



Reliability Analysis Update

Transmission Expansion Advisory
Committee

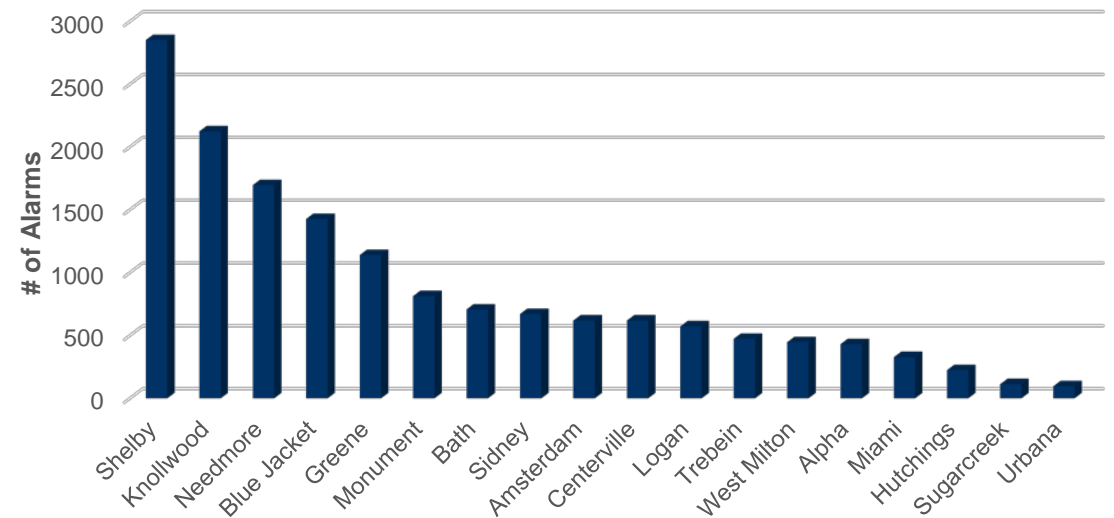
March 07, 2019

- The following definitions explain the basis for excluding flowgates and/or projects from the competitive planning process and designating projects to the incumbent Transmission Owner.
- Flowgates/projects excluded from competition will include the underlined language on the corresponding slide.
 - Immediate Need Exclusion: Due to the immediate need of the violation (3 years or less), the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity - Operating Agreement, Schedule 6 § 1.5.8(m)
 - Below 200kV Exclusion: Due to the lower voltage level of the identified violation(s), the driver(s) for this project are excluded from the competitive proposal window process. As a result, the local Transmission Owner will be the Designated Entity - Operating Agreement, Schedule 6 § 1.5.8(n)
 - FERC 715 (TO Criteria) Exclusion: Due to the violation need of this project resulting solely from FERC 715 TO Reliability Criteria, the driver(s) for this project are excluded from the competitive proposal window process. As a result, the local Transmission Owner will be the Designated Entity - Operating Agreement, Schedule 6 § 1.5.8(o)
 - Substation Equipment Exclusion: Due to identification of the limiting element(s) as substation equipment, the driver(s) for this project are excluded from the competitive proposal window process. As a result, the local Transmission Owner will be the Designated Entity - Operating Agreement, Schedule 6 § 1.5.8(p)

Dayton High Voltage Issues During Light Load

- **Excessive Amount of High Voltage Alarms for Dayton**
 - Approximately 19,000 operational alarms logged in 2017-2018 (including 327 alarms at 345kV buses).
 - Logged more High Voltage Alarms in 2018 with fewer Minimum Load Hours in comparison to 2017.
 - High Voltage Alarm to Minimum Load Hour Ratio Almost Doubled from 2017 to 2018.
- **Limited Means to Control High Voltage**
 - Total loss of ~ 600MVAR of reactive absorption capability in the Dayton Zone Killen & Stuart Retirements (2018) + Hutchings Retirements (2015)
 - After exhausting all typical operating procedures, Dayton is frequently forced to switch out equipment to avoid long-term damage from high voltage exposure. This practice of switching out equipment is not a sustainable operating practice and does not effectively solve the high voltage issues.
 - As a result of retirements, there are only Peaking Plants Left in Zone
 - No existing or planned SVC's, Statcoms, Reactors, etc.

Alarms by 138kV Substation 1/2017 -12/2018



- PJM planners worked closely with Dayton planners to determine what operational and planning changes area available
 - Reviewed EMS snapshots of high voltage conditions to confirm issues
 - Examined impact of planned, approved reactive upgrades
- Outcome of the investigation resulted in the proposed addition of three new 100 MVAR 138 kV reactors on the Dayton system with a 12/31/2021 projected in-service date
- Immediate Need exclusion
- Recommended Solution:
 - **B3108.1:** Install 100 MVAR reactor at Miami 138 kV substation (\$5M)
 - **B3108.2:** Install 100 MVAR reactor at Sugarcreek 138 kV substation (\$5M)
 - **B3108.3:** Install 100 MVAR reactor at Hutchings 138 kV substation (\$5M)



2019 RTEP Analysis Update

- 2019 RTEP case build updates
- PJM continues to exercise cases
- Finalizing modeling assumptions

Dominion End of Life Criteria



Dominion Transmission Zone: Baseline Line #2008 Partial Rebuild, Line #265 Cut-In & Line #156 Retirement

Baseline Reliability: TO Criteria Violation (FERC 715 (TO Criteria) Exclusion)

Problem Statement: Dominion “End of Life Criteria”

A 4.4 mile long section of 230kV Line #2008 between Loudoun to Dulles Junction was constructed on Cor-ten lattice-type double circuit towers. A 4.4 mile long section of 115kV Line #156 between Loudoun to Dulles Junction is on the same structures as Line #2008. These towers have been shown to have inherent corrosion problems that continuously deteriorate the steel members. These lines have been identified to be rebuilt or retired as part of Dominion’s End of Life criteria.

Line #2008 is part of the network feed to Dulles Substation. Removing a section of this line would cause over 241 MWs of load including the whole Dulles Substation to be on radial. Additionally, a failed breaker contingency at Reston Substation would lead to over 311 MW of load to be dropped.

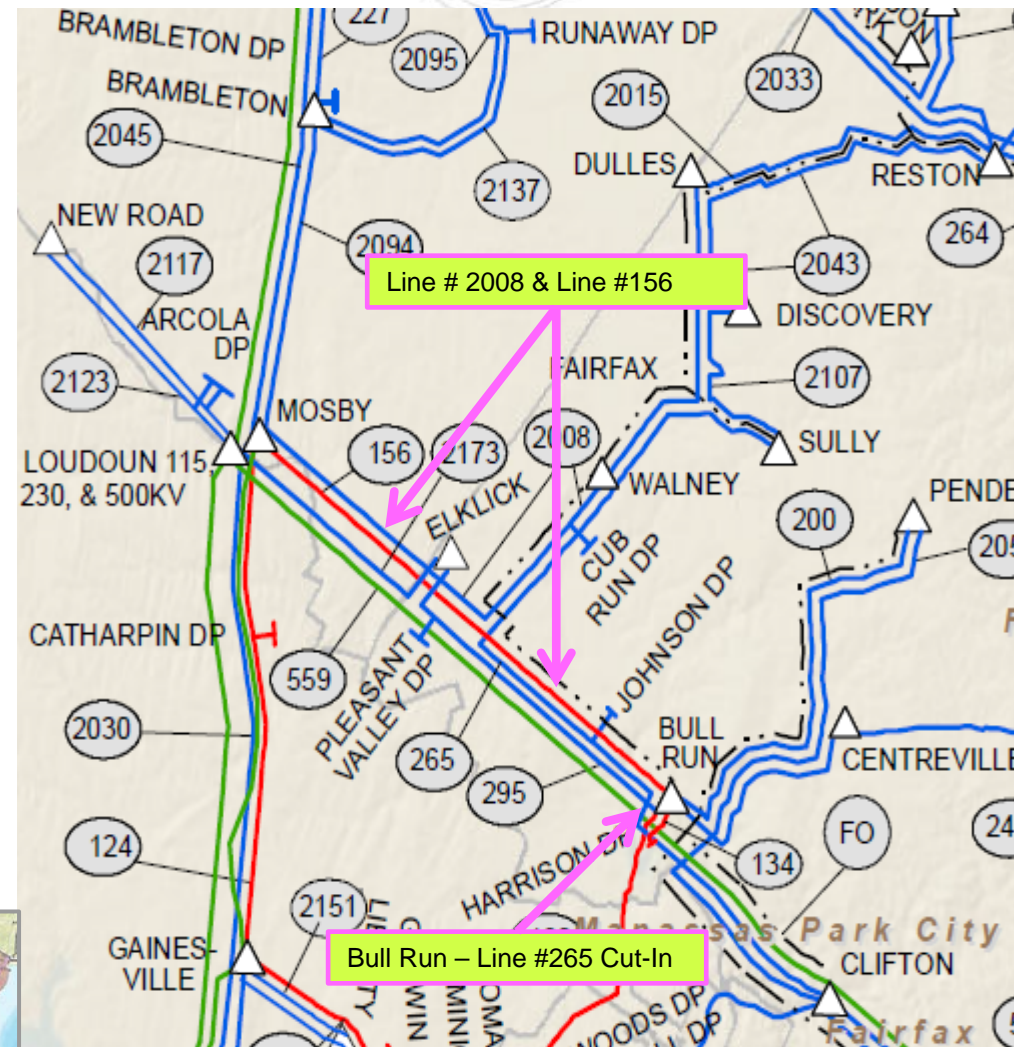
Line #2008 section needs to be rebuilt in order to avoid the above mentioned scenarios and to meet Dominion’s Transmission Planning Criteria.

Recommended Solution:

Rebuild Line #2008 between Loudoun to Dulles Junction using single circuit conductor at current 230kV northern Virginia standards with minimum summer ratings of 1200 MVA.

Continued on next slide...

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





Dominion Transmission Zone: Baseline Line #2008 Partial Rebuild, Line #265 Cut-In & Line #156 Retirement

Recommended Solution: (Continued):

Line #156 from Loudoun to Bull Run (8.44 miles) will be retired. In order to avoid a thermal violation for an N-1-1 contingency, cut and loop 230kV 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.

Line #2008 will share the same structures as existing Line #2173 which is currently on double circuit structures currently with an empty arm. The structures currently carrying Line #2008 and Line #156 will be retired and removed. Two 230/115kV transformers and a 115kV capbank at Loudoun Substation and a 115kV capbank at Bull Run Substation will also be removed. Additionally, a 230kV line switch from existing Line #295 in Bull Run Substation will also be removed. **(b3110)**

Alternative:

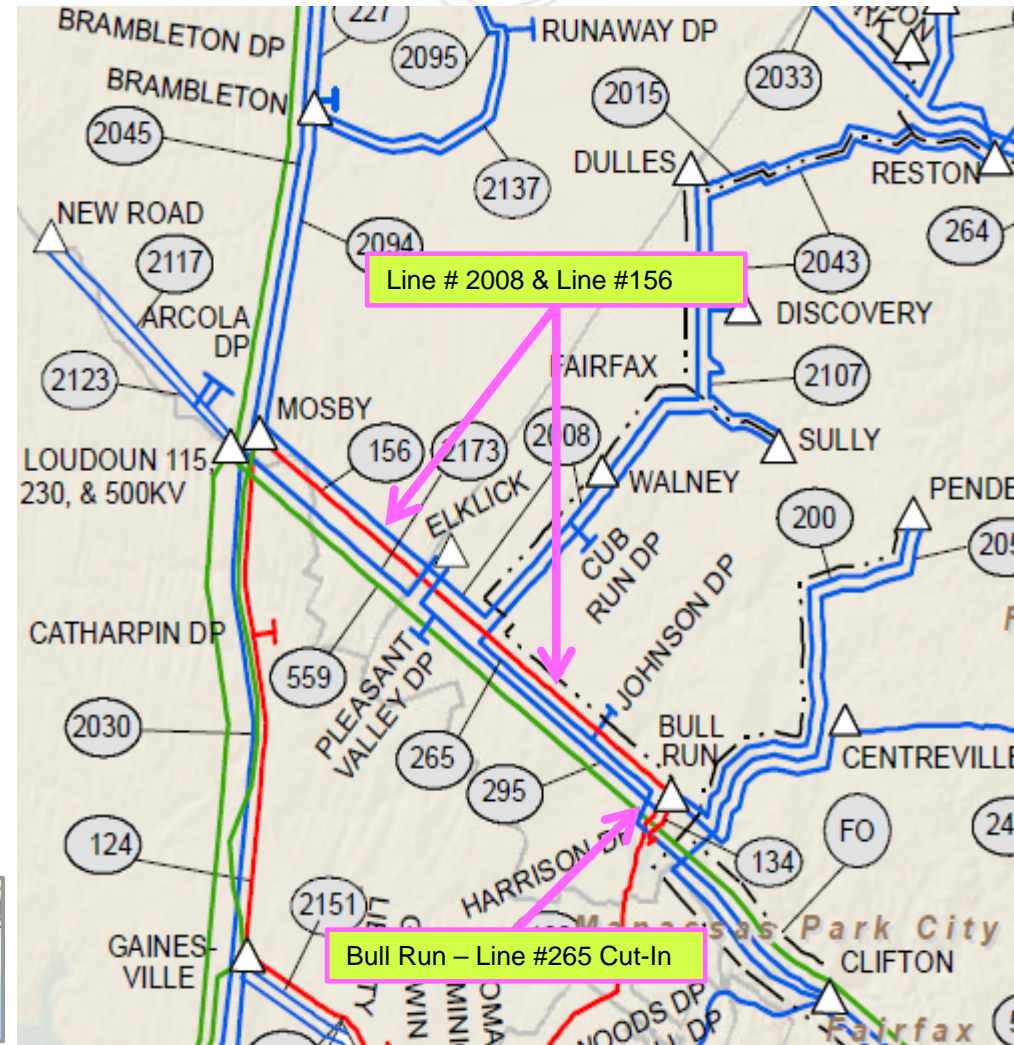
Rebuild partial Line #2008 and Line #156 between Loudoun to Dulles Junction with double circuit steel structures using double circuit conductors at current 230kV northern Virginia standards with minimum summer emergency ratings of 1200 MVA. Operate Line #156 at 115kV. Estimated cost: \$16 M

Estimated Project Cost: \$14 M

Projected In-service Date: 12/31/2023

Project Status: Conceptual

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Dominion Transmission Zone: Baseline Project

Date Project Last Presented: 03/09/2017 TEAC

Problem Statement: Short Circuit

- Seven of the Mt. Storm 500kV breakers are overstressed

Immediate Need:

- 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.

Alternatives Considered:

- Due to the immediate need of the project no alternatives were considered.

Recommended Solution:

- Recertify four Mt. Storm 500kV breakers with 50kA nameplate; 57272, G3TSX1, SX172, Y72 (b2842, b2845, b2846, b2847)
- **Cancel three Mt. Storm 500kV breaker upgrades; G2TY, G2TZ, Z72 (b2843, b2844, b2848)**

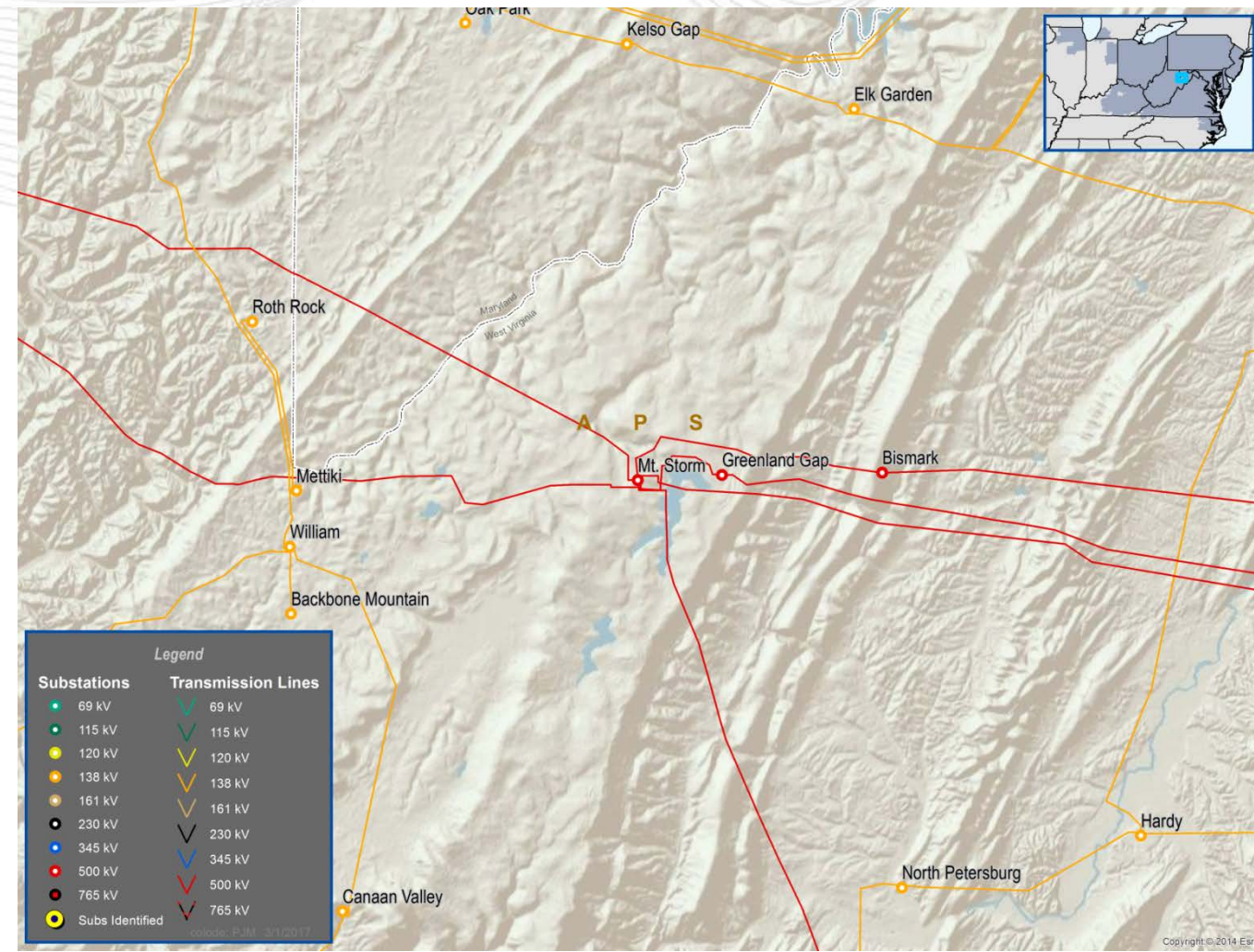
Original Project Cost: \$2.708 M (total)

Revised Project Cost: \$0.008 M (total)

Required IS Date: June 1, 2019

Project Status: Engineering / **Cancelled**

Reason Cancelled: Breaker manufacturer has indicated these three existing breakers are capable of 44kA. Overduty condition is mitigated.



- Continue testing case
- Target to provide preliminary analysis for stakeholder review in late April
- Targeting June for final results

Questions?



2019

- TEAC meetings are the following Thursdays in 2019
- **1/10, 2/7, 3/7, 4/11, 5/16, 6/13, 7/11, 8/8, 9/12, 10/17, 11/14, 12/12.**

- V1 – 02/28/2019 – Original Slides Posted
- V2 – 03/07/2019 – Updated the title to slides 9 & 10 to reflect Line #265.