



Sub-Regional RTEP Committee PJM South

SRRTEP - South
December 1, 2016



PJM Baseline Project B2185 Update

Problem: NERC Category B Violation (DVP Analysis)

- The 2017 summer base case indicates that an outage of Line #69 breaker at Locks overloads Line #69 segment Reams DP to Purdy 115kV by 3% after 69T148 is closed and the load is fed from Clubhouse.
- The overload is created when Center Star DP (SEC) is converted from 34.5kV to 115kV and transferred to Reams DP in 2017.

Original Proposed Solution:

- Uprate Line #69 segment Reams DP to Purdy (19 miles) from 41 MVA to 162 MVA by replacing 5 structures and re-sagging the line from 50 to 75C.

Update:

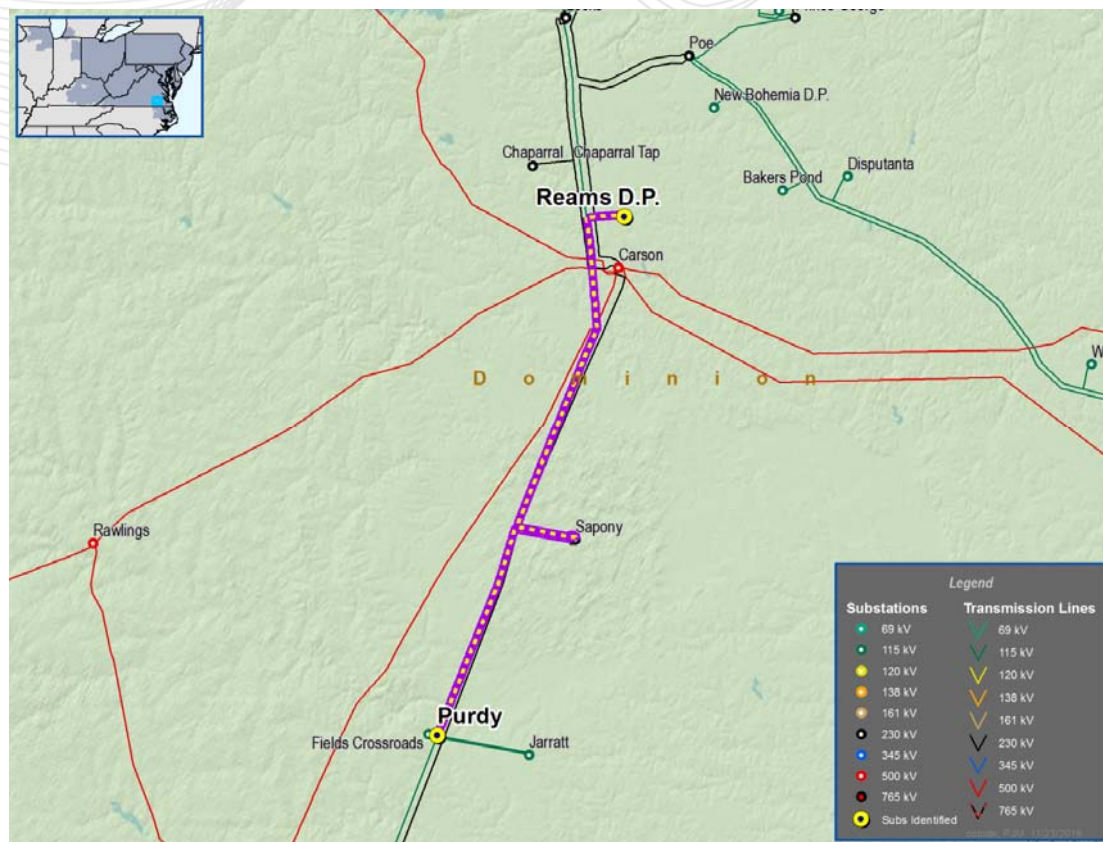
- Desired ratings have been achieved by updating engineering documents upon further review. B2185 will be cancelled since the approved scope was not needed to achieve the desired rating.

Previous Estimated Project Cost: \$ 400 K

Actual Project Cost: \$0

Actual IS Date: September 2016

Dominion Transmission Zone





Dominion Transmission Zone

Existing B2719.1 - .3 Cost Increase

Problem: DOM Limitation on Direct-Connect Load Violation

- Line #31, Altavista – Halifax 115kV, is 36 mile long network . It serves roughly 12,000 customers located in Halifax and Pittsylvania counties. It serves 4 MEC and 2 Dominion delivery points for a total of 6 direct-connect tapped facilities.
- Dominion’s Facilities Connection Requirements C.2.7 states that the number of direct-connect loads (tapped facilities) should be limited to 4 tapped facilities.
- The Hickory Grove DP tap is 8 miles long. Dominion’s Facilities Connection Requirements G.1 states that when tapping lines for loads less than 100 MW and length more than 1 mile, the tap connection may be connected with a 3 or 4 breaker ring.
- This is an immediate need project based on “Limitation on Direct-Connect Load” criteria.
- When this criteria violation was identified, the need date was already in the immediate need timeframe

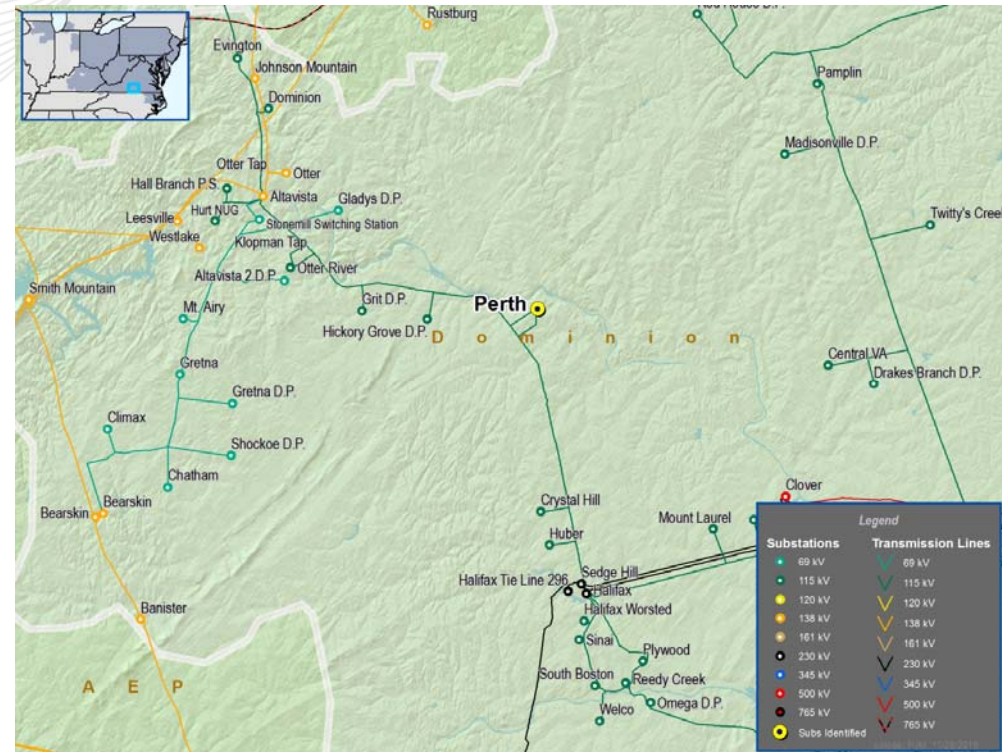
Alternatives Considered

- Given the immediate need timing of the violation, alternatives that would require new lines to be built were not considered.

Proposed Immediate Need Solution

Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

- Expand Perth substation and add a 115kV four breaker ring. (b2719.1)
- Extend the Hickory Grove DP tap 0.28 miles to Perth and terminate it at Perth. (b2719.2)
- Split Line #31 at Perth and terminate it into the new ring bus with 2 breakers separating each of the line terminals to prevent a breaker failure from taking out both 115kV lines. (b2719.3)





Dominion Transmission Zone

Existing B2719.1 - .3 Cost Increase Continued

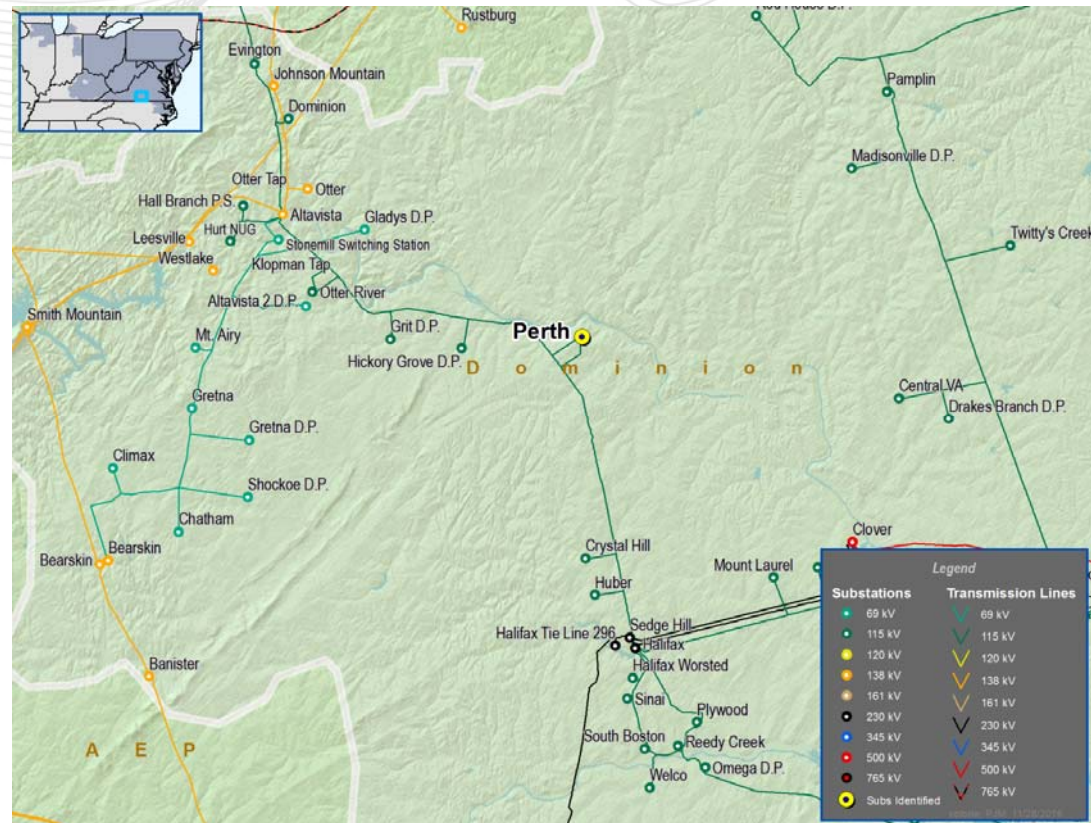
Reason for Cost Increase:

- The cost increase is due to a high level preliminary planning cost estimate versus a detailed cost estimate.
- The cost increase included \$100,000 for a mobile transformer required to serve the distribution load that has no external ties.
- The date was changed from June to December due to the mobile transformer ratings limitation during the late spring and early summer time frame.

Previous Estimated Project Cost: \$7.0 M

Revised Estimated Project Cost: \$8.2 M

Projected IS Date: 12/01/2017





Dominion Transmission Zone

B2654.1 - .3 Cost Increase and Scope Modification

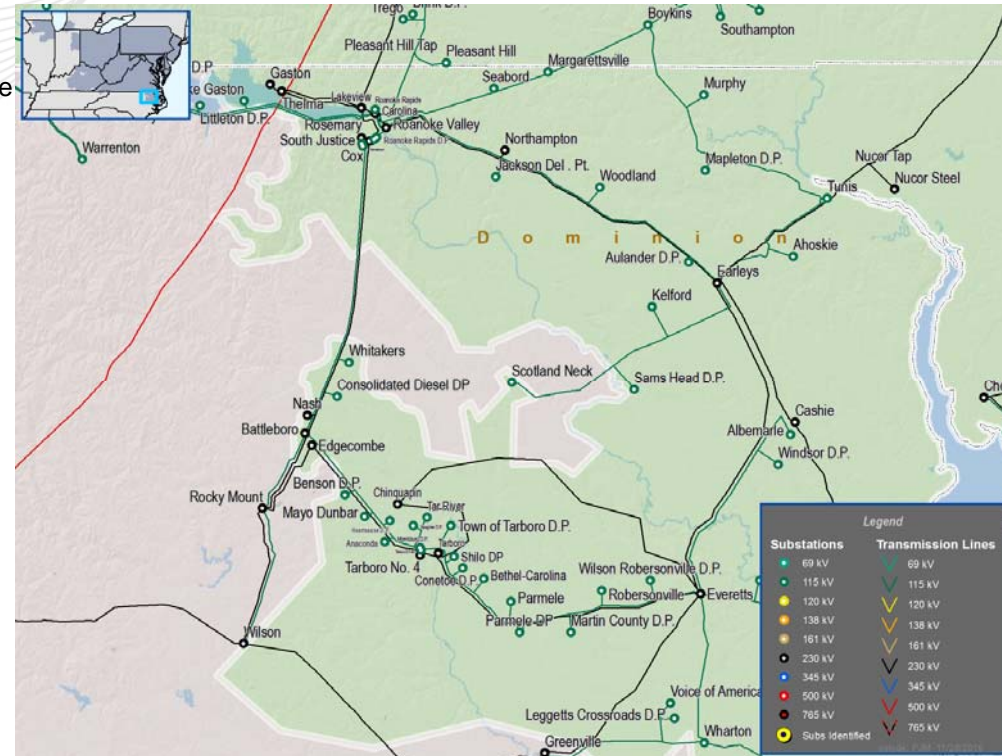
Problem: Dominion Radial Line Criteria Violation

- Line #126 is a 115kV 25 mile radial line from Earleys to Scotland Neck that feeds radial line on 2 pole wood H frames mostly built in 1969.
- The MW-miles for Line #126 is 775 MW-miles respectively, a violation of the DOM radial line criteria.
- This need is time sensitive due to the criteria violation in the immediate need timeframe.
- When this criteria violation was identified, the need date was already in the immediate need timeframe.

Proposed Immediate Need Solution:

Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

- Network Lines #126 by building a 15 mile 115kV line from Scotland Neck to S Justice Branch with a summer emergency rating of 262 MVA. **(b2654.1)**
- Install a 115kV three breaker ring at S Justice Branch **(b2654.2)** and a 115kV breaker at Scotland Neck **(b2654.3)**.
- Install a 224 MVA 230-115kV transformer at Hathaway (existing b1794) for contingency support. The new line would be routed to allow HEMC to convert Dawsons Crossroads DP from 34.5kV to 115kV.





Dominion Transmission Zone

B2654.1 - .3 Cost Increase and Scope Modification Continued

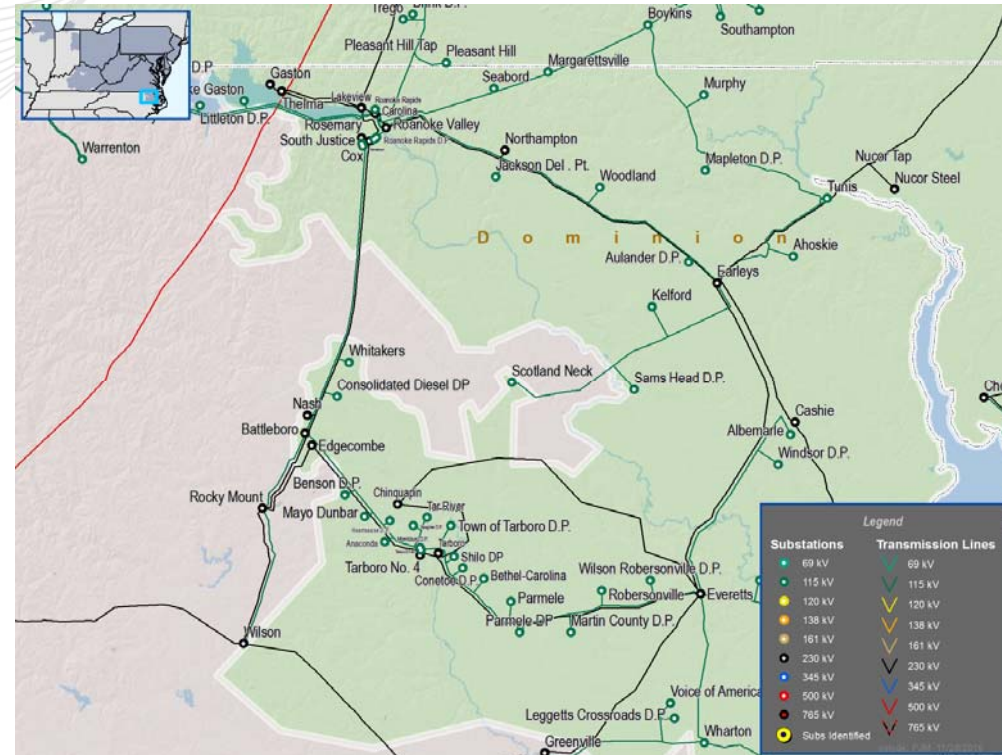
Reason for Cost Increase and Scope Modification:

- Final routing increased the line mileage from 15 to 16 miles from Scotland Neck to South Justice Branch.
- Summer emergency rating target changed to 346 MVA from 262 MVA.
- Install an additional 115kV breaker in the breaker ring at S Justice Branch for a total of four 115kV breakers in the ring for breaker failure reliability.
- The cost increase is due to refined detailed cost estimate updates and the increased line mileage for the final routing.

Previous Estimated Project Cost: \$ 33.0 M

Revised Estimated Project Cost: \$ 46.0 M

Projected IS Date: 06/01/2018





Dominion Transmission Zone

B2653.1 - .3 Cost Increase and Scope Modification

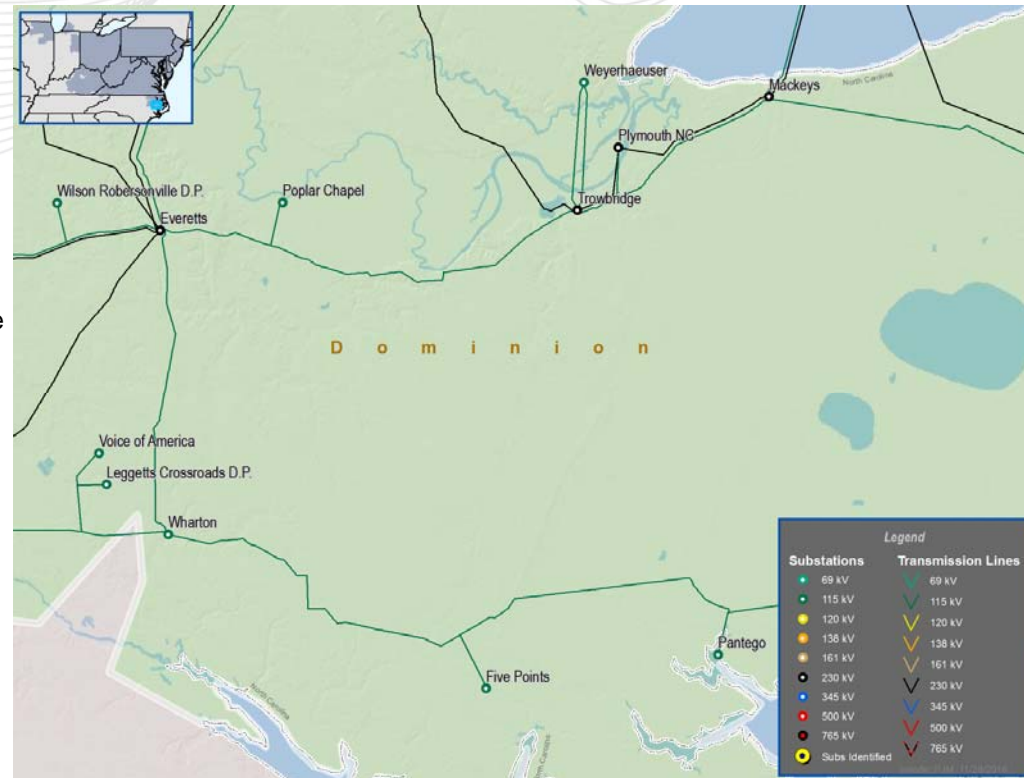
Problem: DOM Radial Line Criteria Violation

- Line #82 is a 115kV radial line from Everetts to Wharton (13.8) miles that feeds radial line #189 from Wharton to Pantego (30.2 miles)
- The MW-miles for Lines #82 and #189 are 2156 and 1419 MW-miles respectively, a violation of the DOM radial line criteria
- This need is time sensitive due to the criteria violation in the immediate need timeframe
- When this criteria violation was identified, the need date was already in the immediate need timeframe

Proposed Immediate Need Solution:

Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be Designated Entity.

- Network Lines #82 and #189 by building a 20 mile 115kV line from Pantego to Trowbridge with a summer emergency rating of 262 MVA. **(b2653.1)**
- Install a 115kV four breaker ring at Pantego **(b2653.2)** and a 115kV breaker at Trowbridge **(b2653.3)**





Dominion Transmission Zone

B2653.1 - .3 Cost Increase and Scope Modification Continued

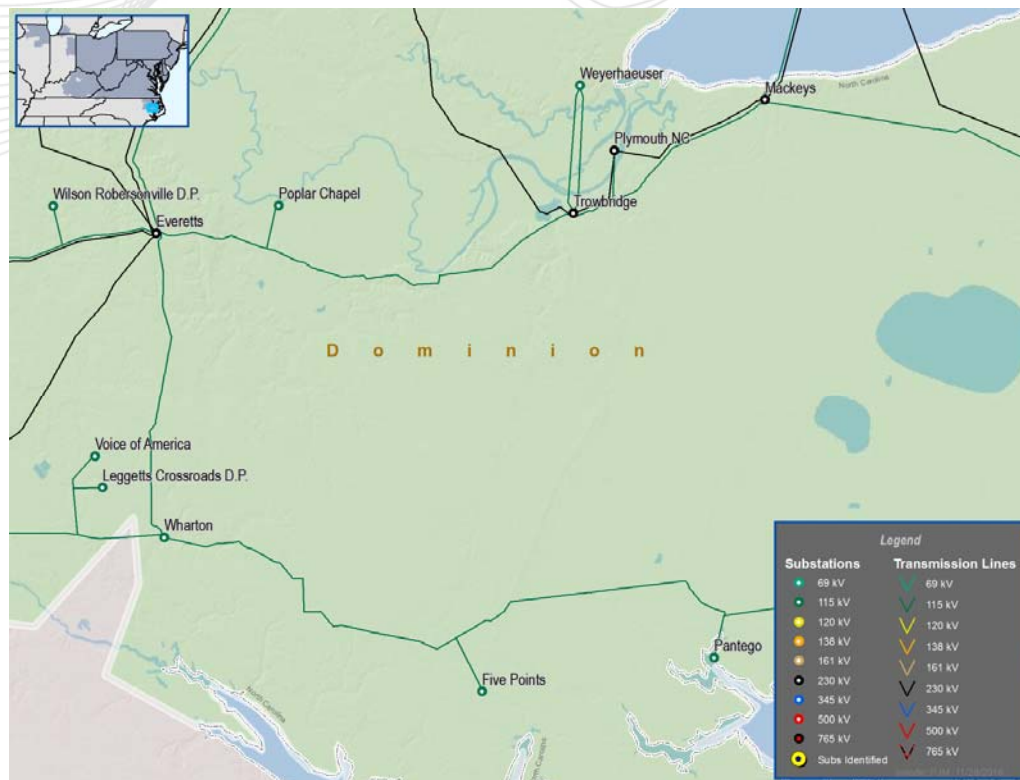
Reason for Cost Increase and Scope Modification:

- Final routing increased the line mileage from 20 to 22 miles from Pantego to Trowbridge
- Summer emergency rating target changed to 346 MVA from 262 MVA
- Install an additional 115kV breaker between the four breaker ring at Pantego and the tap to Tideland EMC's Mattamuskeet DP for system protection requirements
- The cost increase is due to refined detailed cost estimate updates and the increased line mileage for the final routing.

Previous Estimated Project Cost: \$ 35.0 M

Revised Estimated Project Cost: \$ 44.6 M

Projected IS Date: 06/01/2018





Dominion Transmission Zone

Existing B1794 Cost Increase

Problem: N-1 Thermal Violation

- Overload of Rocky Mt – Battleboro 115kV for the loss of Battleboro – Carolina 115kV

Scope:

- Build a new switching station west of Edgcombe NUG to be called Hathaway Switching Station with a 230-115kV transformer, 5-230kV breakers in a breaker and a half scheme, 4-115kV breakers in a ring. Re-configure Battleboro – Benson 115kV, Nash-Hornertown 230kV, and Edgcombe NUG – Rocky Mt 230kV to terminate into Hathaway (b1794).

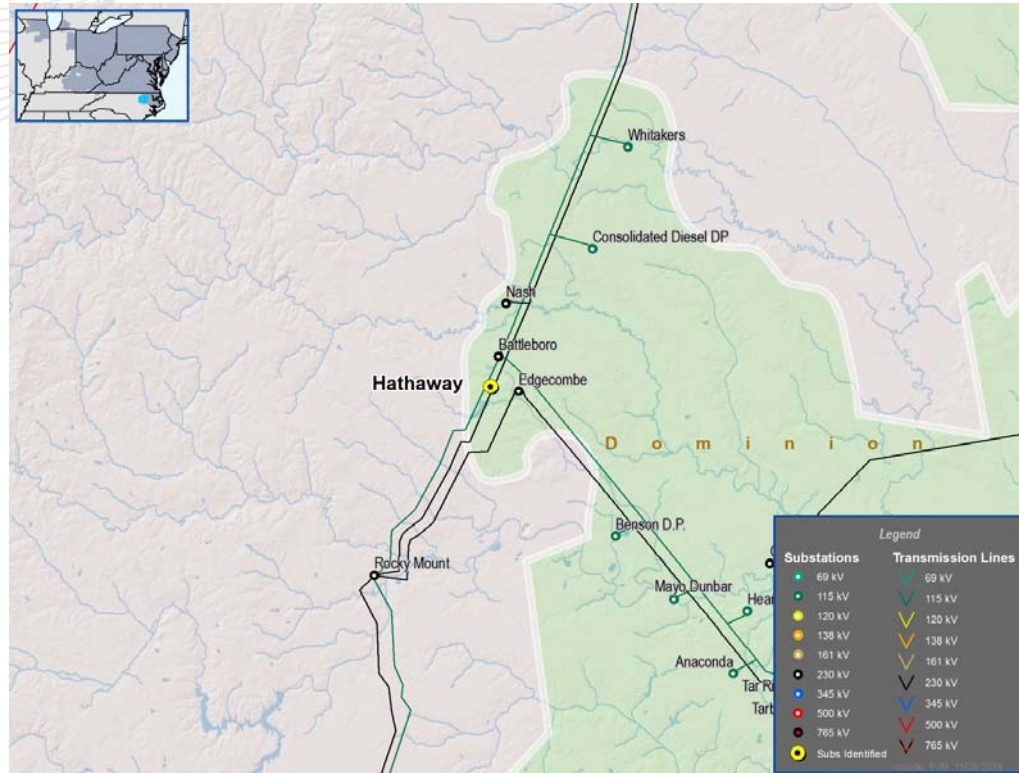
Reason for Cost Increase:

- The cost increase is due to additional substation expense, cost of land, expense for storm drainage and escalation of material and labor costs.

Previous Estimated Project Cost: \$ 19.0M

Revised Estimated Project Cost: \$ 25.4M

Projected IS Date: 06/01/2017





Dominion Transmission Zone

Problem: DOM “End of Life Criteria”

- Line #171 Chase City to Boydton Plank Rd was constructed on wood H-frames with 3/8 inch steel static. The line is approximately 61 years old.
- Removal of this line would violate Dominion’s 700 MW-mile radial line criteria
- This is an immediate need project based on “End of Life” criteria.
- When this criteria violation was identified, the need date was already in the immediate need timeframe.

Alternatives Considered

Given the immediate need timing of the violation, alternatives that would require new lines to be built were not considered.

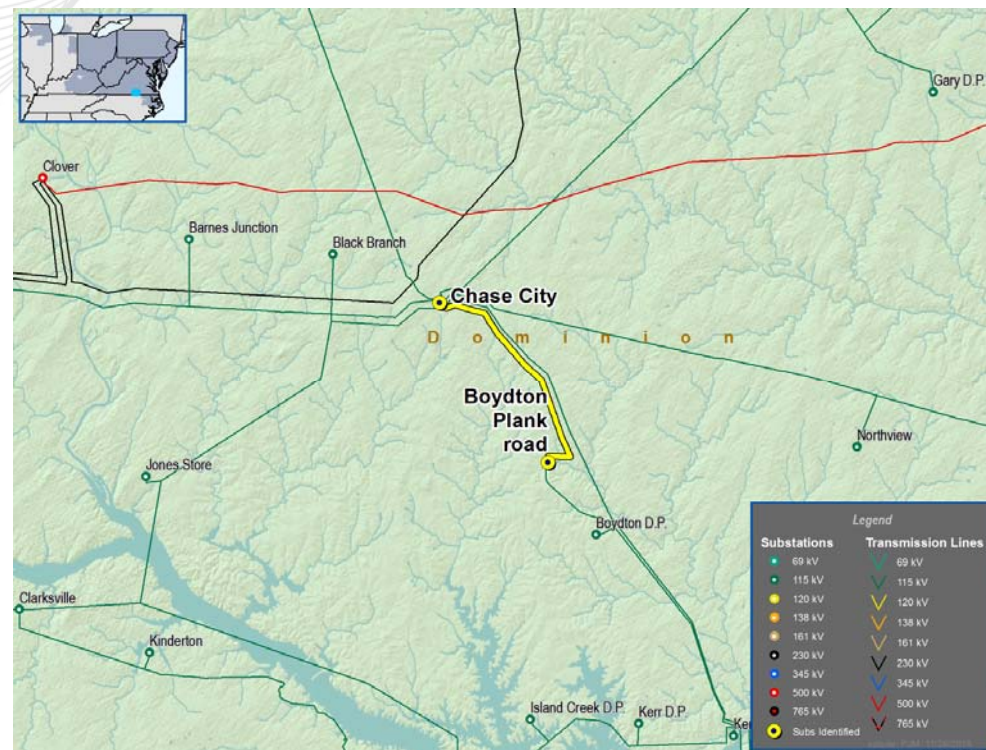
Proposed Immediate Need Solution

Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

- Double circuit structures will be installed as part of project b2746. This project removes Line #171 end-of-life facilities and installs new conductor on the other arms, 9.4 miles, from Chase City to the Boydton Plank Road tap. The conductor used will be at current standards with a summer emergency rating of 393 MVA at 115kV. **(b2802)**

Estimated Project Cost: \$3.5 M

Projected IS Date: 06/30/2019





Dominion Transmission Zone

Problem: DOM Limitation on Direct-Connect Load Violation

- Line #47 (Four Rivers – Fredericksburg) is a 34 mile long 115kV line and serves five delivery points (4 REC and 1 Dominion).
- The Dominion Planning Criteria states that the number of DP's on a transmission line should be limited to four and the Dominion Facility Connection Requirement states that transmission tap lines greater than a mile should be protected by a breaker to improve the reliability of the line.
- This is an immediate need project based on "Limitation on Direct-Connect Load" criteria.
- When this criteria violation was identified, the need date was already in the immediate need timeframe

Alternatives Considered

Given the immediate need timing of the violation, alternatives that would require new lines to be built were not considered.

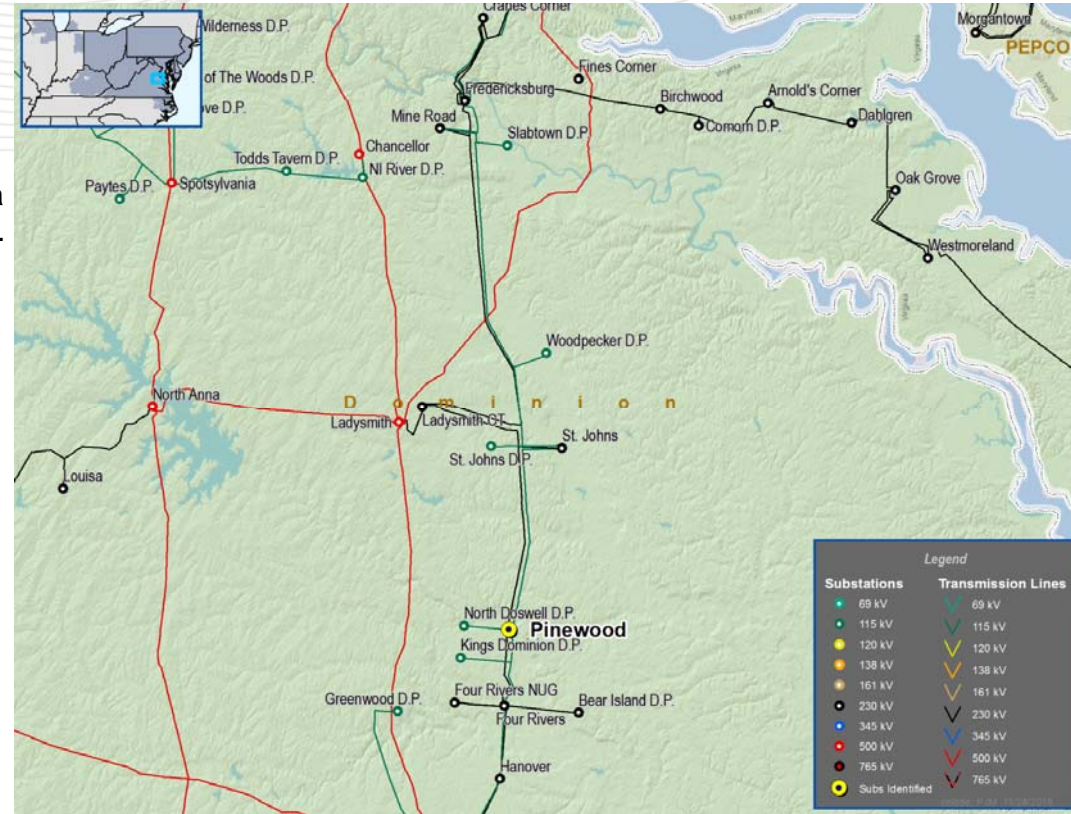
Proposed Immediate Need Solution

Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

- Build a new switching station (Pinewood 115kV Switching Station) at the tap serving North Doswell DP with an 115kV four breaker ring bus (b2815)

Estimated Project Cost: \$ 12.8 M

Projected IS Date: 05/01/2017





Supplemental Upgrades



Dominion Transmission Zone

Existing S0602 Cost Increase

Problem:

- New White Marsh 115kV Delivery Point

Proposed Solution:

- Tap line #89 (Harmony Village to Hayes) and install line switches and associated equipment. (S0602)

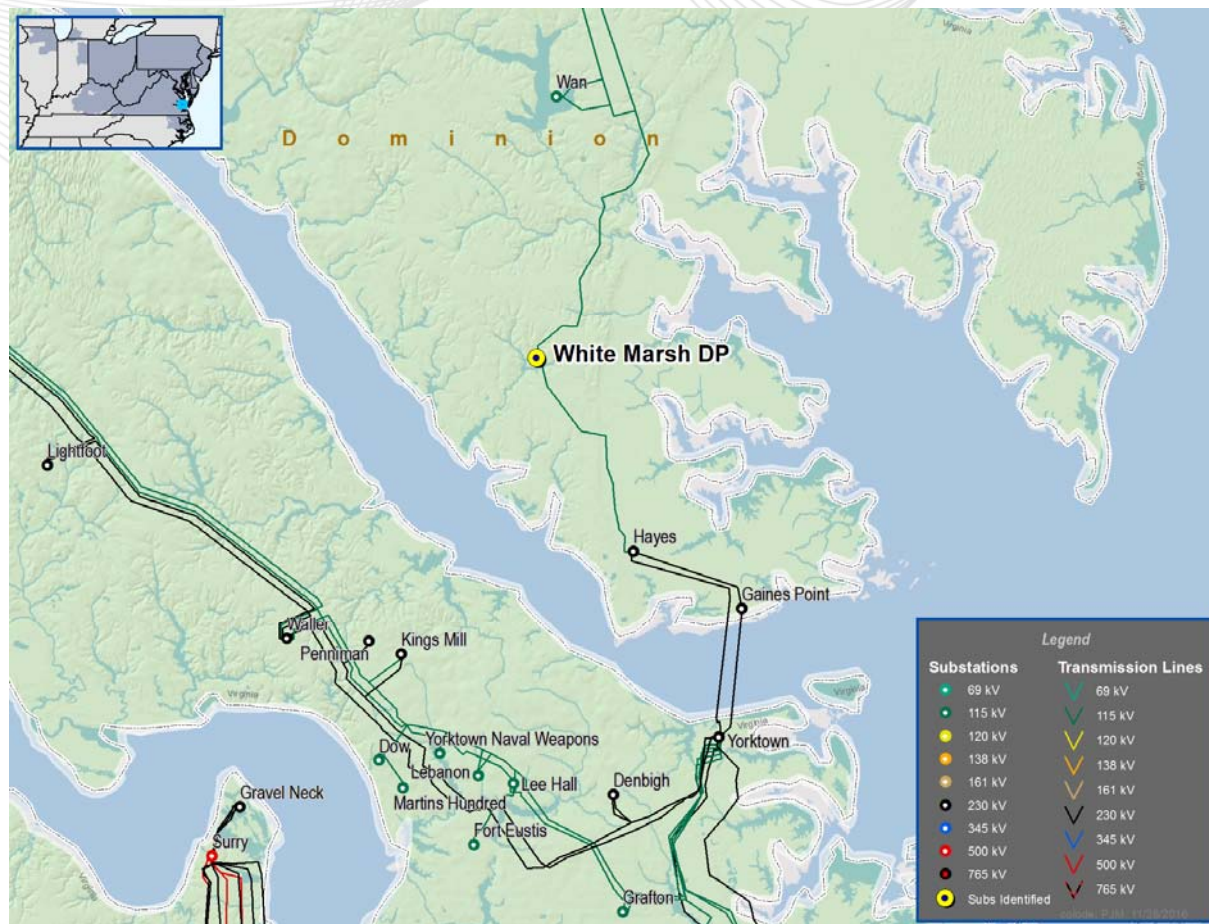
Reason for Cost Increase:

- Increase due to required installation of two steel dead end structures, two steel static poles and one switch structure at site.

Previous Estimated Project Cost: \$400 K

Revised Estimated Project Cost : \$1.7 M

Projected IS Date: 05/01/2017





Dominion Transmission Zone

Existing S0920 Cost Increase

Problem:

- 115 kV Line #90 (Carolina – Kerr Dam) has a 4.5 mile long radial tap that serves Beechwood DP. The need to remove this long tap exposure from the main line was identified to improve overall reliability. Line #90 is a 39 mile long 115kV line, also serving Five Forks DP, Littleton DP and Lake Gaston.

Solution:

- Build a new switching station (Palmer Springs) at the tap serving Beechwood DP with a 115kV three breaker ring to split Line #90 and terminate the end points. Terminate the Beechwood DP tap into the ring. **(S0920)**

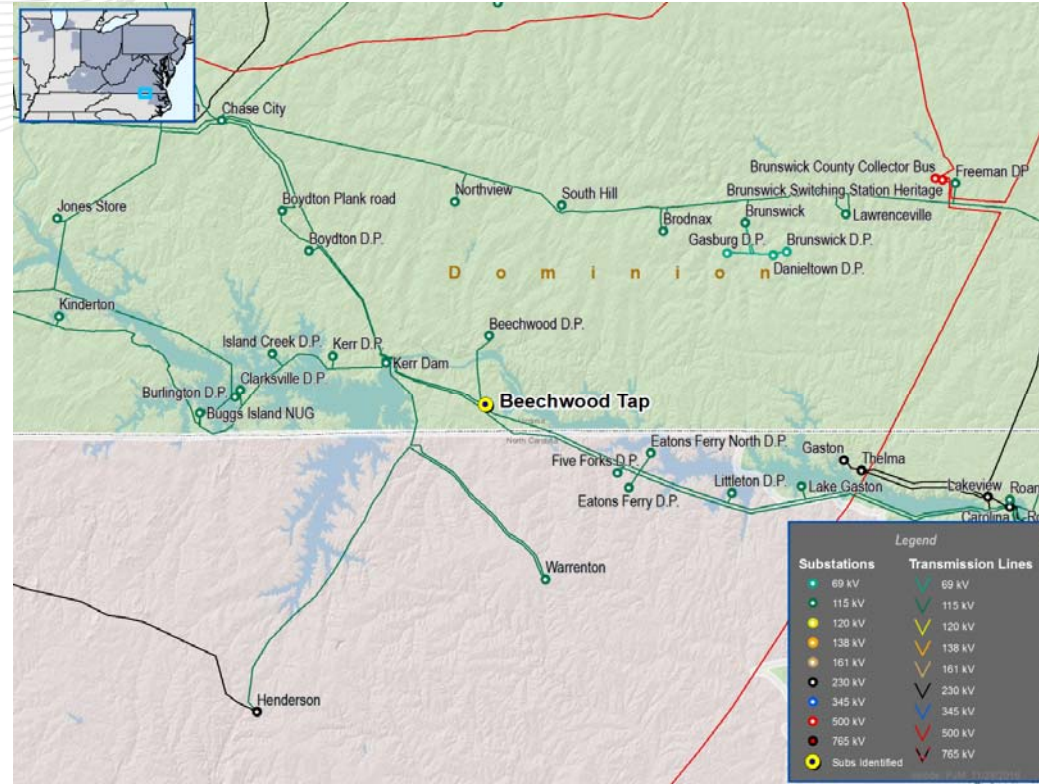
Reason for Cost Increase:

- Added cost for transmission line rearrangement which includes 3 backbones and modification of an existing structure for the new switching station.

Previous Estimated Project Cost: \$5.9 M

Revised Estimated Project Cost: \$7.4 M

Projected IS Date: 12/31/2017





Dominion Transmission Zone

Existing S0610 Cost Increase

Problem:

- Transferring 6 MW from Halifax DP to new Darlington DP for reliability and anticipated industrial park development (no new load initially). Projected load 15 MW by 2024.

Solution:

- Install 2 switches on Line 81 and provide 115kV tap for new 115kV DP.

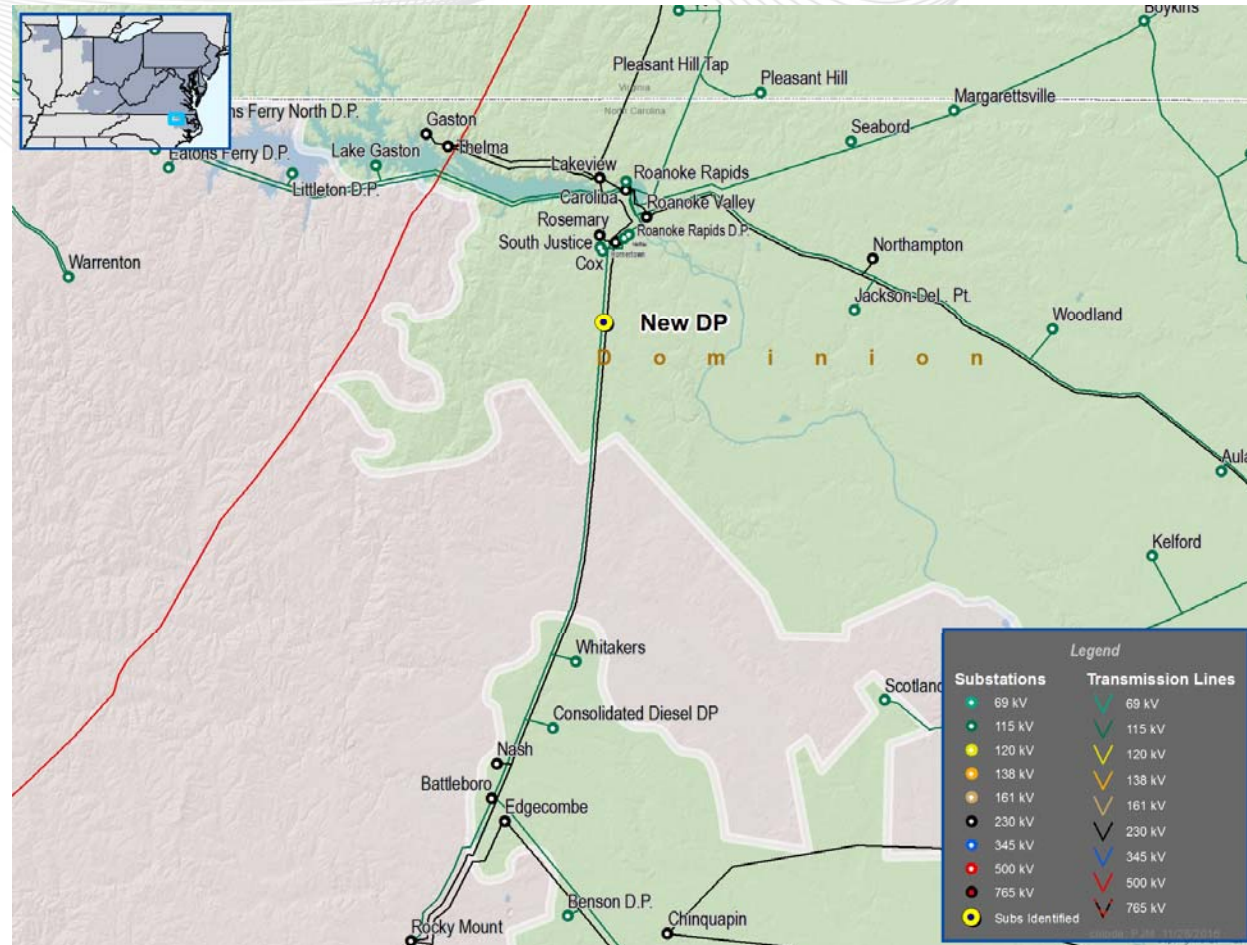
Reason for Cost Increase:

- Modification to the scope of work and timing of the Delivery Point
- Detailed estimated versus ballpark
- Retirement of Halifax DP switches

Previous Estimated Project Cost: \$ 0.6 M

Revised Estimated Project Cost: \$ 2.0 M

Projected IS Date: 01/01/2017





Dominion Transmission Zone

Problem:

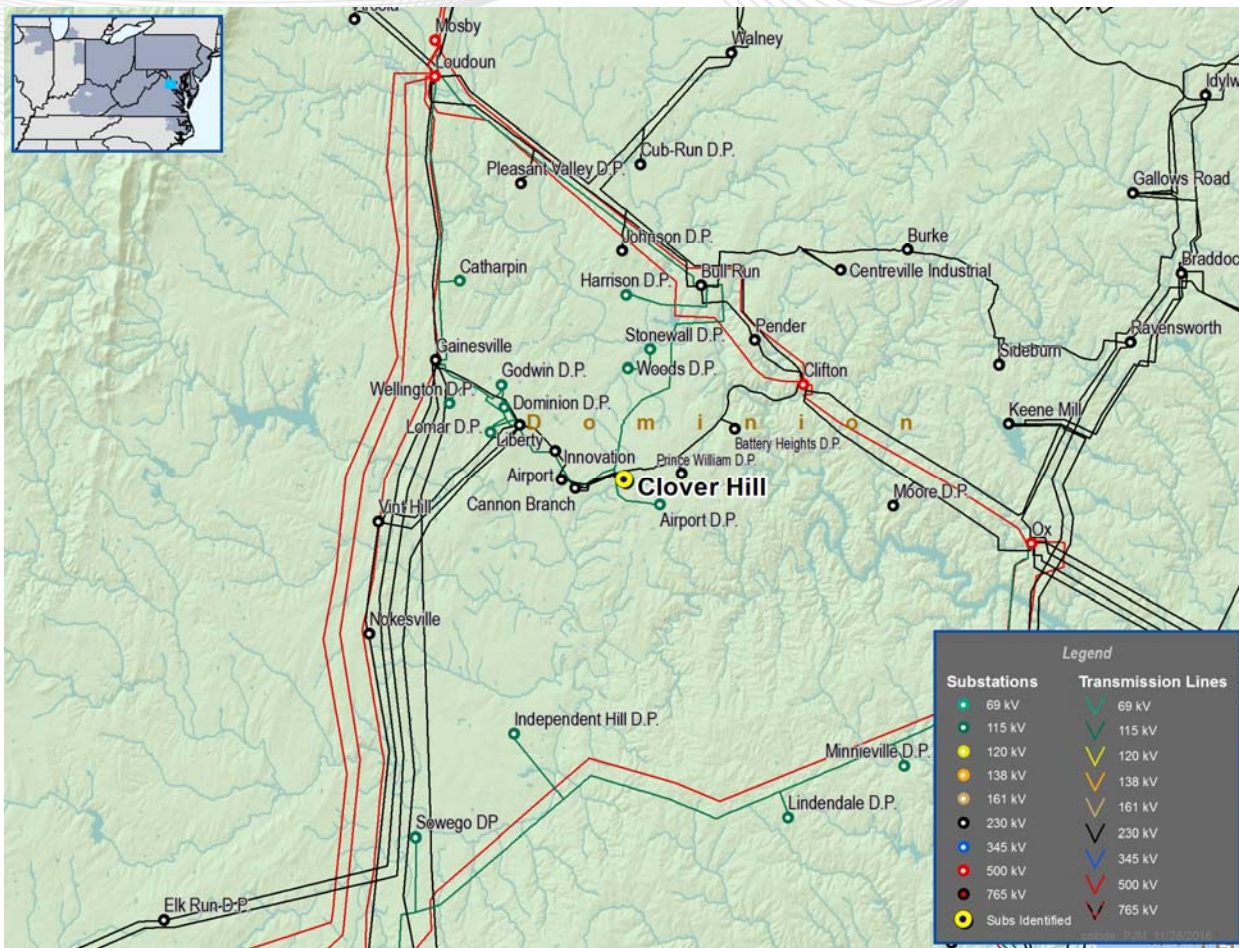
- Dominion Distribution is installing a 2nd 84 MVA 230-34.5kV transformer at Clover Hill to serve growing data center load.

Potential Solution:

- Install a 230kV circuit switcher, high side switches and necessary bus work for the new transformer and additional high side switches for future transformers from same bus. (**\$1237**)

Estimated Project Cost: \$1.3 M

Possible IS Date: 11/15/2017





Dominion Transmission Zone

Problem:

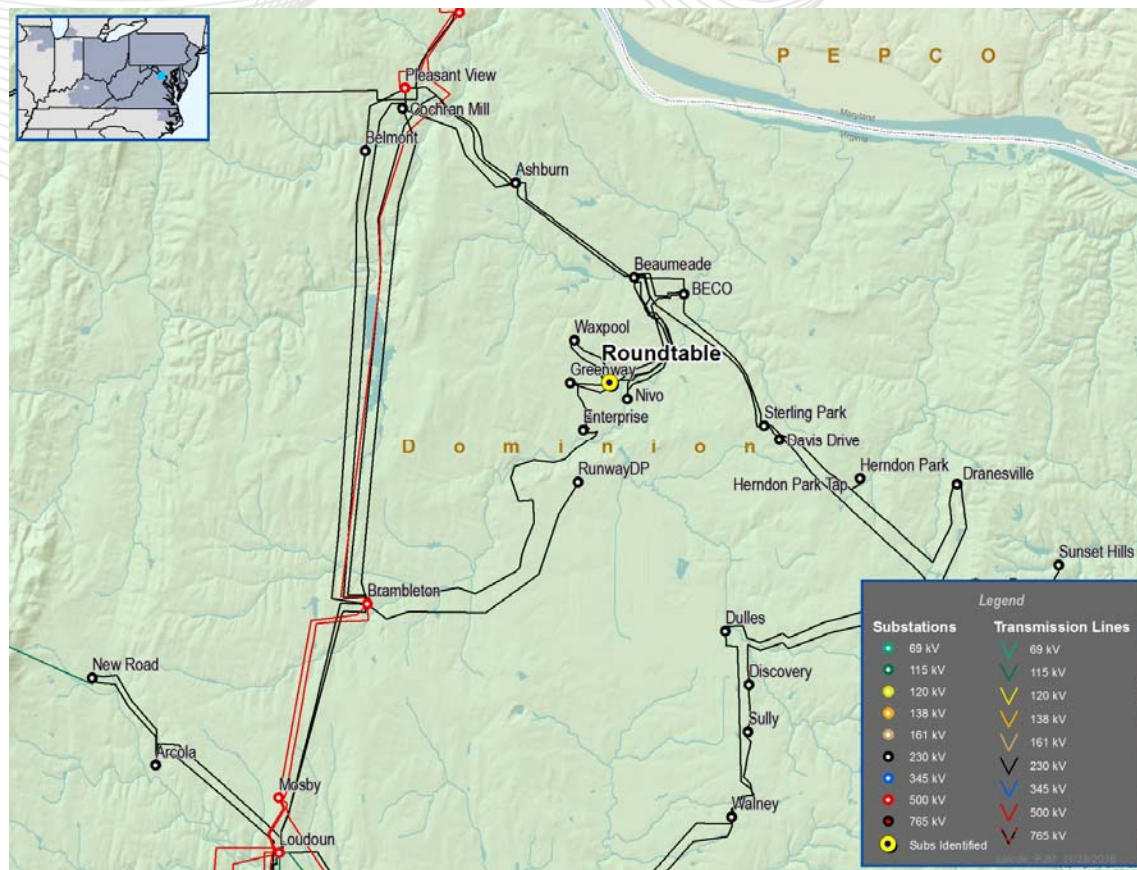
- Dominion Distribution has submitted a DP Request for a new substation to accommodate a new datacenter campus in Ashburn.
- Initial installation will include two 84 MVA 230-34.5 kV transformers with an ultimate capacity of four 84 MVA units.

Potential Solution:

- Interconnect the new substation by cutting and extending both Line #2149 (Enterprise-Waxpool) and Line #2137 (Brambleton-BECO) into and out of the proposed Roundtable Substation. Terminate the lines into a six-breaker 230kV ring bus. Install a 230kV circuit switcher, high side switches and necessary bus work for the new transformers and additional high side switches for future transformers from same bus. (**S1238**)

Estimated Project Cost: \$7.5 M

Possible IS Date: 09/01/2018





Dominion Transmission Zone

Problem:

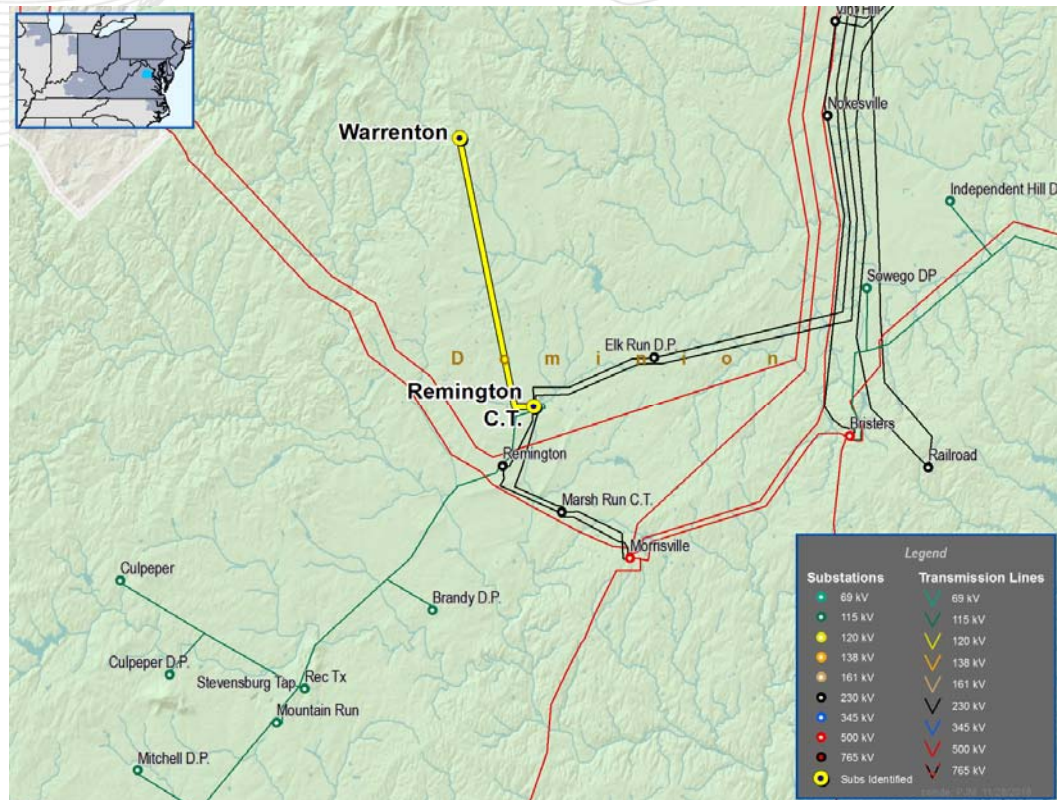
- Dominion Distribution has acquired land along Line #2086 (Remington CT-Warrenton) and submitted a DP Request for a future substation to accommodate projected load growth in southern Fauquier County.
- Line #2086 is being wrecked-and-rebuilt in 2018 from a single-circuit radial to a double-circuit networked configuration under PJM baseline upgrade project b2461.

Potential Solution:

- Coordinate the Line #2086 design of double-circuit structure placements (including line switches and attachments) to accommodate the future Opal tap. This work will be done in 2018. (S1239)

Estimated Project Cost: \$750 K

Possible IS Date: 05/31/2021



- Revision History
 - V1 - Original version posted to PJM.com – 11/28/2016
 - V2 – Updated slide 6 to reference Scotland Neck to South Justice Branch (not Pantego to Trowbridge)
 - Slide 10 - Included language that references project b2746 and the installation of double circuit structures. Remove reference to N-1-1 NERC violation
 - Slide 15 – Previous estimated cost revised as per 3/9/15 subregional