Dominion Supplemental Projects

Transmission Expansion Advisory Committee
June 8, 2021

Changes to Existing Supplemental Projects

Dominion Transmission Zone: Supplemental Do No Harm Analysis

Supplemental Project: s2324.2-s2324.8 (Need-2020-0003 DNH, posted to the 2020 Dominion Local Plan)

Original Scope:

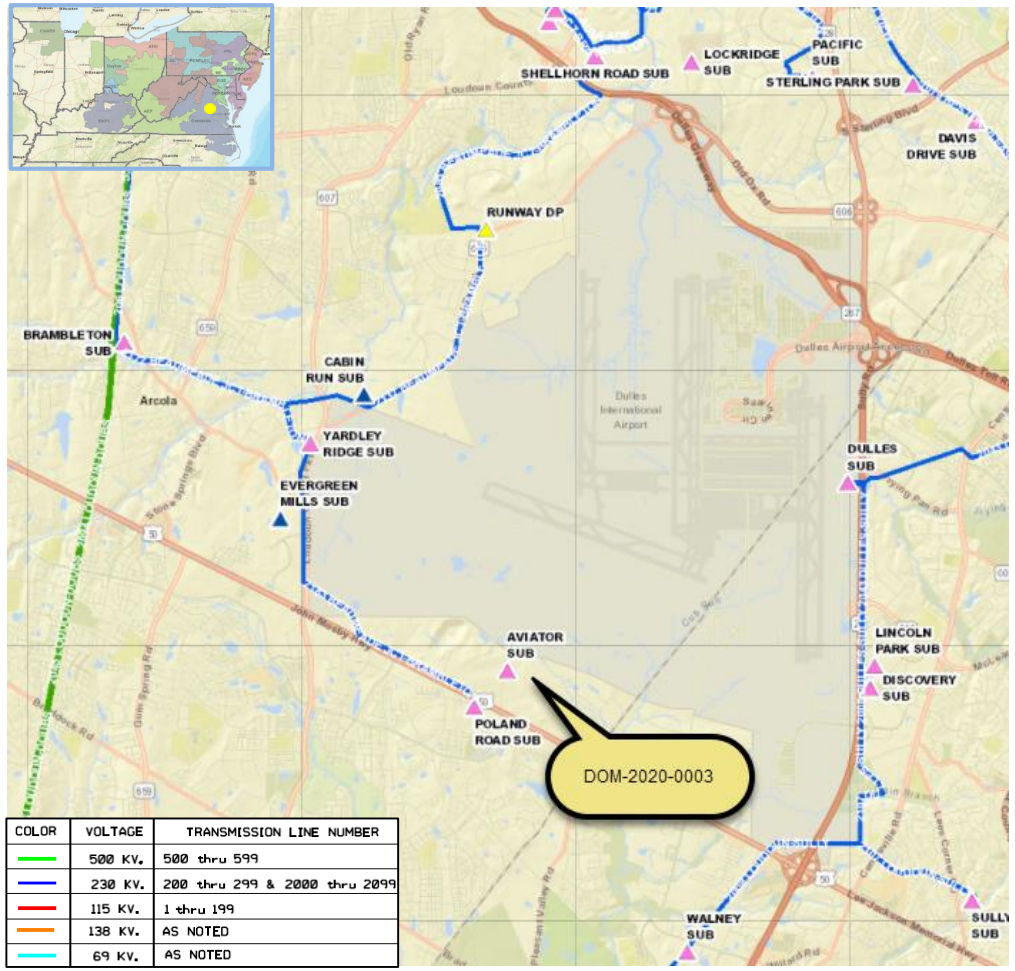
- Build a new substation (Takeoff) by cutting Line #2008 (Lincoln Park-Loudoun) and Line #265 (Bull Run-Sully). Terminate all lines in a 230kV breaker-and-a-half arrangement at Takeoff Substation. **(s2324.2)**
- Extend a new 230kV double-circuit line approx. 3 miles from Aviator to Takeoff. **(s2324.3)**
- Reconductor three 230kV lines using a standard high-capacity conductor.
  - Line segment between Loudoun and Takeoff (approx. 2.21 miles), **(s2324.4)**
  - Line segment between Lincoln Park and Takeoff (approx. 2.63 miles), **(s2324.5)** and
  - Line segment between Sully and Takeoff (approx. 1.16 miles). **(s2324.6)**
- Replace one 230kV breaker at Brambleton (SC102) **(s2324.7)** and three 69kV breakers at Davis Substation (178T186, 18622, T342) **(s2324.8)** with higher interrupting capabilities.

New Scope:

- Build a new substation (Takeoff) by cutting Line #2008 (Lincoln Park-Loudoun) and Line #265 (Bull Run-Sully). Terminate all lines in a 230kV breaker-and-a-half arrangement at Takeoff Substation. **(s2324.2)**
- Extend a new 230kV double-circuit line approx. 3 miles from Aviator to Takeoff. **(s2324.3)**
- Reconductor three 230kV lines using a standard high-capacity conductor.
  - Line segment between Loudoun and Takeoff (approx. 2.21 miles), **(s2324.4)**
  - Line segment between Lincoln Park and Takeoff (approx. 2.63 miles), **(s2324.5)** and
  - Line segment between Sully and Takeoff (approx. 1.16 miles). **(s2324.6)**
- Replace ~~one~~ four 230kV breaker at Brambleton (SC102, H302, H402, 218302) **(s2324.7)** and three 69kV breakers at Davis Substation (178T186, 18622, T342) **(s2324.8)** with higher interrupting capabilities.

Estimated Cost: ~~$74.9M~~ $76.7M (Total)
Projected IS Date: 12/31/2025

Reason for the scope change: Short circuit case updates and reevaluation of previous results.



Needs

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 Equipment Material Condition, Performance and Risk

Need Number: DOM-2021-0046

Process Stage: Need Meeting 06/08/2021

Project Driver: Equipment Material Condition, Performance and Risk

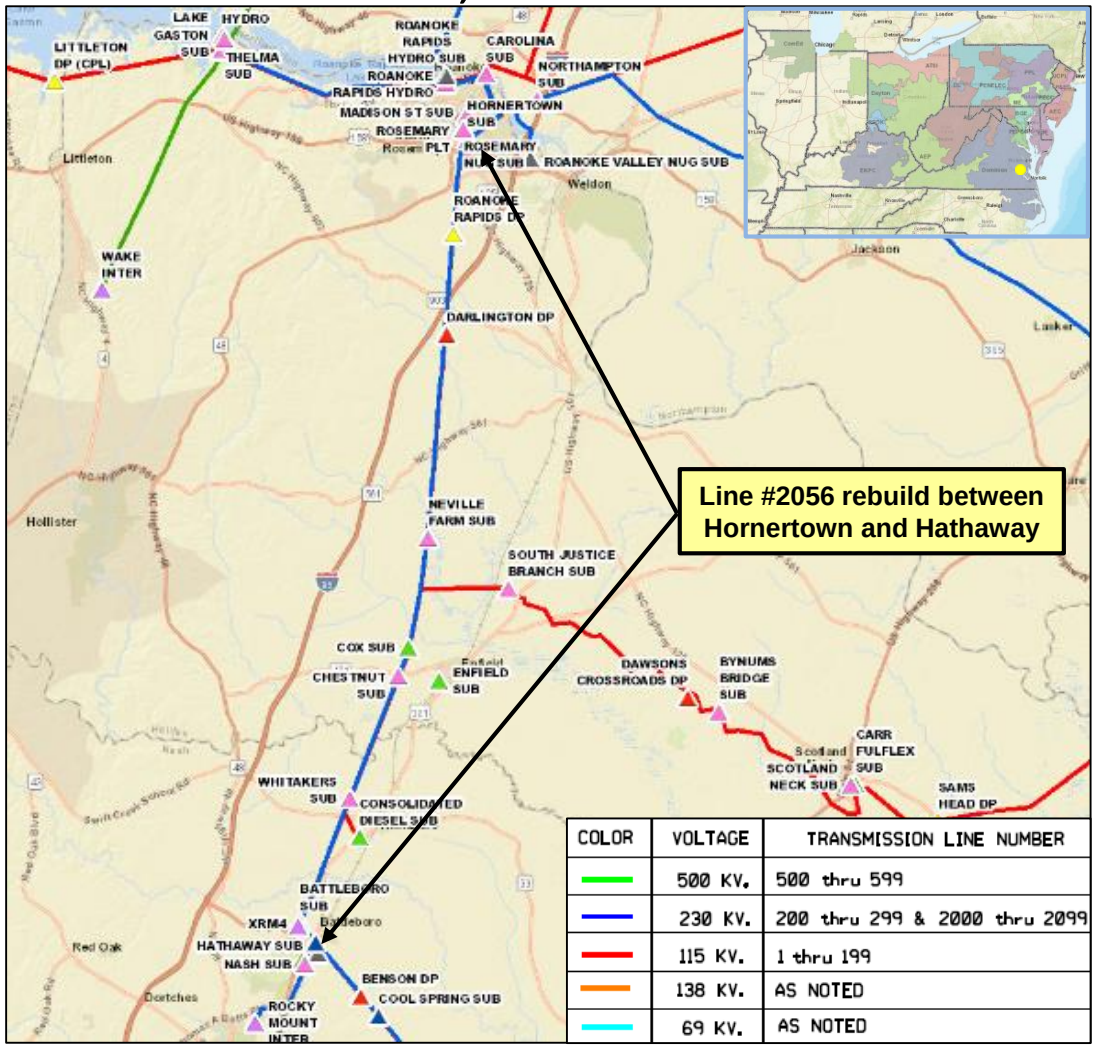
Specific Assumption References:

See details on Equipment Material Condition, Performance and Risk in Dominion's Planning Assumptions presented in December 2020.

Problem Statement:

Dominion Energy has identified a need to replace approximately 28.9 miles of 230kV Line #2056 (Hornertown to Hathaway) based on the Company's End of Life criteria.

- Line #2056 was constructed on steel and wood pole structures in 1967. Conductor is ACSR.
- A field-condition assessment indicated woodpecker damage to several poles and broken insulators in numerous locations.
- Industry guidelines indicate equipment life for steel structures is 40-60 years, wood structures is 35-55 years, conductor and connectors are 40-60 years, and porcelain insulators are 50 years.



Dominion Transmission Zone: Supplemental Equipment Material Condition, Performance and Risk

Need Number: DOM-2021-0047

Process Stage: Need Meeting 06/08/2021

Project Driver: Equipment Material Condition, Performance and Risk

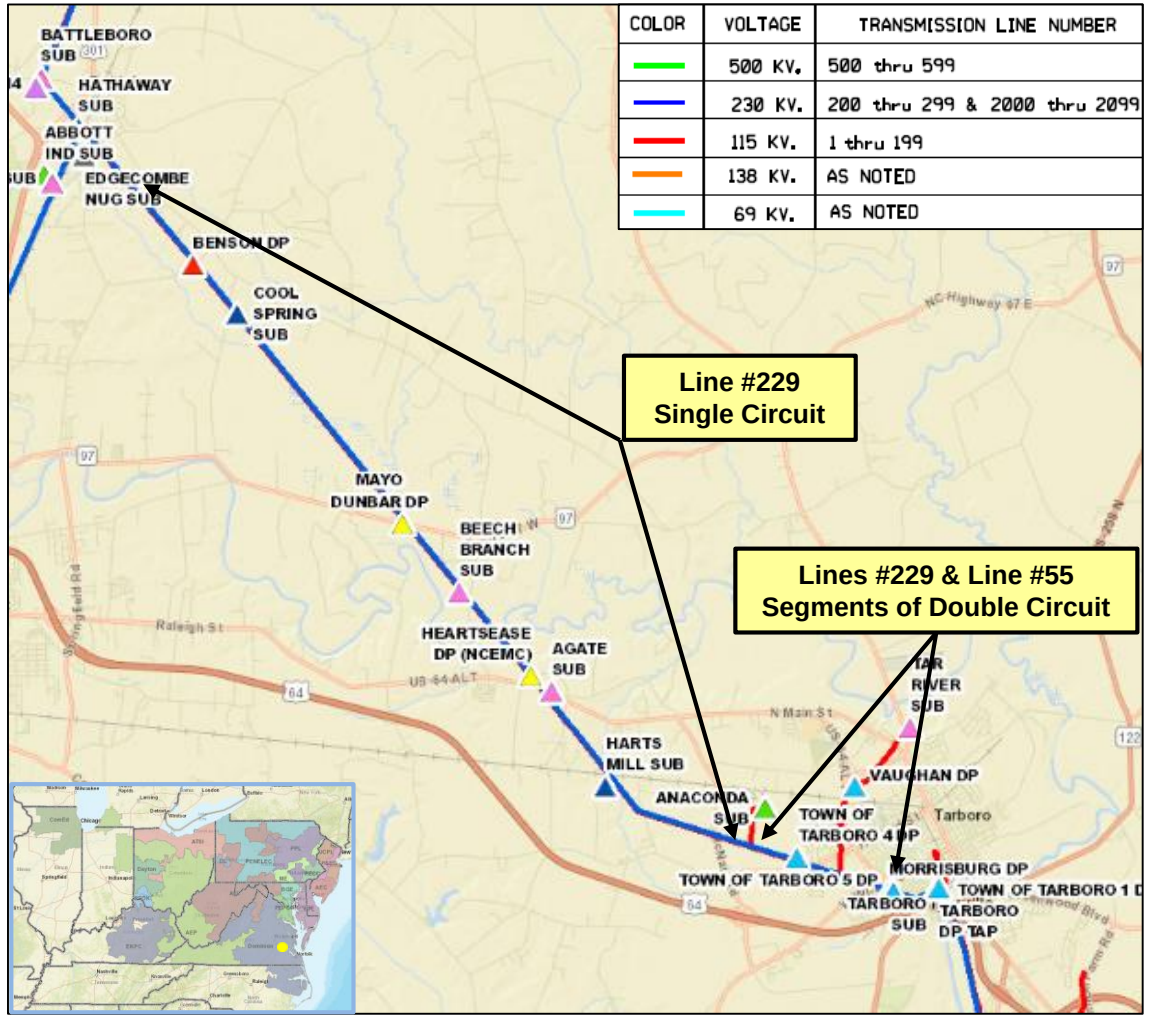
Specific Assumption References:

See details on Equipment Material Condition, Performance and Risk in Dominion's Planning Assumptions presented in December 2020.

Problem Statement:

Dominion Energy has identified a need to replace approximately 16.6 miles of 230kV Line #229 (Tarboro to Edgecomb NUG) which includes segments of double circuit with Line #55 (Tarboro to Anaconda) based on the Company's End of Life criteria.

- Double-circuit is on steel towers and single-circuit is on 2-pole wood H-frame structures all dating back to 1967. Conductor is ACSR.
- A field-condition assessment indicated woodpecker damage and broken insulators.
- Industry guidelines indicate equipment life for steel structures is 40-60 years, wood structures 35-55 years, conductor and connectors are 40-60 years, and porcelain insulators are 50 years.



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 Customer Load Request

Need Number: DOM-2021-0028

Process Stage: Solutions Meeting 06/08/2021

Previously Presented: Need Meeting 04/06/2021

Project Driver: Customer Service

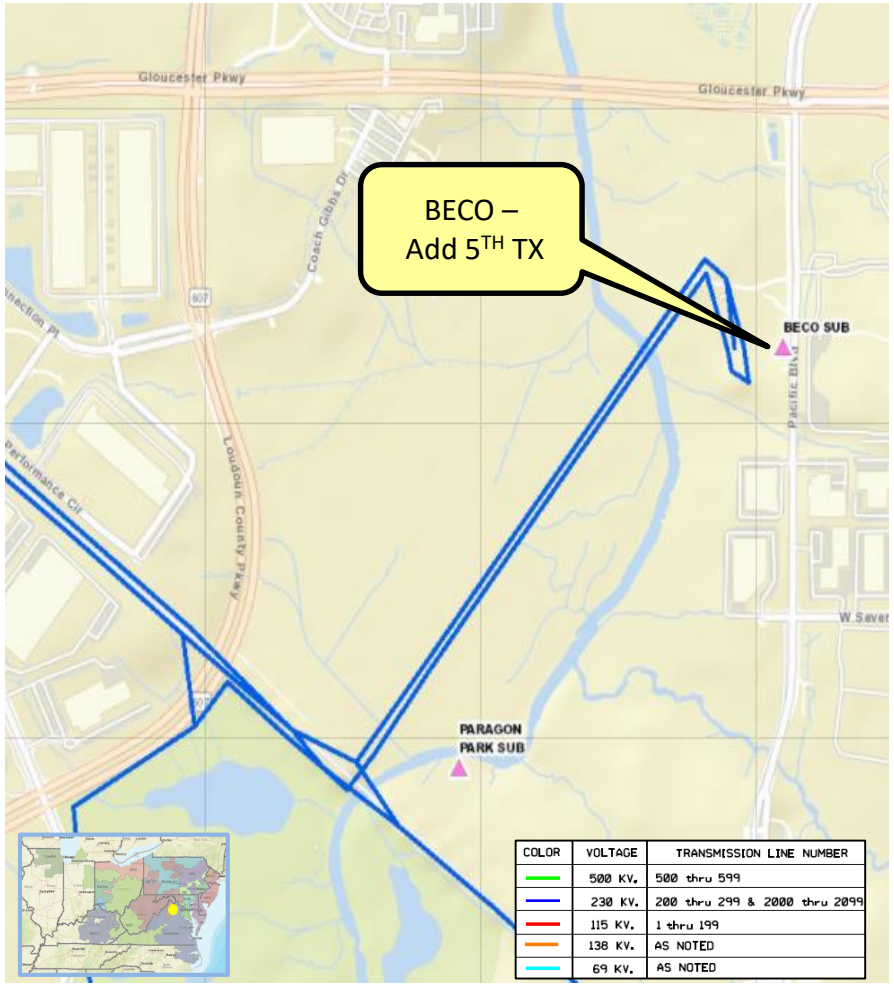
Specific Assumption References:

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

Problem Statement:

DEV Distribution has submitted a DP Request to add the 5th distribution transformer at BECO Substation in Loudoun County. The new transformer is being driven by continued load growth in the area.

Requested in-service date is 06/01/2022.



Initial In-Service Load	Projected 2026 Load
Summer: 299.0 MW	Summer: 250.0 MW

Dominion Transmission Zone: Supplemental
BECO - Add 5th TX - DEV

Need Number: DOM-2021-0028

Process Stage: Solutions Meeting 06/08/2021

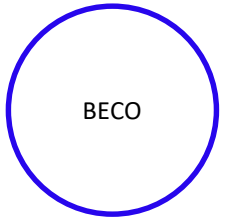
Proposed Solution:

Install a 1200 Amp, 50kAIC circuit switcher and associated equipment (bus, relaying, etc.) to feed the new transformer at BECO.

Estimated Project Cost: $0.5 M

Alternatives Considered:

No feasible alternatives



Projected In-service Date: 06/01/2022

Project Status: Engineering

Model: 2025 RTEP

Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2021-0034

Process Stage: Solutions Meeting 06/08/2021

Previously Presented: Need Meeting 05/11/2021

Project Driver: Customer Service

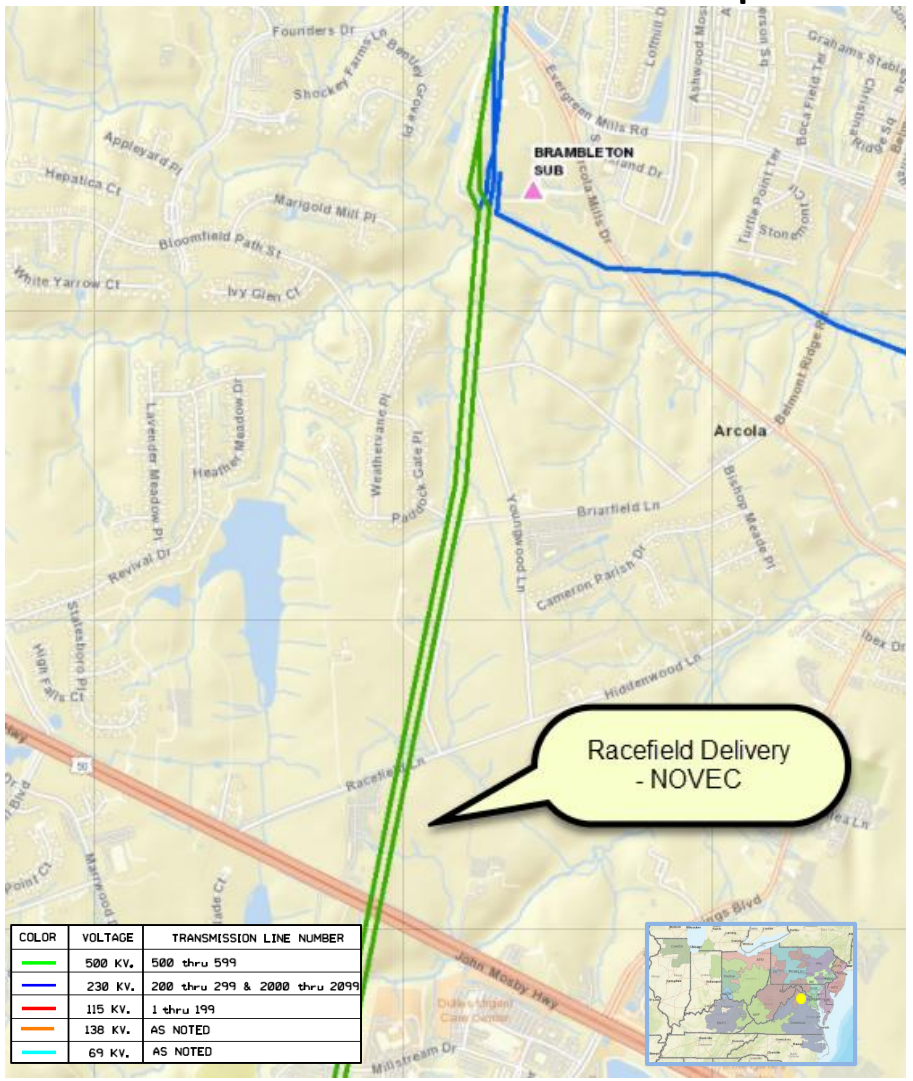
Specific Assumption References:

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

Problem Statement:

NOVEC has submitted a DP Request for a new substation (Racefield) in Loudoun County with a total load in excess of 100MW by 2029. Requested in-service date is 07/24/2023.

Initial In-Service Load	Projected 2025 Load
Summer: 10.0 MW	Summer: 60.5 MW



Dominion Transmission Zone: Supplemental Racefield 230kV Delivery - DEV

Need Number: DOM-2021-0034

Process Stage: Solutions Meeting 06/08/2021

Proposed Solution:

Interconnect the new substation by cutting and extending Line #2094 (Brambleton-Loudoun) to the proposed Racefield Substation. Lines to terminate in a 230kV four-breaker ring arrangement.

Estimated Project Cost: $12.0 M

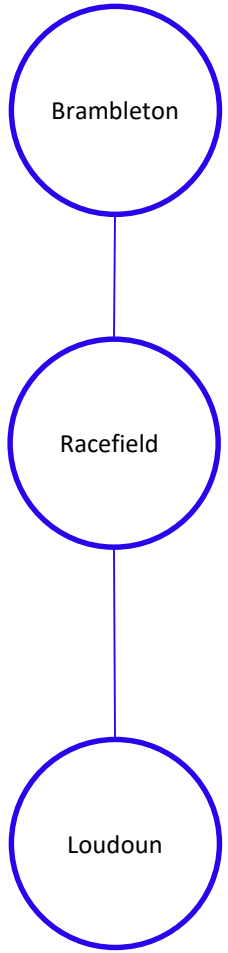
Alternatives Considered:

No feasible alternatives

Projected In-service Date: 07/24/2023

Project Status: Engineering

Model: 2025 RTEP



Dominion Transmission Zone: Supplemental Equipment Material Condition, Performance and Risk

Need Number: DOM-2021-0006

Process Stage: Solutions Meeting 06/08/2021
Previously Presented: Need Meeting 03/09/2021

Project Driver: Equipment Material Condition, Performance and Risk

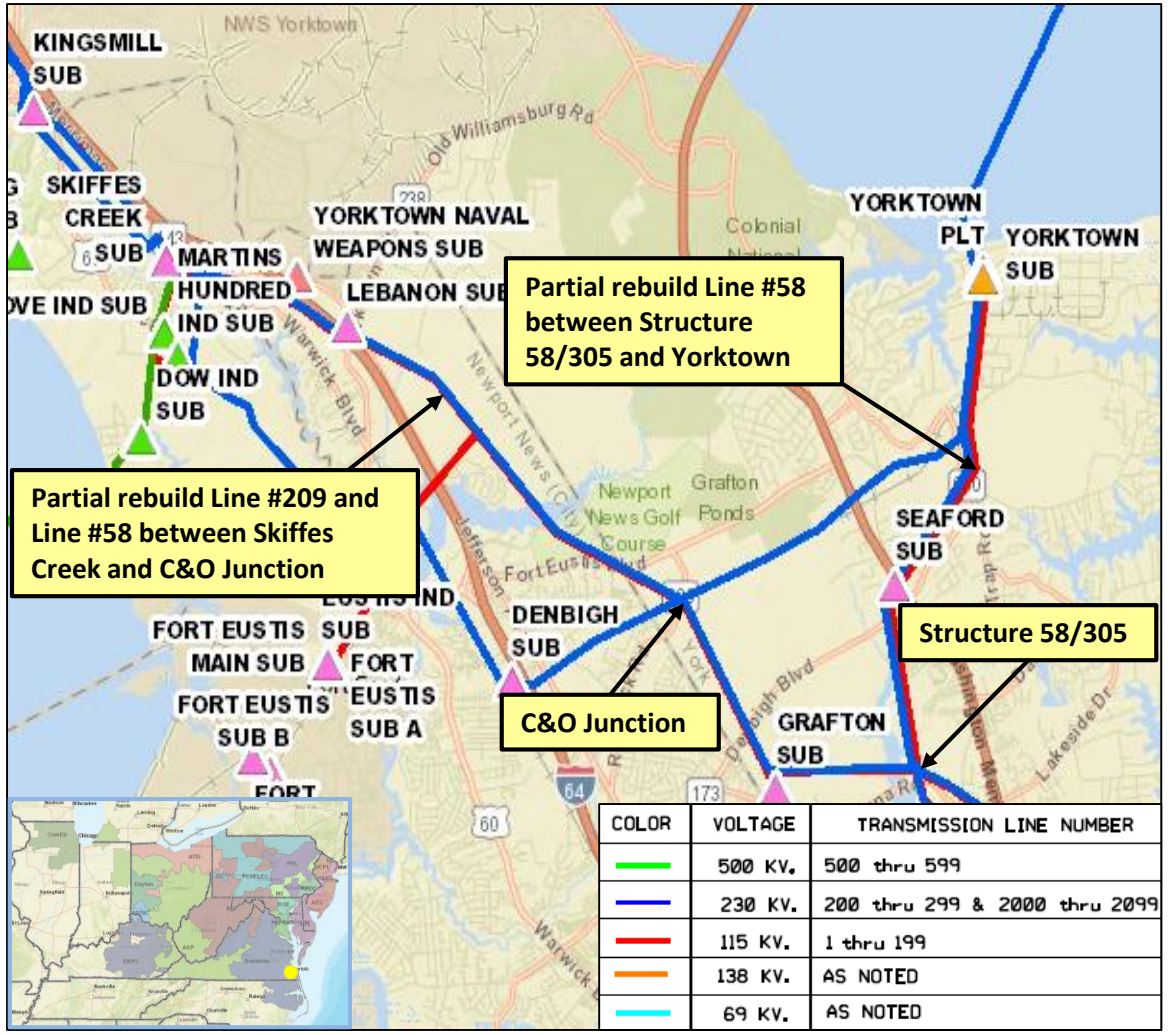
Specific Assumption References:

See details on Equipment Material Condition, Performance and Risk in Dominion's Planning Assumptions presented in December 2020.

Problem Statement:

Dominion Energy has identified a need to replace 52 double-circuit wood pole structures from Skiffes Creek to C&O Junction of Line #209 (Skiffes Creek-Yorktown) and Line #58 (Skiffes Creek-Yorktown), and 47 single-circuit wood pole structures from Structure 58/305 to Yorktown of Line #58 based on the Company's End of Life criteria.

- The 6.2 miles segment from Skiffes Creek-C&O Junction of Line #209 and Line #58, and the 4.5 miles segment from Structure 58/305-Yorktown of Line #58 were constructed on wood H-frame structures in 1952 and includes ACSR conductor and 3#8 static. These structures are at the end of their useful life.
- Industry guidelines indicate equipment life for wood structures is 35-55 years, conductor and connectors are 40-60 years, and porcelain insulators are 50 years.
- Line #209 and Line #58 provide service to Lebanon substation with approximately 46.6MW of load.



Dominion Transmission Zone: Supplemental Line #209 and Line #58 Partial Rebuild

Need Number: DOM-2021-0006

Process Stage: Solutions Meeting 06/08/2021

Proposed Solution:
Rebuild approximately 6.2 miles double circuit segment of Line #209 and Line #58 between Skiffes Creek and C&O Junction to current standards. The normal summer rating of this segment of Line #209 and Line #58 will be 1047MVA and 262MVA, respectively.

Rebuild approximately 4.5 miles single circuit segment of Line #58 to current 115kV standards. The normal summer rating of the line segment will be 262MVA.

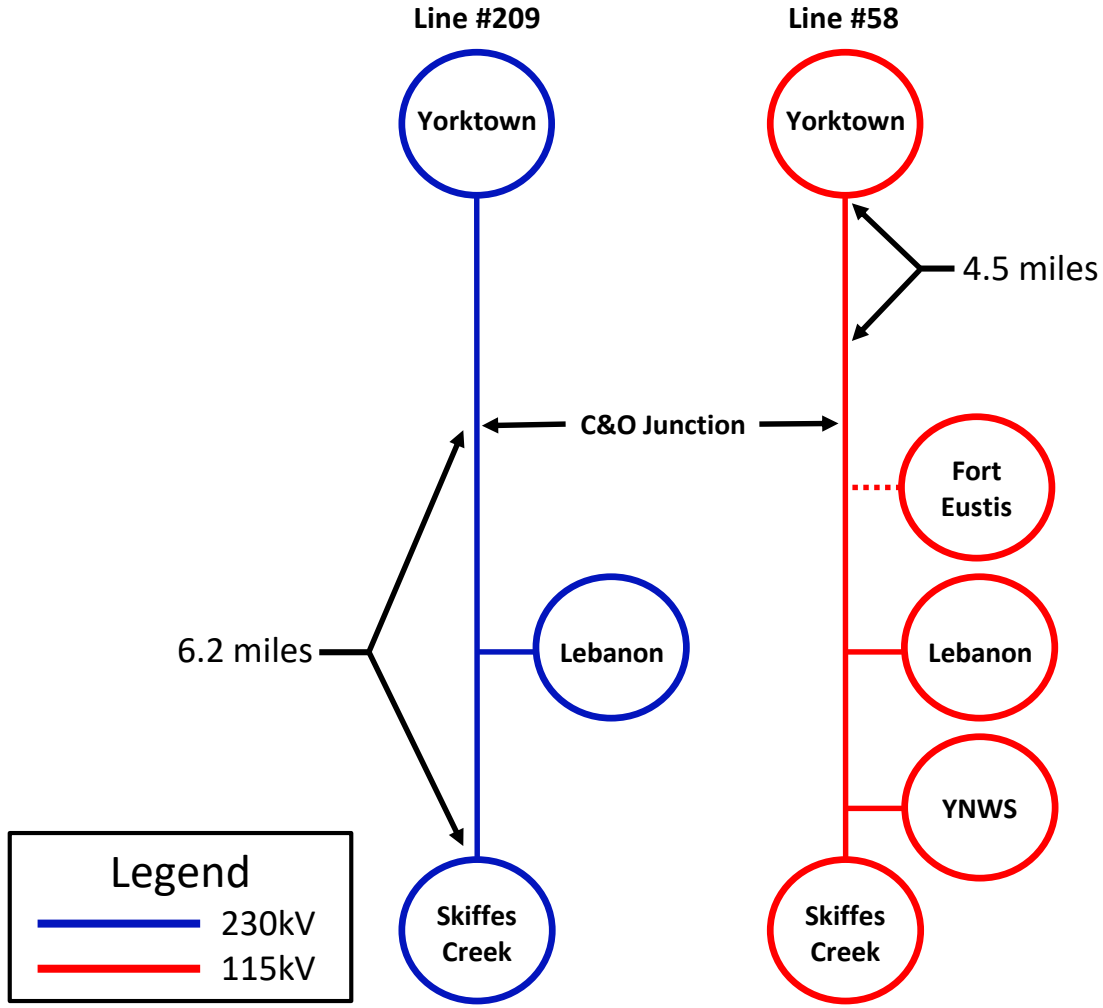
Estimated Project Cost: $19.5 M

Alternatives Considered:
No feasible alternatives

Project Target In-service Date: 12/31/2025

Project Status: Conceptual

Model: 2025 RTEP



Dominion Transmission Zone: Supplemental Equipment Material Condition, Performance and Risk

Need Number: DOM-2021-0025
Process Stage: Solutions Meeting 06/08/2021
Process Stage: Need Meeting 04/06/2021
Project Driver: Equipment Material Condition, Performance and Risk

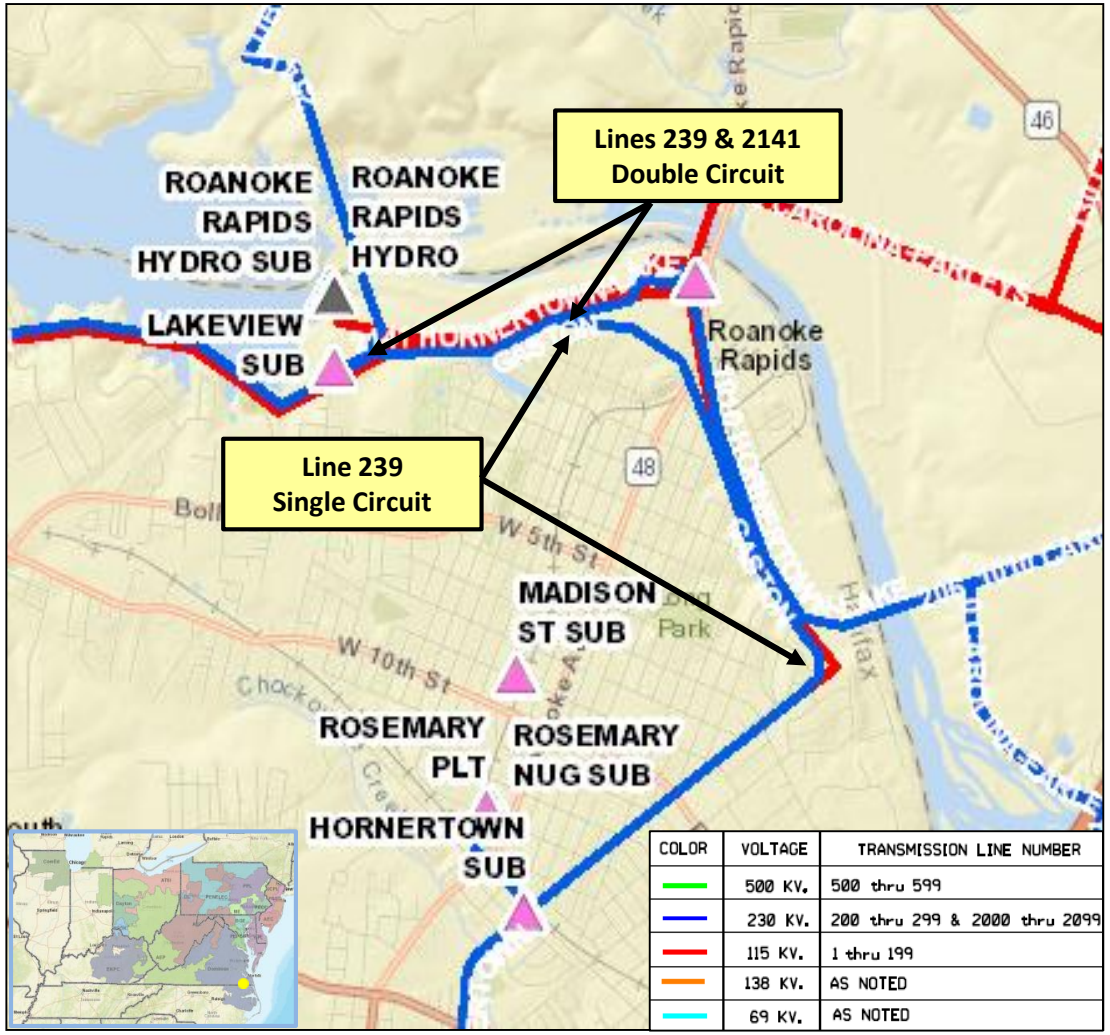
Specific Assumption References:

See details on Equipment Material Condition, Performance and Risk in Dominion's Planning Assumptions presented in December 2020.

Problem Statement:

Dominion Energy has identified a need to replace approximately 2.7 miles of 230kV Line #239 (Lakeview to Hornertown) which includes the double circuit segment with Line #2141 (Carolina to Lakeview) based on the Company's End of Life criteria.

- Double-circuit is on steel towers and single-circuit is on 2-pole wood H-frame structures all dating back to 1967. Conductor is ACSR.
- A field-condition assessment indicated woodpecker damage to several poles and broken insulators in numerous locations.
- Industry guidelines indicate equipment life for steel structures is 40-60 years, conductor and connectors are 40-60 years, and porcelain insulators are 50 years.
- Remaining segment of Line #239 is being rebuilt under project b3114.



Dominion Transmission Zone: Supplemental Line #239 and Line #2141 Partial Rebuild

Need Number: DOM-2021-0025

Process Stage: Solutions Meeting 06/08/2021

Proposed Solution:
Rebuild approximately 1.8 miles single circuit segment of Line #239 to current 230kV standards. The normal summer rating of this line segment will be 1047MVA.

Rebuild approximately 0.9 mile double circuit segment of Line #239 and Line #2141 to current 230kV standards. The normal summer rating of the line segments will be 1047MVA.

Estimated Project Cost: $5 M

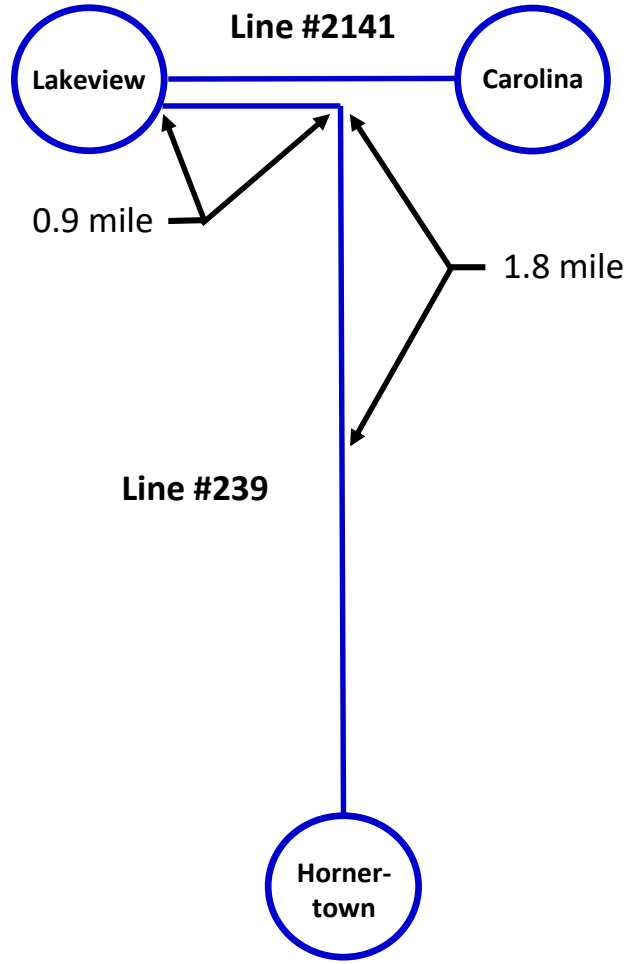
Alternatives Considered:

Without Line #239 and Line #2141 in-service, thermal violations were identified on the Clubhouse 230/115kV transformer under N-1-1 contingency condition.

Project Target In-service Date: 12/31/2022

Project Status: Conceptual

Model: 2025 RTEP



Dominion Transmission Zone: Supplemental Equipment Material Condition, Performance and Risk

Need Number: DOM-2021-0040

Process Stage: Solution Meeting 06/08/2021

Previously Presented: Need Meeting 05/11/2021

Project Driver: Equipment Material Condition, Performance and Risk

Specific Assumption References:
See details on Equipment Material Condition, Performance and Risk in Dominion's Planning Assumptions presented in December 2020.

Problem Statement:

Fredericksburg Tx#7 is a 168 MVA, 230/115/13.2 kV transformer bank manufactured in 1984. The original transformer failed in service and was rebuilt in 2001. This transformer bank has been identified for replacement based on Dominion's transformer health assessment (THA) process. Detailed drivers include:

- 37 service years in total (over 30 years). In service over 20 years after rebuild.
- Reduced BIL ratings (2 levels below current standard).
- Tertiary winding design not meeting current MVA requirement
- Legacy core steel technology with high loss
- Bushings have not yet been upgraded to polymer type for resiliency and safety, like the rest of 230/115 kV fleet.
- Transformer paint coating is degrading.
- Oil DGA shows high CO and CO2 levels since 2017 indicating potential breakdown of dielectric paper insulation on main current carrying conductors inside the transformer.
- THA score less than 80.

Dominion Transmission Zone: Supplemental
Replace Fredericksburg TX #7 - DEV

Need Number: DOM-2021-0040

Process Stage: Solution Meeting 06/08/2021

Proposed Solution:
Replace Fredericksburg TX#7 with a new three-phase, 230-115kV, 224 MVA unit. Replace high side switches, H744M and H644M, with new circuit breakers to provide fault interruption capability. Upgrade high side bus relay panels to current standards. Include any other ancillary equipment (arresters, switches, relays, etc.) as needed.

Estimated Project Cost: $ 4M

Alternatives Considered:
None

Projected In-service Date: 11/30/2023

Project Status: Conceptual

Model: 2025 RTEP

Dominion Transmission Zone: Supplemental Equipment Material Condition, Performance and Risk

Need Number: DOM-2021-0041

Process Stage: Solution Meeting 06/08/2021

Previously Presented: Need Meeting 05/11/2021

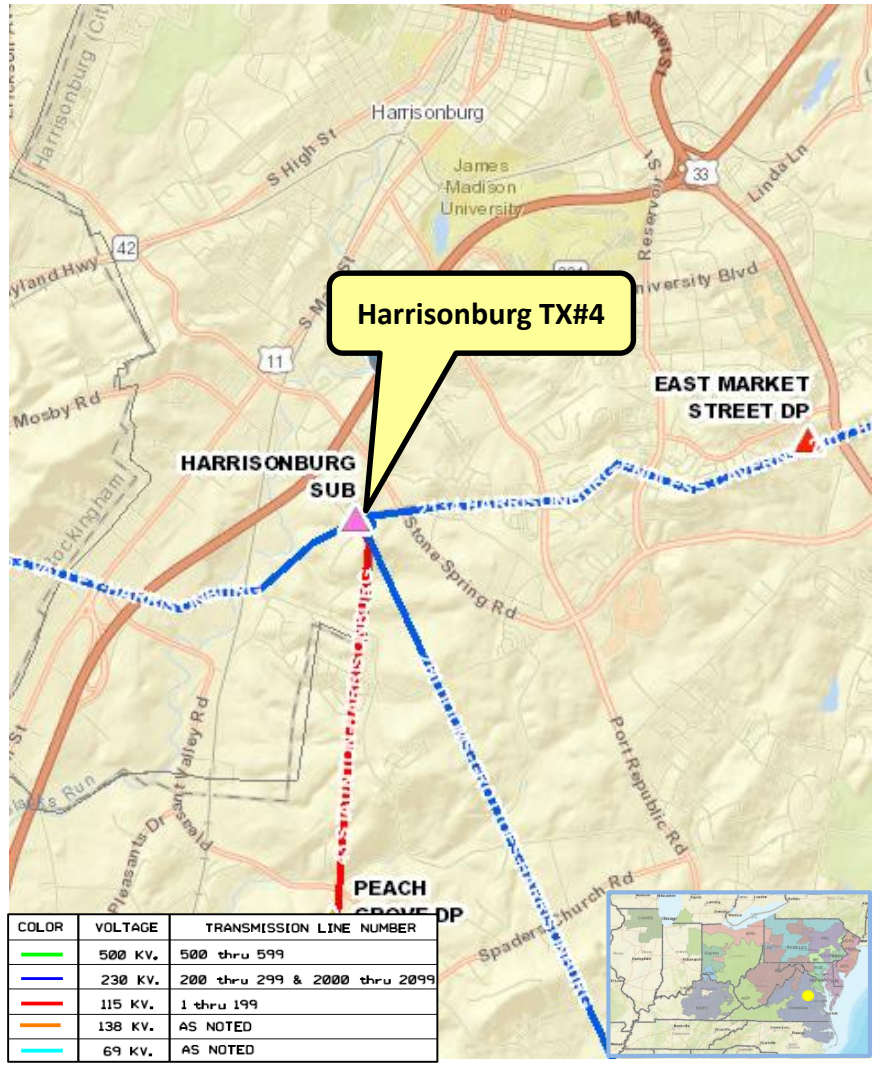
Project Driver: Equipment Material Condition, Performance and Risk

Specific Assumption References:
See details on Equipment Material Condition, Performance and Risk in Dominion's Planning Assumptions presented in December 2020.

Problem Statement:

Harrisonburg TX#4 is a 112 MVA, 230/69/13.2 kV transformer bank consisting of three single-phase units that were manufactured in 1984. This transformer bank has been identified for replacement based on the results of Dominion's transformer health assessment (THA) process. Detailed drivers include:

- Age (>30 years old).
- Reduced BIL ratings (3 levels below standard).
- Legacy core steel technology with high no-load loss.
- Degraded porcelain type bushings
- Oil DGA indicates high levels of Ethane and some Ethylene generated by high-energy arcing in two of the three units. These are signs of weakened or damaged insulations.
- Transformer paint coating is degrading.
- THA score less than 80 for two of the three single-phase units.



Dominion Transmission Zone: Supplemental
Replace Harrisonburg TX#4 - DEV

Need Number: DOM-2021-0041

Process Stage: Solutions Meeting 06/08/2021

Proposed Solution:

Replace Harrisonburg TX#4 with a new three-phase, 230/69/13.2 kV, 168 MVA unit. Include other ancillary equipment (arresters, switches, relays, etc.) as needed.

Estimated Project Cost: $3.2 M

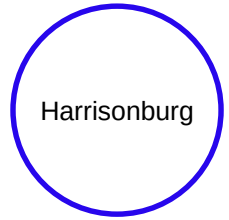
Alternatives Considered:

None

Projected In-service Date: 12/31/2022

Project Status: Engineering

Model: 2025 RTEP



Dominion Transmission Zone: Supplemental Equipment Material Condition, Performance and Risk

Need Number: DOM-2021-0043

Process Stage: Solution Meeting 06/08/2021

Previously Presented: Need Meeting 05/11/2021

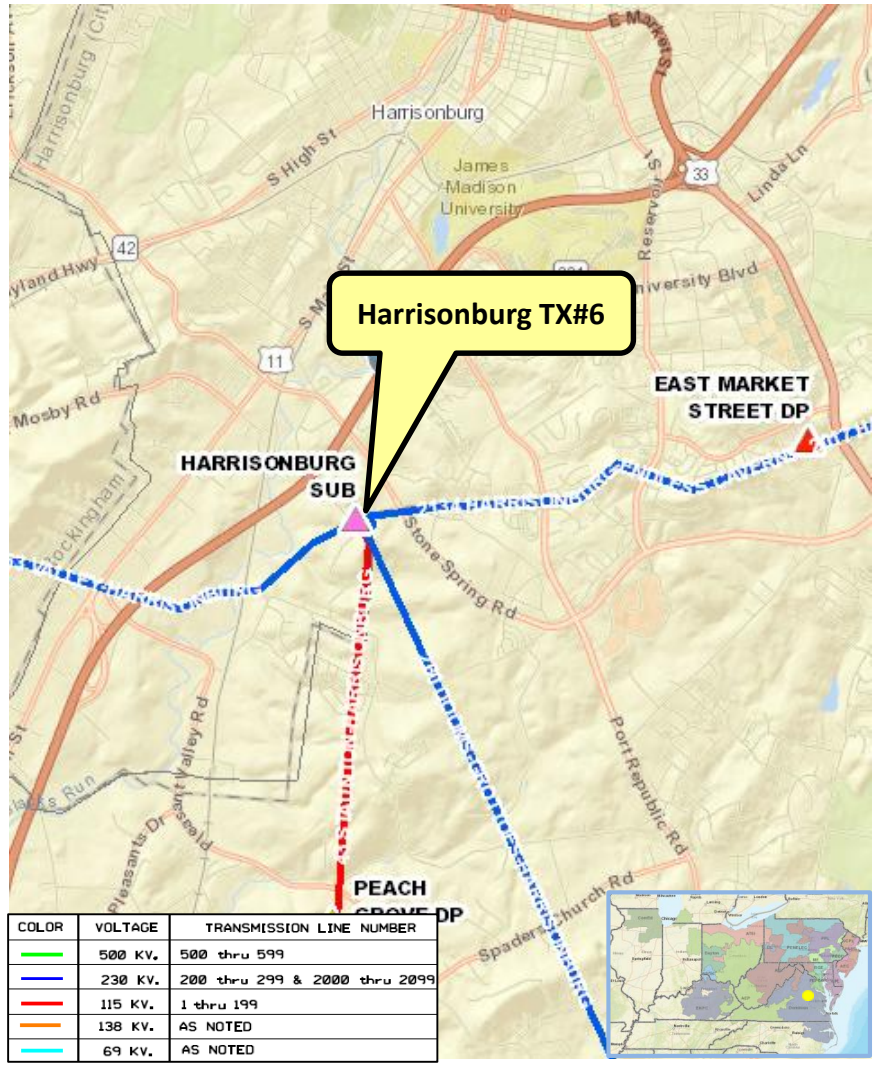
Project Driver: Equipment Material Condition, Performance and Risk

Specific Assumption References:
See details on Equipment Material Condition, Performance and Risk in Dominion's Planning Assumptions presented in December 2020.

Problem Statement:

Harrisonburg TX#6 is a 112 MVA, 230/69/13.2 kV transformer bank consisting of three single-phase units that were manufactured in 1979. This transformer bank has been identified for replacement based on the results of Dominion's transformer health assessment (THA) process. Detailed drivers include:

- Age (>30 years old).
- Reduced BIL ratings (3 levels below standard).
- Legacy core steel technology with high no-load loss.
- Degraded porcelain type bushings.
- Oil DGA indicates high levels of CO2 in one unit; These are signs of deterioration of paper dielectric insulation.
- Transformer paint coating is degrading.
- THA score less than 80 for two of the three single-phase units.



Dominion Transmission Zone: Supplemental
Replace Harrisonburg TX#6 - DEV

Need Number: DOM-2021-0043

Process Stage: Solutions Meeting 06/08/2021

Proposed Solution:

Replace Harrisonburg TX#6 with a new three-phase, 230/69/13.2 kV, 168 MVA unit. Include other ancillary equipment (arresters, switches, relays, etc.) as needed.

Estimated Project Cost: $3.2 M

Alternatives Considered:

None

Projected In-service Date: 12/31/2023

Project Status: Engineering

Model: 2025 RTEP

Dominion Transmission Zone: Supplemental Do No Harm Analysis

Need Number: DOM-2020-0026-DNH
Meeting Date: 06/08/2021
Process Stage: Solutions Meeting 06/08/2021
Supplemental Project Driver: Do No Harm Analysis

Specific Assumption Reference:

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

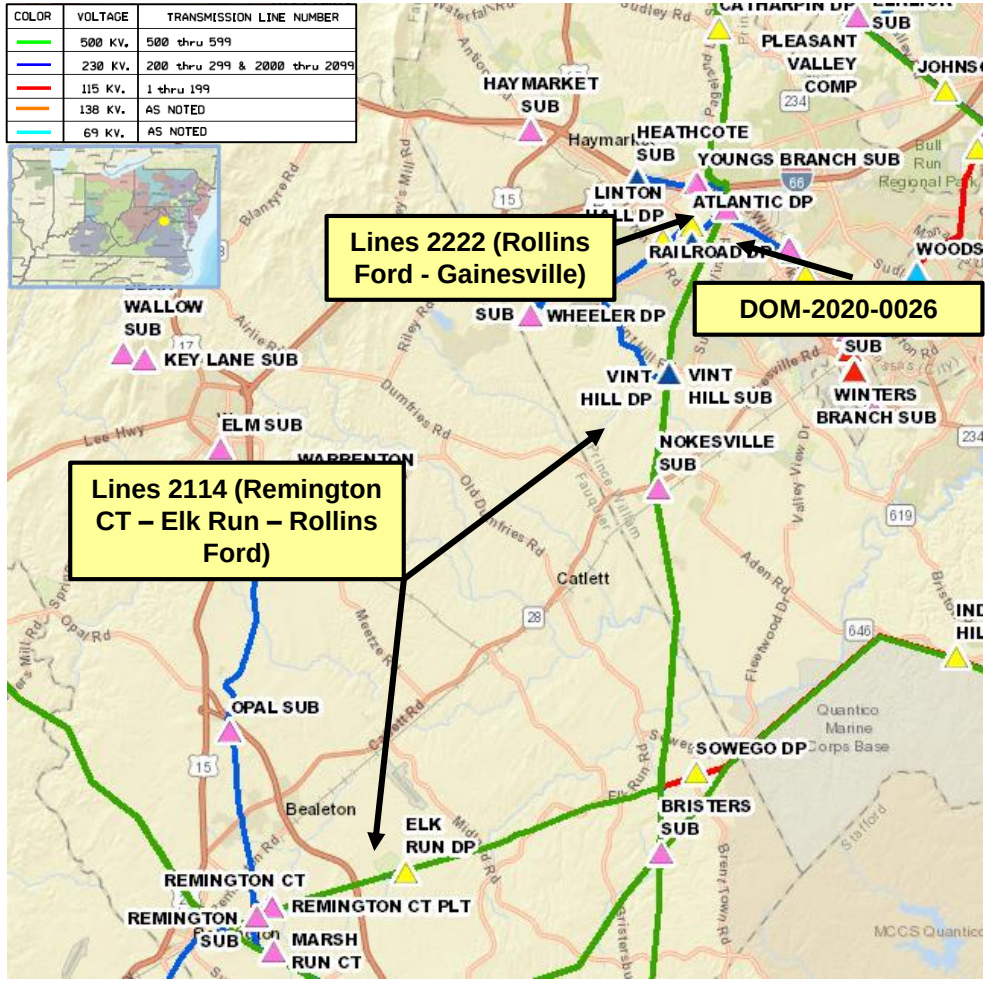
Problem Statement:

PJM has identified a N-1 Generator Deliverability contingency scenario that results in overloads of both segments of Line 2114 (Remington CT to Elk Run; Elk Run to Rollins Ford) in the 2021 Do-No-Harm analysis.

For example, the loss of Line 569 (Loudoun – Morrisville) under contingency DVP-P1-2: Line 569 creates overloads of:

- Line 2114 (Remington CT to Elk Run) – Current rating 1047 MVA
- Line 2114 (Elk Run to Rollins Ford) – Current rating 1047 MVA

The violations are caused by previously presented Supplemental Project DOM-2020-0026 in the Dominion Zone.



Dominion Transmission Zone: Supplemental Do No Harm Analysis

Need Number: DOM-2020-0026-DNH

Meeting Date: 06/08/2021

Process Stage: Solutions Meeting 06/08/2021

Proposed Solution :

Re-conductor the following segments of 230kV Line 2114 using a higher capacity conductor and upgrade terminal equipment to achieve an expected rating of 1574 MVA.

- Line segment from Remington CT to Elk Run (approx. 3.46 miles)
- Line segment from Elk Run to Rollins Ford (approx. 19.71 miles)

Re-conductor approx. 1.11 miles of 230kV Line 2222 from Rollins Ford to Gainesville using a higher capacity conductor and upgrade terminal equipment to achieve an expected rating of 1574 MVA.

TO Alternatives Considered :

No feasible alternatives

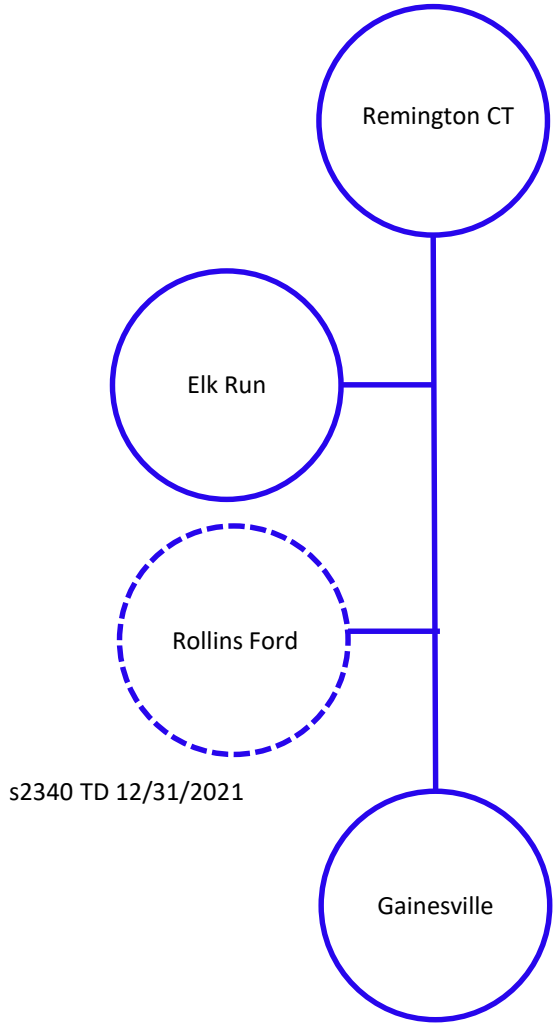
Estimated cost:

Line 2114 (Remington CT – Elk Run – Rollins Ford) - $ 35.0 M

Line 2222 (Rollins Ford - Gainesville) - $ 2.0 M

Projected In-service Date: 12/31/2025

Project Status: Conceptual



Dominion Transmission Zone: Supplemental Do No Harm Analysis

Need Number: DOM-2021-0002-DNH

Meeting Date: 06/08/2021

Process Stage: Solutions Meeting 06/08/2021

Supplemental Project Driver: Do No Harm Analysis

Specific Assumption Reference:

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

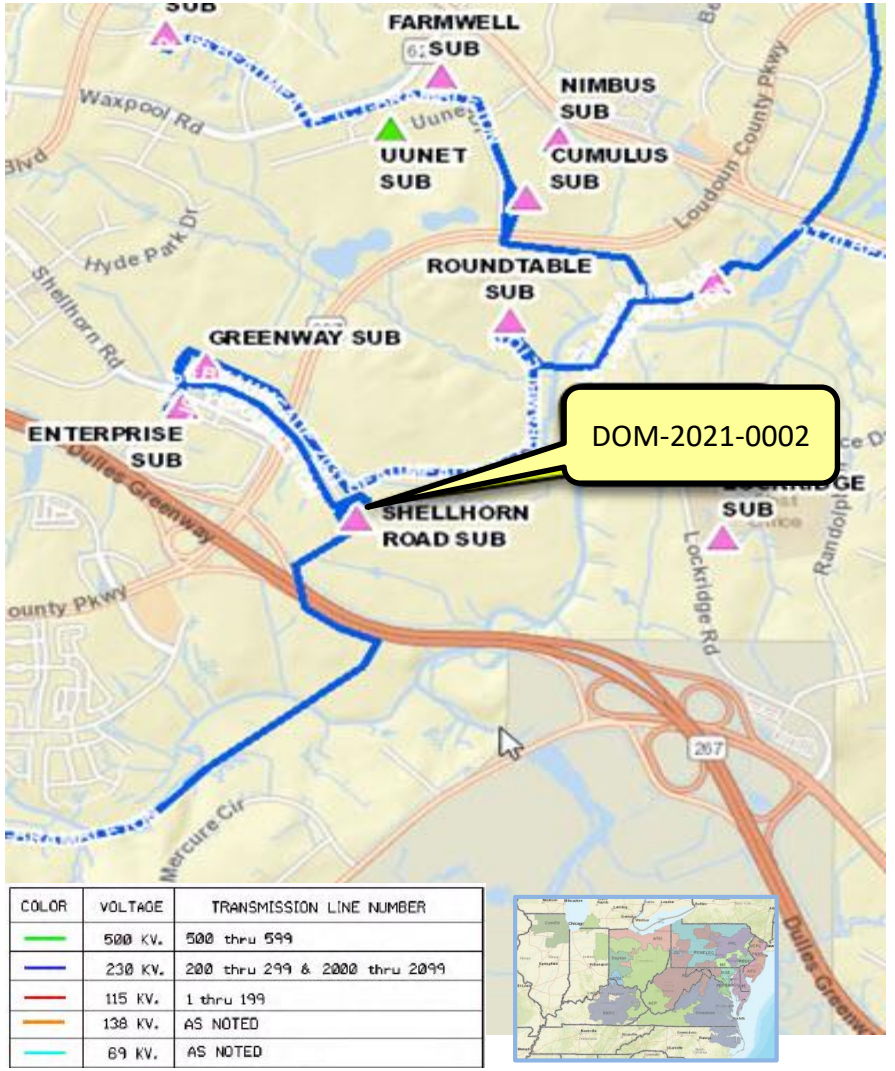
Problem Statement:

PJM has identified a N-1 contingency that results in overloads of two segments of Line 2008 (Loudoun to Takeoff) in the 2021 Do-No-Harm analysis.

For contingency DVP-P4-2: 2172T2210 overloads:

- Line 2008 (Cub Run to Walney) – Current rating 823 MVA
- Line 2008 (Walney to Takeoff) – Current rating 823 MVA

The violations are caused by previously presented Supplemental Project DOM-2021-0002 in the Dominion Zone.



Dominion Transmission Zone: Supplemental Do No Harm Analysis

Need Number: DOM-2020-0002-DNH
Meeting Date: 06/08/2021
Process Stage: Solutions Meeting 06/08/2021

Proposed Solution :

Re-conductor the segments of 230kV Line 2008 between Cub Run and Walney (1.07 miles) and Walney to Takeoff (1.94 miles) using a higher capacity conductor and upgrade terminal equipment to achieve an expected rating of 1574 MVA.

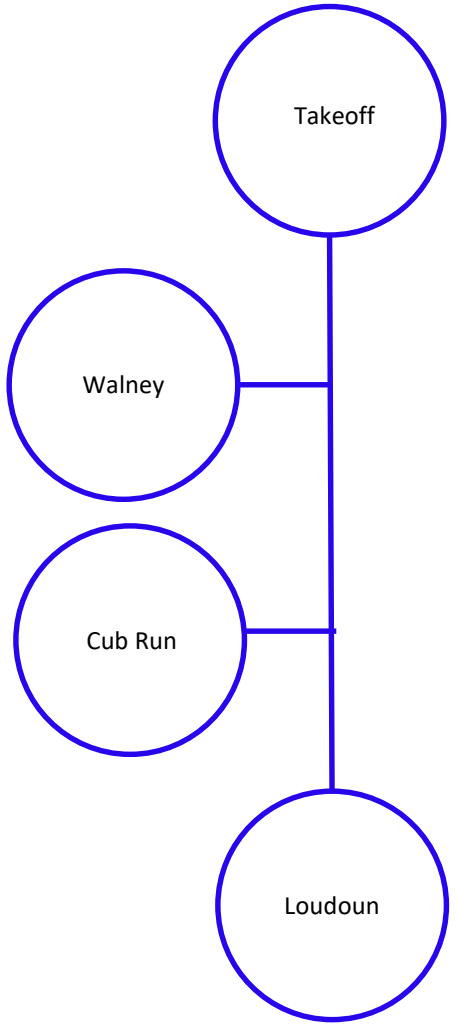
TO Alternatives Considered :

No feasible alternatives

Estimated cost:

Line 2008 (Cub Run – Walney) - $ 2.5 M
Line 2008 (Walney – Takeoff) - $ 3.5 M

Projected In-service Date: 12/31/2025
Project Status: Conceptual



Appendix

High level M-3 Meeting Schedule

Assumptions

Activity	Timing
Posting of TO Assumptions Meeting information	20 days before Assumptions Meeting
Stakeholder comments	10 days after Assumptions Meeting

Needs

Activity	Timing
TOs and Stakeholders Post Needs Meeting slides	10 days before Needs Meeting
Stakeholder comments	10 days after Needs Meeting

Solutions

Activity	Timing
TOs and Stakeholders Post Solutions Meeting slides	10 days before Solutions Meeting
Stakeholder comments	10 days after Solutions Meeting

Submission of Supplemental Projects & Local Plan

Activity	Timing
Do No Harm (DNH) analysis for selected solution	Prior to posting selected solution
Post selected solution(s)	Following completion of DNH analysis
Stakeholder comments	10 days prior to Local Plan Submission for integration into RTEP
Local Plan submitted to PJM for integration into RTEP	Following review and consideration of comments received after posting of selected solutions

Revision History

05/28/2021 – V1 – Original version posted to pjm.com.

06/08/2021 – V2 – Minor edits to slides 15 and 17.