

Sub Regional RTEP Committee - Southern

August 19, 2011

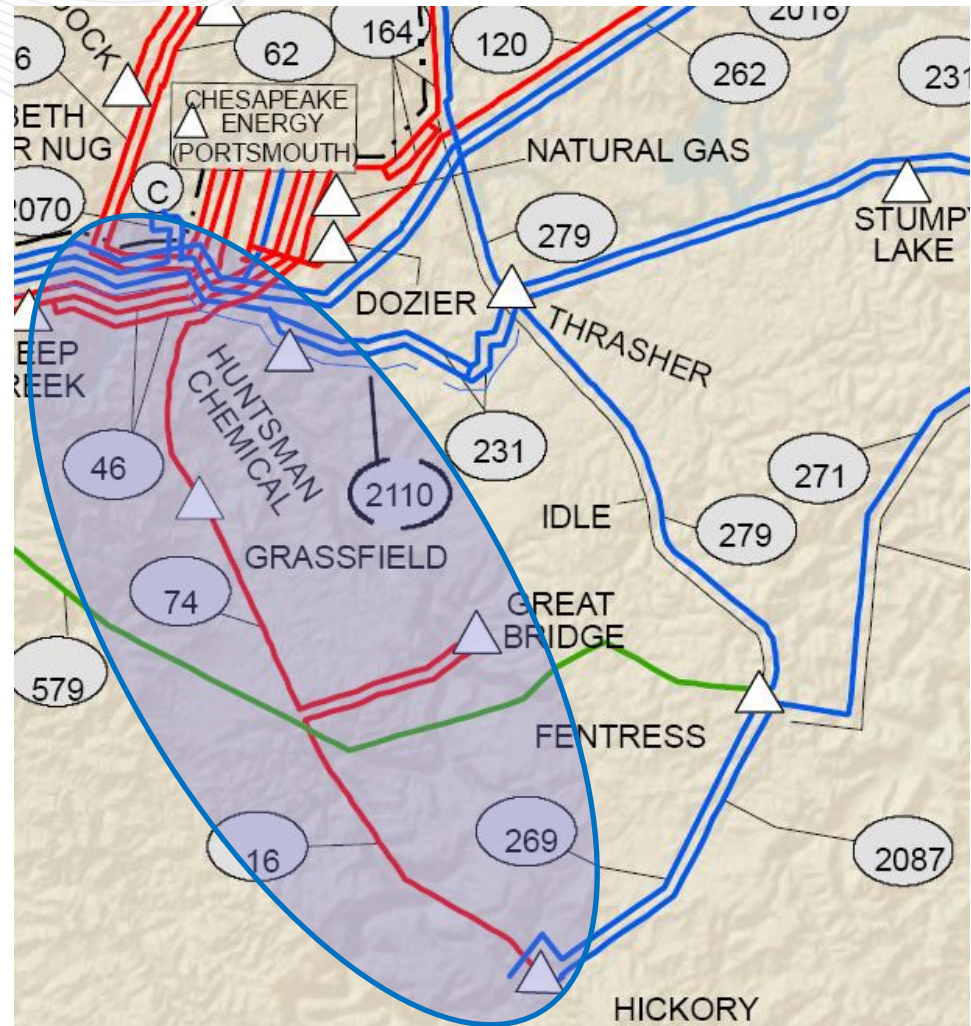
- 2010 – 2015 Project Updates
- 2016 Analysis
 - NERC Category A, B
 - NERC Category C (N-1-1 in progress)
 - Load Deliverability
 - Generator Deliverability



Summer 2013

Region with thermal issues

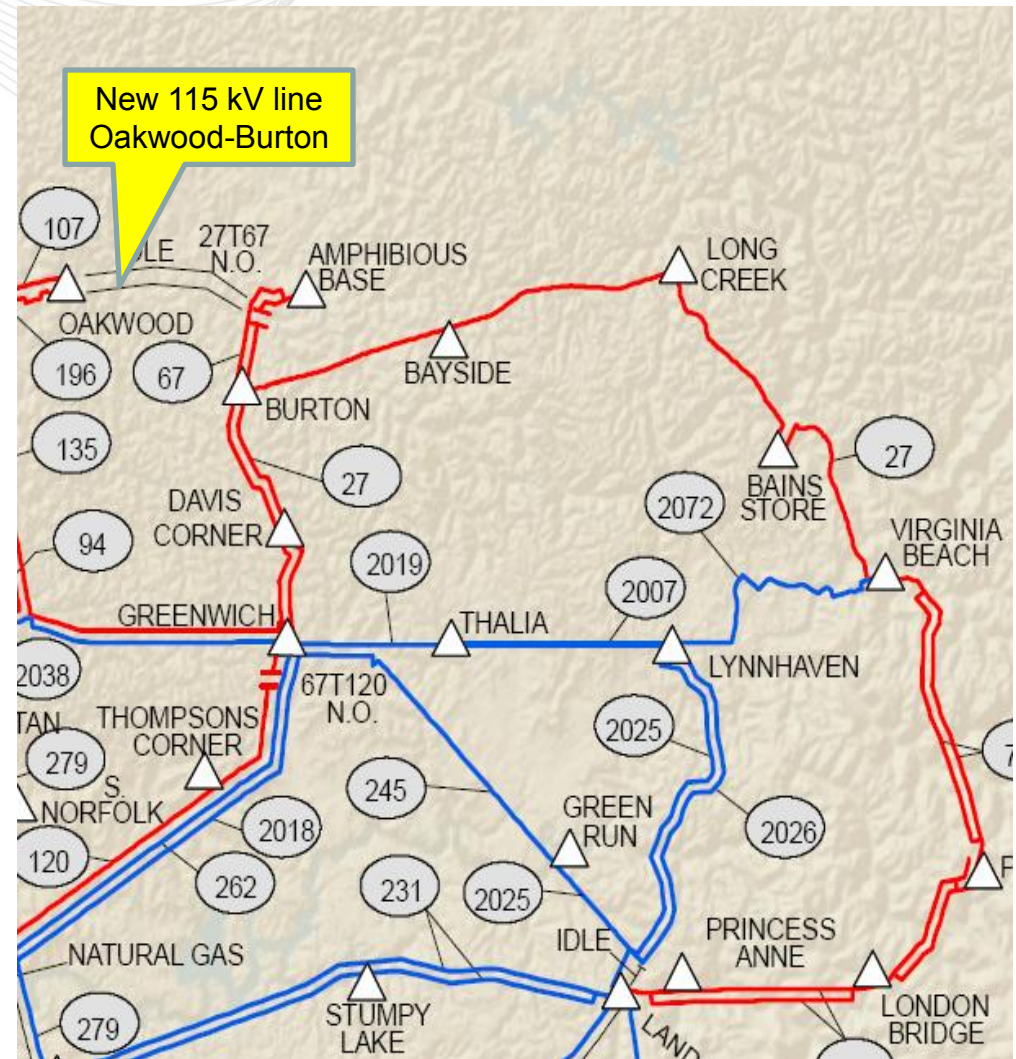
- NERC Category B Violations
- Problem:
 - For the loss of 115kV line #74 at Chesapeake, the Great Bridge switch 16T74 will be closed to restore service to line #74. The Hickory 230/115 kV autotransformer is overloaded for this condition.
 - For the loss of the Hickory 230/115 kV autotransformer, the Great Bridge switch 16T74 will be closed to restore service to line #16. 115 kV line #74 is overloaded for this condition.
- Proposed Solution:
 - Move Hickory loads off the 115 kV system by replacing the 115/34.5 kV transformer #1 at Hickory with a 230/34.5 kV transformer.
- Estimated Project Cost: \$ 0.75 M
- Expected IS Date: 6/1/2013





Summer 2014

- NERC Category B
- Problem A: For the N-1 loss of line #27 (Greenwich 115 kV to Davis Corner 115 kV) the loading on line #27 (Virginia Beach 115 kV to Bains Store 115 kV) exceeds its emergency rating.
- Problem B: For the tower line outage of both line #27 and line #67 at Greenwich 115 kV, line #27 cannot pick up all of the loads on line #67 (about 167 MVA in summer 2014)
- Potential Solutions:
 - Option A: Add 4 breaker ring bus at Burton 115 kV substation. Construct a 115 kV line approximately 3.5 miles from Oakwood 115 kV substation to Burton 115 kV substation
 - Option B: Rebuild Line #27 from Virginia Beach to Bains Store
 - Option C: Open Line #27 into two radials



Solution Evaluation:

	Estimated Project Cost	Right of Way	Does solution resolve criteria violations?	
			A	B
Solutions Considered:				
Option A: Burton 115 KV Ring Bus and 115 kV Line	\$ 4.3-13 M	Existing	Yes	Yes
Option B: Rebuild Line #27 between Va Beach and Bains Store	\$ 13-27 M	Existing	Yes	Yes
Option C: Open Line 327(create two radials)	----	Existing	Yes	No

Recommended Solution:

Option A - Add 4 breaker ring bus at Burton 115 kV substation. Construct a 115 kV line approximately 3.5 miles from Oakwood 115 kV substation to Burton 115 kV substation

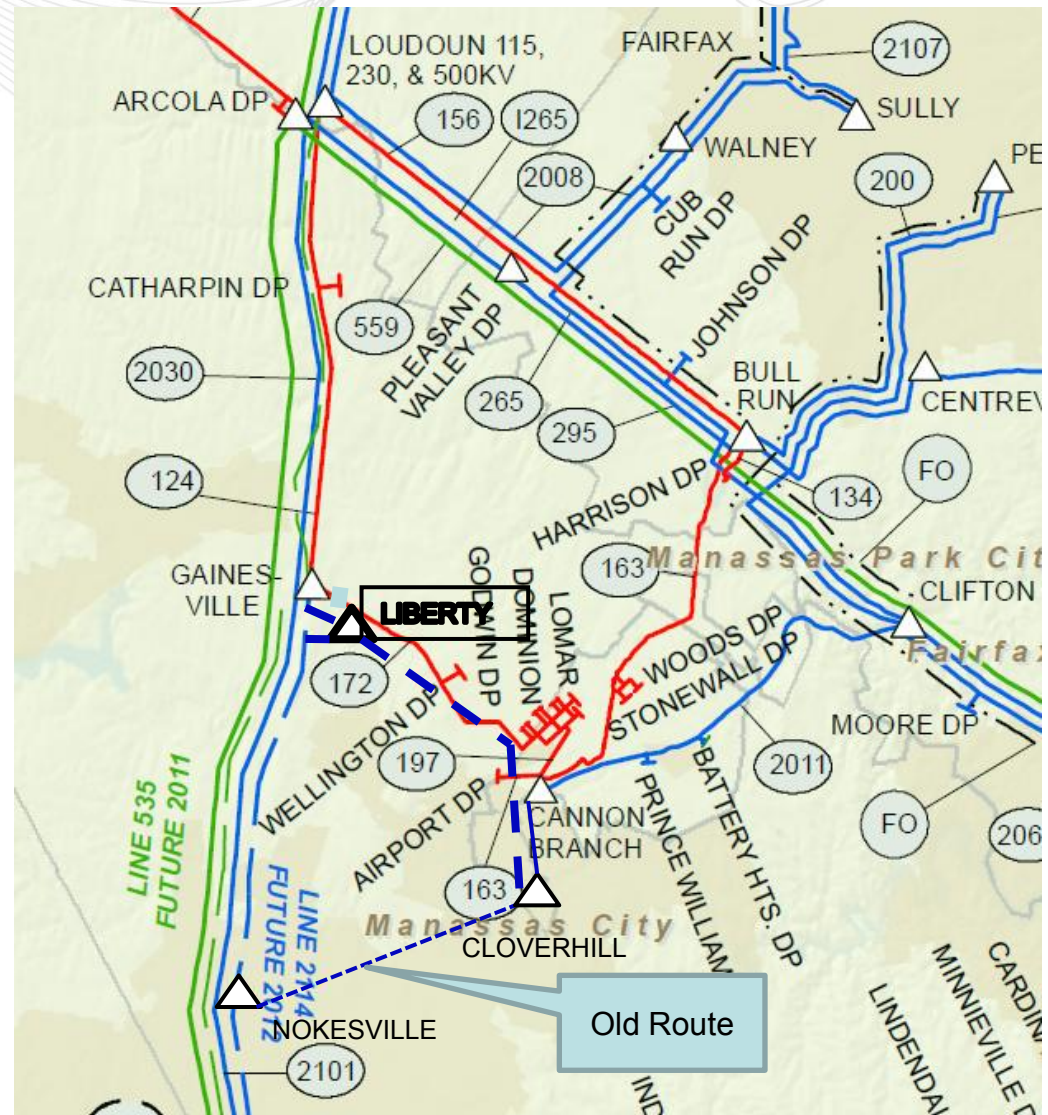
Expected IS Date: 6/1/2014



Summer 2015

NERC Category B&C

- **Update to existing PJM baseline upgrade B1332 - Cannon Branch to Cloverhill to Nokesville 230 kV**
- Routing issues are requiring a re-route of the proposed line.
- Terminal point for new 230kV line changed from Nokesville to new Liberty Substation to maximize utilization of existing ROW.
- Construct a 230kV line approximately 5.75 miles along existing right-of-way from Cloverhill Substation to Liberty Substation.
- Line #2101 will be looped in and out of the new Liberty Substation along existing right-of-way and a new 230/115 kV Tx will be installed.
- The section of 115 kV line between Gainesville and Liberty will be removed.
- Revised Proposed Solution - Build Cannon Branch to Cloverhill to Liberty 230 kV Line
- Estimated Project Cost: \$44 M (\$4 M increase)
- Expected IS Date: 6/1/2015



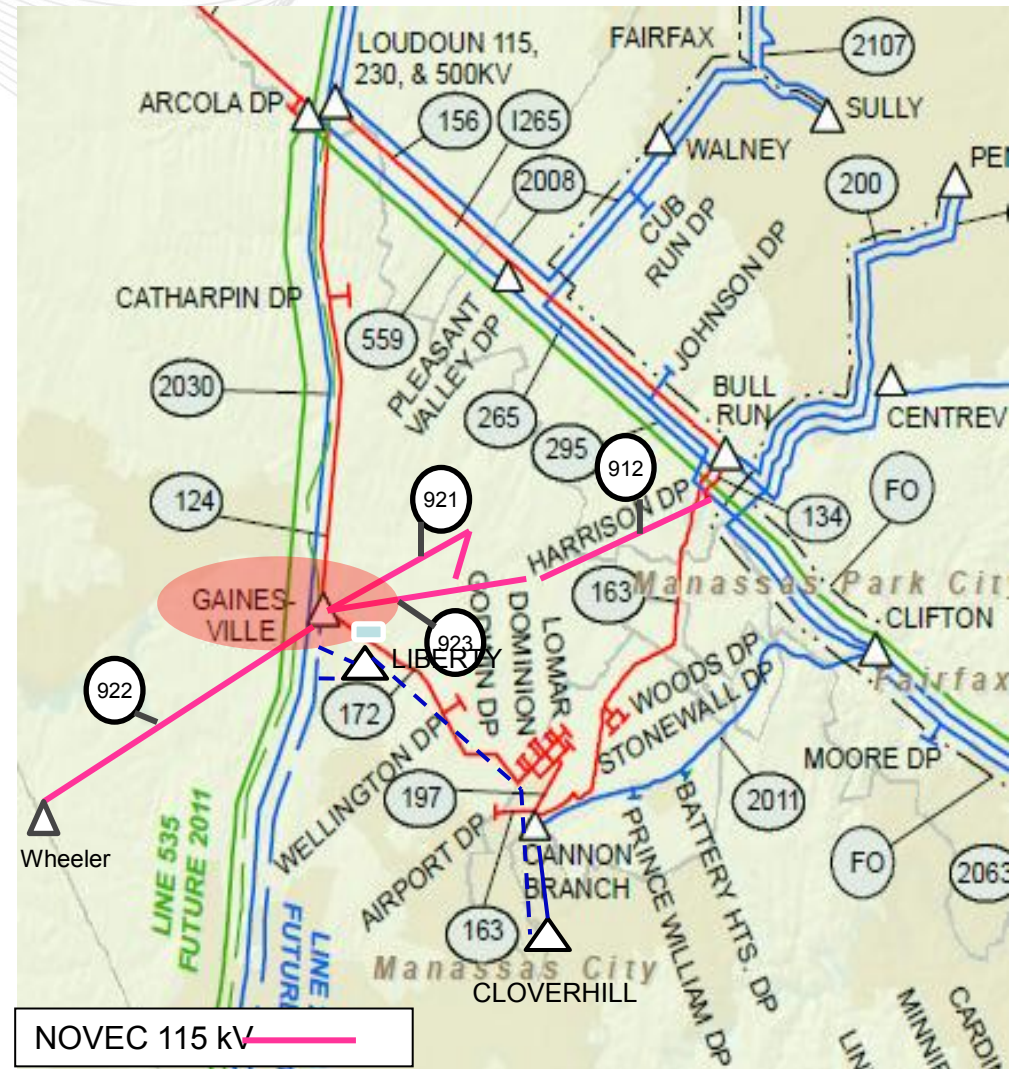


Summer 2016

- No PATH or MAPP
- Warren Generation Addition
 - (Queues V2-03, V4-018 & W2-030 Total 1340 MW)
- DVP Analysis includes all announced generation retirements per Virginia and North Carolina Integrated Resource Plan

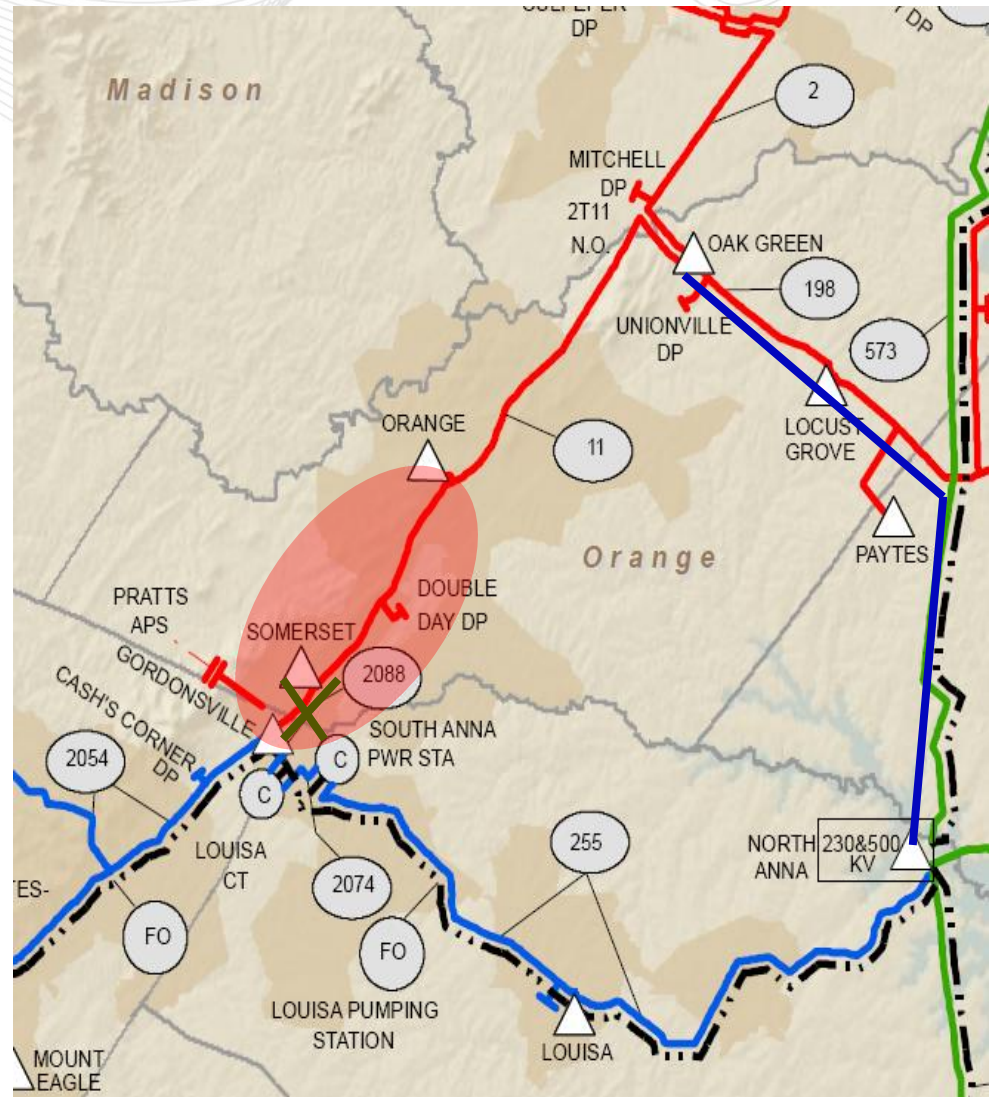
Region with thermal issues

- NERC Category B Violations
- Problem: The 2016 summer base case indicates the following deficiencies:
- Block load addition is adding 90-110 MW
 - An outage of Line #124(Gainesville – Loudoun) overloads the Gainesville 230/115 kV Transformer #3 (This feeds NoVEC circuits #921 & #923)
 - An outage of Line #2030(Gainesville – Loudoun) overloads the Gainesville 230/115 kV Transformer #3.
- Proposed Solution:
 - Install a 230/115 kV Transformer at a new Liberty Substation in the area
- Estimated Project Cost: \$4.3 M
- Expected IS Date: 6/1/2016



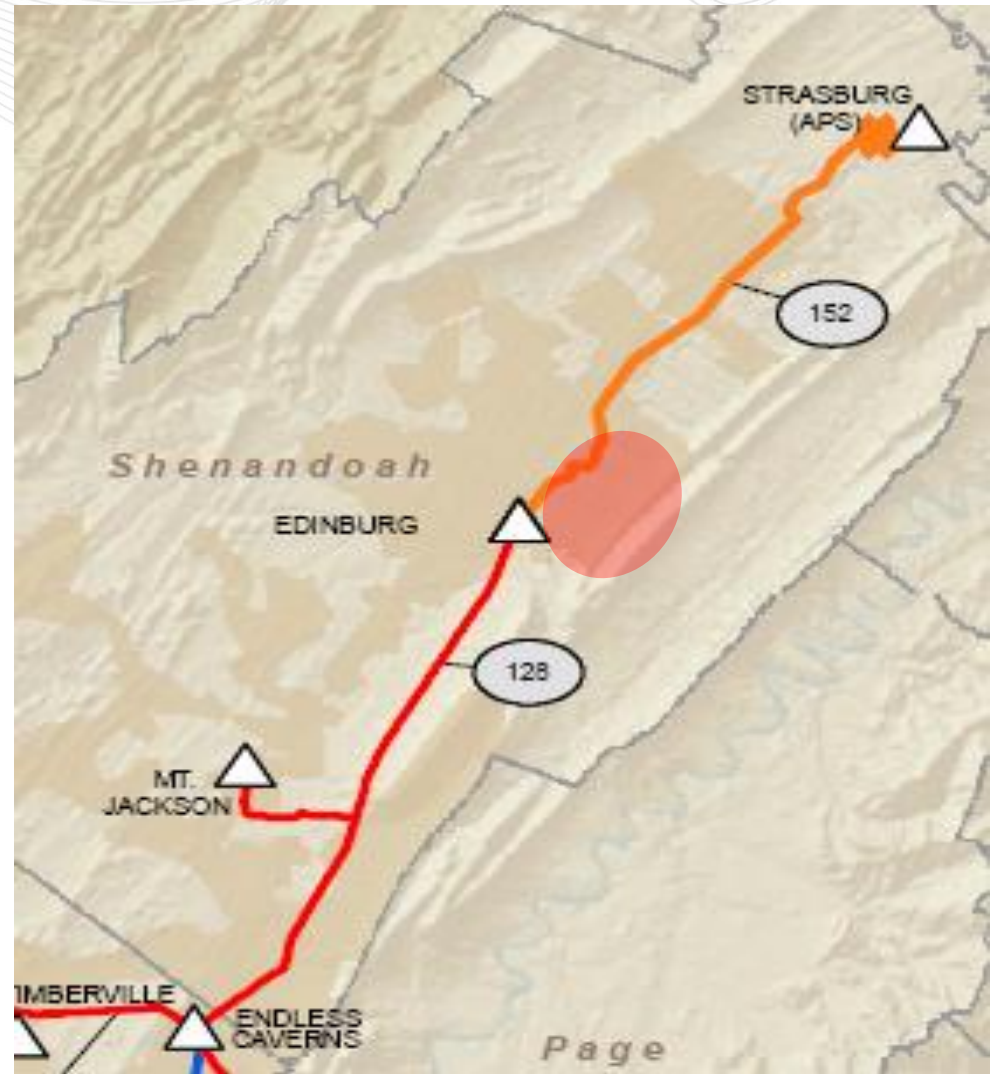
Region with thermal issues

- NERC Category B Violations
- Problem: The 2016 summer base case indicates the following deficiencies:
 - An outage of Line #255(North Anna – Louisa) overloads Line #11 (Gordonsville-Orange) by 10%
 - An outage of Line #255(North Anna – Louisa) overloads Line #11 (Gordonsville-Orange) by 17% (No Warren)
- Potential Solution –
 - Wreck and rebuild Line #11 (Gordonsville-Orange) for higher capacity (230 kV Construction)
 - Convert Paytes Substation to 230 kV new North Anna to Oak Green 230 kV Line
 - Build a second Gordonsville to North Anna 230 kV Line
- Potential IS Date May 2016



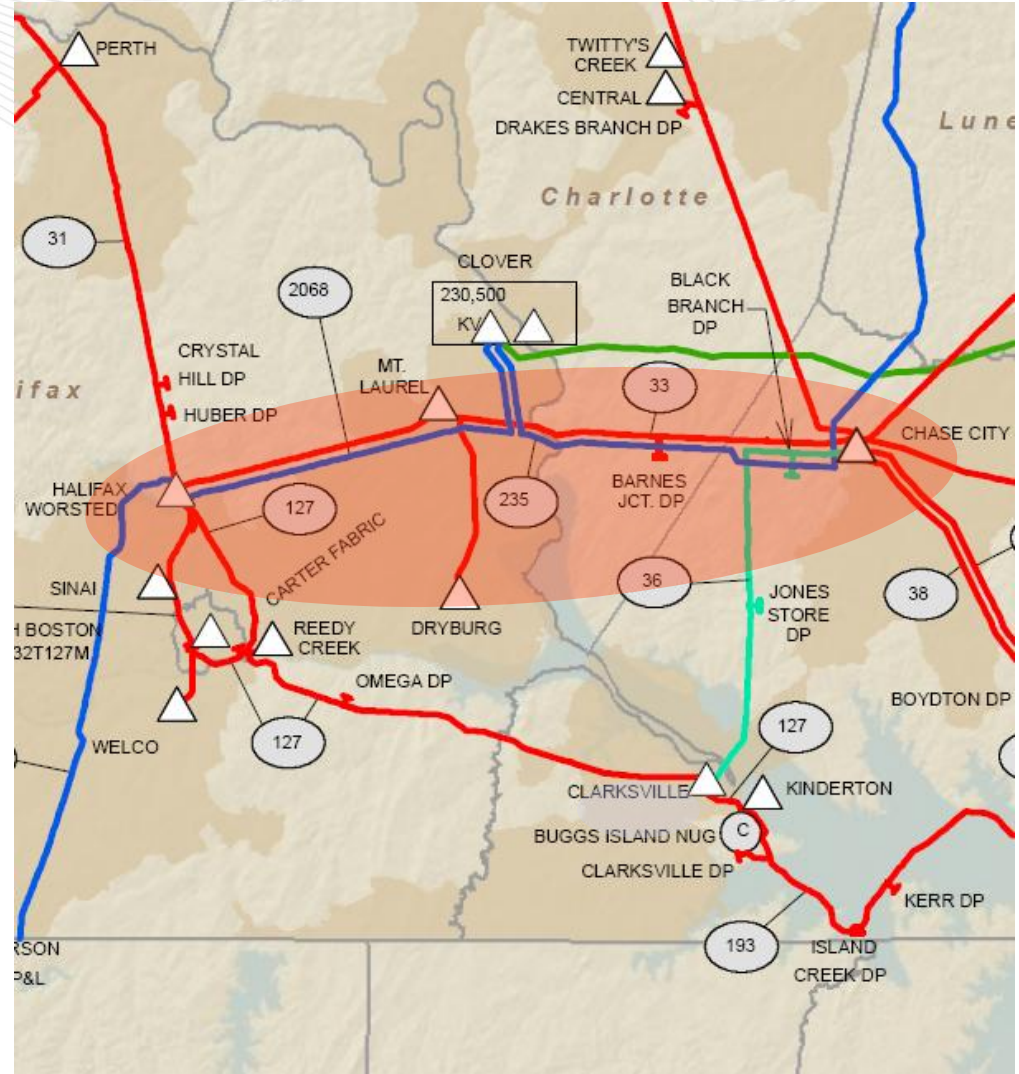
 **Region with thermal issues**

- NERC Category B Violations
- Problem:
 - An outage of Line #553(Cunningham – Elmont 500 kV) overloads the Edinburg 138/115 kV Transformer with no Warren generation online per Dominion’s criteria
- Potential Solution –
 - Install 2nd 138-115 kV Transformer at Edinburg
 - Estimated cost \$4.5 M
- Expected IS Date: 6/1/2016



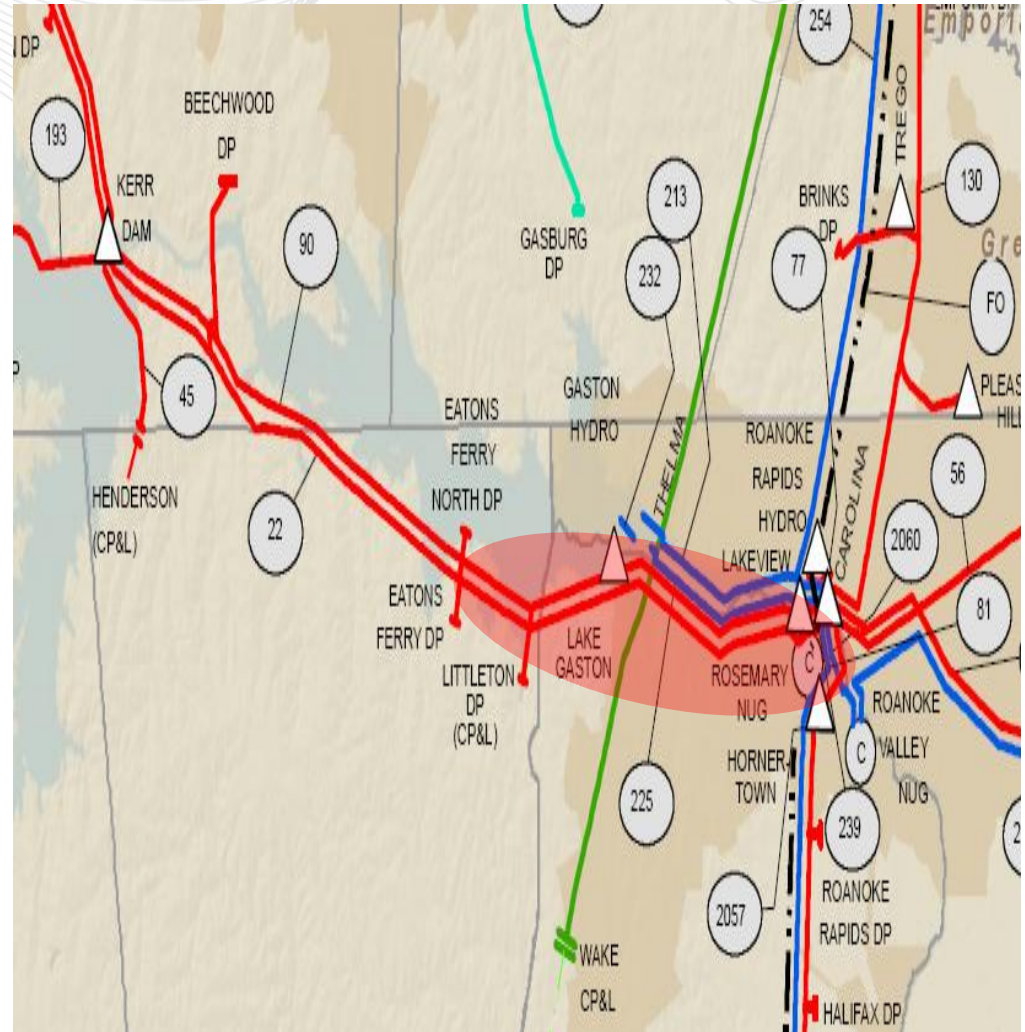
Region with thermal issues

- NERC Category B & C Violations (Generation Deliverability & Dominion Analysis)
- Studied with drought conditions: (Kerr Dam, Gaston and Roanoke Rapids generation off line)
- Problem:
 - N-1 outage of Line #556 (Clover – Carson 500 kV) overloads Line #33 (Halifax – Chase City 115 kV)
 - N-1-1 outage of Line 556 (Clover-Carson) and Line #127 (Halifax - Buggs Island 115 kV) overloads Line #33 (Halifax – Chase City 115 kV)
 - N-1-1 outage of Line #556 (Clover-Carson) and Line #36 (Chase City – Buggs Island) overloads Line #33 (Halifax – Chase City 115 kV)
 - N-1-1 outage of Line #556 (Clover – Carson 500 kV) and Line #296 (Halifax – Person 115 kV) with Halifax 230/115kV Tx #5 overloads Line #33 (Halifax – Chase City 115kV) and the Halifax 230/115kV Tx #4
 - PJM Operations is currently experiencing loading issues on Line 33 (Halifax – Chase City 115kV)
- Potential Solution(s):
 - Interim solution: Apply Dynamic rating technology to achieve higher conductor rating
 - Long Term Solution: Rebuild Line #33
- Expected IS Date: 6/1/2016



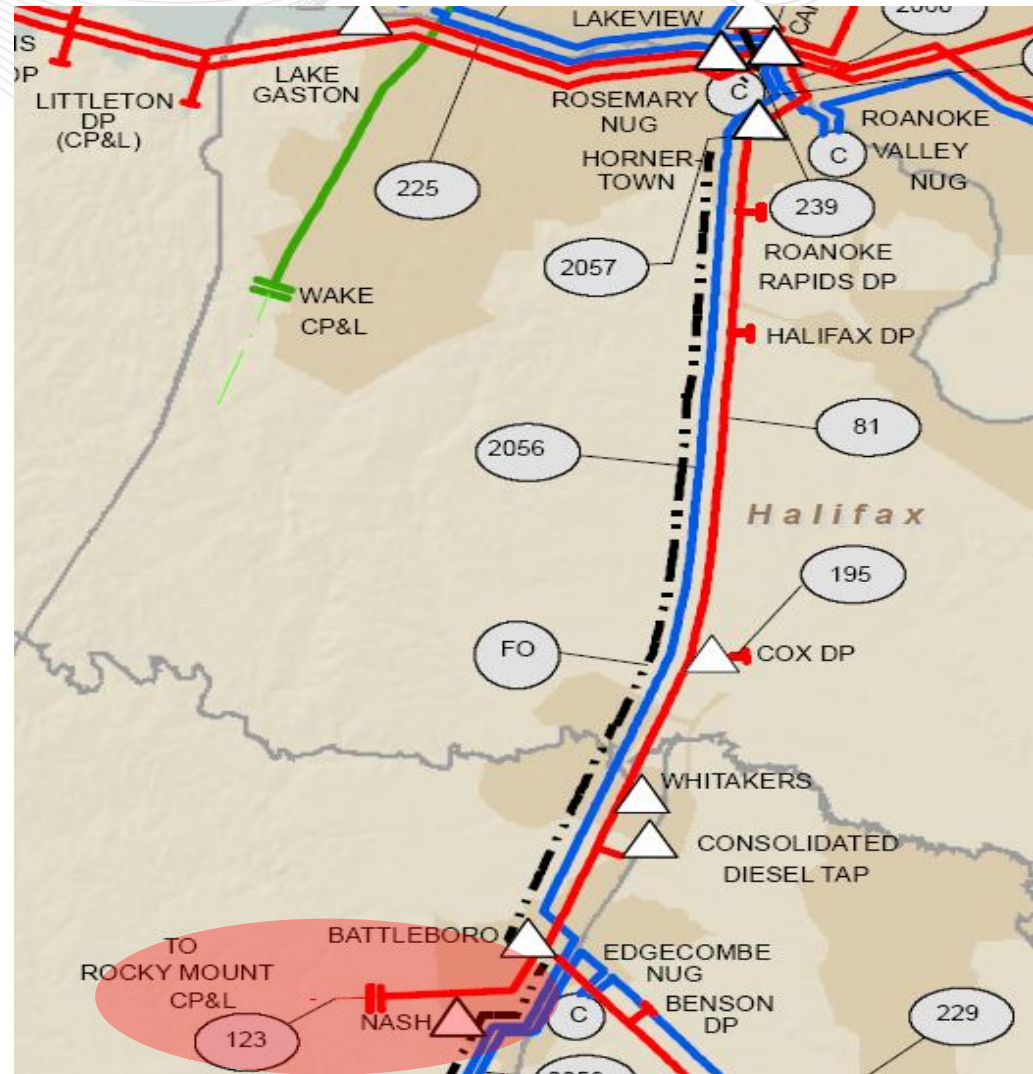
Region with thermal issues

- NERC Category B Violation
- Problem:
 - An outage of Line #90 breaker at Kerr 115 kV overloads Line #22 (Eatons Ferry – Carolina 115 kV) without Surry 230 kV generation available per Dominion planning criteria
- Potential Solution –
 - Wreck and rebuild remaining section of Line #22
- Expected IS Date: 6/1/2016



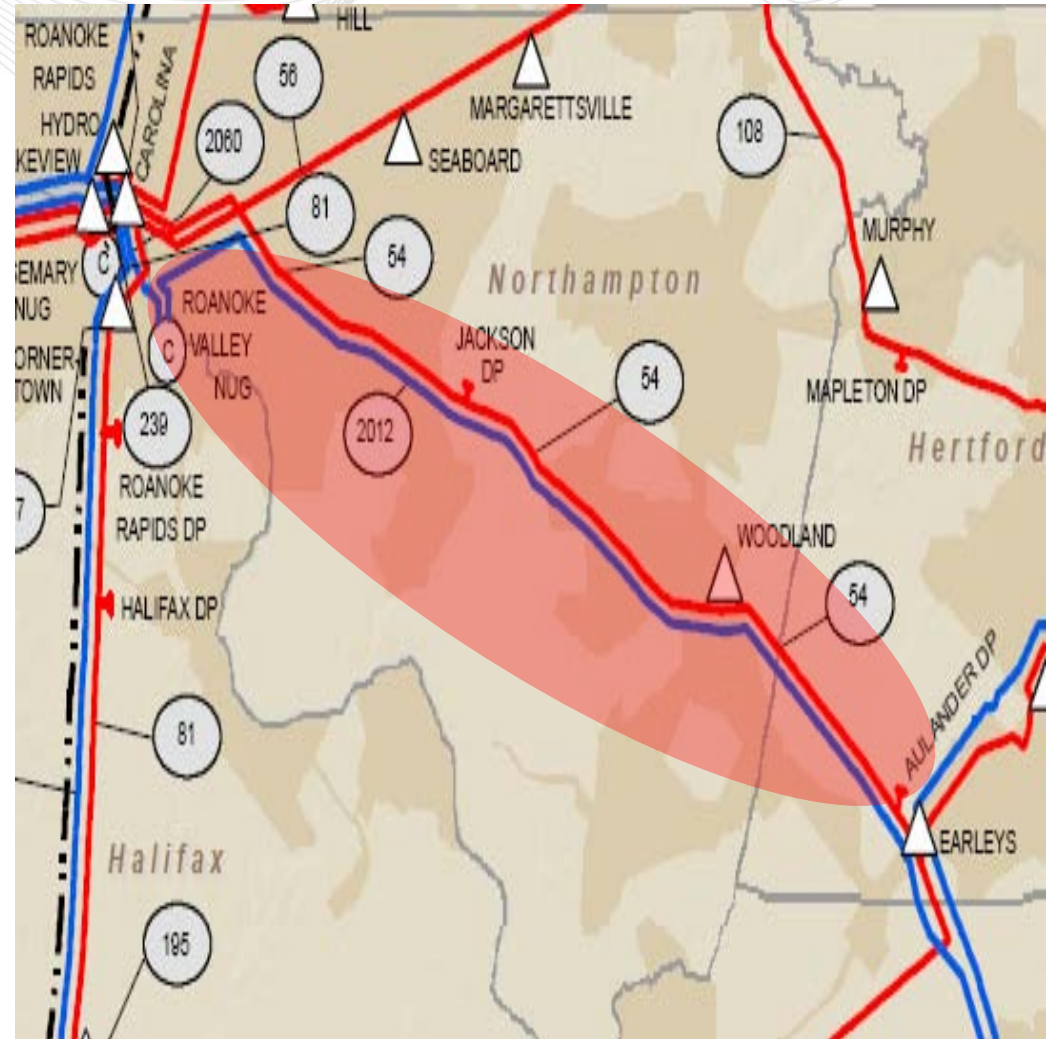
Region with thermal issues

- NERC Category B Violations
- Problem:
 - An outage of Line #81 breaker at Carolina overloads Line #123 (Rocky Mount – Battleboro 115 kV)
 - Existing operating procedure opens 115 kV (tie line) breaker at Rocky Mount
- Potential Solution –
 - Install a 230/115 kV Tx at Battleboro and re-configure 115 kV lines in area.
- Expected IS Date: 6/1/2016



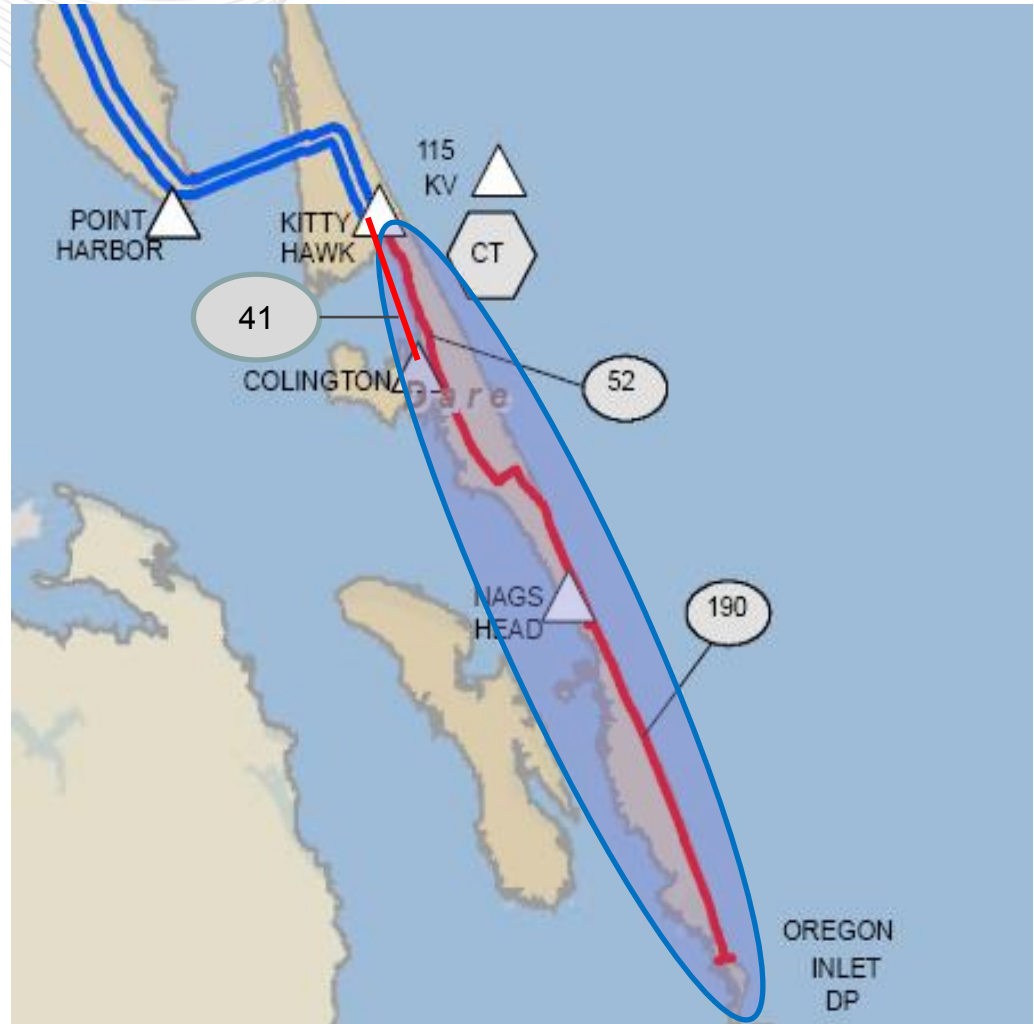
Region with thermal issues

- NERC Category B Violations
- Problem:
 - An outage of Line #2012 (Roanoke Valley – Earleys 230 kV) line overloads Line #54 (Carolina to Earleys 115 kV) without Surry 230 kV generation available per Dominion planning criteria
- Potential Solution
 - Uprate Line #54 (Carolina to Earleys 115 kV) to a higher rating
- Expected IS Date: 6/1/2016



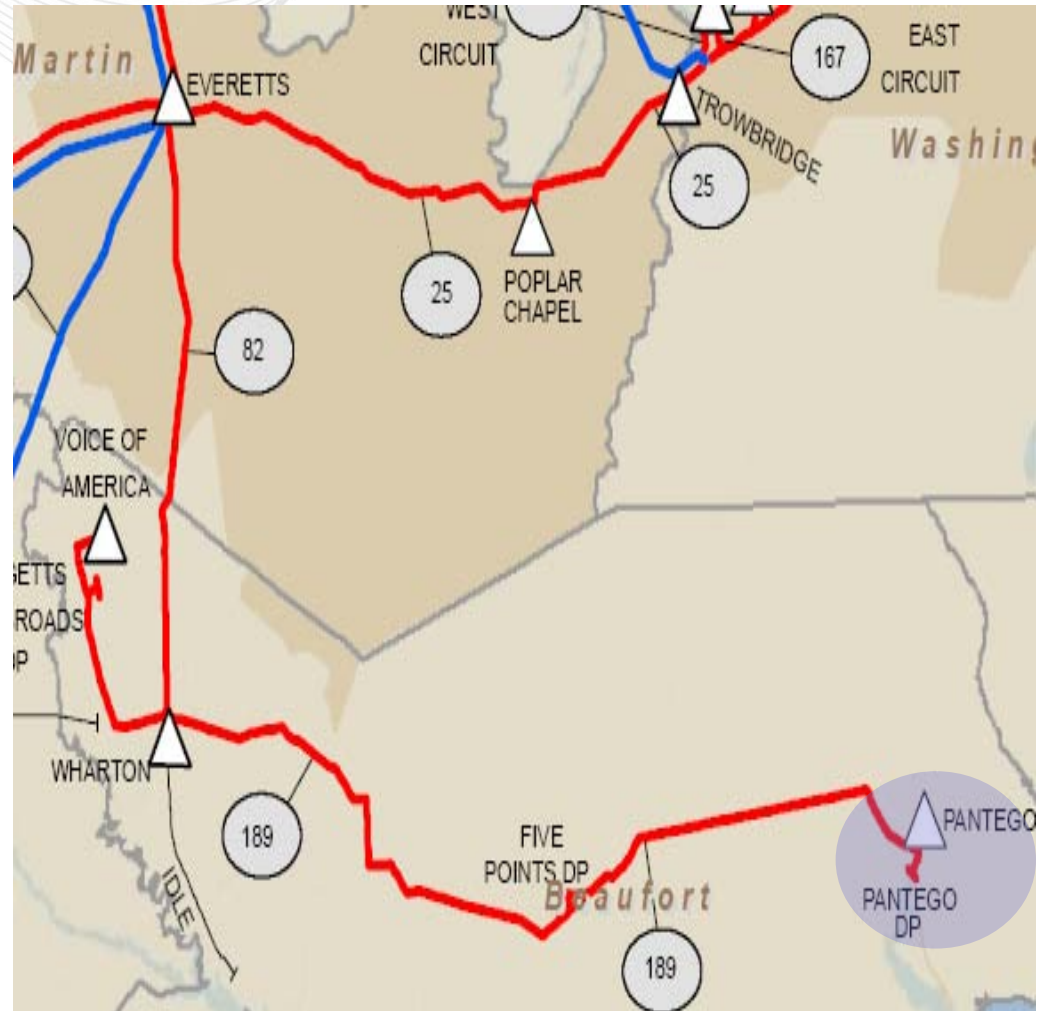
Region with voltage issues

- NERC Category B Violations
- Problem: The 2016 summer base case indicates the following deficiencies:
 - An outage of Line #41 (Kitty Hawk – Colington 115 kV) results in low voltage magnitude on the Outer Banks.
 - An outage of SVC at Colington low voltage magnitude on the Outer Banks.
- Potential Solution –
 - Install additional reactive support. May need to be dynamic.
- Expected IS Date: 6/1/2016



Region with thermal issues

- NERC Category B Violations
- Problem:
 - An outage of the Wharton 115 kV Capacitor bank causes low voltage magnitude at Pantego
- Potential Solution –
 - Split Wharton 115 kV capacitor bank into two smaller units
 - Adjust area LTC program
 - Add additional reactive support in area
- Expected IS Date: 6/1/2016



Rapid Load Growth

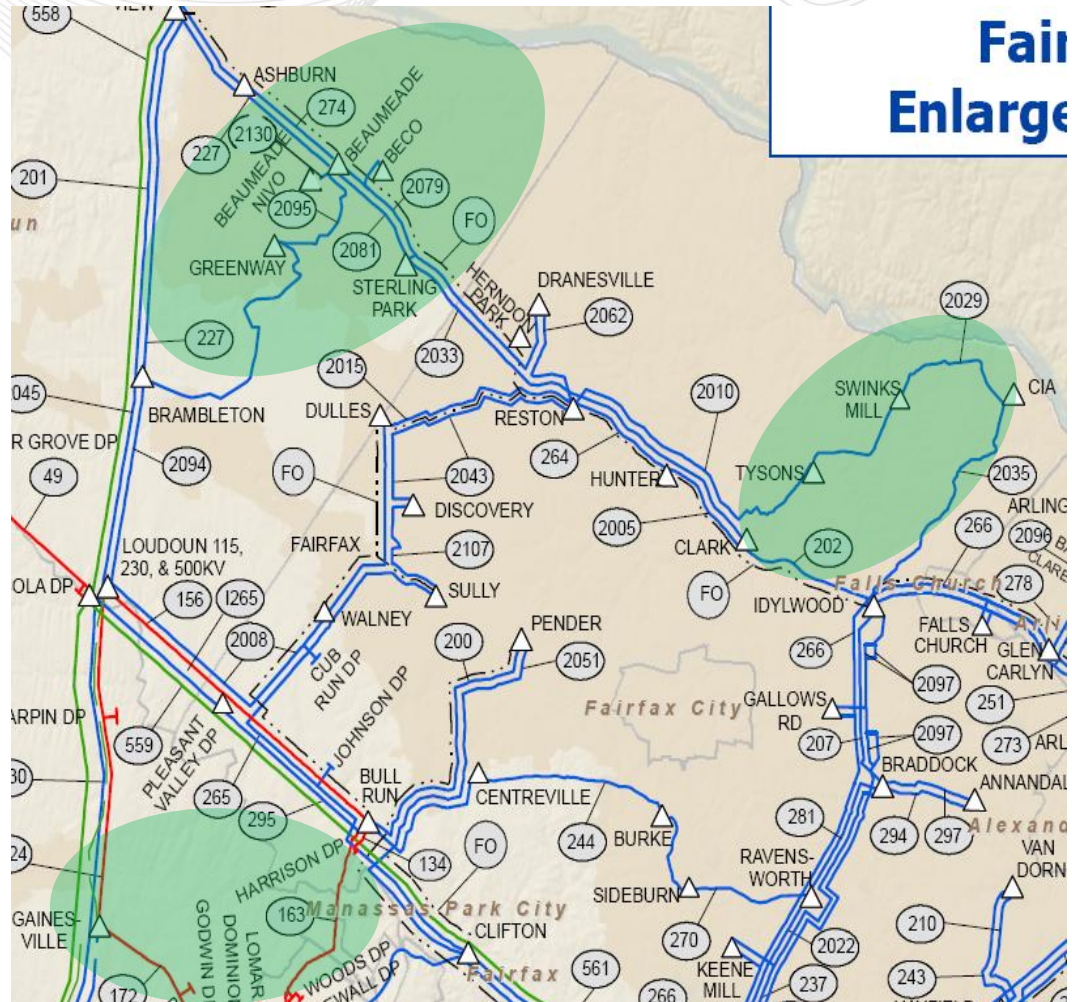
Planning Area of Concern

- Problem:
 - Rapid load growth in area
 - Potential for an additional 300-900 MW over existing models

- System Evaluation:
 - Develop a 2020 case to evaluate long term transmission expansion in area.
 - Evaluate HV and EHV possibilities.

- Estimated Completion Date: 12/2011

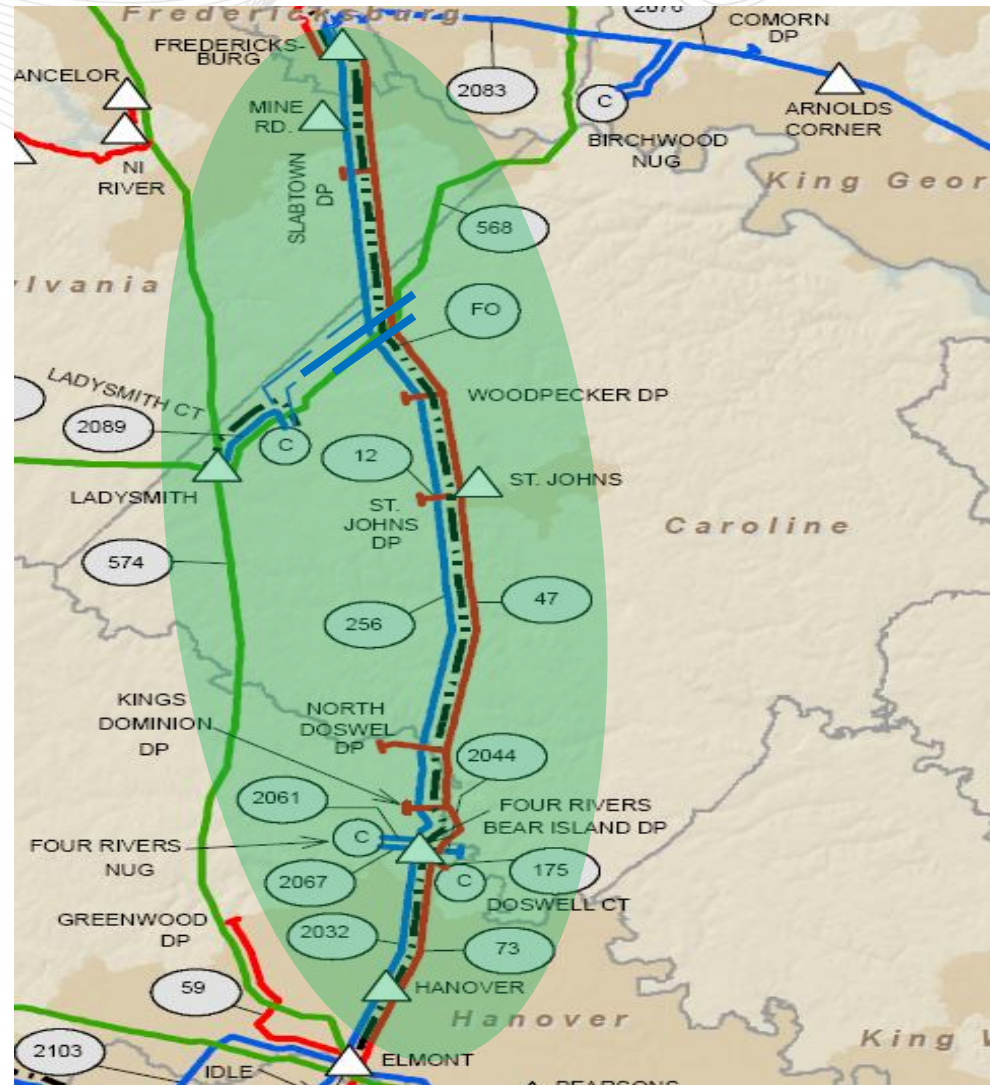
Area of Concern



Planning Area of Concern

- Problem: Load growth in this area is continuing to cause reliability concerns.
- System Evaluation:
 - Line #47 (Fredericksburg – Four Rivers 115 kV) is currently constructed for future 230 kV.
 - Evaluate growth patterns to provide LSE's with potential conversion plan
- Estimated Completion Date: 2/2012

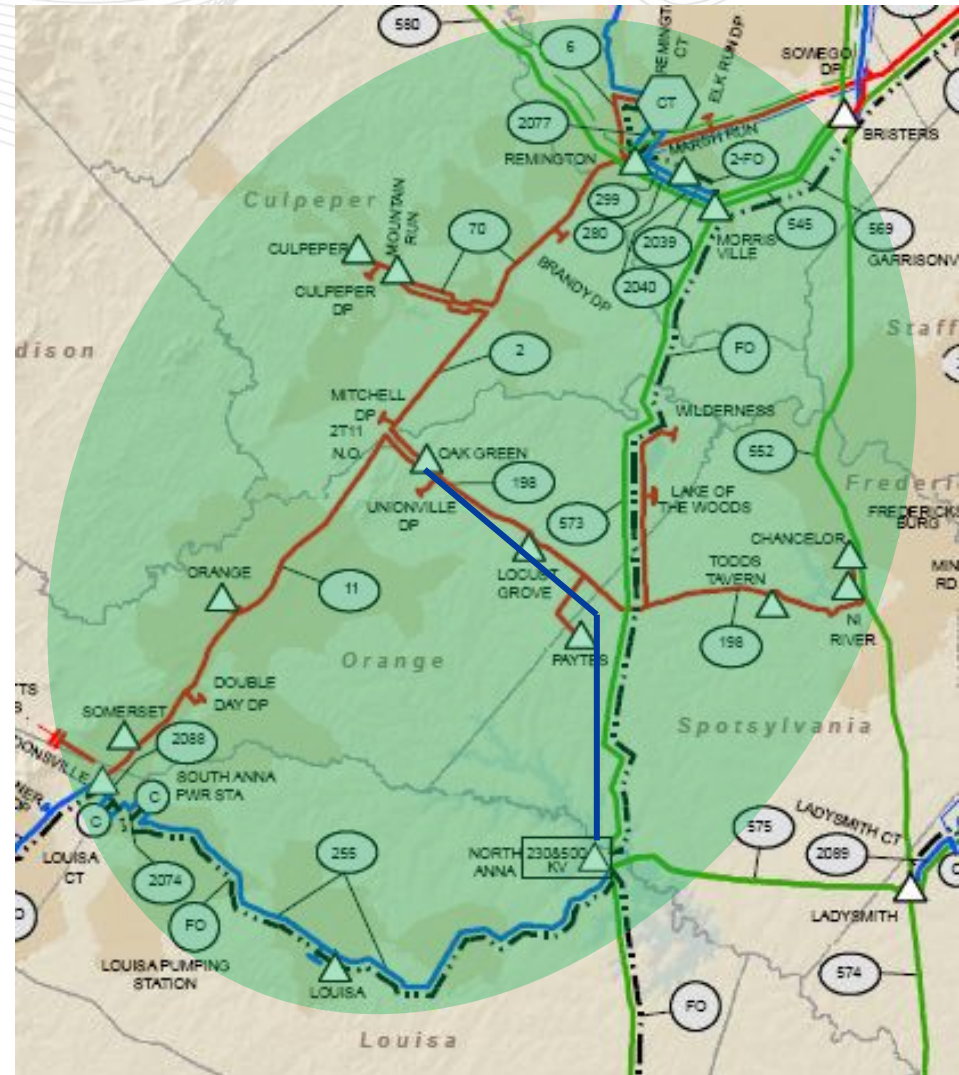
 Area of Concern



Planning Area of Concern

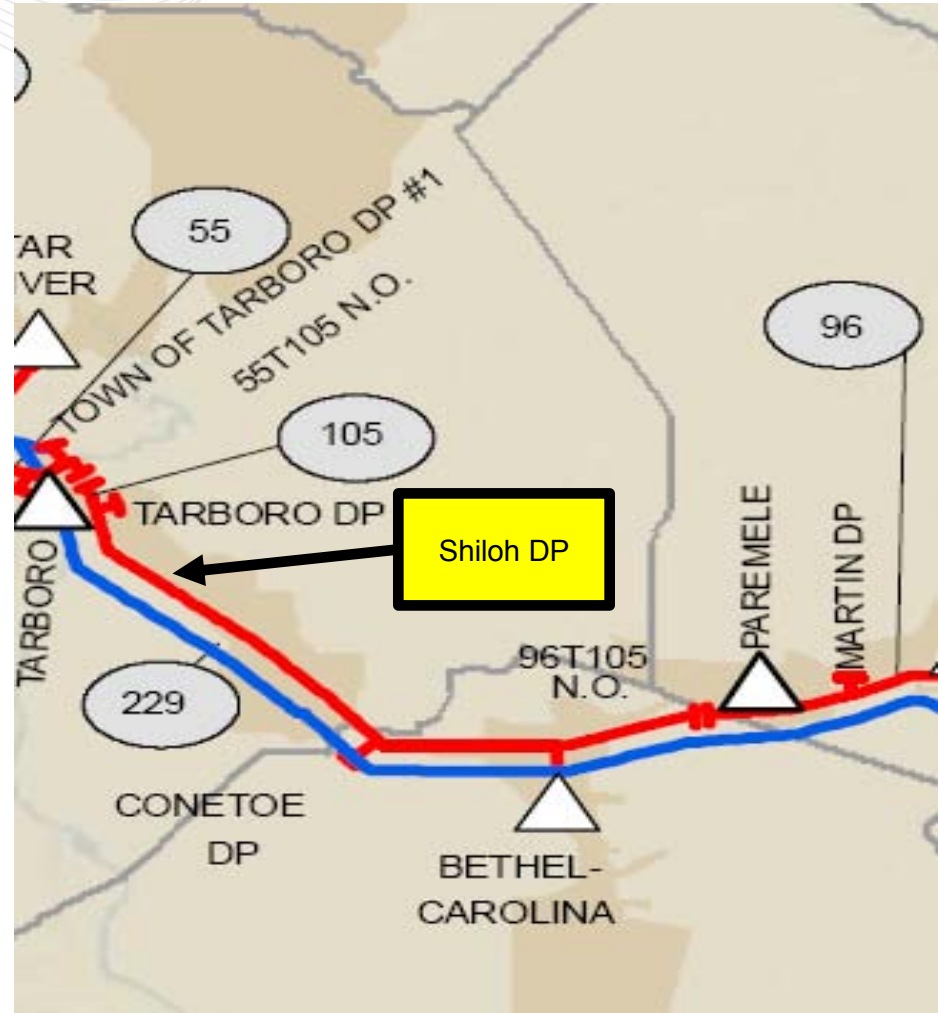
- Problem:
 - Potential rapid load growth area
- System Evaluation:
 - Evaluate load growth patterns to determine when additional reliability deficiencies on lines #2, #11, #70 and #198 may occur.
 - Objective is to provide local LSE's with insight into potential transmission expansion and potential conversion plans.
- Estimated Completion Date: 2/2012

 **Area of Concern**

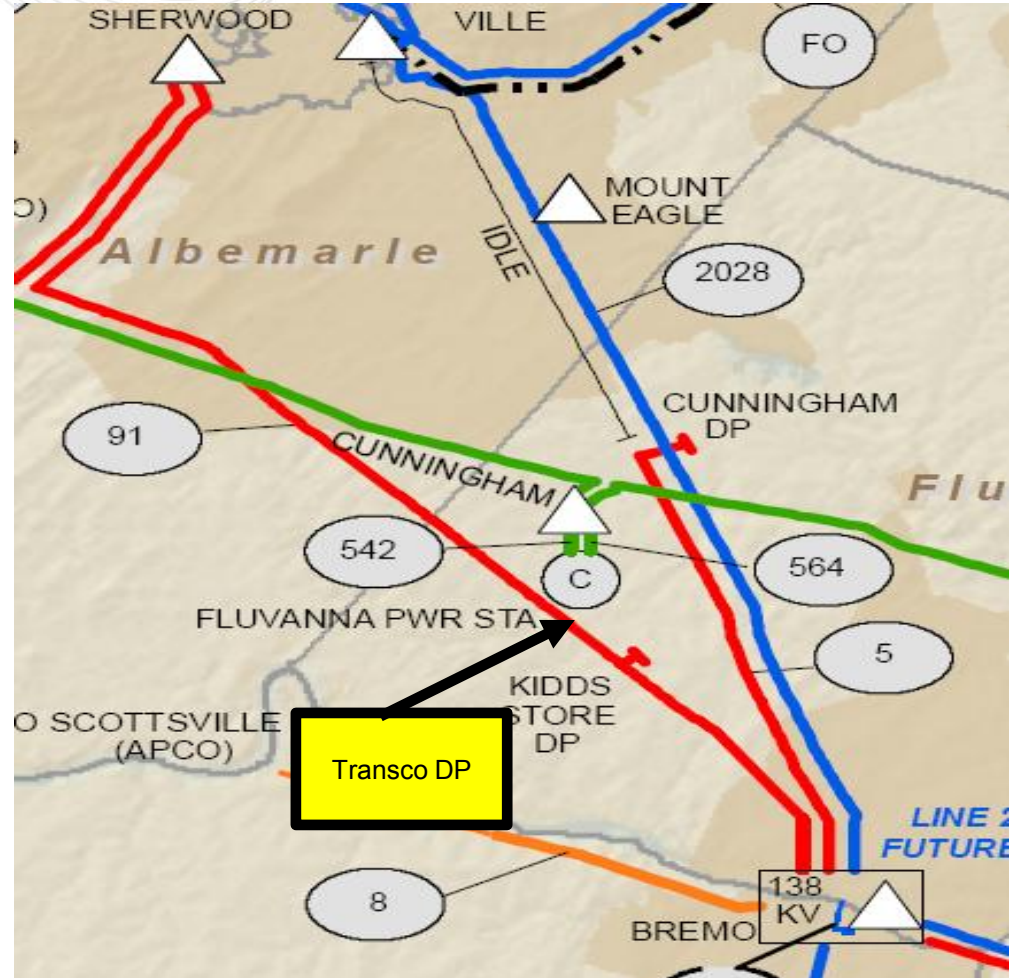


New Supplemental Projects

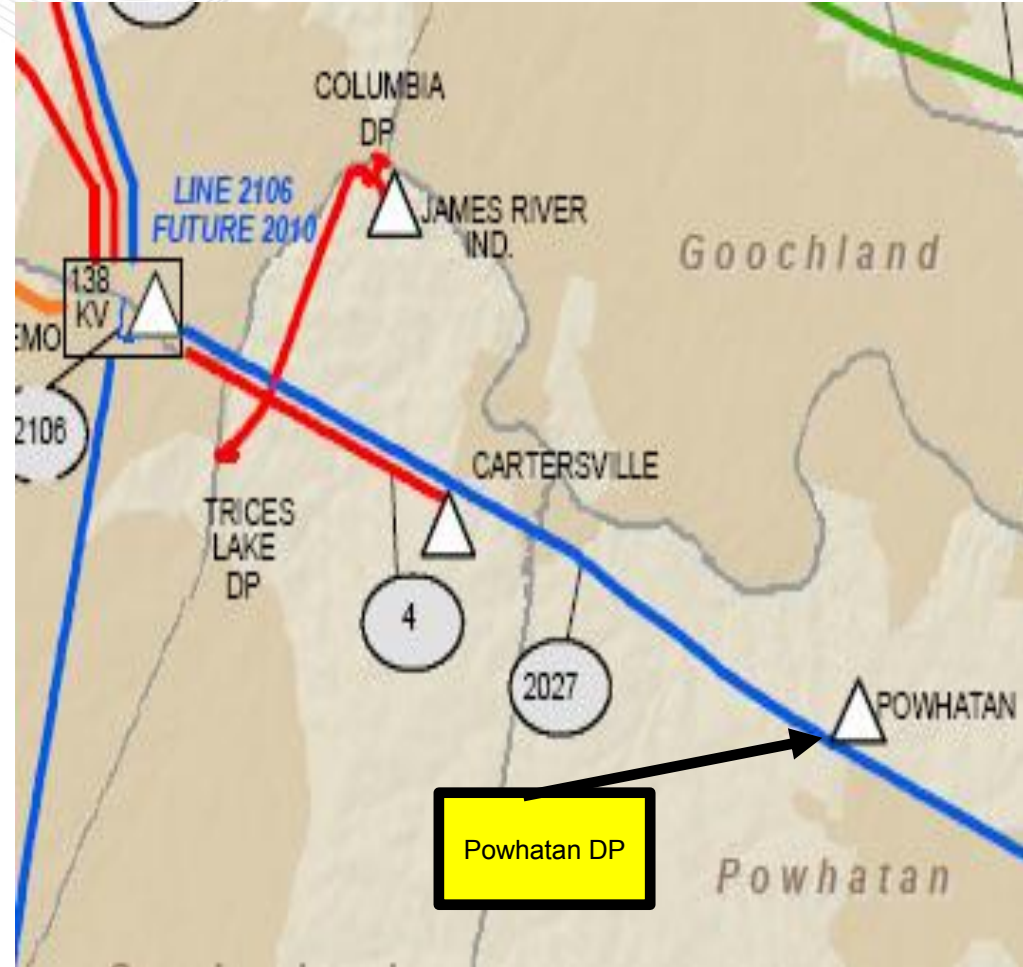
- New 115 kV Shiloh delivery point
- Estimated load is 8 MW(s).
- Potential Solutions:
 - Install 115 kV breaker and build 1.7 Mile long 115 kV line
 - Loop 115 kV line to 1.7 miles to site
- Estimated Project Cost: \$ 2-3 M
- Expected IS Date: 9/2012



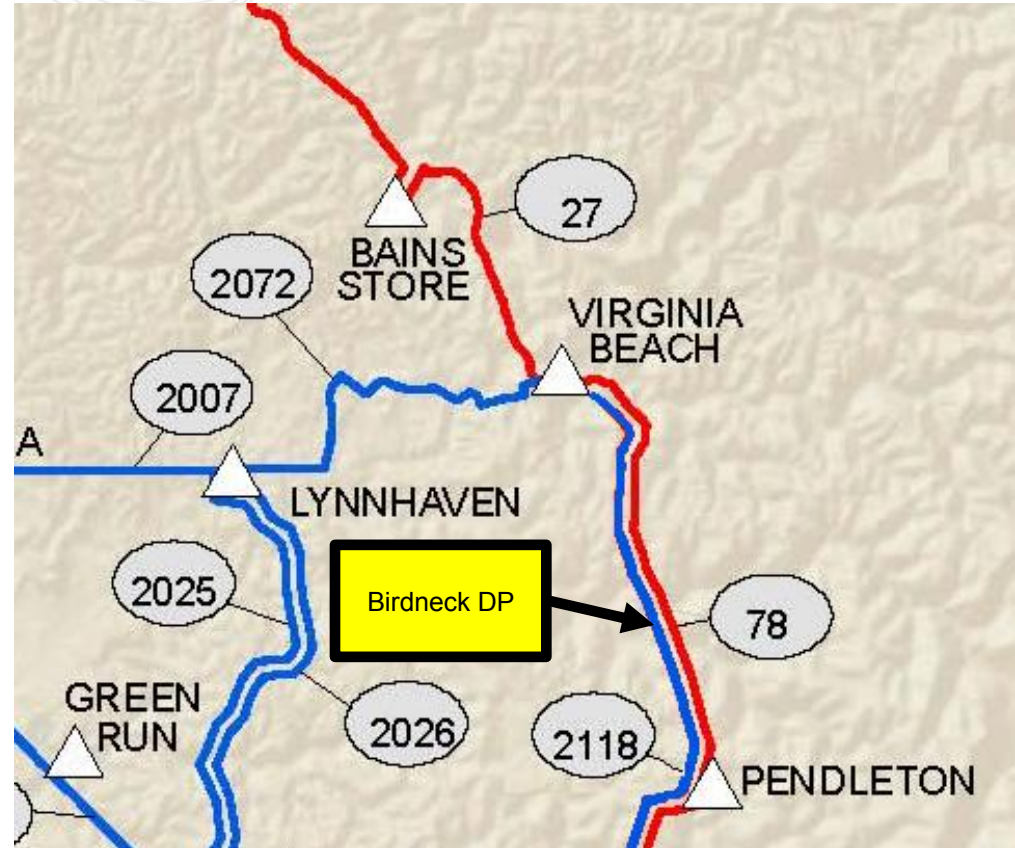
- New 115 kV Transco delivery point
- Estimated load is 28 MW
- Tap Line #91 (Sherwood to Breomo) and install line switches and associated equipment
- Estimated Project Cost \$ 0.75M
- Expected IS Date: 10/2012



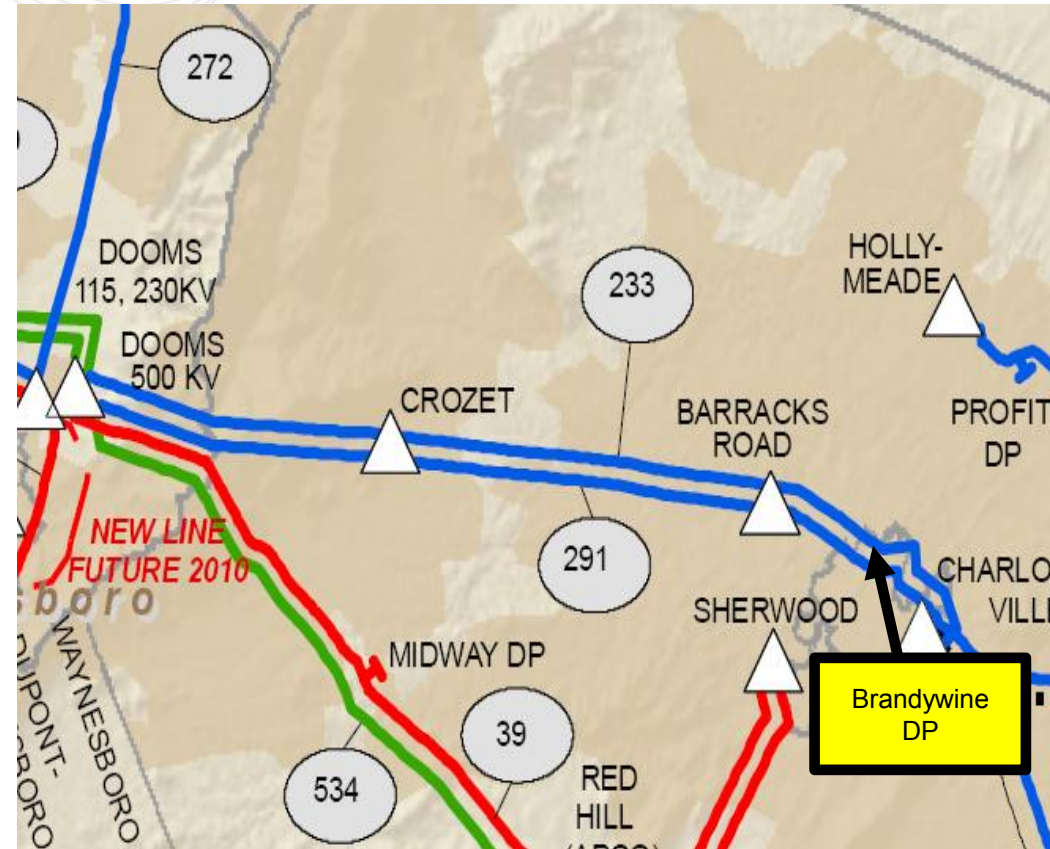
- Convert Powhatan delivery point from 35 kV to 230 kV
- Estimated load 48 MW
- Tap existing Powhatan 230 kV bus and install associated equipment.
- Estimated Project Cost: \$ 0.75 M
- Expected IS Date: 8/2012



- New 230 kV Birdneck delivery point in Virginia Beach, VA.
- Estimated load is 60 MWs
- Tap line #2118 (Landstown to Virginia Beach) and install line switches and associated equipment.
- Estimated Project Cost: \$0.75 M
- Expected IS Date: 6/1/2013



- New 230 kV delivery point at Brandywine in Charlottesville, VA.
- Estimated load is 60 MWs.
- Tap line #233 (Dooms to Charlottesville) and install line switches and associated equipment.
- Estimated Project Cost: \$0.75 M
- Expected IS Date August 2013



- New 230 kV delivery point at Benn's Church.
- Estimated load is 31 MWs.
- Tap line #263 (Chuckatuck to Newport News) and install line switches and associated equipment.
- Estimated Cost \$0.85 M
- Expected IS Date: 6/1/2014



- New transmission delivery point at NSF Dahlgren
- Will serve a projected load of 45 MWs in 2014, growing to 85 MWs in 2017
- Note: revised analysis based on 2011 load projections delayed previous voltage violations from 2014 to 2017 which removed the 2014 need for var correction.

- Potential solutions:

Option A – split existing 230 kV line in the vicinity of Arnolds Corner and loop the 230 kV line in and out of the Dahlgren.

Estimated Project Cost \$ 28.5 M

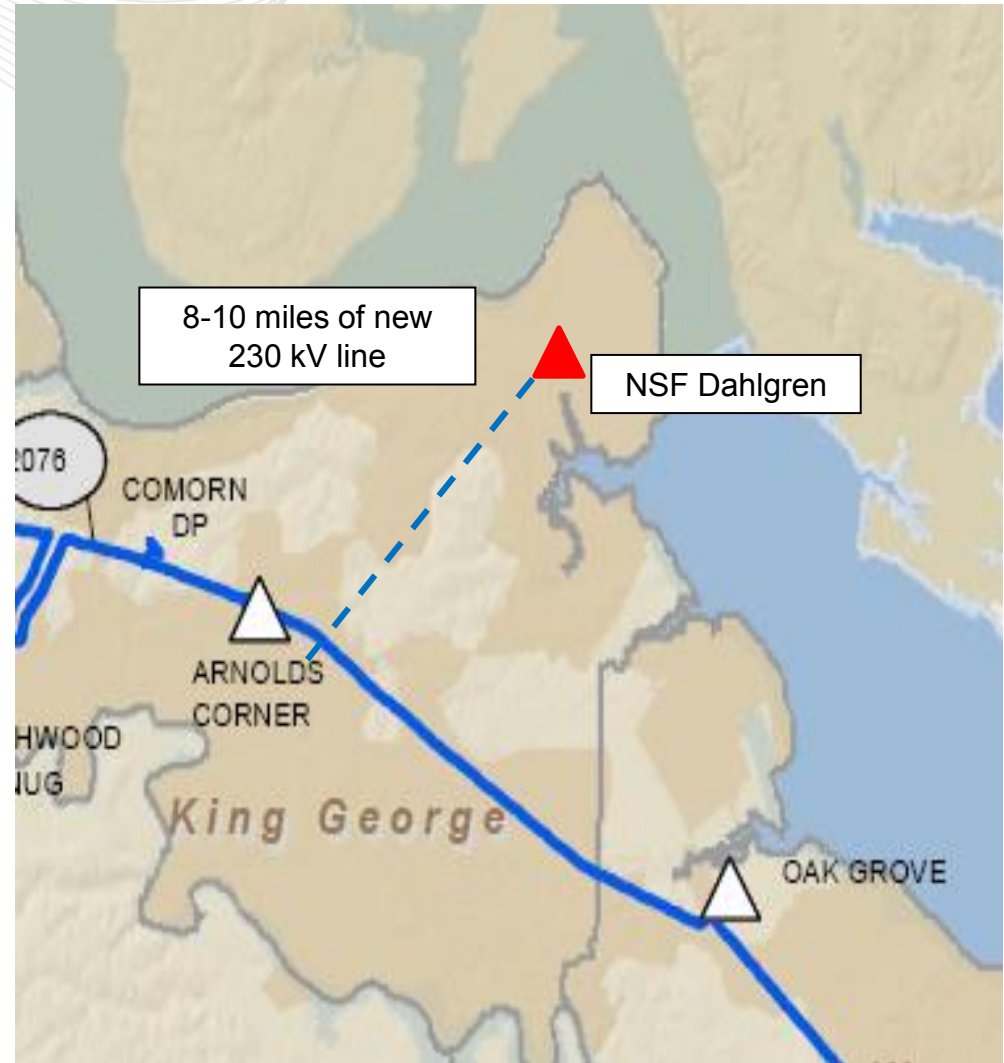
Option B - establish a new 230 kV breaker station in the vicinity of Arnolds and build a radial 230 kV line to Dahlgren site.

Estimated Project Cost \$ 30.8 M

Option C – Build a radial 230 kV line from Morgantown PS to Dahlgren.

Estimated Project Cost \$ 70 M

- Recommended Solution : Option A
- Expected IS Date: 6/1/2014



Elm Farm 115 kV Delivery Point Supplemental Project

- New 115 kV delivery point named Elm Farm in Woodbridge, VA.
- Estimated initial load is 30 MWs.
- Tap line #183 (Bristers to Ox) and install line switches and associated equipment.
- Estimated Project Cost: \$0.75 M
- Expected IS Date: 6/1/2015

