Reliability Analysis Update

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Transmission Expansion Advisory Committee

September 1, 2020

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First Review

Baseline Reliability Projects

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Dominion Transmission Zone: Baseline 500kV Line #514 Rebuild (End of Life Criteria)

Process Stage: First Review

Criteria: Dominion's FERC 715 Planning Criteria (C.2.9 – End of Life Criteria)

Assumption Reference: FERC 715 Planning Criteria

Model Used for Analysis: 2020 Series 2025 RTEP

Problem Statement:

- The Doubs(FE) - Goose Creek(DEV) 500kV transmission Line #514 is an approximately 18-mile long line(3-miles is DEV owned) primarily constructed on weathering (COR-TEN®) steel lattice structures.
- Third party assessment has determined that the towers have corroded to a point where they exhibit pre-mature thinning of structure members and packout at joints. If left unaddressed these issues could result in failure of structures and potentially the collapse for the line. (DOM-O5)

Existing Facility Rating: 2323/2323/2671 MVA

Proposed Facility Rating: 4330/4330/4979 MVA Summer

4980/5023/5928 MVA Winter

Note: The End of Life issue identified for Line #514 is linked to the M-3 need identified as APS-2020-011

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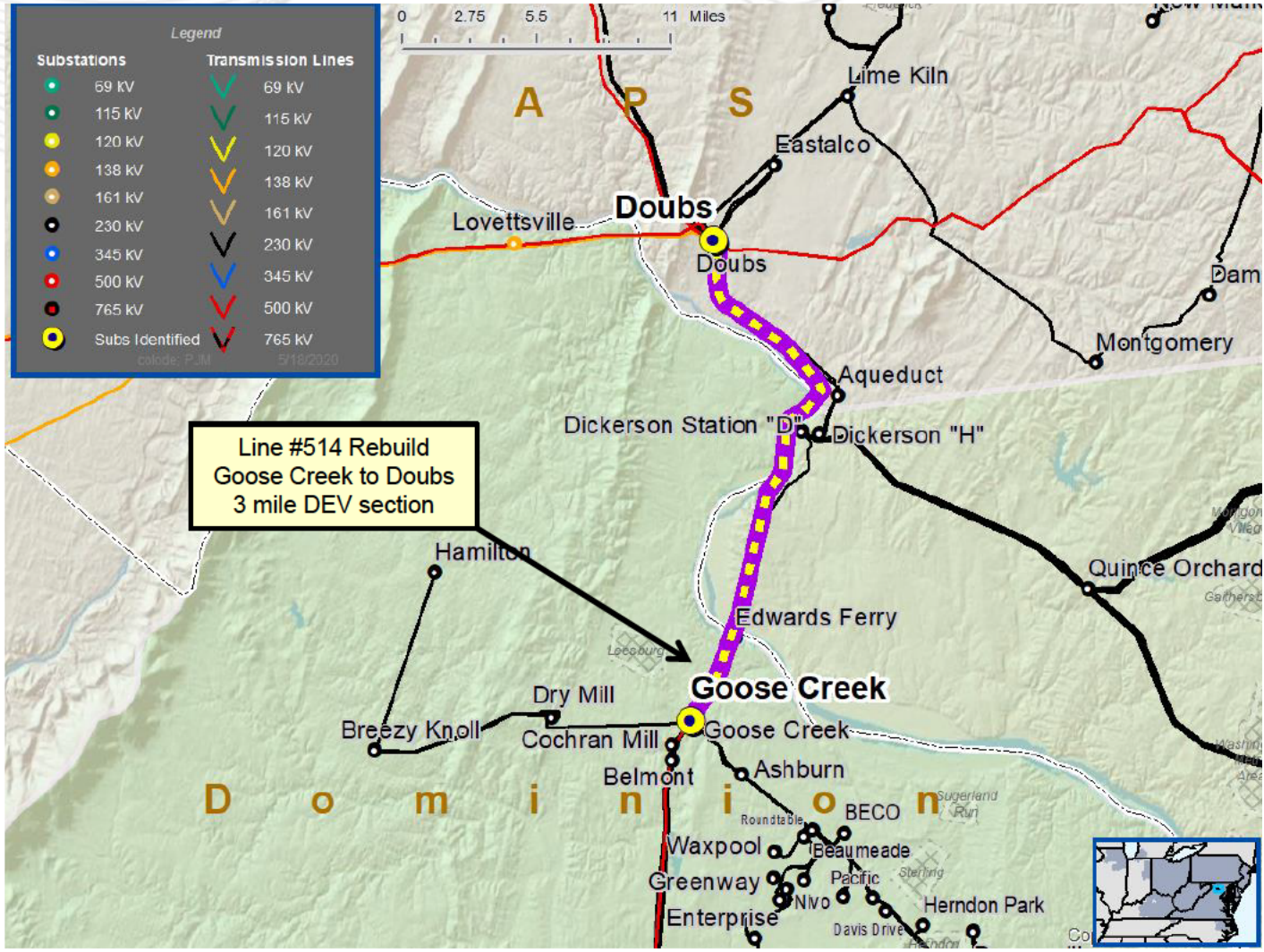

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Dominion Transmission Zone: Baseline 500kV Line #514 Rebuild (End of Life Criteria)

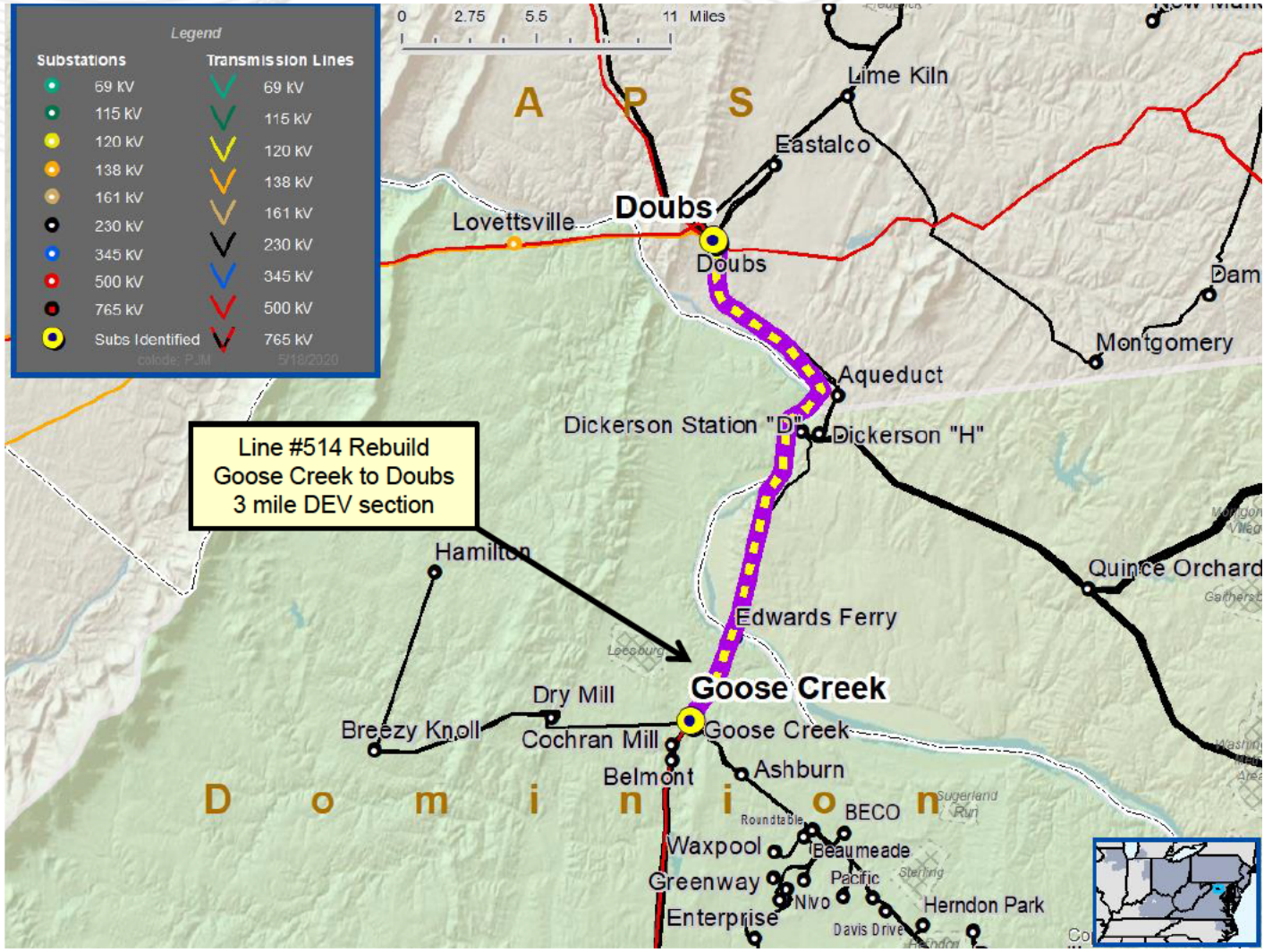
Proposed Solution:
Proposal 2020-W2-441: DEV's portion of Line #514 consists of 16 structures and 3 of these structures were replaced in 2014 with galvanized structures. Replace the remaining 13 COR-TEN® towers with galvanized steel towers. Reconductor 3 mile section with 3-1351.5 ACSR 45/7. Upgrade line terminal equipment at Goose Creek substation to support the Line #514 rebuild.

- **Estimated Cost:** $7.6M

Alternatives:
Maintain existing condition is not a practicable alternative from a safety and reliability standpoint

- **Estimated Cost:** $0

Required In-Service: 6/1/2025



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Dominion Transmission Zone: Baseline Northern Neck Area

Process Stage: First Review

Criteria: Winter N-1-1 Thermal & Voltage, 300 MW Load Loss

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP winter case

Proposal Window Exclusion: Immediate Need

Problem Statement:

- Various voltage magnitude and drop violations in the Northern Neck area for the loss of 230kv Line #224 Lanexa – Northern Neck and 230kV Line #2145 Birchwood – Dahlgren. (N2-WVM28-N2-WVM63, N2-WVD1-N2-WVD60).
- Overload of 115kV Lines Rappahannock – Whitestone and Harmony Village – Greys Point for the loss of 230kV Line #224 Lanexa – Northern Neck and 230kV Line #2145 Birchwood – Dahlgren. (N2-WT9-N2-WT12)
- Continued use of operating procedure to open 115kV Line 65 at Northern Neck end to accommodate outages on one of the two 230 kV feeds into Northern Neck to mitigate thermal overloads on Line 65 and also to help control & mitigate voltage issues when either of the 230kV feeds are out going to the Northern Neck area results in a PJM planning criteria violation of dropping over 300 MW in the 2022/2023 timeframe based on the 2020 PJM load forecast.

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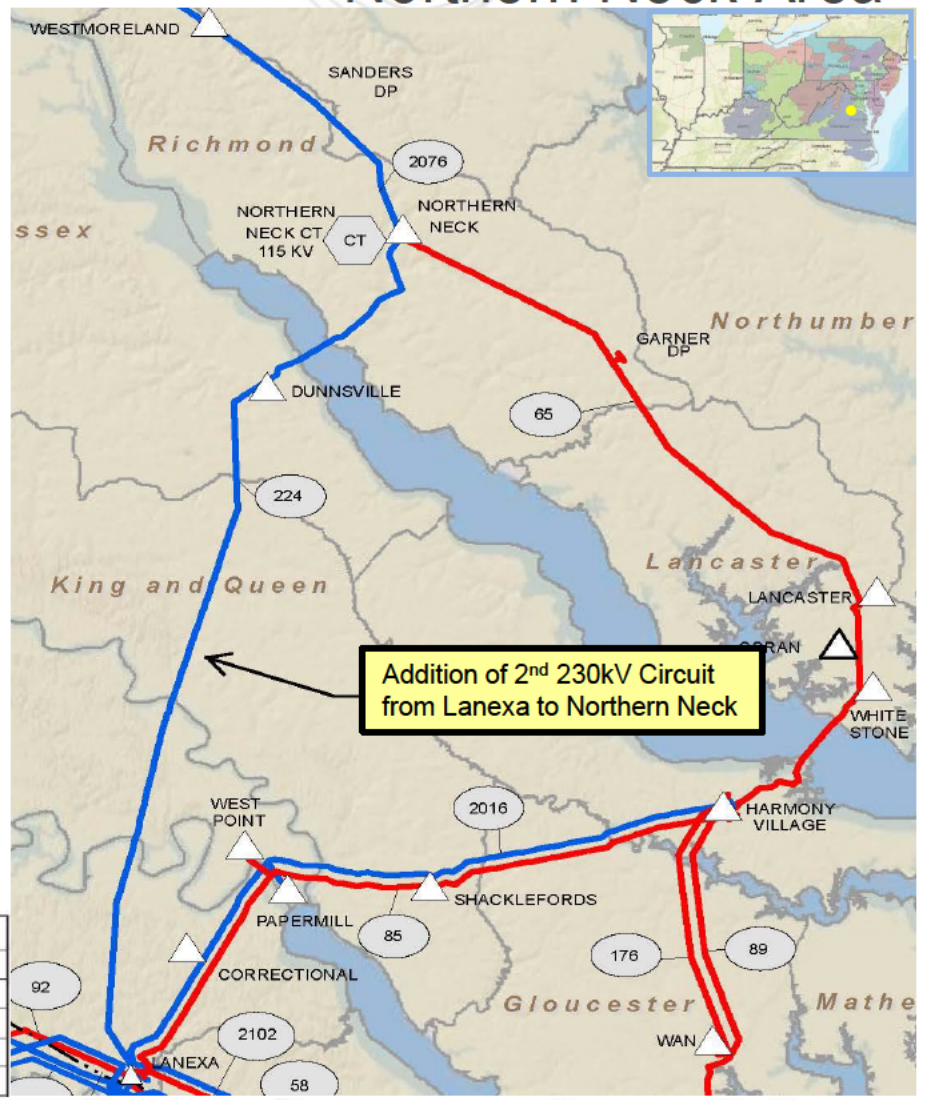

COLOR	VOLTAGE	TRANSMISSION LINE NUMBER
	500 KV.	500 thru 599
	230 KV.	200 thru 299 & 2000 thru 2099
	115 KV.	1 thru 199
	138 KV.	AS NOTED
	69 KV.	AS NOTED

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Dominion Transmission Zone: Baseline Northern Neck Area

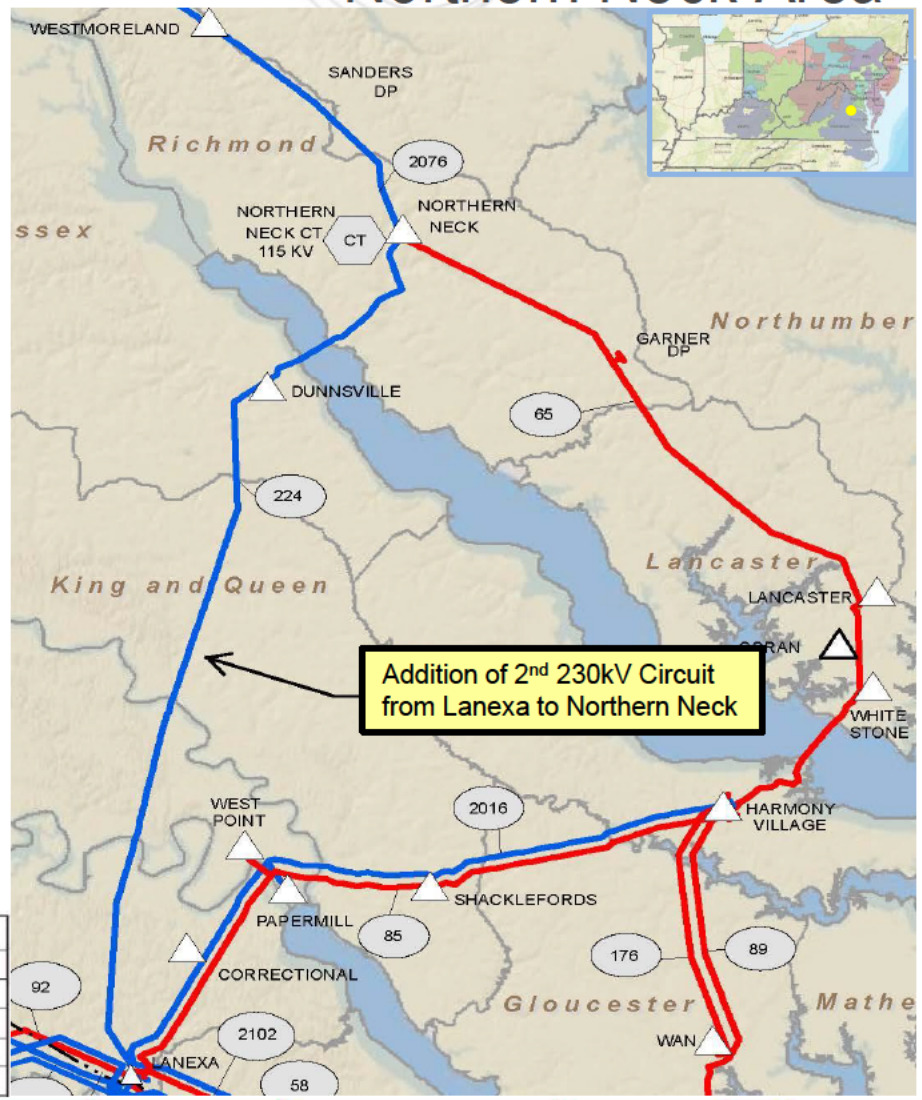
Proposed Solution:
Install a 2nd 230kV circuit with a minimum summer emergency rating of 1047 MVA between Lanexa and Northern Neck Substations. The 2nd circuit will utilize the vacant arms on the double-circuit structures that are being installed on the Line #224 (Lanexa-Northern Neck) End-of-Life rebuild project (b3089). The Northern Neck terminal will be expanded from a 230kV, 4-breaker ring bus to a 6-breaker ring bus while the Lanexa terminal will be expanded from a 6-breaker ring bus to a breaker-and-a-half arrangement.

Estimated Cost: $23.0 M

- New 230 kV Circuit: $14.0 M
- Northern Neck Substation work: $ 5.0 M
- Lanexa Substation work: $ 4.0 M

Alternatives: N/A

Required In-Service: 6/1/2023



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Recommended Solution
Baseline Reliability Projects

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Dominion Transmission Zone: Baseline
Clifton 230kV Breaker "201182" and "XT2011" Replacements

Process Stage: Recommended Solution

Criteria: Over Duty Breaker

Assumption Reference: none

Model Used for Analysis: 2024 short circuit model

Proposal Window Exclusion: FERC 715 (TO Criteria)
Baseline Reliability: TO Criteria Violation (FERC 715 (TO Criteria) Exclusion)
*This project inherits the exclusion of its parent project.

Problem Statement:
The Clifton 230kV breakers "201182" and "XT2011" are overdutied.

Significant Driver:
b3110: Rebuild Line #2008 between Loudoun to Dulles Junction. Retire Line #156 from Loudoun to Bull Run. Cut and loop Line #265 (Clifton – Sully) into Bull Run Substation. Add three (3) 230kV breakers at Bull Run to accommodate the new line and upgrade the substation. (Dominion "End of Life Criteria").

Existing Facility Rating: 50kA interrupting duty

Preliminary Facility Rating: 50kA interrupting duty

Recommended Solution:
b3110.3: Replace the Clifton 230kV breakers "201182" and "XT2011" with 63kA breakers

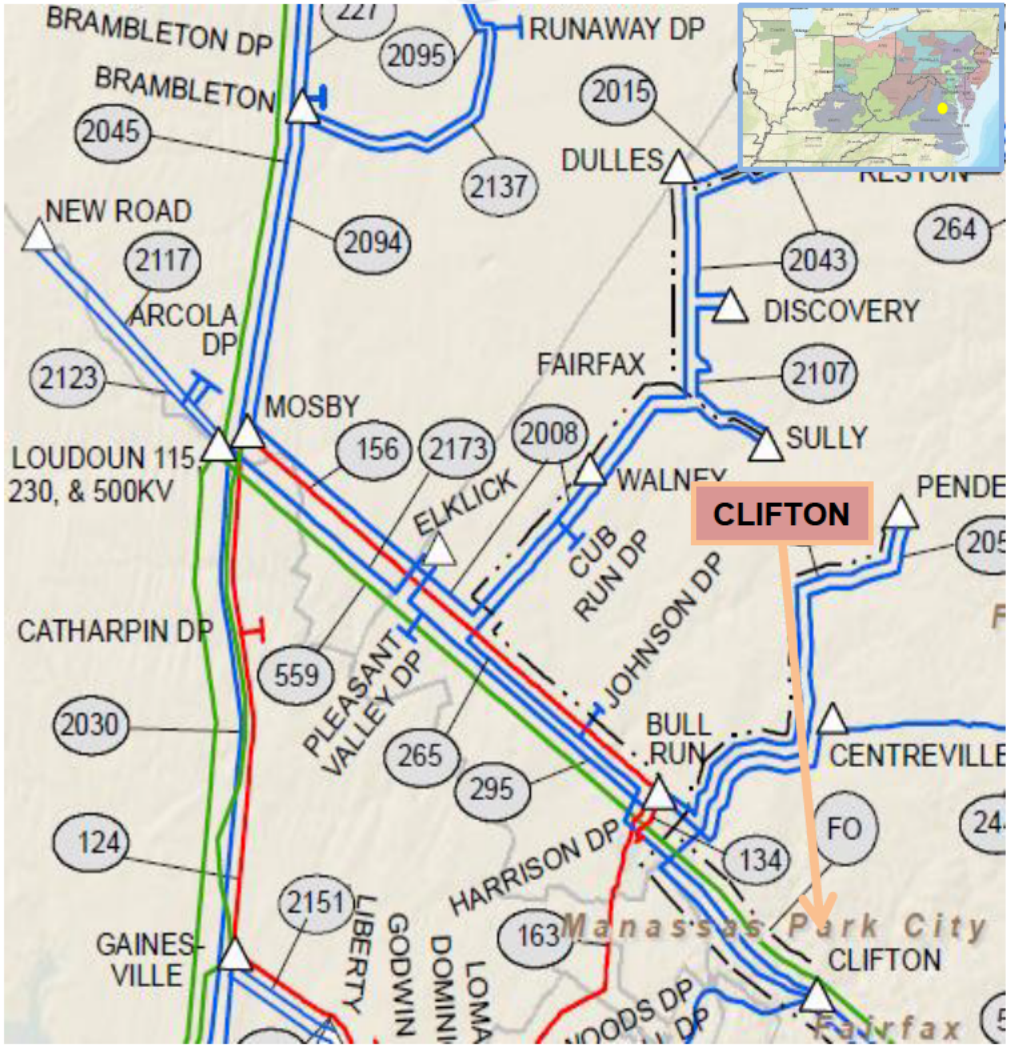
Estimated Cost: $0.934M ($0.467M each)

Required In-Service: 12/31/2021

Projected In-Service: 12/31/2021

Previously Presented: 8/4/2020

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



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Cancellation
Baseline Reliability Projects

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APS Zone: Baseline
Yukon Substation

Process Stage: Recommended Solution - **CANCEL**

Criteria: Over duty breakers

Assumption Reference: none

Model Used for Analysis: PJM Short Circuit models 2021 and 2024

Proposal Window Exclusion: Substation Equipment Exclusion

Problem Statement:

The Yukon 138kV breakers 'Y-11', 'Y-13', 'Y-18', 'Y-19', 'Y-4', 'Y-5', 'Y-8', 'Y-9', 'Y10', 'Y12', 'Y14', 'Y2', 'Y21', and 'Y22' are overstressed

Existing Facility Rating: 63kA

Preliminary Facility Rating: 63kA

Recommended Solution:
B2666.1 – b2666.14
Yukon 138kV breakers 'Y-11', 'Y-13', 'Y-18', 'Y-19', 'Y-4', 'Y-5', 'Y-8', 'Y-9', 'Y10', 'Y12', 'Y14', 'Y2', 'Y21', and 'Y22' with 80kA breakers

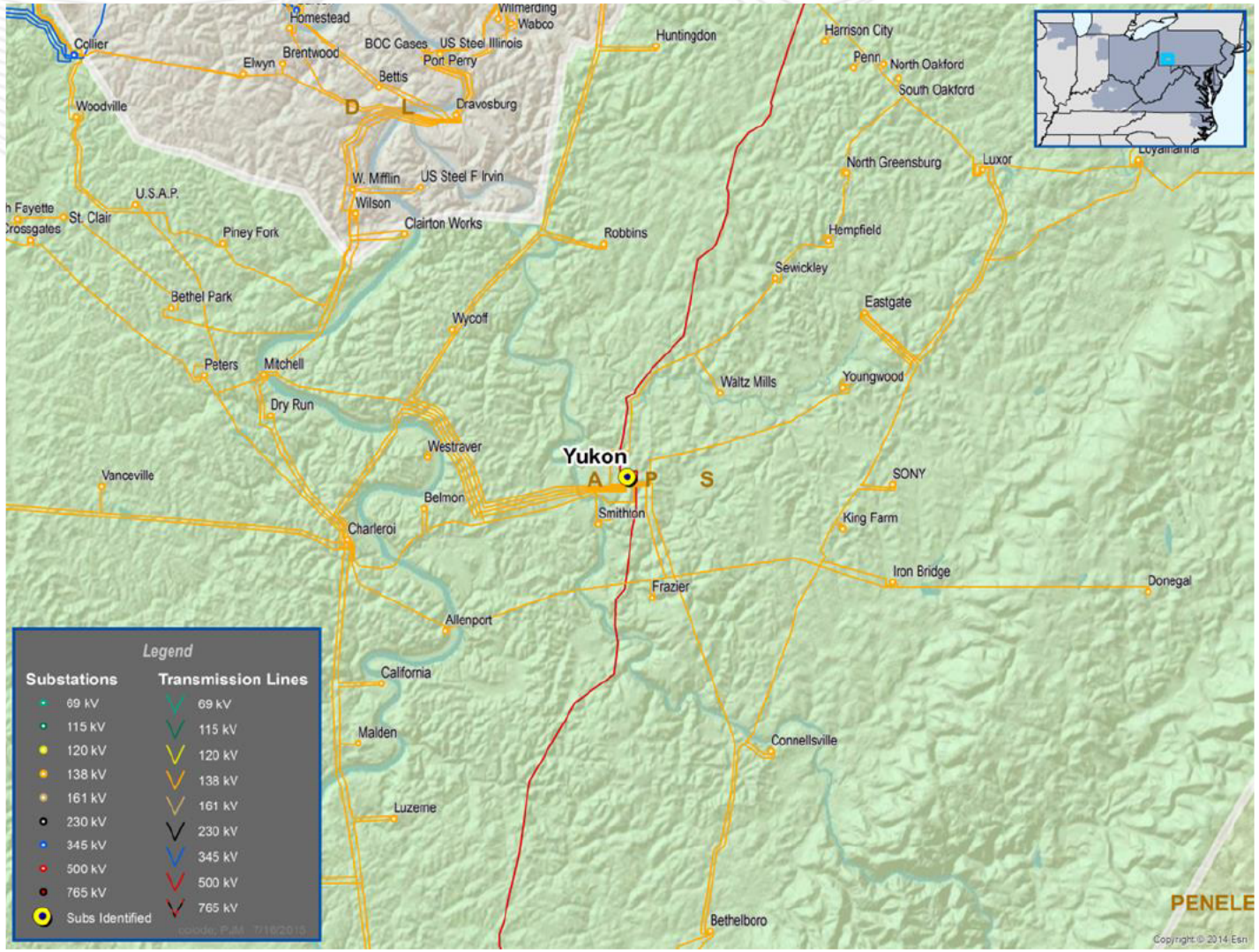
Estimated Cost: $11.5M

Required In-Service: 6/1/2020

Projected In-Service: **CANCEL**

Previously Presented: 9/10/2015

Cancellation Reason: Breakers no longer over duty following model retool for FE Gen Deactivation Reinstatement



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2020 RTEP Analysis Update

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Window 1

May 15, 2020

– Preliminary 2025 results posted

- Summer Baseline and N-1 Thermal
- Summer Generator Deliverability

July 1, 2020

– Proposal Window No.1 opened

August 31, 2020

– Proposal Window No.1 closed
(anticipated at the time material posted to the TEAC)

Window 2

Complete evaluations of the project and presentations to the stakeholders

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Competitive Planner Contact Information

- If you have any questions related to Competitive Planning Process and Competitive Planner Tool, please contact ProposalWindow-Admin@pjm.com
- If you need an assistance with registration to Competitive Planner Tool, please contact AccountManager@pjm.com
- PJM Competitive Planning Process Webpage
  https://www.pjm.com/planning/competitive-planning-process.aspx
- Access Competitive Planner tool through PJM Planning Center Webpage
  https://www.pjm.com/markets-and-operations/etools/planning-center.aspx
- Competitive Planner Tool Updates at Tech Change Forum
  https://www.pjm.com/committees-and-groups/tech-change-forum.aspx

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Contact

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Reliability Analysis Update

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Questions?

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Upcoming TEAC Meetings

2020

- TEAC meetings are the following Tuesdays or Wednesday in 2020
- 1/7, 2/4, 3/10, 4/14, 5/12, 6/2, 7/7, 8/4, 9/1, 10/6, 11/4 (Wednesday), 12/1.

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Revision History

- V1 – 8/25/2020 – Original slides posted
- V2 – 9/1/2020 – Added description to Significant Driver on Slide #8

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