 interconnect project. This tap will take place at | $0.44 | 8/31/2021 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| | a location that is approximately 1.25 miles from the Pohatcong substation and 1.50 miles from the Hackettstown substation. | | |
| n8151.2 | Relay settings will be revised for tap at Pohatcong 34.5 kV. | $0.04 | 8/31/2021 |
| n8151.3 | Adjust relay settings at AF1-328 substation. | $0.07 | 8/31/2021 |
| n8157 | Update 138 kV line relaying at the Bremo 138 kV station. | $0.18 | 9/12/2018 |
| n8159.1 | AF1-290 Mechanicstown Interconnection Sub: Design, install and test/commission MPLS Equipment for SCADA transport. | $0.25 | 11/15/2023 |
| n8159.2 | Fiber from AF1-290 Mechanicstown to Feagans Mill-Millville: Install fiber from Mechanicstown to backbone for communication transport. | $0.27 | 11/15/2023 |
| n8159.3 | Feagans Mill-Millville 138 kV Line Loop: Loop the Feagans Mill-Millville 138 kV into the new Mechanicstown substation. | $1.91 | 11/15/2023 |
| n8159.4 | Stonewall substation: Line Terminal Upgrade. | $0.66 | 11/15/2023 |
| n8159.5 | Feagans Mill substation: Modify drawings and nameplates for line name change. | $0.03 | 11/15/2023 |
| n8159.6 | Millville substation: Line Terminal Upgrade. | $0.62 | 11/15/2023 |
| n8160.1 | Tap the Y701 Cozy Lake (Franklin) 34.5 kV line to interconnect to the new AF1-325 customer substation. | $1.50 | 1/1/2026 |
| n8160.2 | Revise relay settings at Franklin 34.5 kV. | $0.05 | 1/1/2026 |
| n8166.1 | 115 kV line to provide for the AF1-320 interconnection at the new Merrill Creek 115 kV substation. | $6.36 | 12/1/2022 |
| n8166.2 | Modify drawings, relay settings and nameplates for line name change at Flanders 115 kV. | $0.13 | 12/1/2022 |
| n8166.3 | Modify drawings, relay settings and nameplates for line name change at Drakestown 115 kV. | $0.13 | 12/1/2022 |
| n8166.4 | Replace one 115 kV wave trap, line tuner and coax for Gilbert line exit at Morris Park 115 kV. | $0.82 | 12/1/2022 |
| n8166.5 | Relay setting changes at Pequest River 115 kV. | $0.21 | 12/1/2022 |
| n8166.6 | Review drawings, nameplates and relay settings Gilbert 115 kV. | $0.15 | 12/1/2022 |
| n8166.7 | Merrill Creek substation: Install new three-breaker ring bus at Merrill Creek substation 115 kV. | $13.74 | 12/1/2022 |
| n8166.8 | SCADA/Fiber Communication: Install fiber from Merrill Creek to backbone for communication transport. Fiber backbone location is subject to change at Merrill Creek to Fiber Backbone.<br>Design, install and test/commission MPLS Equipment for SCADA transport at Merrill Creek 115 kV. | $1.39 | 12/1/2022 |
| n8166.9 | SCADA/Fiber Communication: Design, install and test/commission MPLS Equipment for SCADA transport at Merrill Creek 115 kV. | $0.39 | 12/1/2022 |
| n8187.1 | Farmers Valley-Ridgway 115 kV Line Loop: Construct a loop from the Farmers Valley-Ridgway 115 kV line to the new substation, approximately 14.4 miles from Farmers Valley substation. | $1.69 | 12/31/2020 |
| n8187.2 | Ridgway substation 115 kV: Line terminal upgrade. | $0.19 | 12/31/2020 |
| n8187.3 | Farmers substation 115 kV: Line terminal upgrade. | $0.30 | 12/31/2020 |
| n8187.4 | Pierce Brook substation 115 kV: Line terminal upgrade. | $0.06 | 12/31/2020 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n8188.1 | Brookville-Squab Hollow 138 kV Line: Loop the Brookville-Squab Hollow 138 kV line into the new AE2-316 interconnection sub. | $1.58 | 12/31/2020 |
| n8188.2 | Brookville 138 kV: Install new relays and modify relay settings. | $0.24 | 12/31/2020 |
| n8188.3 | Armstrong 138 kV: Install anti-islanding transmitter. | $0.19 | 12/31/2020 |
| n8188.4 | Squab Hollow 138 kV: Install anti-islanding transmitter. | $0.21 | 12/31/2020 |
| n8188.5 | Install fiber from AE2-316 to Backbone for communication transport at AE2- 316 Direct Connect – Squab Solar. | $1.11 | 12/31/2020 |
| n8188.6 | SCADA/Fiber Communication: Design, install and test/commission MPLS Equipment for SCADA transport at AE2-316 interconnection substation. | $0.29 | 12/31/2020 |
| n8193.1 | Install fiber from AE2-344 interconnection substation to Edinboro South for communication transport. | $0.40 | 3/31/2026 |
| n8193.10 | Morgan Street substation 115 kV: Line Terminal Upgrade. | $0.59 | 3/31/2026 |
| n8193.2 | Design, install and test/commission MPLS Equipment for SCADA transport at AE2-344 interconnection substation. | $0.19 | 3/31/2026 |
| n8193.3 | Edinboro South-Morgan Street-Springboro 115 kV Line Loop: Loop from the MF1/MFS (Edinboro South-Morgan Street-Springboro) 115 kV line to the new AE2-344 interconnection substation. | $0.97 | 3/31/2026 |
| n8193.4 | Edinboro South 115 kV: Line Terminal Upgrade. | $0.55 | 3/31/2026 |
| n8193.5 | Wayne substation 115 kV: Line Terminal Upgrade. | $0.03 | 3/31/2026 |
| n8193.6 | Geneva substation 115 kV: Line Terminal Upgrade. | $0.53 | 3/31/2026 |
| n8193.7 | Erie West substation 115 kV: Line Terminal Upgrade. | $0.21 | 3/31/2026 |
| n8193.8 | Erie South substation 115 kV: Line Terminal Upgrade. | $0.21 | 3/31/2026 |
| n8193.9 | Springboro substation 115 kV: Line Terminal Upgrade. | $0.52 | 3/31/2026 |
| n8198.1 | Install (3) 34.5 kV load-break air switches with SCADA control on the Cookstown-New Lisbon (W75) 34.5 kV line approximately 0.3 miles from the Fort Dix W75 Tap and 3.1 miles from the Hanover Solar Tap (at structures 116 & 117). | $0.36 | 12/31/2020 |
| n8198.2 | Review Cookstown line relay settings as required for AF2-254 tap at New Lisbon 34.5 kV. | $0.04 | 12/31/2020 |
| n8198.3 | Review New Lisbon line relay settings as required for AF2-254 tap at Cookstown 34.5 kV. | $0.04 | 12/31/2020 |
| n8206 | Snyder: Extend the Snyder 69 kV bus. Install one 69 kV circuit breaker. | $0.87 | 10/31/2021 |
| n8207.1 | New SCADA switch at AF2-130 POI: Add new SCADA switch at the proposed tap point near pole No. 0C-37451 on the 34.5 kV Tionesta Jct./Crown distribution ckt No. 00519-51 | $0.10 | 6/30/2023 |
| n8207.2 | AF2-130 Generation substation: Integrate customer protection and controls to the FE transmission system. | $0.08 | 6/30/2023 |
| n8207.3 | Crown substation: Installing 34.5 kV PT as well as SEL-351S. | $0.63 | 6/30/2023 |
| n8207.4 | Tionesta substation 34.5 kV: Revise relay settings. | $0.11 | 6/30/2023 |
| n8210.1 | Branchville to Holiday Lakes 34.5 kV line: The Branchville to Holiday Lakes 34.5 kV line will be tapped to accommodate the Customer Facility. This tap will take place at a location that is approximately 1.50 miles from the Holiday Lakes substation and 10 miles from the Branchville substation | $1.42 | 3/1/2021 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n8210.2 | Branchville substation 34.5 kV: Revise relay settings. | $0.05 | 3/1/2021 |
| n8211.1 | Albright-Cross School 138 kV Line: Loop in and out the Albright-Cross School AFA 138 kV line to new three-breaker ring bus at Swanton 138 kV substation. | $1.36 | 8/31/2025 |
| n8211.2 | Cross School 138 kV substation: Replace one 138 kV, 2000A, wave trap, line tuner and coax on Albright line exit with one 138 kV, 2000A wideband wave trap, line tuner and coax. Replace line relaying panel for the Swanton line terminal. | $1.38 | 8/31/2025 |
| n8211.3 | Albright 138kV substation: Replace one 138 kV, 2000A, wave trap, line tuner and coax on Cross School line exit with one 138 kV, 2000A wideband wave trap, line tuner and coax. Replace line relaying panel for the Swanton line terminal. | $1.81 | 8/31/2025 |
| n8211.4 | Dan's Rock substation 138 kV: Design, install and test/commission new licensed microwave link at Dan's Rock MW. | $0.19 | 8/31/2025 |
| n8211.5 | Design, install and test/commission MPLS Equipment for SCADA transport at Swanton 138 kV substation. | $0.66 | 8/31/2025 |
| n8211.6 | AF2-356 Interconnection substation (OTB): Install physical security camera system. | $1.80 | 8/31/2025 |
| n8217.1 | Groton substation 138 kV: Expand existing Groton ring bus to a four- breaker ring bus. | $1.64 | 12/31/2021 |
| n8217.2 | Hayes substation 138 kV: Modify relay setting. | $0.13 | 12/31/2021 |
| n8217.3 | West Fremont substation 138 kV: Revise relay settings. | $0.13 | 12/31/2021 |
| n8221.1 | Construct a new 69 kV three-breaker ring bus on the Cardington-Tangy 69 kV line. | $5.78 | 11/30/2022 |
| n8221.2 | Design, install and test/commission MPLS Equipment for SCADA transport on the Cardington-Tangy 69 kV line. | $0.26 | 11/30/2022 |
| n8221.3 | Loop the Cardington-Tangy 69 kV line to create the interconnection for the new AF1-122 three-breaker ring bus, approximately 1.1 miles from the Cardington substation. Install fiber from the new AF1-122 three-breaker ring bus to the Cardington substation. | $1.14 | 11/30/2022 |
| n8221.4 | Relay Settings Changes, Drawing Updates and Nameplates at Tangy 69 kV substation. | $0.06 | 11/30/2022 |
| n8221.5 | Upgrade line relaying at Cardington 69 kV substation. | $0.56 | 11/30/2022 |
| n8312.1 | Corry East-Four Mile 115 kV Line Loop: Loop the Corry East-Four Mile Junction 115 kV line into the new substation, approximately 7.7 miles from Four Mile Junction substation. | $0.96 | 8/30/2019 |
| n8312.2 | Warren substation 115 kV: Provide interconnection facilities for PJM AF1- 098. | $0.59 | 8/30/2019 |
| n8312.3 | Corry East substation 115 kV: Provide interconnection facilities for PJM AF1-098. Replace carrier equipment and relaying at Corry East. | $0.89 | 8/30/2019 |
| n8312.4 | Four Mile substation 115 kV: Provide interconnection facilities for PJM AF1- 098. Replace carrier equipment and relaying at Four Mile Junction. | $0.77 | 8/30/2019 |
| n8312.5 | Construct a new interconnection substation with 3-115 kV breakers in a ring bus configuration at Four Mile 115 kV substation. | $7.90 | 8/30/2019 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n8312.6 | Install fiber from AF1-098 to Four Mile Junction for communication transport at AF1-098. | $4.70 | 8/30/2019 |
| n8312.7 | Design, install and test/commission MPLS Equipment for SCADA transport at AF1-098 | $0.29 | 8/30/2019 |
| n8313.1 | Install Tap Pole at Emlenton 34.5 kV. | $0.02 | 3/17/2020 |
| n8313.2 | Haynie 34.5 kV: Revise Relay Settings. | $0.27 | 3/17/2020 |
| n8313.3 | Emlenton 34.5 kV: Revise Relay Settings. | $0.27 | 3/17/2020 |
| n8314.1 | SCADA/Fiber Communication: Design, install and test/commission MPLS Equipment for SCADA transport at the new AF1-086 interconnection substation. | $0.21 | 9/20/2019 |
| n8314.2 | Install fiber from AF1-086 interconnection substation to ADSS Backbone for communication transport. | $1.26 | 9/20/2019 |
| n8314.3 | Garman-Shawville 115 kV Line Loop: Loop existing Garman Shawville 115 kV line into the new CPV Rogue's Wind interconnection substation. | $1.21 | 9/20/2019 |
| n8314.4 | Madera 115 kV: Modify drawings and nameplates for line name change. | $0.03 | 9/20/2019 |
| n8314.5 | Westover 115 kV: Modify drawings and nameplates for line name change. | $0.03 | 9/20/2019 |
| n8314.6 | Glory 115 kV: Line Terminal upgrade. | $0.39 | 9/20/2019 |
| n8314.7 | Shawville 115 kV: Line Terminal upgrade. | $0.57 | 9/20/2019 |
| n8314.8 | Garman 115 kV: Line Terminal upgrade. | $0.81 | 9/20/2019 |
| n8319 | Relocate the East Bend 345 kV line from the T bay to the R bay at the Tanners Creek 345 kV substation. This addresses the breaker failure contingency AEP_P4_No. 14920_05TANNER 345_T_SRT-A for the Tanners tie breaker failure. | $3.10 | 12/31/2021 |
| n8327 | Replace existing 23 kV Bedford relaying with one SEL-351S and install one SATEC meter. | $0.77 | 9/15/2022 |
| n8337.1 | Construct a new line exit out of the Galion substation by adding a new 138 kV breaker. | $2.14 | 12/31/2023 |
| n8337.2 | Modify Relay Settings Roberts 138 kV. | $0.10 | 12/31/2023 |
| n8337.3 | Modify Relay Settings at Cardington 138 kV. | $0.10 | 12/31/2023 |
| n8337.4 | Modify Relay Settings at Leaside 138 kV. | $0.10 | 12/31/2023 |
| n8337.5 | Modify Relay Settings at Ontario 138 kV. | $0.10 | 12/31/2023 |
| n8359.1 | Upgrade existing Sullivan 138 kV (previously named Napoleon Muni Northside) substation to a five-breaker ring bus substation. | $2.94 | 11/1/2022 |
| n8359.2 | Re-terminate the Midway-Sullivan 138 kV line into the expanded substation to support new generation interconnection. | $0.71 | 11/1/2022 |
| n8359.3 | Revise relay settings at Striker 138 kV substation. | $0.08 | 11/1/2022 |
| n8359.4 | Perform end to end testing and revising relay settings at Midway 138 kV substation. | $0.08 | 11/1/2022 |
| n8359.5 | Integrate upgrades to the Sullivan 138 kV substation to the FirstEnergy transmission system. | $0.08 | 11/1/2022 |
| n8370.1 | Tap Cambridge Springs-Corry Central 34.5kV line and convert approximately three-quarters of a mile of 12 kV to 35 kV. | $0.42 | 1/1/2023 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n8370.2 | Update relay settings on 34.5 kV Cambridge Springs line. | $0.05 | 1/1/2023 |
| n8370.3 | Installation of one 700 MHz radio system to support SCADA Switch at AF1- 094 tap location. | $0.06 | 1/1/2023 |
| n8374.1 | Warfordsburg substation: Replace existing McConnellsburg line relaying with one standard line relaying panel with two SEL-421 and one SEL-501 BFT. | $0.19 | 3/28/2019 |
| n8374.2 | Warfordsburg-Purcell Jct 34.5 kV Line: Install two main line switches on the existing Warfordsburg-Purcell Jct 34.5 kV line. | $0.12 | 3/28/2019 |
| n8374.3 | Mercersburg-AD1-061 34.5 kV Tap: Reconductor approximately 1.6 mi from Mercersburg-AD1-061 (Elk Hill 1) Tap 34.5 kV line from Mercersburg substation to Pole PA406-WP47 with 795 ACSR conductor. | $1.32 | 3/28/2019 |
| n8374.4 | Mercersburg substation 34.5 kV: Replace limiting conductors and revise relay settings. | $0.23 | 3/28/2019 |
| n8374.5 | McConnellsburg substation 34.5 kV: Revise relay settings. | $0.13 | 3/28/2019 |
| n8438.1 | Construct three Breaker 138 kV station in a Breaker and a Half Configuration for AE2-323 interconnection. | $6.36 | 4/4/2019 |
| n8438.2 | Install two Dead End Structures, two Spans of Conductor, two Spans of OPGW Shield wire, Connect New 138 kV station to Existing Twin Branch-Guardian Transmission Circuit and upgrade remote end relays. | $0.69 | 4/4/2019 |
| n8443.1 | Build a new 69 kV IC substation with a three-breaker ring bus. Two of the positions on the ring bus will be transmission line terminals for the tie-in of the Kellam-Cheriton 69 kV line (Line 6750) to the substation. The other position will be a terminal configured for AF2-055 with a disconnect switch. | $5.00 | 6/1/2027 |
| n8443.2 | Rebuild about 20 miles of Cheriton/Bayview-Kellam 69 kV. Install reverse power relay at Cheriton station to trip the generator tie if power flow is greater that 0.15 MW toward AF2-055. | $20.00 | 6/1/2027 |
| n8443.3 | Install dynamic VAR compensation at Kellam-Chriton 69 kV substation. | $5.00 | 6/1/2027 |
| n8443.4 | Communication network upgrades for Island detection at Oakhall 69 kV substation. | $0.50 | 6/1/2027 |
| n8443.5 | Communication network upgrades for Island detection at Oakhall 69 kV substation. | $0.50 | 6/1/2027 |
| n8445 | Update Protective Relay Settings at the Proposed AF1-215 345 kV station. | $0.05 | 3/16/2020 |
| n8449.1 | Install one 230 kV breaker and a new 230 kV line terminal position to create a five-breaker ring bus at Erie East substation. | $2.91 | 6/1/2026 |
| n8449.2 | Install anti-islanding (transfer trip) equipment at Four Mile Junction substation. | $0.63 | 6/1/2026 |
| n8449.3 | Fiber connection and associated conduit to customer substation at Erie East substation. | $0.18 | 6/1/2026 |
| n8450.1 | Bruceton Mills Interconnection Sub 138 kV: Construct three-breaker ring-bus substation for new generation interconnection. | $8.38 | 9/30/2021 |
| n8450.2 | AE1-106 Sub: Design, install and test/commission multi-protocol label switching (MPLS) equipment for SCADA transport. | $0.74 | 9/30/2021 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n8450.3 | Design, install and test/commission microwave equipment for Supervisory Control and Data Acquisition (SCADA) transport between AE1-106 Customer Facility and Bruceton Mills 138 kV substation. | $0.23 | 9/30/2021 |
| n8450.4 | Brandonville Junction (Albright-Hazelton-Lake Lynn) 138 kV: Loop the existing Brandonville Junction (Albright-Hazelton-Lake Lynn) 138 kV line into the new Bruceton Mills substation. | $1.67 | 9/30/2021 |
| n8450.5 | Lake Lynn substation 138 kV: Replace Panel No. 4 existing line relaying with new breaker control panel with one SEL451 and one SATEC meter. | $0.33 | 9/30/2021 |
| n8450.6 | Hazelton substation 138 kV: Provide remote end equipment required for AE1-106. | $0.93 | 9/30/2021 |
| n8450.7 | Albright substation 138 kV: Provide remote end equipment required for AE1-106. | $1.72 | 9/30/2021 |
| n8451.1 | Construct a new 138 kV three-breaker ring bus looping in the South Akron- Toronto 138 kV line to provide interconnection facilities for AE2-194. | $6.38 | 5/1/2022 |
| n8451.10 | Relay settings for the Gilchrist- Lakemore 138 kV line will be adjusted. | $0.09 | 5/1/2022 |
| n8451.12 | Relay settings for the Lakemore- South Akron 138 kV line will be adjusted. | $0.19 | 5/1/2022 |
| n8451.13 | Relay settings for the Boardman-Toronto 138 kV line will be adjusted. | $0.09 | 5/1/2022 |
| n8451.14 | Relay settings for the Lowellville- Dobbins 138 kV line will be adjusted. | $0.09 | 5/1/2022 |
| n8451.15 | Relay settings for the Urban-Firestone 138 kV line will be adjusted. | $0.19 | 5/1/2022 |
| n8451.16 | Relay settings for the Tusc-Urban 138 kV line will be adjusted. | $0.09 | 5/1/2022 |
| n8451.2 | The South Akron to Toronto 138 kV line will be cut and looped into the new 138 kV interconnection substation. This cut will take place at a location that is approximately 21 miles from the Toronto substation. It is assumed that the interconnection substation will be located within one span (approximately 0.1 mile) from the existing line. | $3.06 | 5/1/2022 |
| n8451.5 | 138 kV line relay setting for AE2-194 Interconnection (South Akron) will be changed. | $0.50 | 5/1/2022 |
| n8451.6 | One 138 kV 2000A dual-frequency wave traps, line tuners and coax will be installed. | $0.17 | 5/1/2022 |
| n8451.7 | Relay settings for the Dobbins-Toronoto 138 kV line will be adjusted. | $0.19 | 5/1/2022 |
| n8451.8 | Relay settings for the Dale- South Akron 138 kV line will be adjusted. | $0.09 | 5/1/2022 |
| n8451.9 | Relay settings for the Sammis-Toronoto 138 kV line will be adjusted. | $0.09 | 5/1/2022 |
| n8455.1 | Sandridge substation: Establish new 69 kV line position for AF1-064. | $1.56 | 3/31/2022 |
| n8455.2 | Midway substation 69 kV: Install Carrier equipment for anti-islanding. | $0.50 | 3/31/2022 |
| n8455.3 | Bowling Green No.2 69 kV: Install Carrier equipment for anti-islanding. | $0.47 | 3/31/2022 |
| n8457.1 | AE2-262/AE2-263 Interconnection Sub: Construct a new 230 kV three-breaker ring bus looping in the Moshannon-Milesburg 230 kV line to provide interconnection facilities for AE2-262/AE2-263. | $11.43 | 6/30/2022 |
| n8457.2 | AE2-262/AE2-263 Interconnection Sub: Design, install and test/commission MPLS Equipment for SCADA transport at new Interconnection Sub. | $0.24 | 6/30/2022 |
| n8457.3 | AE2-262/AE2-263 Interconnection Sub: Install fiber from AE2-262/AE2-263 New Interconnection substation to fiber backbone for communication transport. | $0.15 | 6/30/2022 |

| Upgrade ID | Description | Cost Estimate ($M) | Required In-Service Date |
|---|---|---|---|
| n8457.4 | Moshannon-Milesburg 230 kV Line: The Moshannon-Milesburg 230 kV line will be cut and looped into the new 230 kV interconnect substation. This cut will take place at a location that is approximately 16.3 miles from the Moshannon substation. | $1.72 | 6/30/2022 |
| n8457.5 | Moshannon 230 kV: Anti-islanding and carrier equipment will be installed in existing relay panels. Existing Milesburg line relaying will be replaced. | $0.69 | 6/30/2022 |
| n8457.6 | Milesburg 230 kV: One existing 230 kV CVT, wave trap, line tuner and circuit breaker will be replaced. Anti-islanding will be installed. Existing Moshannon line relaying panel will be replaced. | $1.82 | 6/30/2022 |
| n8457.7 | Dale Summit 230 kV: A new carrier relaying panel with anti-islanding will be installed for the Milesburg and Shingletown exits. | $0.57 | 6/30/2022 |
| n8457.8 | Shingletown 230 kV: A new carrier relaying panel with anti-islanding will be installed for the Dale Summit exit. | $0.61 | 6/30/2022 |
| n8458 | Install one 23 kV line potential transformer and associated structure on Bedford North line Replace 23 kV Bedford North line relays with one line relaying panel with one SEL351S and one SATEC Meter. | $0.69 | 12/15/2022 |

| Upgrade Id | Sub Region | Description | Project Type | Voltage | Cost Estimate | Required Date | Transmission Owner | Proposal IDs |
|---|---|---|---|---|---|---|---|---|
| b3800.306 | South | Install one (1) 500KV, 150 MVAr Shunt Capacitor Bank & associated equipment at Morrisville substation. This addition will require a control house expansion to accommodate for two new panels. | Baseline | 230 | 3.63 | 6/1/2027 | Dominion | 2022-W3-231 |
| b3800.309 | South | Install one (1) 230kV, 150MVAr Shunt Capacitor Bank & associated equipment at Wishing Star Substation. | Baseline | 230 | 6.09 | 6/1/2027 | Dominion | 2022-W3-231 |
| b3800.310 | South | install one (1) 500kV, 293.8MVAr Shunt Capacitor Bank & associated equipment at Wishing Star Substation. | Baseline | 500 | 3.97 | 6/1/2027 | Dominion | 2022-W3-231 |
| b3800.311 | South | Rebuild 500kV Line #545 Bristers - Morrisville as a single circuit monopole line to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. | Baseline | 500 | 65.86 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.312 | South | Rebuild 500kV Line #569 Loudoun - Morrisville to accommodate the new 500 kV line in the existing right-of-way. New conductor to have a summer rating of 4357 MVA. | Baseline | 500 | 175.62 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.313 | South | Rebuild approximately 10.29 miles line segment of Line #535 (Meadow Brook to Loudoun) to accommodate the new 500 kV line in the existing ROW. | Baseline | 500 | 65.86 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.314 | South | Rebuild approximately 4.83 miles of 500kV Line #546 Mosby - Wishing Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. Upgrade and install equipment at Mosby substation to upgrade terminal equipment to be rated for 5000A for 500kV Lines #546. | Baseline | 500 | 49.79 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.315 | South | Rebuild approximately 4.59 miles of 500kV Line #590 Mosby - Wishing Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. Upgrade and install equipment at Mosby substation to upgrade terminal equipment to be rated for 5000A for 500kV Lines #590. | Baseline | 500 | 49.79 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.316 | South | Rebuild approximately 6.17 miles of 230kV Line #2030 Gainesville - Mint Springs to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 13.98 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.317 | South | Rebuild approximately 1.58 miles of 230kV Line #2030 Mint Springs - Loudoun to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 3.59 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.318 | South | Rebuild approximately 4.2 miles of 230kV Line #2045 Loudoun - North Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 14.52 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.319 | South | Rebuild approximately 0.88 miles of 230kV Line #2045 North Star - Brambleton to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 3.04 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.320 | South | Rebuild approximately 1.22 miles of 230kV Line #2227 Brambleton - Racefield to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 4.36 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.321 | South | Rebuild approximately 3.69 miles of 230kV Line #2094 Racefield - Loudoun to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 13.2 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.322 | South | Rebuild approximately 9.16 miles of 230kV Line #2101 Bristers - Nokesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 12.99 | 6/1/2027 | Dominion | 2022-W3-711 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| b3800.323 | South | Rebuild approximately 2.89 miles of 230kV Line #2101 Nokesville - Vint Hill TP to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 4.1 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.324 | South | Rebuild approximately 0.33 miles of 230kV Line #2101 Vint Hill TP - Vint Hill to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 0.47 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.325 | South | Rebuild approximately 3.32 miles of 230kV Line #2114 Rollins Ford - Vint Hill to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 4.35 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.326 | South | Rebuild approximately 10.09 miles of 230kV Line #2114 Vint Hill - Elk Run to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 13.21 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.327 | South | Rebuild approximately 4.43 miles of 230kV Line #2140 Heathcote - Catharpin to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 10.64 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.328 | South | Rebuild approximately 2.88 miles of 230kV Line #2140 Catharpin - Loudoun to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 6.92 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.329 | South | Rebuild approximately 0.25 miles of 230kV Line #2151 Railroad DP - Gainesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 4.39 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.330 | South | Rebuild approximately 4.14 miles of 230kV Line #2163 Vint Hill - Liberty to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 17.56 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.331 | South | Rebuild approximately 0.48 miles of Line #2176 Heathcote - Gainesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 8.78 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.332 | South | Rebuild approximately 1.11 miles of Line #2222 Rollins Ford - Gainesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 230 | 13.17 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.333 | South | Rebuild approximately 1.65 miles of Line #183 Bristers - Ox to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. | Baseline | 115 | 8.78 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.336 | South | Upgrade and install equipment at Bristers substation to support the new conductor 5000A rating for 500kV Line #545. | Baseline | 500 | 5.72 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.337 | South | Upgrade and install equipment at Brambleton substation to support the new conductor termination. All terminal equipment for 230kV Lines #2045 & #2094 to be rated for 4000A continuous current rating. | Baseline | 230 | 4.65 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.338 | South | Revise relay settings at Dawkins Branch | Baseline | 230 | 0.02 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.339 | South | Upgrade and install equipment at Gainesville substation to support the new conductor termination. All terminal equipment for 230kV Line #2030 to be rated for 4000A continuous current rating. | Baseline | 230 | 3.71 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.340 | South | Revise relay settings at Heathcote | Baseline | 230 | 0.02 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.341 | South | Upgrade and install equipment at Loudoun substation for 230kV Line #2094 Loudoun - Racefield to be rated for 4000A continuous current rating. | Baseline | 230 | 2.5 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.342 | South | Upgrade and install equipment at Loudoun substation for 230kV Line #2045 Loudoun - North Star to be rated for 4000A continuous current rating. | Baseline | 230 | 2.5 | 6/1/2027 | Dominion | 2022-W3-711 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| b3800.343 | South | Upgrade and install equipment at Loudoun substation for 230kV Line #2030 Loudoun - Mint Springs to be rated for 4000A continuous current rating. | Baseline | 500 | 1 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.344 | South | Upgrade and install equipment at Loudoun substation to support the new conductor 5000A rating for 500kV Line #569 Loudoun - Morrisville. | Baseline | 500 | 10.7 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.345 | South | Revise relay settings at Mint Springs | Baseline | 230 | 0.03 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.346 | South | Upgrade and install equipment at Morrisville substation to support the new 500kV conductor termination. All terminal equipment to be rated for 5000 A for 500kV Line #545 & #569. Upgrade 500 kV bus 2 to 5000 A. | Baseline | 500 | 17.54 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.347 | South | Revise relay settings at North Star | Baseline | 230 | 0.03 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.348 | South | Revise relay settings at Racefield | Baseline | 230 | 0.03 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.349 | South | Revise relay settings at Railroad | Baseline | 230 | 0.02 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.350 | South | Install terminal equipment at Vint Hill substation to support a 5000A line to Morrisville. Update relay settings for 230kV Lines #2101, #2163, and 500kV Line #535. | Baseline | 500 | 23.64 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.351 | South | Update relay settings at Vint Hill for 230kV Line #2101 Vint Hill - Bristers | Baseline | 230 | 0.03 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.352 | South | Update relay settings at Vint Hill for 230kV Line #2163 Vint Hill - Liberty | Baseline | 230 | 0.03 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.353 | South | Update relay settings at Vint Hill for 500kV Line #535 Vint Hill - Loudoun | Baseline | 500 | 0.03 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.354 | South | Install terminal equipment at Wishing Star substation to support a 5000A line to Vint Hill. Update relay settings for 500kV Lines #546 and #590. | Baseline | 500 | 12.3 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.355 | South | Revise relay settings at Youngs Branch | Baseline | 230 | 0.02 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.356 | South | Build a new 500kV line from Vint Hill to Wishing Star. The line will be supported on single circuit monopoles. New conductor to have a summer rating of 4357 MVA. Line length is approximately 16.59 miles. | Baseline | 500 | 87.81 | 6/1/2027 | Dominion | 2022-W3-711 |
| b3800.357 | South | Build a new 500kV line from Morrisville to Vint Hill. New conductor to have a summer rating of 4357 MVA. Line length is approximately 19.71 miles. | Baseline | 500 | 101.89 | 6/1/2027 | Dominion | 2022-W3-711 |

# Dominion Supplemental Projects

Transmission Expansion Advisory Committee
April 30, 2024

# Solutions

Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

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# Dominion Transmission Zone: Supplemental Do No Harm Analysis

**Need Number:** DOM-2022-0046-DNH & DOM-2022-0047-DNH Update
**Process Stage:** Solutions Meeting 04/30/2024
**Previously Presented:** Solutions Meeting 02/07/2023
**Project Driver:** Do No Harm Analysis

**Specific Assumption References:**

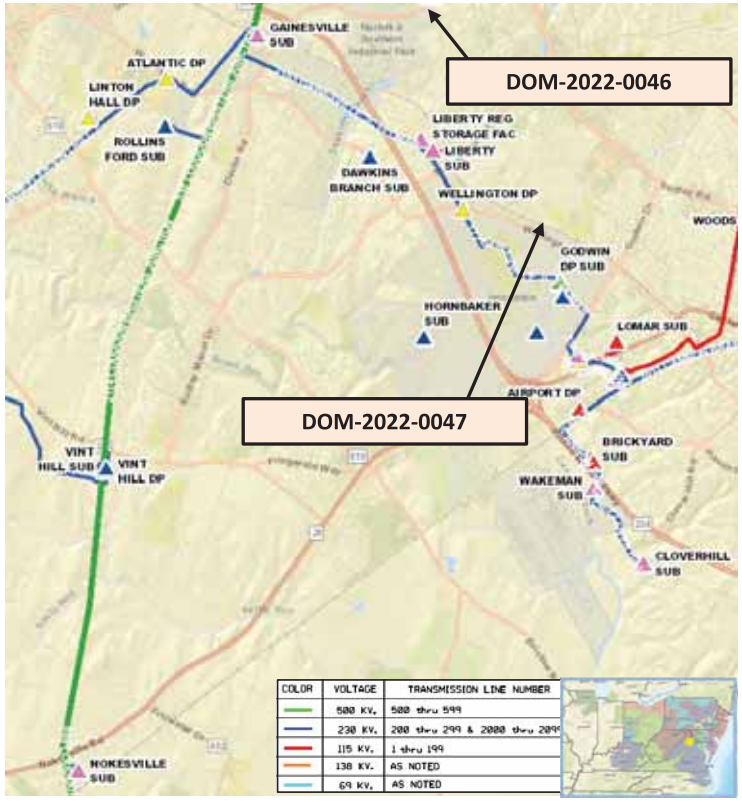
Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

**Problem Statement:**

PJM has identified N-1-1 thermal violations on the following separate facilities in the 2022 Do-No-Harm analysis:

- Line #2101 (Nokesville to Bristers Segment)
  - Contingency Scenario: DVP_P1-2: LN 569 and DVP_P1-2: LN 539
- Bristers 500-230 kV TX#1
  - Contingency Scenario: DVP_P1-3: 8BRISTER-TX#1 and DVP_P1-2: LN 539
- Bristers 500-230 kV TX#2
  - Contingency Scenario: DVP_P1-3: 8BRISTER-TX#2 and DVP_P1-2: LN 539

The violations are caused by previously presented Supplemental Projects DOM-2022-0046 and DOM-2022-0047 in the Dominion Zone.



# Dominion Transmission Zone: Supplemental Do No Harm Analysis

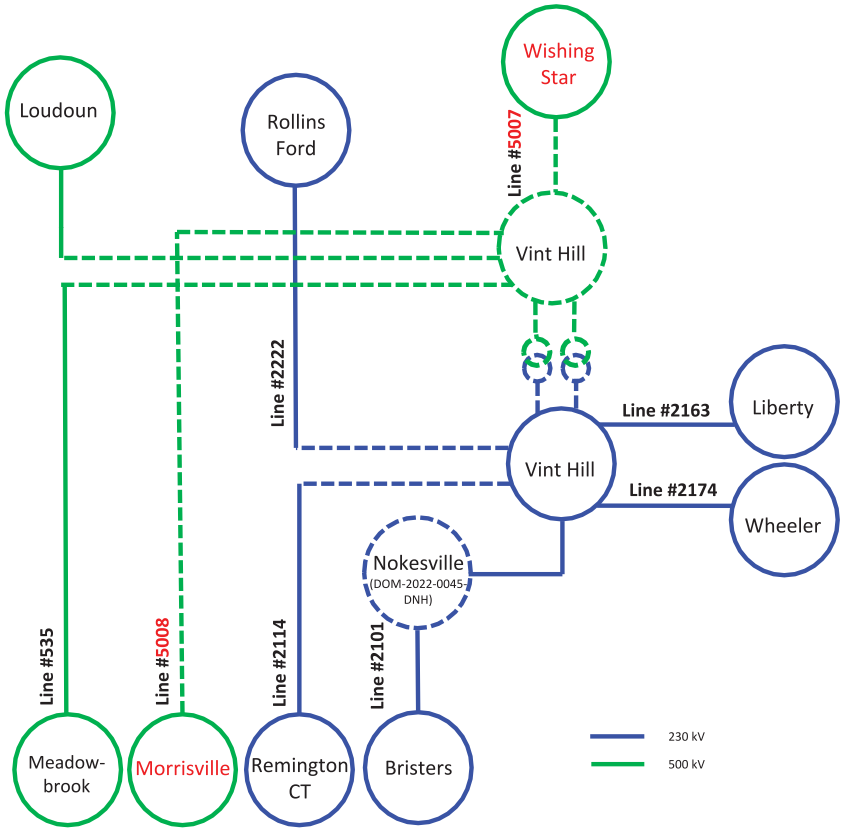
**Need Number:** DOM-2022-0046-DNH & DOM-2022-0047-DNH Update
**Process Stage:** Solutions Meeting 04/30/2024

**Proposed Solution (Part 2 of 2):**

To address: Bristers 500-230 kV TX #1 & 2 Violation

- Install (2) 1400 MVA 500-230 kV transformer and associated 500 kV and 230 kV equipment (breakers, switches, leads) at Vint Hill Substation to supply the area with a 500 kV source
- Cut and loop 500 kV line #535 (Loudoun – Meadowbrook) ~~and #569 (Loudoun – Morrisville)~~ as the 500 kV source~~s~~ into the proposed 500 kV ring bus. Via approval during the 2022 Competitive Open Window #3, new Morrisville – Vint Hill and Vint Hill – Wishing Star 500 kV will be the 2nd 500 kV source
- Vint Hill Substation will be expanded to the north of the existing site to accommodate the 500 kV ring required for the addition of the new transformers
- Existing terminations for 230 kV line #2174 (Wheeler – Vint Hill), line #2101 (Bristers – Vint Hill), and line #2163 (Liberty – Vint Hill) will be rearranged to terminate into the expanded Vint Hill Substation
- 230 kV line #2114 (Remington CT – Rollins Ford) will also be cut and looped into the expanded Vint Hill Substation due to spatial constraints along the existing right-of-way

**Estimated Project Cost:** ~~$115~~ $114.0M (Total)
Transmission Line Cost: ~~$5~~ $4.0M
Substation Cost: $110.0M
**Alternatives Considered:**
No feasible alternatives
**Projected In-service Date:** 12/31/2027
**Project Status:** Conceptual
**Model:** 2025 RTEP



# Reliability Analysis Update



Sami Abdulsalam, Director
PJM Transmission Planning

Transmission Expansion Advisory Committee
December 3, 2024

# 2024 RTEP Window 1 Updates

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# First Read (Regional Cluster)

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# 2024W1 – Regional Cluster
# Preferred Solution: 2024-W1-24

**Proposed Solution:** 2024-W1-24 **Revised**

- Build a new 230kV Line from Elmont – Ladysmith on the existing 5-2 structures between the two stations
  - Terminal equipment upgrades at Elmont & Ladysmith
- Build a new 230kV Line from Cloverhill – Ox
  - Terminal equipment upgrades at Ox and Cloverhill
- Build a new 230kV Line from Raines – Cloud
  - Terminal equipment upgrades at Cloud and Raines
- Reconductor and convert 115kV Line #121 to 230kV between Poe – Prince George
  - Terminal equipment upgrades at Poe & Prince George
- Build a new 230kV Line #9491 from Morrisville – Anderson using existing tower structures supporting 500kV Line #545 Bristers – Morrisville
  - Terminal equipment upgrades at Morrisville and Anderson Branch

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**Estimated Cost: $672.43 M**

**Required IS Date:** 6/1/2029
**Projected IS Date:** 6/1/2029

Continued on next slide…

# 2024W1 – Regional Cluster
# Preferred Solution: 2024-W1-24

## Existing Facility Rating:

| # | Branch | SN/SE/WN/WE (MVA) |
|---|---|---|
| 1 | 230kV Line #280 Marsh Run – Remington<br>230kV Line #299 Marsh Run - Remington CT | 1202/1202/1332/1332<br>608/608/769/769 |
| 2 | 230kV Line #2161 Gainesville – Wheeler | 808/808/895/895 |
| 3 | 230kV Line #213 Thelma – Lakeview<br>230kV Line #225 Thelma – Lakeview | 470/470/596/596<br>470/470/550/555 |
| 4 | 230kV Line #2003 Chesterfield – Tyler<br>230kV Line #2003 Tyler – Locks – Poe | 1047/1047/1160/1160<br>470/470/596/596 |
| 5 | 230kV Line #2002 Carson – Poe | 722/722/914/914 |
| 6 | 230kV Line from Nokesville – Hornbaker | NA |
| 7 | 230kV Line from Elmont – Ladysmith | NA |
| 8 | 230kV Line from Cloverhill – Ox | NA |
| 19 | 230kV Line from Raines – Cloud | NA |
| 10 | 115kV Line #121 to 230kV between Poe – Prince George | 262/262/290/290 |
| 11 | 230kV Line #9491 from Morrisville – Anderson | NA |

## Preliminary Facility Rating:

| # | Branch | SN/SE/WN/WE (MVA) |
|---|---|---|
| 1 | 230kV Line #280 and #299 Marsh Run - Remington CT | 1573/1573/1648/1648 |
| 2 | 230kV Line #2161 Gainesville – Wheeler | 1573/1573/1648/1648 |
| 3 | 230kV Line #213 and #225 from Thelma – Lakeview | 1573/1573/1648/1648 |
| 4 | 230kV Line #2003 Chesterfield – Tyler – Locks – Poe | 1573/1573/1648/1648 |
| 5 | 230kV Line #2002 Carson – Poe | 1573/1573/1648/1648 |
| 6 | 230kV Line from Nokesville – Hornbaker | 1573/1573/1648/1648 |
| 7 | 230kV Line from Elmont – Ladysmith | 1573/1573/1648/1648 |
| 8 | 230kV Line from Cloverhill – Ox | 1573/1573/1648/1648 |
| 9 | 230kV Line from Raines – Cloud | 1573/1573/1648/1648 |
| 10 | 115kV Line #121 to 230kV between Poe – Prince George | 1573/1573/1648/1648 |
| 11 | 230kV Line #9491 from Morrisville – Anderson | 1573/1573/1648/1648 |

# Reliability Analysis Update



Sami Abdulsalam, Director
PJM Transmission Planning

Transmission Expansion Advisory Committee
January 7, 2025

# Recommended Solution (Regional Cluster)

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# 2024W1 – Regional Cluster
# Recommended Solution: 2024-W1-24

**Recommended Solution:** 2024-W1-24 **Revised**

- Rebuild 230kV Line #280 and #299 Marsh Run - Remington CT
  - Terminal equipment upgrades at Marsh Run & Remington
- Partial reconductor/partial wreck & rebuild of 230kV Line #2161 Gainesville – Wheeler
  - Terminal equipment upgrades at Gainesville & Wheeler
  - Relay resets at Trident substation
- Rebuild 230kV Line #213 and #225 from Thelma – Lakeview
  - Terminal equipment upgrades at Thelma & Lakeview
- Reconductor 230kV Line #2003 Chesterfield – Tyler – Locks – Poe
  - Terminal equipment upgrades at Poe & Tyler
  - Relay resets at Chesterfield
- Reconductor 230kV Line #2002 Carson – Poe
  - Terminal equipment upgrades at Carson & Poe
- Build a new 230kV Line from Nokesville – Hornbaker using the vacant arms of the double circuit monopole structures installed as part of a previous project
  - Terminal equipment upgrades at Nokesville & Hornbaker

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# 2024W1 – Regional Cluster
# Recommended Solution: 2024-W1-24

**Recommended Solution:** 2024-W1-24 **Revised**

- Build a new 230kV Line from Elmont – Ladysmith on the existing 5-2 structures between the two stations
  - Terminal equipment upgrades at Elmont & Ladysmith
- Build a new 230kV Line from Cloverhill – Ox
  - Terminal equipment upgrades at Ox and Cloverhill
- Build a new 230kV Line from Raines – Cloud
  - Terminal equipment upgrades at Cloud and Raines
- Reconductor and convert 115kV Line #121 to 230kV between Poe – Prince George
  - Terminal equipment upgrades at Poe & Prince George
- Build a new 230kV Line #9491 from Morrisville – Anderson using existing tower structures supporting 500kV Line #545 Bristers – Morrisville
  - Terminal equipment upgrades at Morrisville and Anderson Branch

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**Estimated Cost: $672.43 M**

**Required IS Date:** 6/1/2029
**Projected IS Date:** 6/1/2029

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# 2024W1 – Regional Cluster
# Recommended Solution: 2024-W1-24

| Upgrade Id | Description | Cost Estimate ($M) |
|---|---|---|
| b4000.300 | Rebuild approximately 1.71 miles of 230kV line 299 from the Marsh Run substation to the Remington CT substation. New conductor has a summer rating of 1573 MVA. | $5.35 |
| b4000.301 | Reconductor approximately 1.24 miles of 230kV line 280 from Remington - the Marsh Run CT substation to the Remington substation. New conductor has a summer rating of 1573 MVA. | $3.88 |
| b4000.302 | Uprate line #299 terminal equipment, line leads, and bus at Marsh Run substation to be rated to 4000A. | $2.53 |
| b4000.303 | Uprate line #299 terminal equipment, line leads, and bus at Remington CT substation to be rated to 4000A. | $2.44 |
| b4000.304 | Partial reconductor/partial wreck & rebuild of 230kV Line #2161 Gainesville – Wheeler. New conductor has a summer rating of 1573 MVA. (Wheeler - Linton Tap segment) | $17.72 |
| b4000.305 | Partial reconductor/partial wreck & rebuild of 230kV Line #2161 Gainesville – Wheeler. New conductor has a summer rating of 1573 MVA. (Linton Tap - Atlantic segment) | $3.49 |
| b4000.306 | Partial reconductor/partial wreck & rebuild of 230kV Line #2161 Gainesville – Wheeler. New conductor has a summer rating of 1573 MVA. (Atlantic - Trident segment) | $1.72 |
| b4000.307 | Partial reconductor/partial wreck & rebuild of 230kV Line #2161 Gainesville – Wheeler. New conductor has a summer rating of 1573 MVA. (Trident - Gainesville segment) | $6.16 |
| b4000.308 | Upgrade all line #2161 terminal equipment at Gainesville to 4000A. A CCVT will also be replaced due to aging. | $1.78 |
| b4000.309 | Upgrade all line #2161 terminal equipment Wheeler substation to 4000A. | $2.25 |
| b4000.310 | Revise relay settings at Trident substation. | $0.03 |
| b4000.311 | Rebuild 230kV Line #213 and #225 from Thelma – Lakeview. New conductor has a summer rating of 1573 MVA. | $44.69 |
| b4000.312 | At Thelma subsation, upgrade line lead, wave traps (213WT & 225WT), circuit breaker leads to 4000A. CB switches 22535, 23235, 23238 and 21335 will also be upgrade to 4000A DEB switches. CCVTs 213P1, 213P2 and 213P3 will be replaced due to aging. | $2.30 |
| b4000.313 | At Lakeview substation, upgrade wave traps 213WT and 225WT, line leads, and circuit breaker leads to 4000A. Upgrade CB switches 22565 and 22564 to 4000A double-end break switches. Replace CCVTs 225P1, 225P2, and 225P3 due to aging. | $1.72 |
| b4000.314 | Reconductor 230kV Line #2003 Chesterfield – Tyler segment. New conductor has a summer rating of 1573 MVA. | $3.16 |
| b4000.315 | Reconductor 230kV Line #2003 Tyler – Poe segment. New conductor has a summer rating of 1573 MVA. | $20.61 |
| b4000.316 | At Poe substation, uprate all Line #2003 terminal equipment, line leads, and bus to be rated to 4000A. | $1.79 |
| b4000.317 | At Tyler substation, upgrade the necessary line terminal equipment to maintain 4000A at Tyler substation. | $0.54 |
| b4000.318 | Revise relay settings at Chesterfield substation. | $0.02 |
| b4000.319 | Reconductor 230kV Line #2002 Carson – Poe. New conductor has a summer rating of 1573 MVA. | $30.29 |
| b4000.320 | At Carson substation, upgrade all line #2002 terminal equipment at Carson to 4000A. CCVTs will also be replaced due to aging. | $0.89 |
| b4000.321 | At Poe substation, upgrade all line #2002 terminal equipment at Carson to 4000A. CCVTs will also be replaced due to aging. | $0.81 |
| b4000.322 | Build a new 230kV Line from Nokesville – Hornbaker using the vacant arms of the double circuit monopole structures installed as part of previous project 993027. New conductor has a summer rating of 1573 MVA. | $15.28 |
| b4000.323 | Upgrade terminal equipment at Nokesville substation. The project adds one more line to Nokesville, including the installation of one 230kV breaker and two 230kV switches. | $1.43 |
| b4000.324 | Upgrade terminal equipment at Hornbaker substation. This project provides for installing a new 230kV 4000A rated line terminal at Hornbaker to accommodate the new line to Nokesville. | $1.43 |
| b4000.325 | Build a new 26.38mi 230kV Line from Elmont – Ladysmith on the existing 5-2 structures between the two stations. New conductor has a summer rating of 1573 MVA. | $26.09 |
| b4000.326 | At Elmont substation, install/upgrade associated equipment to accommodate a 4000A line rating for the new 230kV line between Elmont - Ladysmith. | $2.19 |
| b4000.327 | Upgrade/install equipment at Ladysmith substation to 4000A. Expansion will be required to accommodate a total of three (3) new 230kV strings of breaker and a half scheme. | $8.72 |
| b4000.328 | Construct a new 24.5-mile 230 kV line 2XXX from Cloverhill substation to Ox substation. | $287.54 |
| b4000.329 | At Ox substation, install the necessary associated equipment to accomdate the new line between Cloverhill - Ox. This project also includes expanding the substation with associated security level 1 fencing and super post structure needed. | $6.37 |
| b4000.330 | At Cloverhill substation, install the necessary associated equipment to accomdate the new line between Cloverhill - Ox. This project also includes demolishing and reconstructing the existing bus system and roadway. | $2.27 |
| b4000.331 | Construct a new 230kV single circuit line from Raines substation to Cloud substation to solve electrical violations cause by the significant load growth in South Hill, Virginia. The scope also includes an idle 230kV circuit being installed between these stations. | $77.50 |
| b4000.332 | At Cloud substation, upgrade substation terminal equipment to 4000A. | $1.43 |
| b4000.333 | At Raines substation, upgrade substation terminal equipment to 4000A. | $1.32 |
| b4000.334 | Reconductor 115kV line #121 from Poe - Prince George. Specifically, line #121 will be reconductored and converted to 230kV from Poe substation to Prince George substation. | $14.62 |
| b4000.335 | At Poe substation, install a new 230kV six breaker ultimate ring bus which will fit the station to current 230kV standards. The substation scope includes the installation of 230kV breaker and half GIS bus. Work at Poe subsation is associated with line #121 reconductor. | $38.28 |
| b4000.336 | Build a new 230-115kV Prince George substation along the existing 115 or 230kV corridor. The substation scope includes the installation of 230kV breakers & 1-115kV breaker along with its associated terminal equipment initially but will have provision for making it a 6-breaker ring (both 230 & 115kV) in future. The existing 230-115kV transformer at Prince George will be relocated to serve this new substation. | $26.62 |
| b4000.337 | Extend a new 230 kV line approximately 7.85 miles between the existing Morrisville and Anderson Branch substations. The existing tower structures currently supporting the Bristers to Morrisville 500 kV Line #545 will be used to support this new line as shared tower structures. | $5.26 |
| b4000.338 | At Morrisville substation, install/upgrade substation terminal equipment to 4000A. | $0.95 |
| b4000.339 | At Anderson Branch substation, install/upgrade substation terminal equipment to 4000A. | $0.95 |

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# 2024W1 – Regional Cluster
# Recommended Solution: 2024-W1-781

**Recommended Solution:** 2024-W1-781

- Upgrade 500/230kV transformer at Goose Creek substation.
  **Estimated Cost: $34.01M (b4000.340)**
- Uprate bus at Brambleton to support 500kV LN #558 Aspen – Brambleton uprate.
  **Estimated Cost: $0M (b4000.343)**
- Remove Vint Hill substation terminal from Wishing Star – Vint Hill – Morrisville 500kV Line. **Estimated Cost: $0M (b4000.341)**
- Remove terminal equipment from Vint Hill 500kV substation.
  **Estimated Cost: $0M (b4000.342)**

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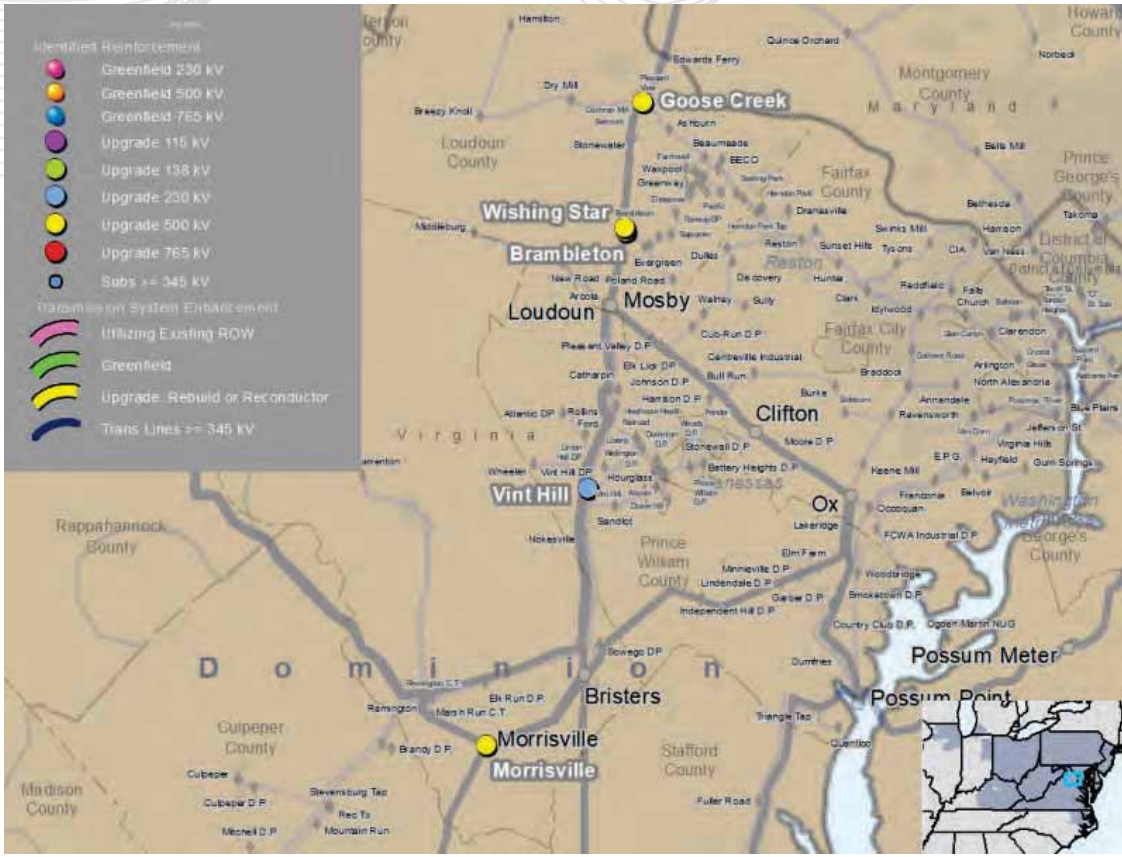
| # | Branch | SN/SE/WN/WE (MVA) |
|---|---|---|
| 1 | 500kV LN #558 Aspen – Brambleton | 3464/3464/3984/4018 |
| 2 | 500/230kV Goose Creek Transformer | 900/954/1159/1213 |

| # | Branch | SN/SE/WN/WE (MVA) |
|---|---|---|
| 1 | 500kV LN #558 Aspen – Brambleton | 4357/4357/5155/5155 |
| 2 | 500/230kV Goose Creek Transformer | 1440/1440/1440/1440 |

**Estimated Cost:** ~~$34.03 M~~ $34.01 M
**Required IS Date:** 6/1/2029
**Projected IS Date:** 6/1/2029



# Reliability Analysis Update



Stan Sliwa, Senior Lead Engineer
PJM Transmission Planning

Transmission Expansion Advisory Committee
April 1, 2025

# Cancellations

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# DOM Transmission Zone: Baseline Loudoun – Morrisville 500kV

**Process Stage:** Cancellation

**Criteria:** End of Life

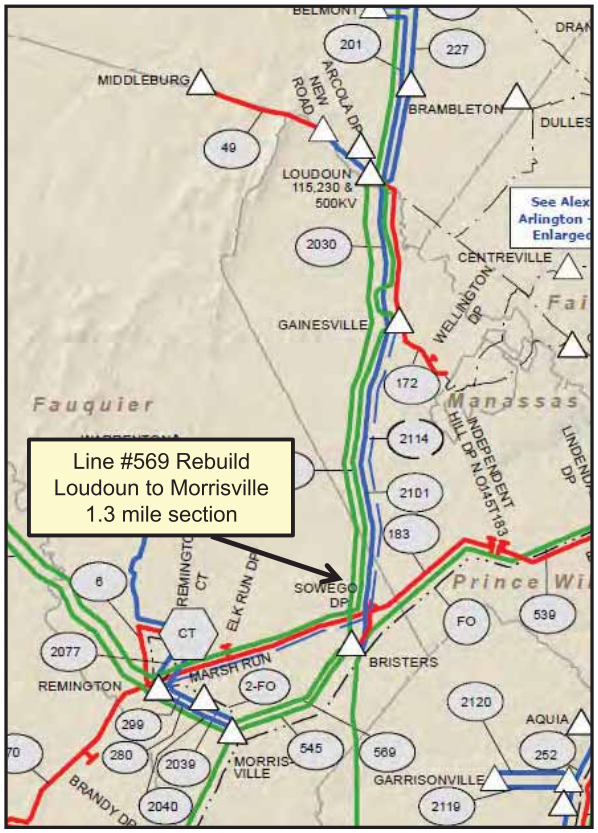
**Assumption Reference**: FERC 715

**B3211:** Rebuild the 1.3 mile section of Line #569 Loudoun to Morrisville with single-circuit 500 kV structures at the current 500 kV standard. This will increase the rating of Line #569 to 3424 MVA.

The upgrade was identified through reliability studies that indicated that retiring Line #569 would result in thermal overloads in accordance with P6 NERC criteria violations.

**Cancellation Reason:** Baseline project b3800.312 from 2022 Window 3 will rebuil entire portion of line #569 Loudoun – Morrisville, therefore eliminating the need project.

| COLOR | VOLTAGE | TRANSMISSION LINE NUMBER |
|---|---|---|
| | 500 KV. | 500 thru 599 |
| | 230 KV. | 200 thru 299 & 2000 thru 2099 |
| | 115 KV. | 1 thru 199 |
| | 138 KV. | AS NOTED |
| | 69 KV. | AS NOTED |




**Previously Presented:** 8/8/2019 TEAC

**Estimated Project Cost: $4.5 M**

**Required In-Service Date:** As Soon As Possible

**Projected In-Service Date:** 12/31/2024

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