Reliability Analysis Update

Aaron Berner, Senior Manager

Transmission Expansion Advisory Committee

Tuesday, November 30, 2021

2021 RTEP Proposal Window

Second Review

Baseline Reliability Projects

AEP Transmission Zone: Baseline
Delphos Area

Process Stage: Second Review

Criteria: AEP FERC 715 Criteria

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2026 RTEP cases

Proposal Window Exclusion: None

Problem Statement:

AEP -T15, AEP -T16, AEP -T17, AEP -T18, AEP -T19, AEP -T20, AEP -T21, AEP -T22, AEP -T23, AEP -T24, AEP -T25, AEP -T26, AEP -T27, AEP -T28, AEP -T47, AEP -T48, AEP -T49, AEP -T50, AEP -T51, AEP -T52, AEP -T53, AEP -T54, AEP -T55, AEP -T56, AEP -T57, AEP -T58, AEP -T73, AEP -T74, AEP -T75, AEP -T76

In 2026 RTEP summer, winter and light load cases, the North Delphos – East Delphos 69kV line and the East Delphos – Elida Road 69kV line are overloaded for multiple N-1-1 contingency pairs. The North Delphos – East Delphos 69kV line and the Delphos – South Delphos are overload for a N-1-1 contingency pair.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05N DELPHO – 05E DELPHO 69KV	46/46/56/56
05E DELPHO – 05ELIDA ROAD 69KV	46/46/56/56
05DELPHO – 05S DELPHO 69KV	50/50/63/63
05N DELPHO – 05S DELPHO 69KV	54/54/76/76

SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

AEP Transmission Zone: Baseline
Delphos Area

As part of the 2021 RTEP Window #1, the projects listed in the table below are proposed to address the following violations: AEP -T15, AEP -T16, AEP -T17, AEP -T18, AEP -T19, AEP -T20, AEP -T21, AEP -T22, AEP -T23, AEP -T24, AEP -T25, AEP -T26, AEP -T27, AEP -T28, AEP -T51, AEP -T52, AEP -T53, AEP -T54, AEP -T73, AEP -T74, AEP -T75, AEP -T76

(NOTE: Proposal 202 and 786 additionally addresses: AEP -T47, AEP -T48, AEP -T49, AEP -T50, AEP -T55 , AEP -T56, AEP -T57, AEP -T58)

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
202	AEP	Delphos Area Line Rebuilds	8.871
786	AEP	Haviland Sectionalizing Addition (Plus convert s2389 to baseline)	1.309 (plus $65.36M for s2389 conversion)
503	CNTLTM	LS Rockford - LS West Van Wert 69kV Transmission Project	14.415

Proposed Solution: Proposal #2021_1-202

- Rebuild approximately 3.5 miles of overloaded 69 kV line between North Delphos-East Delphos-Elida Road switch. This includes approximately 1.1 miles of double circuit line that makes up a portion of the North Delphos-South Delphos 69 kV line and the North Delphos-East Delphos 69 kV line. Approximately 2.4 miles of single circuit line will also be rebuilt between the double circuit portion to East Delphos station and from East Delphos to Elida Road Switch. (**B3346.1**) Estimated cost: $8.434M
- Replace the line entrance spans at South Delphos to eliminate the overloaded 4/0 Copper and 4/0 ACSR conductor. (**B3346.2**) Estimated cost: $0.437M

Total Estimated Cost: $8.871M

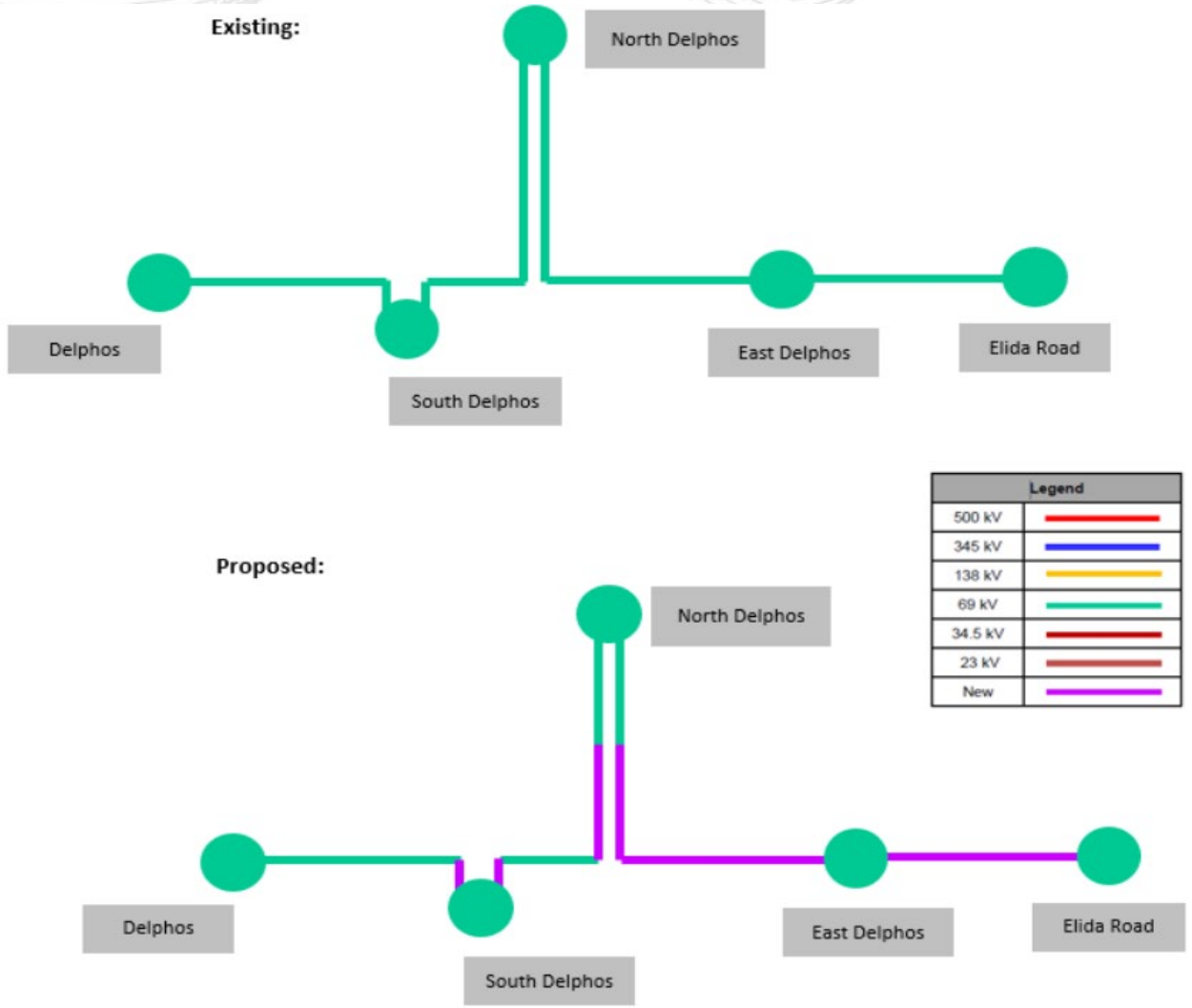
AEP Transmission Zone: Baseline
Delphos Area

Additional Benefit: The lines that are will addressed on the proposal include: One mile of the 5.26 mile North Delphos – South Delphos 69kV line asset consists of 22 wood pole structures, originally installed in 1943 primarily with 2/0 COPPER 7 (20COP) conductor. The line asset is part of two circuits: North Delphos – Van Wert 69kV and North Delphos-West Moulton 69kV circuits. There are currently 7 open conditions specifically affecting the 1 mile section of the line The Delphos Junction – East Delphos 69kV Line asset is 2.29 miles long and consists of wood pole structures, originally installed in 1939 primarily with 2/0 COPPER 7 (2/0COP) conductor. There are 40 structures with at least one open condition, which relates to 74% of the structures on the line. There are 36 open conditions related to broken or missing ground lead wires which could lead to the poor lightning performance. There are currently 9 structure related open conditions specifically affecting the Knee/Vee Brace (broken/rot).

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05N DELPHO – 05E DELPHO 69KV	68/71/71/71
05E DELPHO – 05ELIDA ROAD 69KV	82/90/107/113
05DELPHO – 05S DELPHO 69KV	73/73/91/91
05N DELPHO – 05S DELPHO 69KV	68/73/90/91

Required IS Date: 6/1/2026
Projected IS Date: 6/1/2026
Previously Presented: 11/2/2021



SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

AEP Transmission Zone: Baseline
Dehue Area

Process Stage: Second Review

Criteria: AEP FERC 715 Criteria

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2026 RTEP cases

Proposal Window Exclusion: None

Problem Statement:

AEP -T6, AEP -T7, AEP -T8

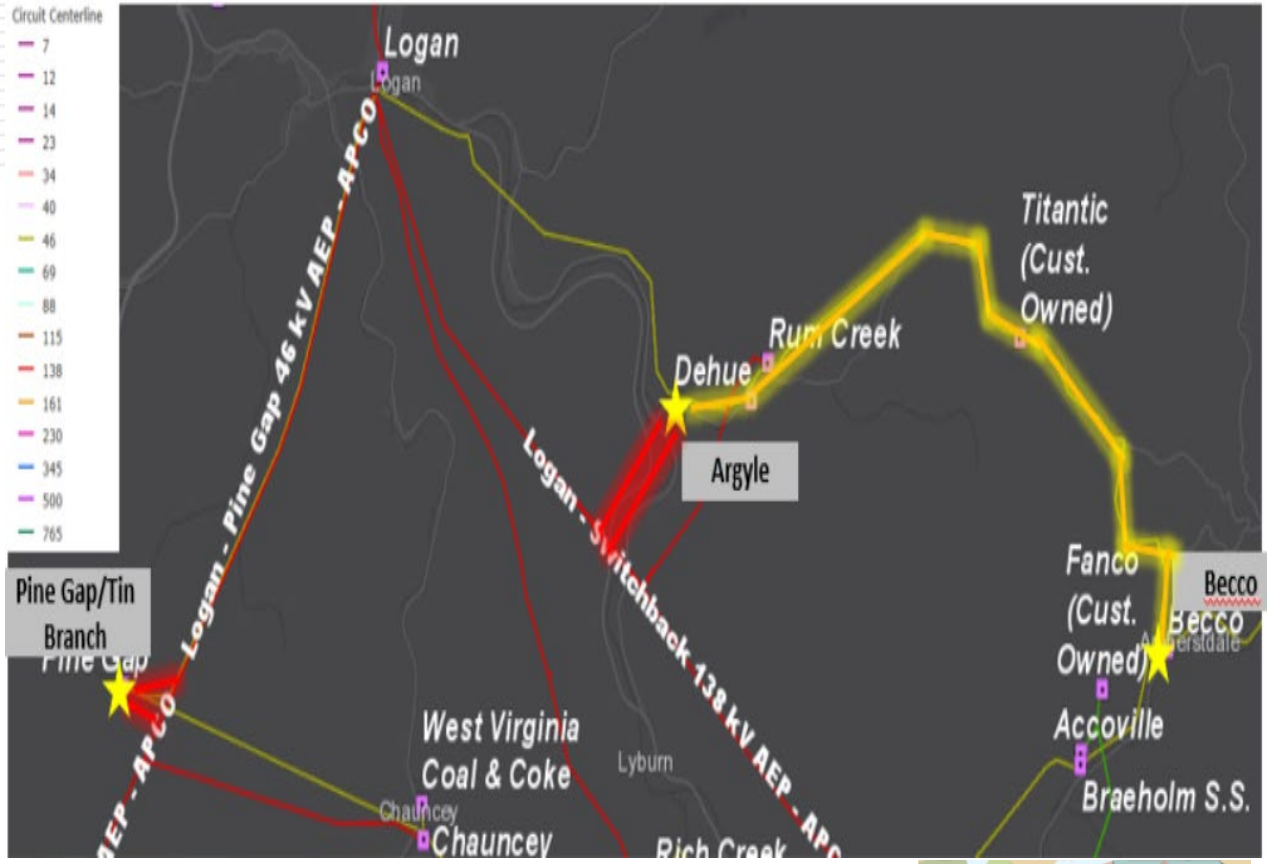
In 2026 RTEP light load case, the Becco – Slagle 46kV line, the Dehue – Pine Gap 46kV line and Dehue – Slagle 46kV line are overload for a N-1-1 contingency pair.

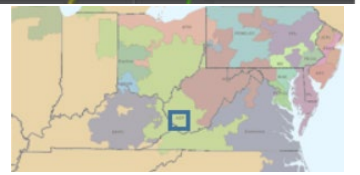
AEP-VM1, AEP-VM2, AEP-VM3, AEP-VM4, AEP-VM5, AEP-VM6, AEP-VM7, AEP-VM8, AEP-VM9, AEP-VD1, AEP-VD2, AEP-VD3, AEP-VD4, AEP-VD5, AEP-VD6, AEP-VD7, AEP-VD8, AEP-VD9 (excluded from Window due to <200KV exclusion).

Low voltage and voltage drop violations at Three Fork, Toney Fork, Cyclone, Pardee, Crane,, Latrobe, Becco, Slagle, Dehue 46kV buses for a N-1-1 contingency pair.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05BECCO – 05SLAGLE 46KV	23/23/32/32
05DEHUE– 05SLAGLE 46KV	23/23/32/32
05DEHUE – 05PINE GAP 46KV	27/27/34/34





SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

AEP Transmission Zone: Baseline

Dehue Area

As part of the 2021 RTEP Window #1, the projects listed in the table below are proposed to address the following violations: AEP -T6, AEP -T7, AEP -T8, AEP-VM1, AEP-VM2, AEP-VM3, AEP-VM4, AEP-VM5, AEP-VM6, AEP-VM7, AEP-VM8, AEP-VM9, AEP-VD1, AEP-VD2, AEP-VD3, AEP-VD4, AEP-VD5, AEP-VD6, AEP-VD7, AEP-VD8, AEP-VD9

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
365	AEP	Accoville-Becco 69 kV	13.048
310	AEP	Becco-Pine Gap Rebuild	50.191
488	AEP	Dehue Expansion and Line Rebuilds	65.798

Recommended Solution: Proposal #2021_1-488

- Construct a 138kV single bus station (Tin Branch) consisting of a 138kV box bay with a distribution transformer and 12kV distribution bay. Two 138kV lines will feed this station (from Logan and Sprigg Stations), and distribution will have one 12kV feed. Install two 138 kV circuit breakers on the line exits. Install 138 kV circuit switcher for the new transformer. (**B3348.1**) Estimated cost: $5.584M
- Construct a new 138/46/12 kV Argyle station to replace Dehue station. Install a 138kV ring bus using a breaker-and-a-half configuration, with an autotransformer with a 46kV feed and a distribution transformer with a 12kV distribution bay. Two 138kV lines will feed this station (from Logan and Wyoming Stations). There will also be a 46kV feed from this station to Becco Station. Distribution will have two 12kV feeds. Retire Dehue station in its entirety. (**B3348.2**) Estimated cost: $9.996M
- Bring the Logan - Sprigg #2 138kV circuit in and out of Tin Branch station by constructing approximately 1.75 miles of new overhead double circuit 138kV line. Double circuit T3 series lattice towers will be used along with 795,000cm ACSR 26/7 conductor. One shield wire will be conventional 7 #8 ALUMOWELD and one shield wire will be OPGW. (**B3348.3**) Estimated cost: $8.578M
- Logan - Wyoming No. 1 circuit in and out of the proposed Argyle Station. Double circuit T3 series lattice towers will be used along with 795,000cm ACSR 26/7 conductor. One shield wire will be conventional 7 #8 ALUMOWELD and one shield wire will be OPGW. (**B3348.4**) Estimated cost: $7.702M
- Rebuild approximately 10 miles of 46 kV line between Becco and the new Argyle substation. Retire approximately 16 miles of 46 kV line between the new Argyle substation and Chauncey station. (**B3348.5**) Estimated cost: $33.705M
- Adjust relay settings due to new line terminations and retirements at Logan, Wyoming, Sprigg, Becco, and Chauncey stations. (**B3348.6**) Estimated cost: $0.233M

Total Estimated Cost: $65.798M

AEP Transmission Zone: Baseline
Dehue Area

Additional Benefit:

- This project will also address the needs reviewed with stakeholders under need number AEP-2020-AP044 in the November 20, 2020 W-SRRTEP.
- This project will also address the asset performance, condition, and risk needs on the Chauncey - Pine Gap 46kV Line which is a 1937 vintage wood pole line with 29 open structure conditions with 59% of the structures along the line with at least one open condition.
- This proposal, by constructing approximately 3.5 miles of greenfield 138 kV line and two new stations, allows for the retirement of over 15 miles of deteriorating 46 kV line in very challenging territory, helping to reduce future rebuild investment required to address asset renewal needs on the 46 kV system.
- This project will also address the asset performance, condition, and risk needs at Pine Gap 46kV station:
    - Transformer #1 is a 46/12kV 1949s vintage bank. The transformer has high levels of acetylene, decreasing and low interfacial tension (IFT), and high and rising moisture levels. These levels indicate increased decomposition of the paper insulating materials and indicate that electrical discharges have been occurring within the main tank. The insulation is shrinking and weakening. This is an indication of an aged oil with polar contaminants and oxidation byproducts. The values of IFT and moisture indicate the dielectric strength of the insulation system (oil and paper) is in poor condition. The oil containment is extremely deteriorated with the lining visible above the station stone.
    - Pine Gap Substation currently deploys 16 relays, implemented to ensure the adequate protection and operation of the substation. Currently, all 16 relays are in need of replacement. All 16 of these are of the electromechanical and static type which have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack vendor support. The existing control house lacks enough panel space to accommodate new relaying.

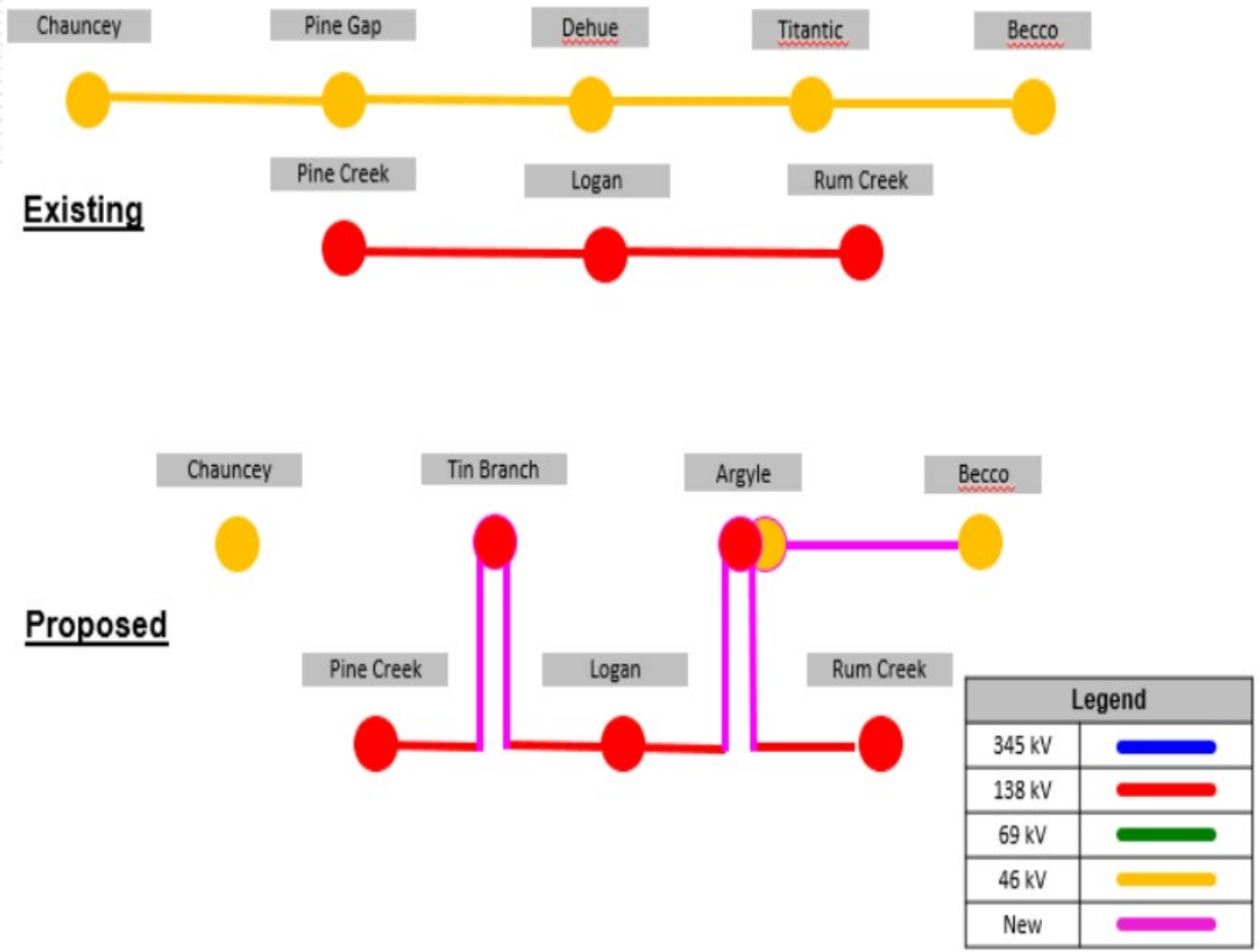
AEP Transmission Zone: Baseline

Dehue Area

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05LOGAN1– 05ARGYLE 138KV	257/360/325/404
05RUMCKZ – 05ARGYLE 138KV	257/360/325/404
05ARGYLE 138/69/46KV 1st winding	90/90/90/90
05ARGYLE 138/69/46KV 2nd winding	90/90/90/90
05ARGYLE 138/69/46KV 3rd winding	60/60/60/60

Required IS Date: 11/1/2026
Projected IS Date: 6/30/2026
Previously Presented: 11/2/2021



SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

Dominion Transmission Zone: Baseline Remington CT - Gainesville

Process Stage: Second Review

Criteria: Generator Deliverability, N-1

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2026 RTEP cases

Proposal Window Exclusion: None

Problem Statement:

GD-S12, GD-S17, GD-S715, GD-S37, GD-S717, N1-ST49

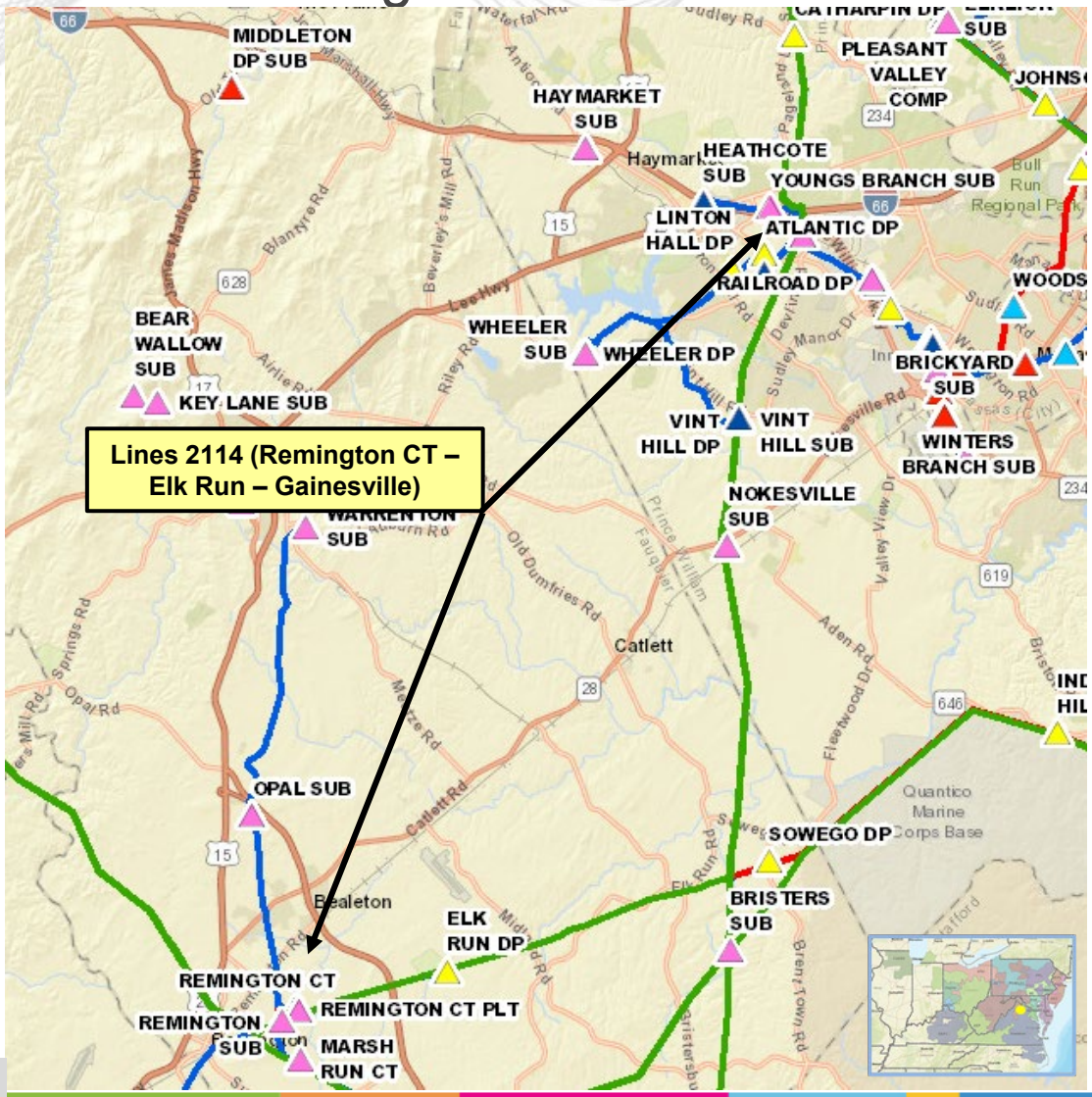
In the 2026 RTEP summer case, 230kV Line #2114 Remington CT – Gainesville is overloaded for a tower contingency under N-1 and a single & tower contingencies under Generator Deliverability.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
6REMNGCT– 6ELK RUN 230kV	1047/1047/1160/1160
6ELK RUN – 6GAINSVL 230kV	1047/1047/1160/1160

Continued on next slide….

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



SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

Dominion Transmission Zone: Baseline Remington CT - Gainesville

As part of the 2021 RTEP Window #1, the following projects were proposed to address violations on 230kV Line #2114:

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
445	Dominion	Line #2114 Remington CT to Gainesville full reconductor. Upgrade wave trap and substation conductor at both terminals. Upgrade Brambleton breakers.	30.680
333	Dominion	Line #2114 Remington CT to Gainesville full reconductor. Upgrade terminal equipment at both ends to include 230kV circuit breakers, switches and leads to achieve 4000A rating. Upgrade Brambleton breakers.	39.693
298(1)	TRNSRC	Construct greenfield Lee District 500 kV station with 6-breaker ring bus.	72.876

(1)Proposal 298 also addresses Generator Deliverability violation GD-S30. (This flowgate was eliminated as a result of the 2021 RTEP re-tool).

Recommended Solution: Proposal #2021_1-445

- Reconductor approximately 24.42 miles of 230kV Line #2114 Remington CT - Elk Run - Gainesville to achieve a summer rating of 1574 MVA by fully reconductoring the line and upgrading the wave trap and substation conductor at Remington CT and Gainesville. **Estimated cost: $28.988M (b3689.1)**
- Replace 230 kV breakers SC102, H302, H402, and 218302 at Brambleton substation with 4000A 80kA breakers and associated equipment including breaker leads as necessary to address breaker duty issues identified in short circuit analysis. **Estimated cost: $1.692M (b3689.2)**

Continued on next slide….

Dominion Transmission Zone: Baseline Remington CT - Gainesville

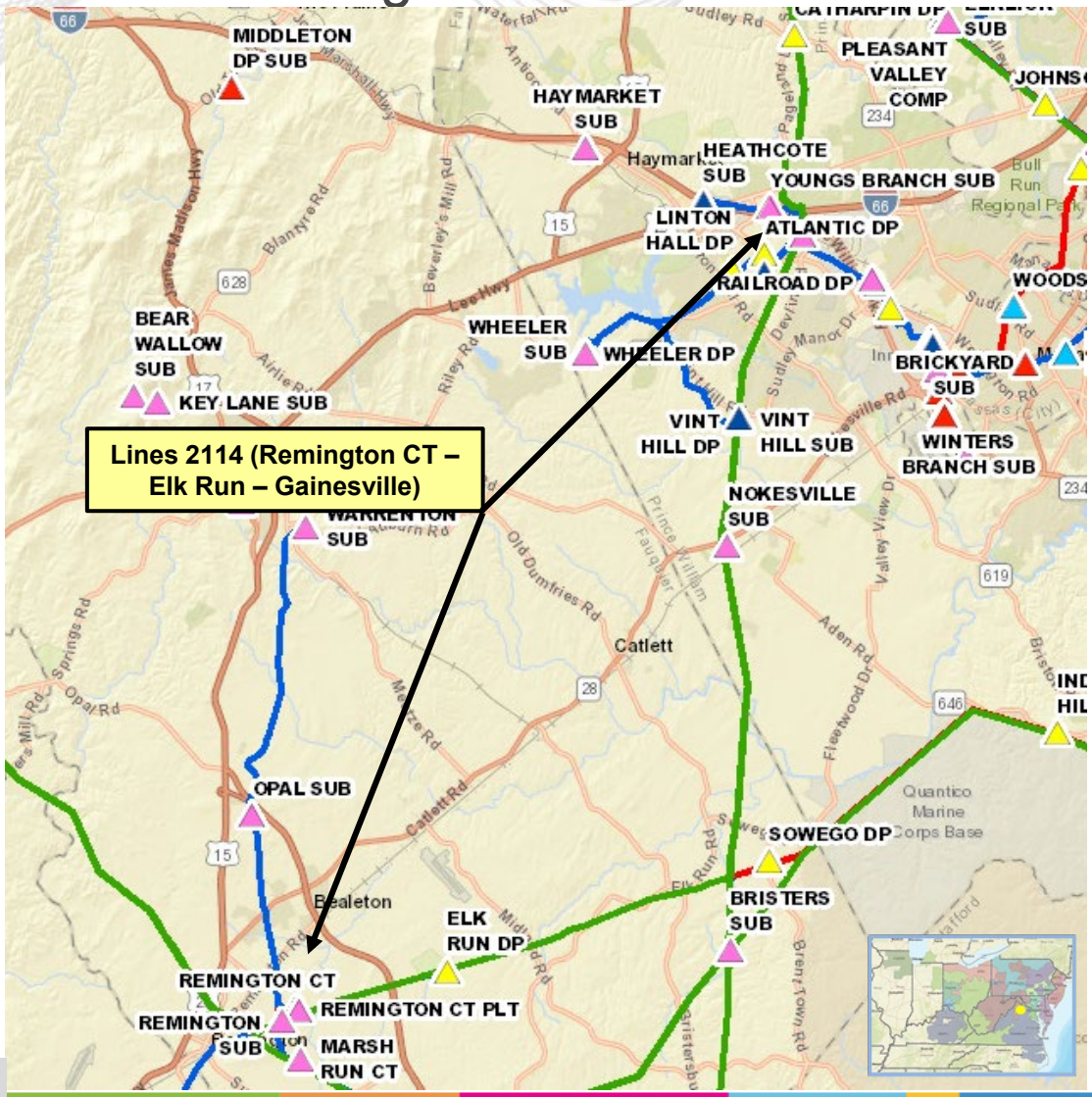
Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
6REMNGCT– 6ELK RUN 230kV	1574/1574/1650/1650
6ELK RUN – 6GAINSVL 230kV	1574/1574/1650/1650

Total Estimated Cost: $30.680M

Projected In-Service Date: 6/1/2026
Required In-Service Date: 6/1/2026

Previously Presented: 11/2/2021



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

SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

Dominion Transmission Zone: Baseline Cub Run - Walney

Process Stage: Second Review

Criteria: N-1

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2026 RTEP cases

Proposal Window Exclusion: None

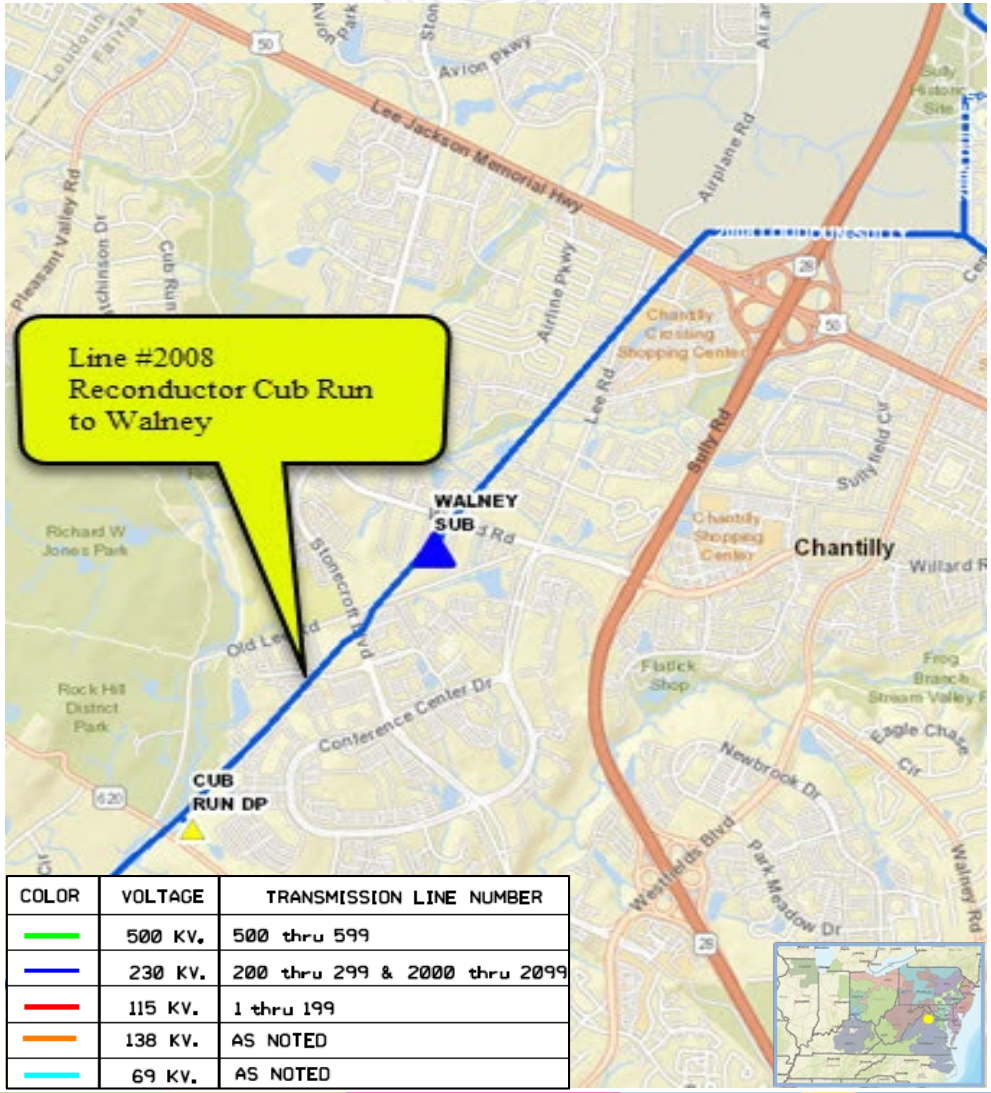
Problem Statement:

N1-ST33

In the 2026 RTEP summer case, 230kV Line #2008 Cub Run to Walney is overloaded for a breaker contingency under N-1.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
6CUBRUN – 6WALNEY 230kV	823/823/944/944



Continued on next slide….

SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

Dominion Transmission Zone: Baseline Cub Run - Walney

As part of the 2021 RTEP Window #1, the following project was proposed to address violations on 230kV Line #2008:

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
600	Dominion	Line #2008 Cub Run to Walney reconductor. Replace line switch 200826 with a 4000A switch.	1.934

Recommended Solution: Proposal #2021_1-600

- Reconductor approximately 1.07 miles of 230kV Line #2008 segment from Cub Run – Walney to achieve a summer rating of 1574 MVA. Replace line switch 200826 with a 4000A switch. **(b3690)**

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
6CUBRUN – 6WALNEY 230kV	1574/1574/1650/1650

Total Estimated Cost: $1.934M

Projected In-Service Date: 6/1/2026

Required In-Service Date: 6/1/2026

Previously Presented: 11/2/2021

Dominion Transmission Zone: Baseline Lakeview - Carolina

Process Stage: Second Review

Criteria: Generator Deliverability

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2026 RTEP cases

Proposal Window Exclusion: None

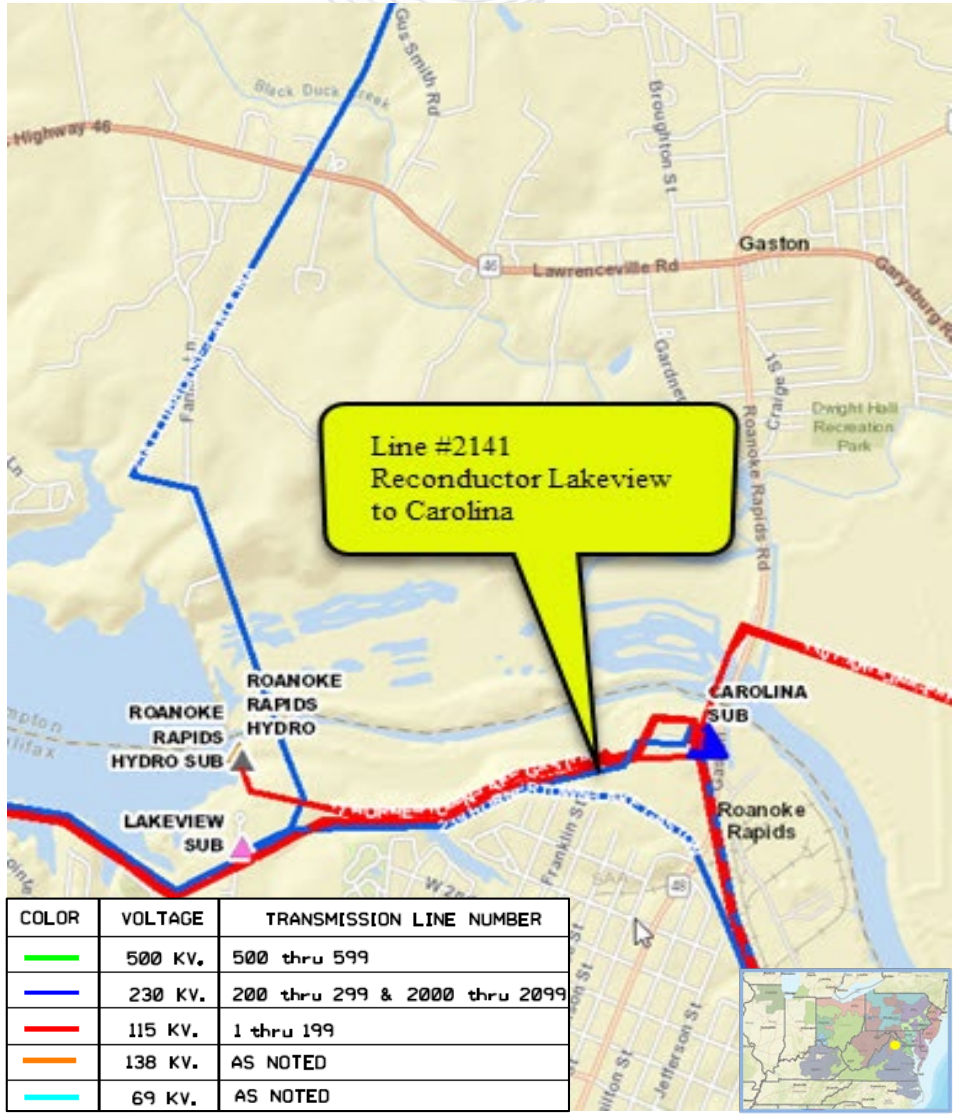
Problem Statement:

GD-S19

In the 2026 RTEP summer case, 230kV Line #2141 Lakeview to Carolina is overloaded for a single contingency under Generator Deliverability.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
6LAKEVEW – 6CAROLNA 230kV	399/399/505/505



Continued on next slide….

SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

Dominion Transmission Zone: Baseline Lakeview - Carolina

As part of the 2021 RTEP Window #1, the following project was proposed to address violations on 230kV Line #2141:

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
414	Dominion	Line #2141 Lakeview to Carolina reconductor	1.185

Recommended Solution: Proposal #2021_1-414

- Reconductor approximately 1.4 miles of 230kV Line #2141 from Lakeview – Carolina to achieve a summer rating of 1047 MVA. **(b3691)**

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
6LAKEVEW – 6CAROLNA 230kV	1047/1047/1160/1160

Total Estimated Cost: $1.185M
Projected In-Service Date: 6/1/2026
Required In-Service Date: 6/1/2026

Previously Presented: 11/2/2021

Dominion Transmission Zone: Baseline Elmont - Chickahominy

Process Stage: Second Review

Criteria: FERC Form 715 (C.2.9 End-of-Life Criteria)

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2026 RTEP cases

Proposal Window Exclusion: None

Problem Statement:

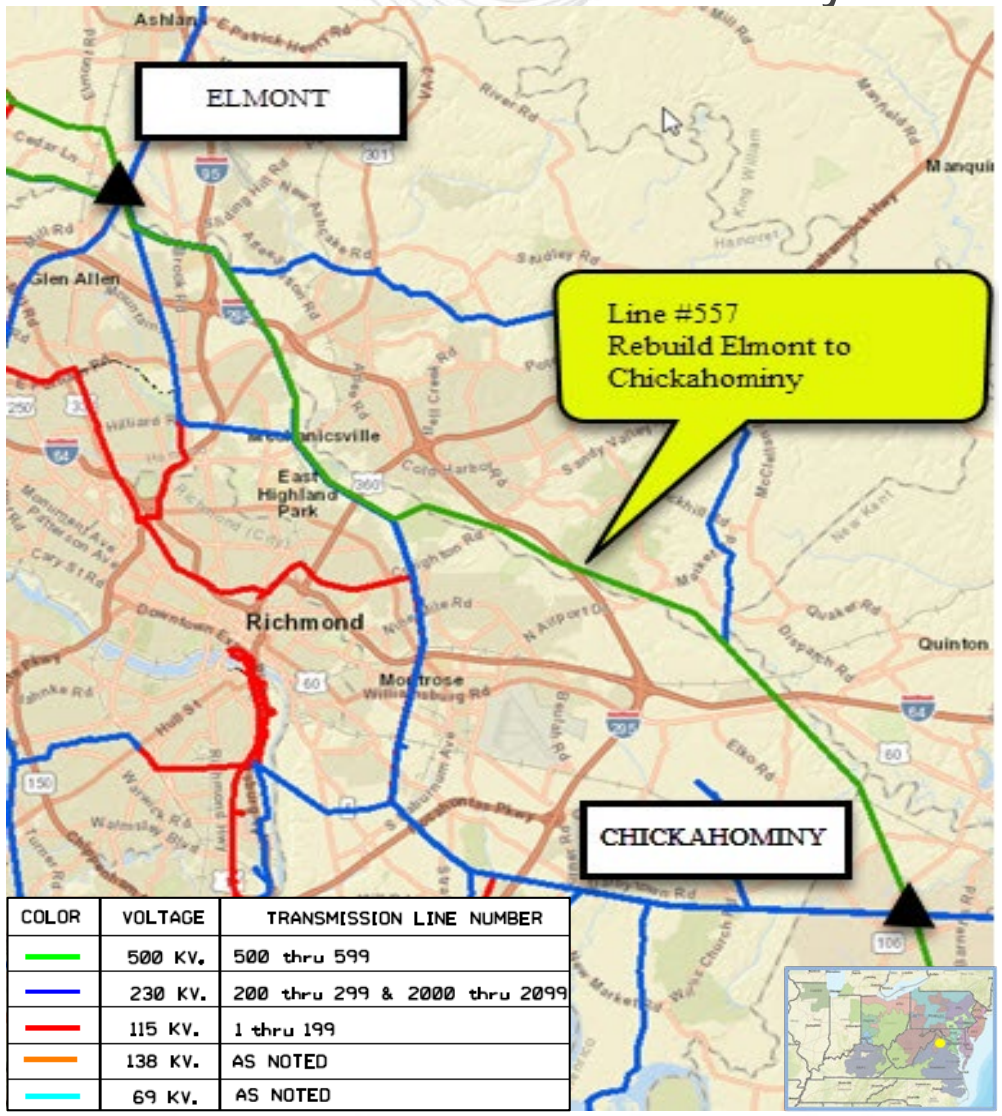
DOM-O2

500kV Line #557 Elmont to Chickahominy was constructed in 1971 with ACAR conductor and 5-series Corten towers that need to be rebuilt to current standards based on Dominion's End-of-Life Criteria.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
8ELMONT – 8CHCKAHM 500kV	2598/2598/2988/3014

Continued on next slide….



SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

Dominion Transmission Zone: Baseline Elmont - Chickahominy

As part of the 2021 RTEP Window #1, the following projects was proposed to address violations on 500kV Line #557:

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
124	Dominion	Line #557 Elmont to Chickahominy reconductor	58.155

Recommended Solution: Proposal #2021_1-124

- Rebuild approximately 27.7-miles of 500 kV transmission line from Elmont to Chickahominy with current 500 kV standards construction practices to achieve a summer rating of 4330 MVA. **(b3692)**

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
8ELMONT – 8CHCKAHM 500kV	4330/4330/4980/5023

Total Estimated Cost: $58.155M

Projected In-Service Date: 6/1/2026

Required In-Service Date: 6/1/2026

Previously Presented: 11/2/2021

Dominion Transmission Zone: Baseline Lexington & Bath County 500kV

Process Stage: Second Review

Criteria: N-1 Voltage Magnitude & Drop

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2026 RTEP cases

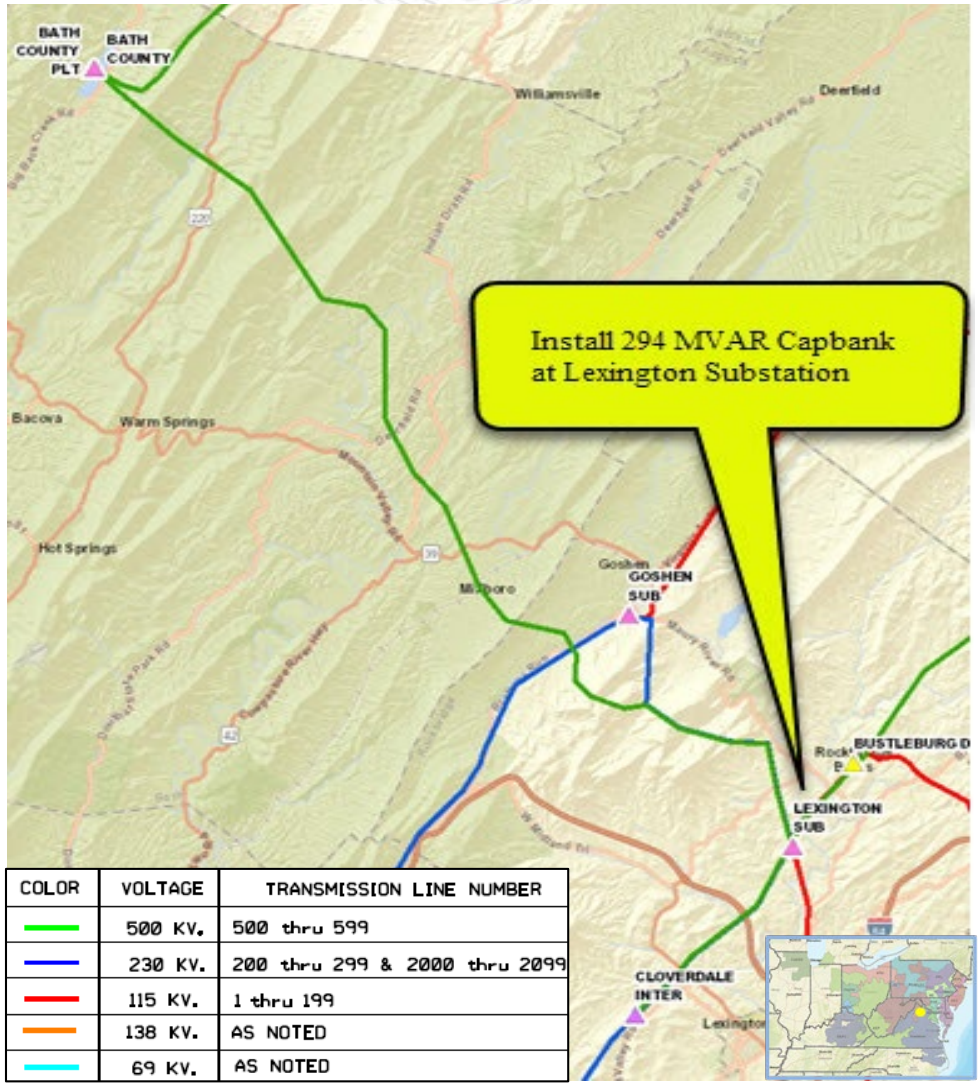
Proposal Window Exclusion: None

Problem Statement:

N1-LLVM1, N1-LLVM2, N1-LLVM3, N1-LLVM4, N1-LLVM5, N1-LLVM6, N1-LLVM7, N1-LLVM8, N1-LLVD1, N1-LLVD2, N1-LLVD3

In the 2026 RTEP light load case, there are voltage magnitude and voltage drop violations at the 500kV buses of Lexington and Bath County for single and breaker contingencies under N-1.

Continued on next slide….



Dominion Transmission Zone: Baseline
Lexington & Bath County 500kV

As part of the 2021 RTEP Window #1, the following project was proposed to address violations at Lexington and Bath County 500kV:

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
722	Dominion	Install 294 MVar Cap Bank at Lexington substation	5.860

Recommended Solution: Proposal #2021_1-722

- Expand substation and install approximately 294 MVar cap bank at 500kV Lexington substation along with a 500kV breaker. Adjust the tap positions associated with the two 230/69kV transformers at Harrisonburg to neutral position and lock them. **(b3693)**

Total Estimated Cost: $5.860M

Projected In-Service Date: 11/1/2026

Required In-Service Date: 11/1/2026

Previously Presented: 11/2/2021

SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

Dominion Transmission Zone: Baseline Ox 500/230kV Transformers

Process Stage: Second Review

Criteria: FERC Form 715 (C.2.1.3 Critical Stress Case)

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2026 RTEP cases

Proposal Window Exclusion: None

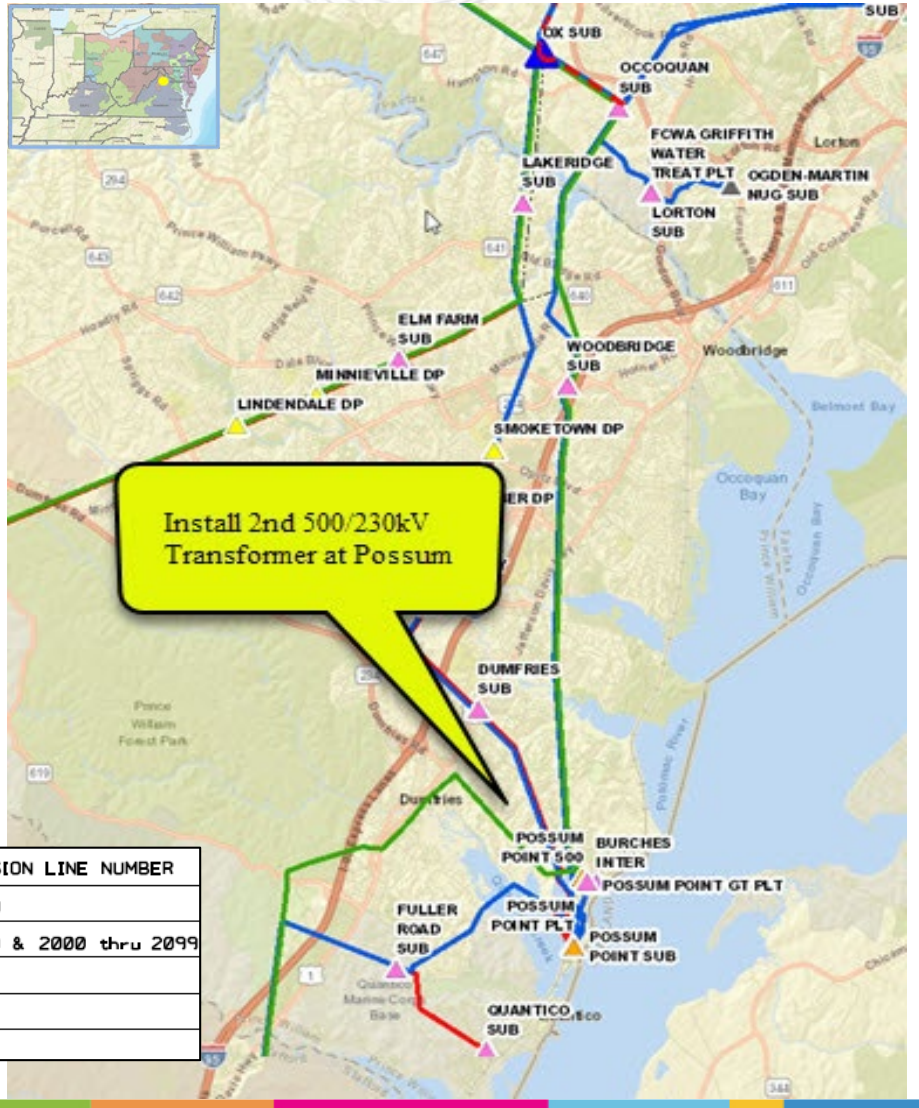
Problem Statement:

DOM-T3, DOM-T4

In the 2026 RTEP summer case, the Ox 500/230kV transformer #1 & Ox 500/230kV transformer #2 are overloaded under Dominion stress case criteria. (Outage of the most critical generator followed by single contingency: N-1-1).

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
8OX – 6OX #1 500/230kV	931.9/963.8/1198.8/1242.3
8OX – 6OX #2 500/230kV	909.3/951.9/1167.6/1220.4



Continued on next slide….

SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

Dominion Transmission Zone: Baseline Ox 500/230kV Transformers

As part of the 2021 RTEP Window #1, the following projects were proposed to address violations on 500/230kV transformer #1 & #2 at Ox:

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
57(1)	Dominion	Install 2nd 500/230kV transformer at Possum Point	24.539
319	Dominion	Replace both 500/230kV transformers at Ox	63.768
637	Dominion	Expand Occoquan substation via the installation of a 500kV GIS ring bus, 1-1100MVA 500/230kV transformer and 230kV breaker-and-a-half bus arrangement.	75.389

(1) Proposal 57 corresponds to baseline b2443.6 that was brought to TEAC to be canceled but not taken to Board to cancel due to issue being identified in the 2021 RTEP and potential for project to be brought back if the proposal was provided to mitigate the violation. (Adding 2nd 500/230kV transformer at Possum Point.)

Recommended Solution: Proposal #2021_1-57

- Install a 2nd 500kV-230kV 840MVA transformer bank at Possum Point 500kV yard, a 0.8 mile long 230kV line extension between Possum Point 500kV and Possum Point 230kV substation, and a new 230kV breaker at Possum 230kV yard to terminate the extension. **(b2443.6)**

  Note: Possum Point 500kV Substation and Possum Point 230kV Substation are separated by approximately 0.85 miles.

Continued on next slide….

Dominion Transmission Zone: Baseline Ox 500/230kV Transformers

Preliminary Facility Rating:

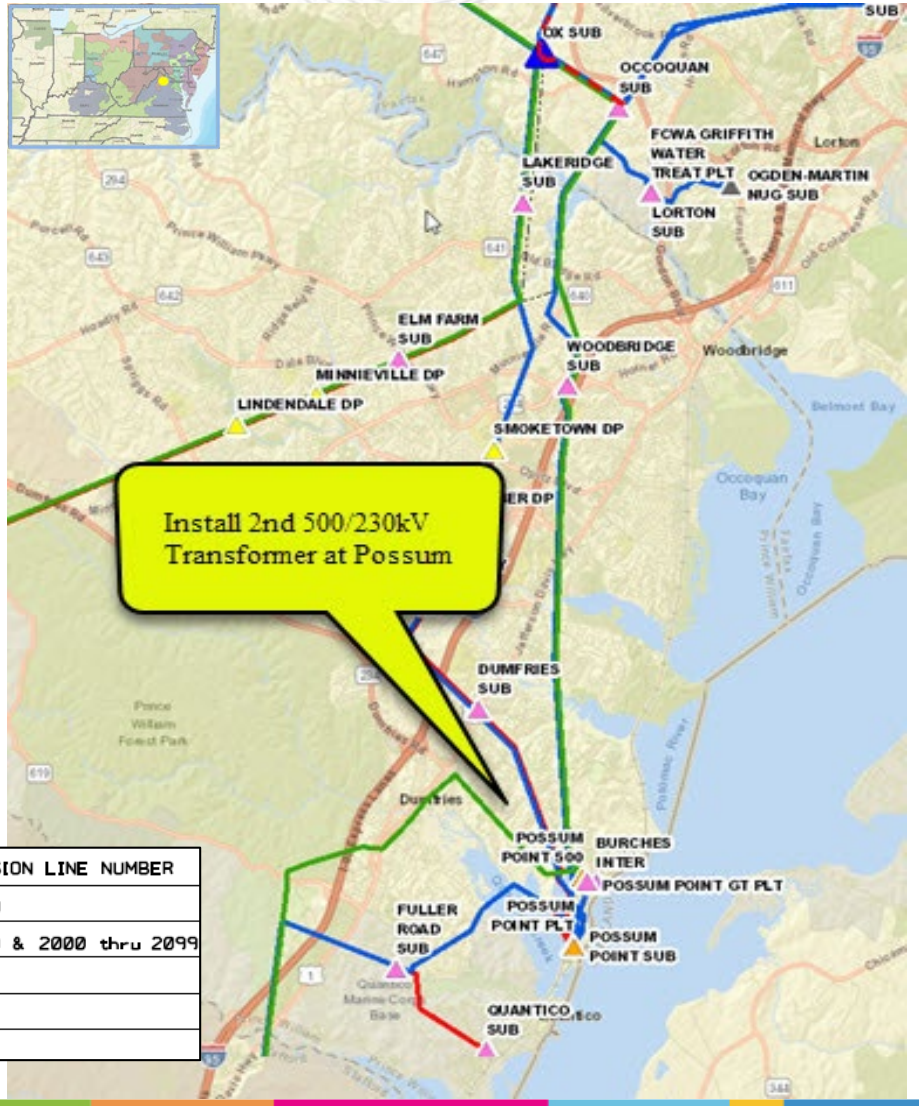
Branch	SN/SE/WN/WE (MVA)
8POSSUM – 6POSSUM #2 500/230kV	902.4/945.9/1155.4/1209.9

Total Estimated Cost: $24.539M

Projected In-Service Date: 6/1/2026

Required In-Service Date: 6/1/2026

Previously Presented: 11/2/2021



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

SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

Dominion Transmission Zone: Baseline Fredericksburg/Carson/Hopewell Area

Process Stage: Second Review

Criteria: Generator Deliverability, FERC Form 715 (C.2.1.3 Critical Stress Case) & N-1

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2026 RTEP cases

Proposal Window Exclusion: None

Problem Statement:

In the 2026 RTEP summer case:

Fredericksburg (Group 1: N2-SLD1, N2-SLD2, GD-S16, GD-S467, DOM-T5)

- 230kV Line #2104 Cranes Corner to Stafford is overloaded for a single and breaker contingency under Generator Deliverability and is also overloaded under Dominion stress case criteria.
- Load loss of 307 MW under N-1-1.

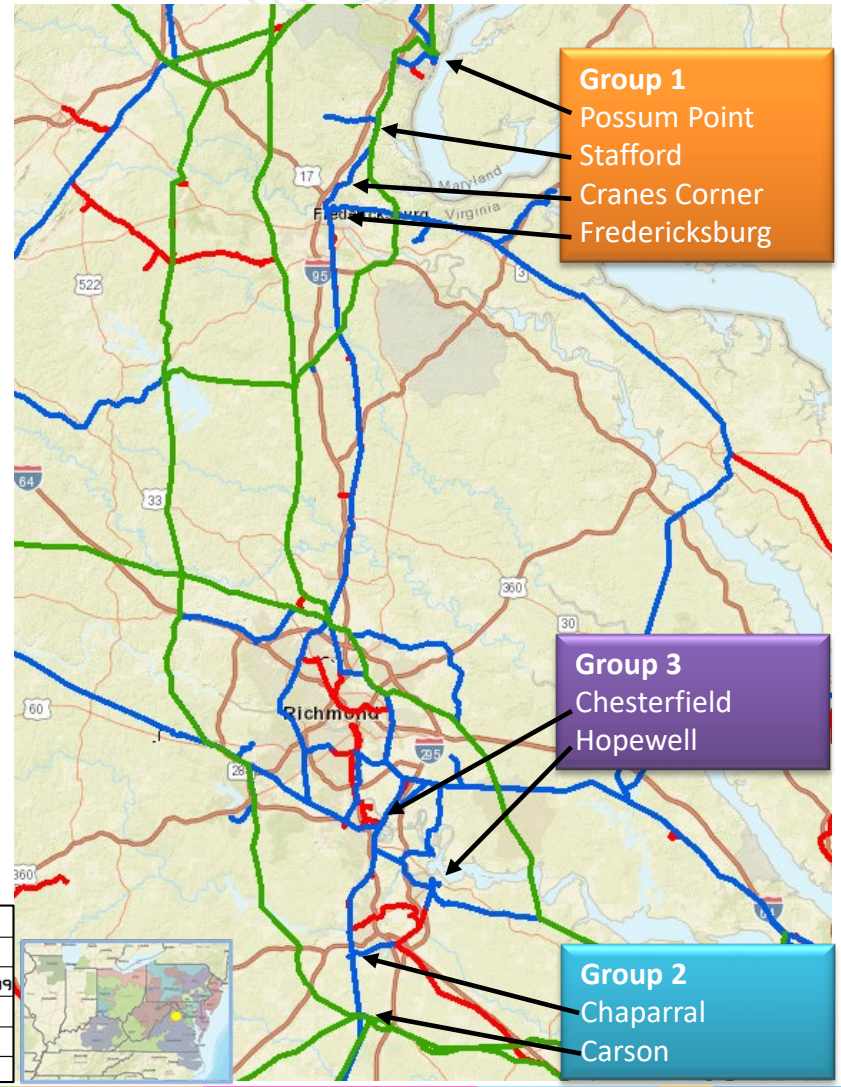
Carson (Group 2: GD-S465, GD-S39)

- Carson 500/230kV transformer #2 is overloaded for a breaker contingency under Generator Deliverability.
- 230kV Line #249 Carson to Chaparral is overloaded for a single contingency under Generator Deliverability.

Hopewell (Group 3: GD-S18, GD-S33, GD-S436)

- 230kV Line #211 is overloaded for a single contingency under Generator Deliverability.
- 230kV Line #228 is overloaded for a single and breaker contingency under Generator Deliverability.

Continued on next slide….



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

Dominion Transmission Zone: Baseline Fredericksburg/Carson/Hopewell Area

Existing Facility Rating:

Area	Branch	SN/SE/WN/WE (MVA)
Fredericksburg	6CRANES – 6STAFORD 230kV	722/722/914/914
Carson	8CARSON – 6CARSON 500/230kV #2	928.1/961.6/1192.8/1238.1
Carson	6CARSON – 6CHAPARRAL T 230kV	595/595/659/659
Carson	6LOCKS – 6CHAPARRAL T 230kV	595/595/659/659
Carson	6LOCKS – 3HARROWG 115kV	147/147/185/185
Hopewell	6HOPEWLL – 6CHESTF A 230kV	478/478/606/606
Hopewell	6HOPEWLL – 6CHESTF B 230kV	478/478/606/606

As part of the 2021 RTEP Window #1, the following project was proposed to address violations at Fredericksburg, Carson and Hopewell:

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
224	Dominion	**Fredericksburg**: Convert 115kV Line #29 to 230 kV; Reconductor 230kV Line #2104 Cranes Corner to Aquia Harbor. Feed Quantico via Fuller Road Substation **Carson**: Energize Carson 500/230kV Tx#1; Reconductor 230kV Line #249 Carson to Locks; Partial Rebuild 115kV Line #100 Locks to Harrowgate **Hopewell**: Partial rebuild 2.9 miles of double circuit 230kV Lines #211/228	93.412

Continued on next slide….

Dominion Transmission Zone: Baseline Fredericksburg/Carson/Hopewell Area

Recommended Solution: Proposal #2021_1-224

Fredericksburg

- Convert Line #29 Aquia Harbor to Possum Point to 230 kV (Extended Line #2104) and swap Line #2104 and converted Line #29 at Aquia Harbor backbone termination. Upgrade terminal equipment at Possum Point to terminate converted Line 29 (now extended Line #2104). (Line #29 from Fredericksburg to Aquia Harbor is being rebuilt under baseline b2981 to 230kV standards.) **Estimated cost: $9.386M (b3694.1)**

- Upgrade Aquia Harbor terminal equipment to not limit 230kV Line #9281 conductor rating. **Estimated cost: $0.631M (b3694.2)**

- Upgrade Fredericksburg terminal equipment by rearranging 230 kV bus configuration to terminate converted Line 29 (now becoming 9281). The project will add a new breaker at the 230kV bay and reconfigure line termination of 230kV Lines #2157, #2090, and #2083. **Estimated cost: $2.725M (b3694.3)**

- Reconductor/rebuild approximately 7.6 miles of 230kV Line #2104 Cranes Corner – Stafford to achieve a summer rating of 1047 MVA[(1)]. Reconductor/rebuild approximately 0.34 miles of 230kV Line #2104 Stafford – Aquia Harbor to achieve a summer rating of 1047 MVA. Upgrade terminal equipment at Cranes Corner to not limit the new conductor rating. **Estimated cost: $19.596M (b3694.4)**

- Upgrade wave trap and line leads at 230kV Line #2090 Ladysmith CT terminal to achieve 4000A rating. **Estimated cost: $0.152M (b3694.5)**

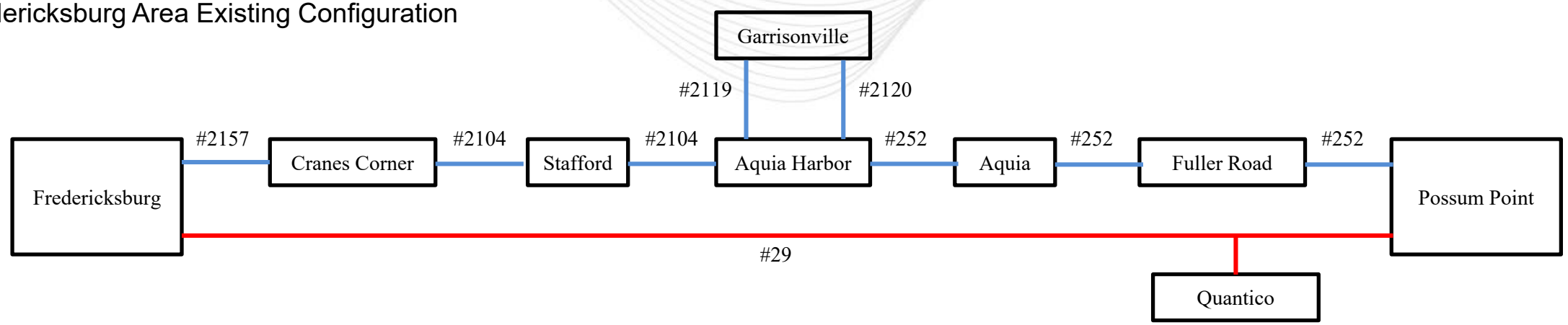
- Upgrade Fuller Road substation to feed Quantico substation via 115 kV radial line. Install four breaker ring and break 230kV Line #252 into two new lines: 1) #252 between Aquia Harbor to Fuller Road and 2) #9282 between Fuller Road and Possum Point. Install a 230/115 kV transformer which will serve Quantico substation. **Estimated cost: $24.159M (b3694.6)**

[(1)] This portion of the project will be addressed by baseline b3321 as it overlaps the violation associated with the deactivation of Morgantown 1 and 2 presented at the 8/31 TEAC.

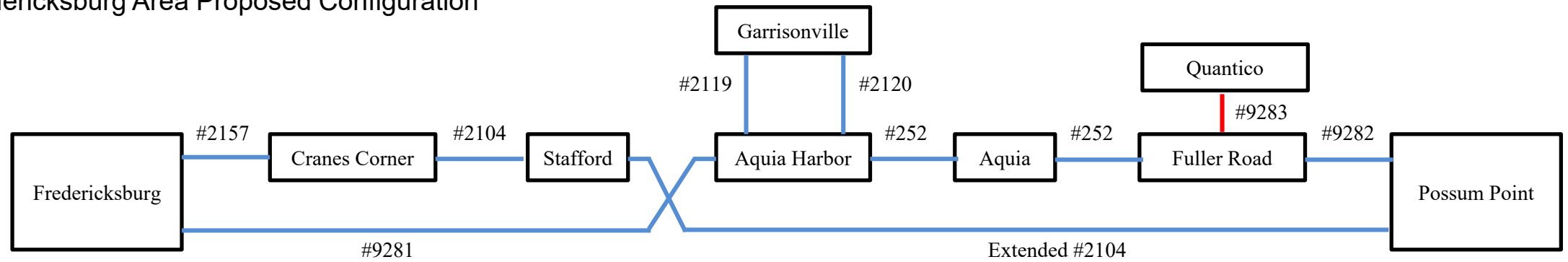
Continued on next slide….

Dominion Transmission Zone: Baseline Fredericksburg/Carson/Hopewell Area

Fredericksburg Area Existing Configuration



Fredericksburg Area Proposed Configuration



Continued on next slide….

Dominion Transmission Zone: Baseline Fredericksburg/Carson/Hopewell Area

Recommended Solution: Proposal #2021_1-224

Carson

- Energize in-service spare 500/230kV Carson Tx#1 **(b3694.7)**
- Partial wreck and rebuild 10.34 miles of 230kV Line #249 Carson - Locks to achieve a minimum summer emergency rating of 1047 MVA. Upgrade terminal equipment at Carson and Locks to not limit the new conductor rating. **Estimated cost: $15.365M (b3694.8)**
- Wreck and rebuild 5.4 miles of 115kV Line #100 Locks - Harrowgate to achieve a minimum summer emergency rating of 393 MVA. Upgrade terminal equipment at Locks and Harrowgate to not limit the new conductor rating and perform Line #100 Chesterfield terminal relay work. **Estimated cost: $9.097M (b3694.9)**

Hopewell

- Rebuild approximately 2.9 miles of 230 kV Line #211 Chesterfield – Hopewell to achieve a minimum summer emergency rating of 1046 MVA. **Estimated cost: $4.914M (b3694.10)**
- Rebuild approximately 2.9 miles of 230 kV Line #228 Chesterfield - Hopewell to achieve a minimum summer emergency rating of 1046 MVA. **Estimated cost: $4.914M (b3694.11)**
- Upgrade equipment at Chesterfield substation to not limit ratings on Lines 211 and 228. **Estimated cost: $0.759M (b3694.12)**
- Upgrade equipment at Hopewell substation to not limit ratings on Lines 211 and 228. **Estimated cost: $1.714M (b3694.13)**

Continued on next slide….

Dominion Transmission Zone: Baseline Fredericksburg/Carson/Hopewell Area

Preliminary Facility Rating:

Area	Branch	SN/SE/WN/WE (MVA)
Fredericksburg	6CRANES – 6STAFORD 230kV	1047/1047/1160/1160
Carson	8CARSON – 6CARSON 500/230kV #1	889.2/939.4/1140/1193.7
Carson	6CARSON – 6CHAPARRAL T 230kV	1047/1047/1160/1160
Carson	6LOCKS – 6CHAPARRAL T 230kV	1047/1047/1160/1160
Carson	6LOCKS – 3HARROWG 115kV	393/393/412/412
Hopewell	6HOPEWLL – 6CHESTF A 230kV	1046/1046/1095/1095
Hopewell	6HOPEWLL – 6CHESTF B 230kV	1046/1046/1095/1095

Total Estimated Cost: $93.412M

Projected In-Service Date: 6/1/2026
Required In-Service Date: 6/1/2026

Previously Presented: 11/2/2021

2021 SAA Proposal Window to Support NJ OSW

Update on Review

- PJM working through various analysis to validate performance of Option 1A proposals
- PJM working with consultants to begin evaluations of constructability and financial terms for the proposals
  - Concentrating initially on getting evaluations for the offshore portions started, e.g.: Option 2 & 3
- Working towards schedule provided in NJBPU guidance document: https://www.nj.gov/bpu/pdf/ofrp/SAA%20Process%20Overview.pdf

  (Same document as referenced in October TEAC)

Proposal Overviews

- Some proposals elected to use default POIs of Deans, Smithburg, Larrabee, & Cardiff, while others chose different locations (e.g.: Sewaren, Werner, Line taps with new substations, etc.)
- Both HVDC (320, 400kV) and HVAC (230, 275, 345kV) OSW platforms and connections proposed
- Proposals contained “links” between platforms proposed as part of Option 2, that would provide some “back-up” injection capability, while others submitted Option 3 proposals
- Entities submitted joint proposals as well as proposals that could be linked, but were not required to be linked and could be paired with other proposals

Proposal Overviews

- Many proposals are able to be adjusted for changes in schedule and MW injection quantities based on NJBPU needs
- Cost containment provisions are wide ranging in the proposed terms
- Some entities proposed facilities to accommodate the NJ BPU generation solicitation number 2 as identified in the proposal overview
- Some proposals provided capabilities to achieve near 7,500MW, while others exceeded this by 2,000 - 4,000MW

Contact

Facilitator:
Sue Glatz,
Suzanne.Glatz@pjm.com

Secretary:
Mike Zhang,
Michael.Zhang@pjm.com

SME/Presenter:
Aaron Berner,
Aaron.Berner@pjm.com

Reliability Analysis Update

Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

Revision History

Version No.	Date	Description
1	11/23/2021	• Original slides posted
2	12/13/2021	• Slide #6, Changed the 2nd “Required IS date” to “Projected IS date”
3	4/27/2022	• Slide #29, Changed “Reconductor” to “Rebuild” for the 211/228 uprates in the Hopewell area.