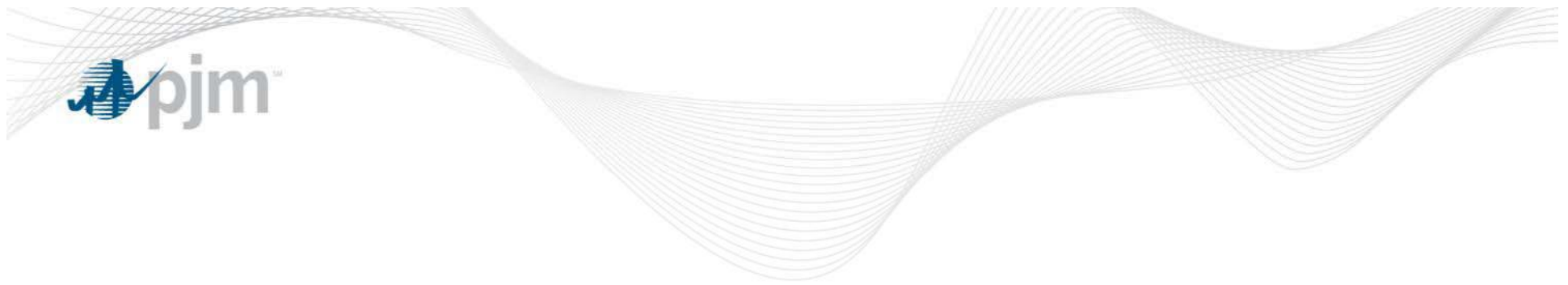




# Transmission Expansion Advisory Committee

October 22, 2009



## 2014 Baseline - 15 Year Planning Results



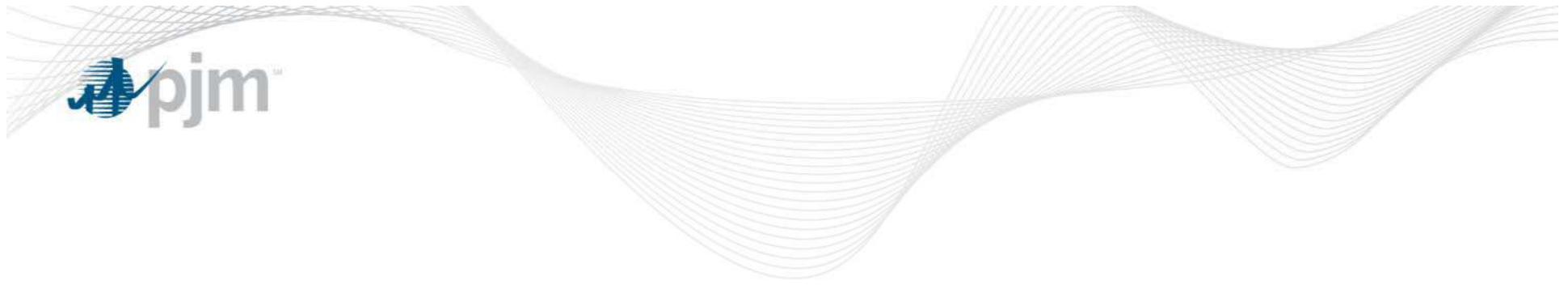
# 15 Year Planning Result – Single Contingencies

Fr Name	To Name	CKT	KVs	2014 LD(%)	2024 LD(%)	100% LD Year
Conastone	Graceton	1	230/230	99.11	108.28	2015
Byron R	Cherry Valley R	1	345/345	99.59	110.72	2015
Linwood	Chichester	2	230/230	99.74	97.04	2015
Linwood	Chichester	1	230/230	99.38	96.69	2015
Conastone	Mt. Carmel 22	1	230/230	98.53	118.78	2015
Byron B	Cherry Valley B	1	345/345	96.87	106.75	2017
Sandy Spring 2314	High Ridge 16	1	230/230	92.08	110.23	2018
Sandy Spring 2334	High Ridge 16	1	230/230	93.33	111.7	2018
Richmond Reactor	Richmond	1	230/230	93.42	112.5	2018
East Frankfort B	Goodings Grove 3B	1	345/345	95.95	102.6	2019
Conowingo	Nottingham	1	230/230	94.33	104.91	2019
Mt. Carmel	Northwest 2326	1	230/230	91.28	110.1	2020
Conastone	Mt. Carmel 10	1	230/230	86.19	103.84	2023
Mt. Storm	Doubs	1	500/500	87.14	103.09	2023
Bear Creek	Altoona	1	230/230	88.78	102.38	2023
Dresden R	Elwood R	1	345/345	94.06	100.32	2023
OX	Galloway	1	230/230	87.48	102.61	2023
Plesant View	Ashburn	1	230/230	80.5	101.65	2024
S. P. Terminal 2344	Riverside 2339	1	230/230	89.53	100.57	2024
Burtonsville 2334	Sandy Spring 2334	1	230/230	84.41	100.93	2024
Pruntytown	Mt. Storm	1	500/500	82.11	101.6	2024
Churchland	Sewells Point	1	230/230	84.13	101.67	2024



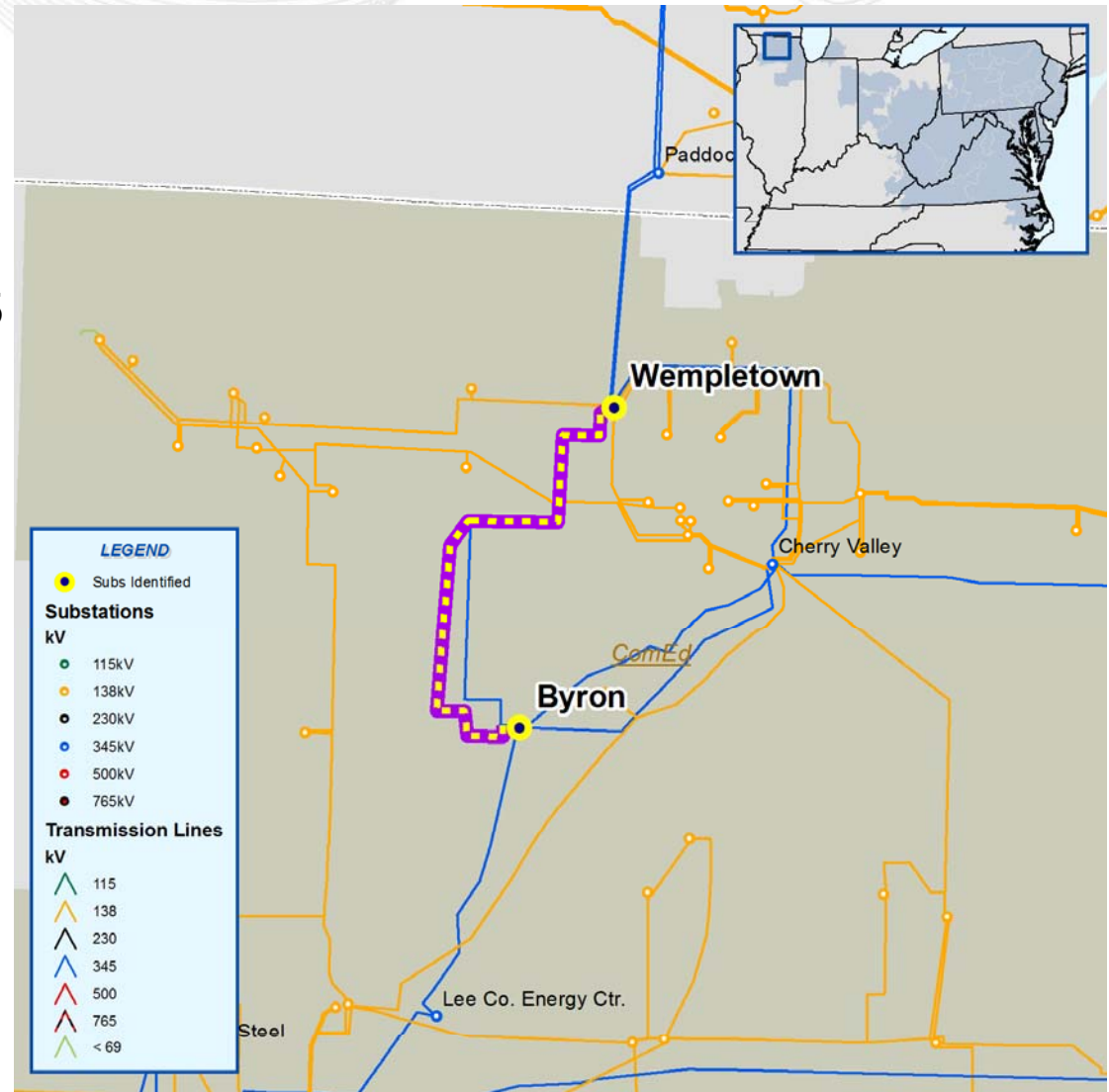
# 15 Year Planning Result – Tower Contingencies

From Name	To Name	CKT	KVs	2014 LD(%)	2024 LD(%)	100% LD Year
Conastone	Graceton	1	230/230	108.23	125.7	2014
Graceton	Bagley	1	230/230	95.42	120.95	2017
Byron R	Wempletown B	1	345/345	97.6	106.83	2017
Oak Grove	Bowie 23045	1	230/230	94.61	103.4	2020
Kittatinny	Newton	1	230/230	94.32	103.94	2020
Oak Grove	Bowie 23042	1	230/230	93.87	102.58	2020
Bowie	Burtonsville 2314	1	230/230	94.61	103.4	2020
Bowie	Burtonsville 2334	1	230/230	93.87	102.58	2020
Doubs	Jefferson	1	230/230	93.96	102.21	2021
Mickleton	Thorofare	1	230/230	93.89	102.04	2022
Conastone	Mt. Carmel	1	230/230	85.95	105.09	2022
Jefferson	Monocacy	1	230/230	93.15	101.28	2023
Bagley	Raphael Road	1	230/230	78.69	101.07	2024
Mt.Carmel	Northwest 2326	1	230/230	82.08	100.5	2024

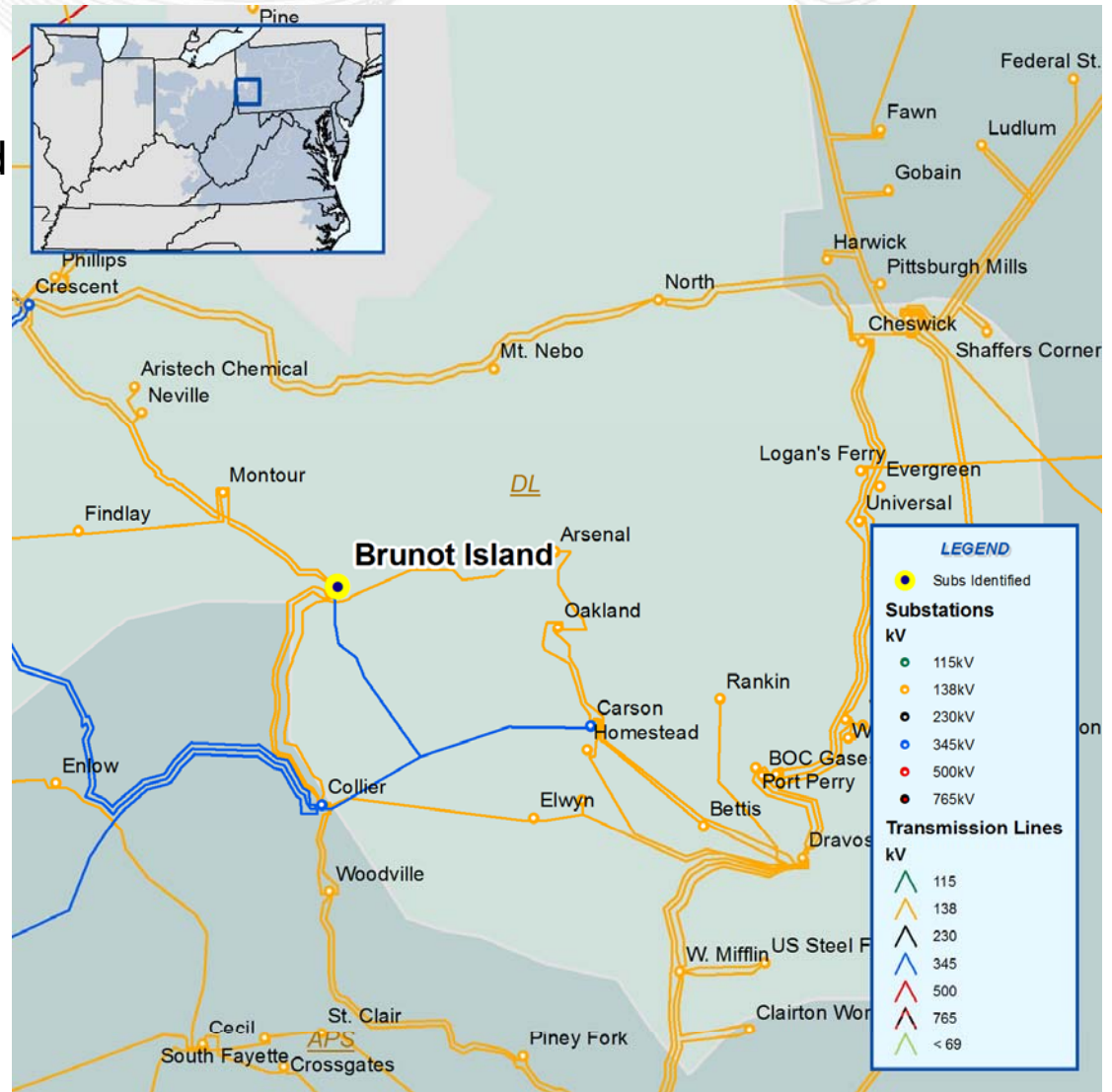


# Baseline Reliability Update

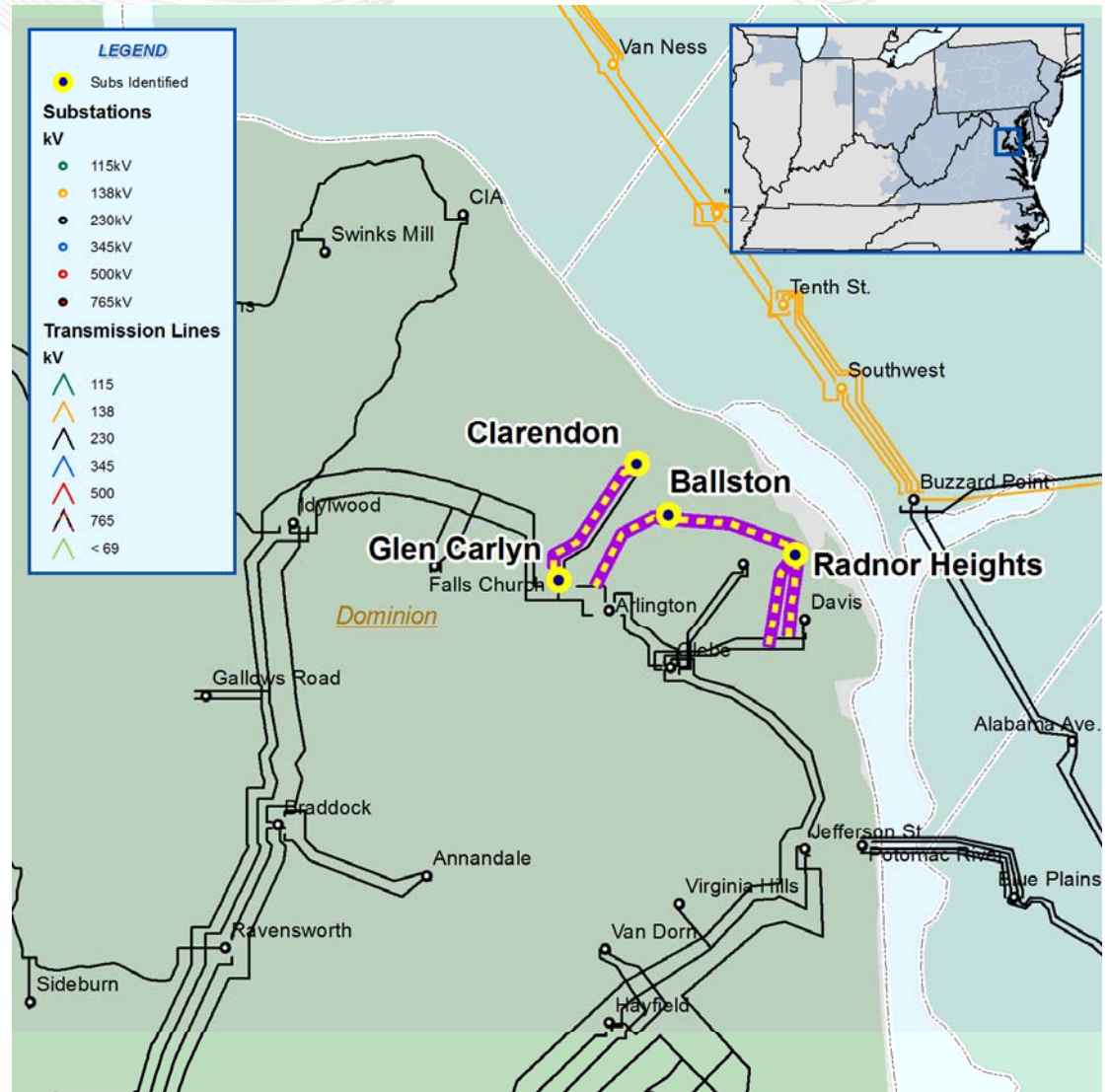
- Generator deliverability violation
- Byron - Wempletown 345kV (Line L0624) is overloaded in 2014 for the Tower outage of both Byron – Cherry Valley 345 kV lines
- Proposed Solution: Change relay settings on Byron – Wempletown 345 kV to bring relay trip setting up to 115% of Rate C (2396 MVA) (b1054)
- Estimated Project Cost: \$5 k
- Required IS Date: 6/1/2014



- N-1-1 thermal violation on Brunot Island - Brady 345 kV line for the loss of Brunot Island - Arsenal 345 kV circuit #1 + Brunot Island - Arsenal 345 kV circuit #2
- Proposed Solution: Increase rating by forced cooling on Brunot Island – Brady 345 kV line
- Estimated Project Cost: \$0.0
  - Cost is part of the b0501 project
- Required IS Date: 6/1/2014

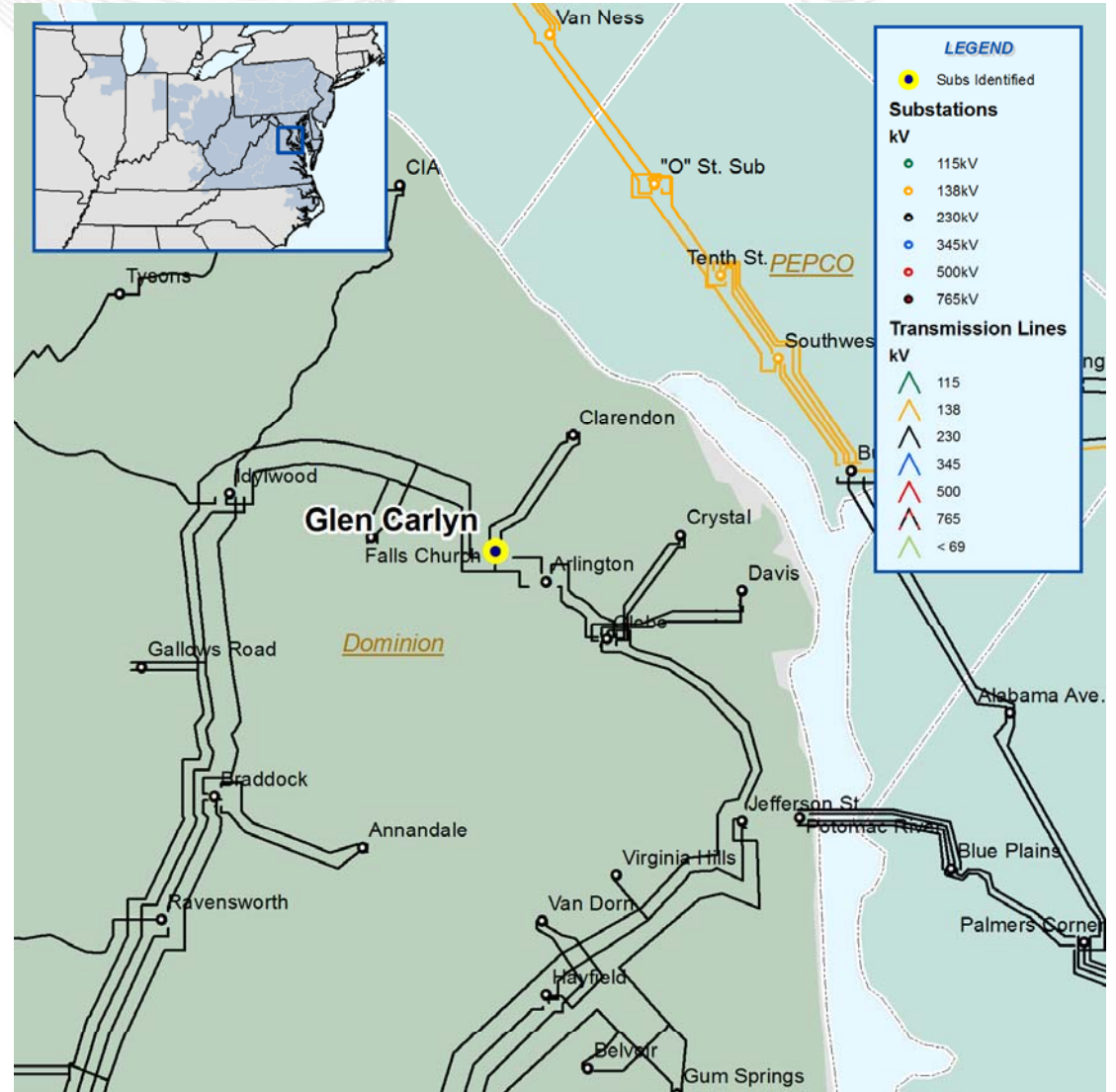


- High load area currently fed by two 230 kV underground lines originating from same substation
- N-2 contingency loss of both underground lines would leave high load area in a blackout
- Problem requires a project is to establish a new transmission source into the area from a secondary substation
- Previous recommended solution: (b0783) Build new circuit from Arlington – Ballston
- Estimated cost: \$80 M
- Proposed new solution: Build new Radnor Heights Sub, add new underground circuit from Ballston - Radnor Heights, Tap the Glebe - Davis line and create circuits from Davis - Radnor Heights and Glebe - Radnor Heights
- Estimated cost: \$80 M
- Required IS Date of Proposed Solution: 6/1/2014

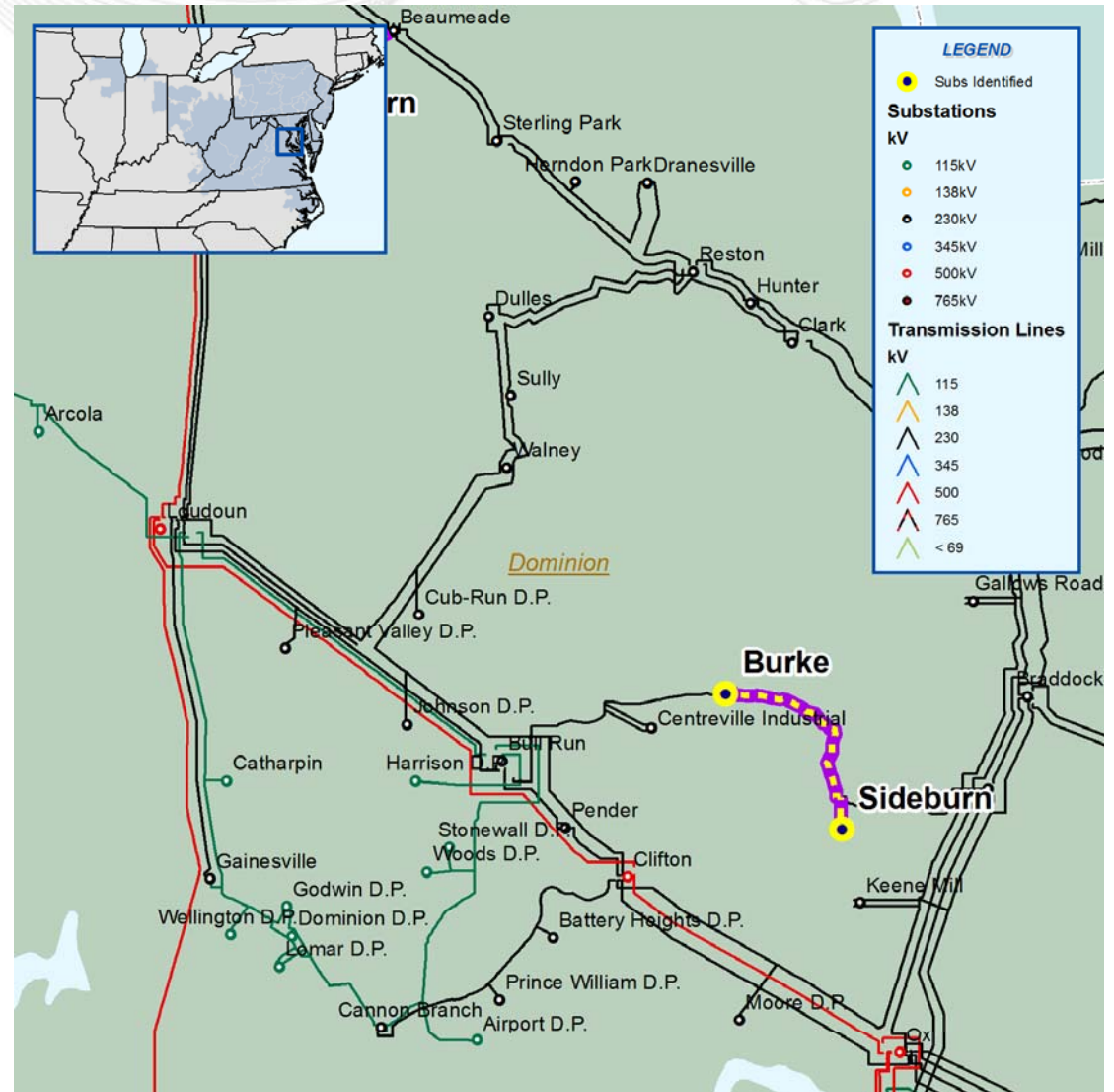




- For the loss of 230 kV lines #266 and #273 into Glen Carlyn, Transformer #1 and #3 along with 230 kV lines #277 and #278 will be out of service
- Solution: Loop 230 kV line #251 Idylwood - Arlington into the GIS sub (b0768)
- Estimated Cost: \$25 M
- Old required IS Date: 5/1/2010
- New required IS Date: 5/1/2011



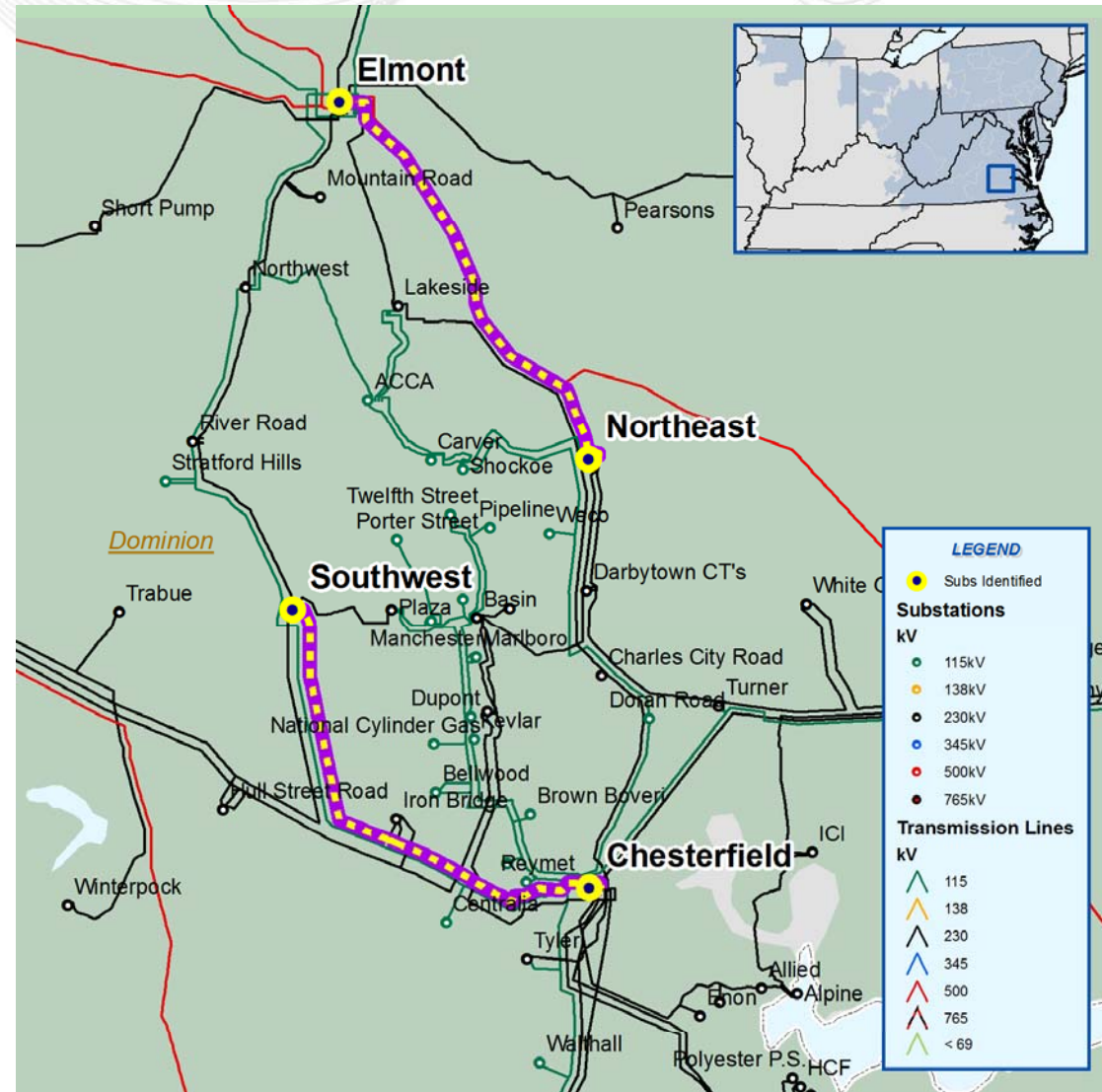
- The Burke to Sideburn underground circuit overloads for the N-1-1 loss of Bull Run - Loudoun 230 kV and Clifton - Pender 230 kV
- Solution: Install 2<sup>nd</sup> Burke to Sideburn 230 kV underground cable
- Estimated cost: \$4.0 M
- Required IS date: 6/1/2014





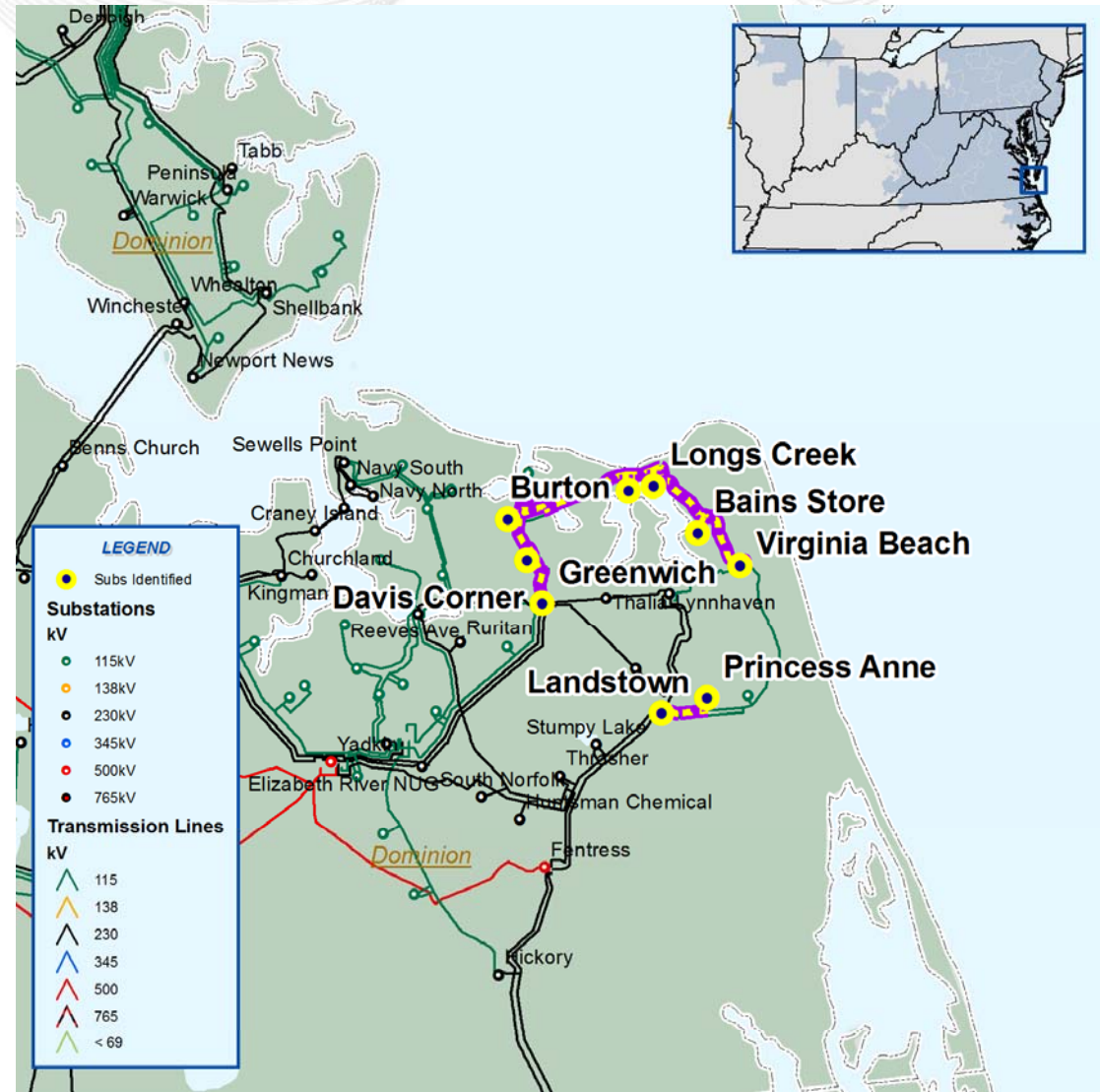
# Dominion Transmission Zone

- Voltage violation at Northwest 230 kV for the loss of Chesterfield to Southwest 230 kV & Northwest to Elmont 230 kV
- Old Solution: Install a 150 MVAR 230 kV capacitor at Northwest (b0452)
- New Solution: Install a 150 MVAR 230 kV capacitor and one 230 kV breaker at Northwest
- Estimated cost: \$1.7 M
- Required IS date: 6/1/2012

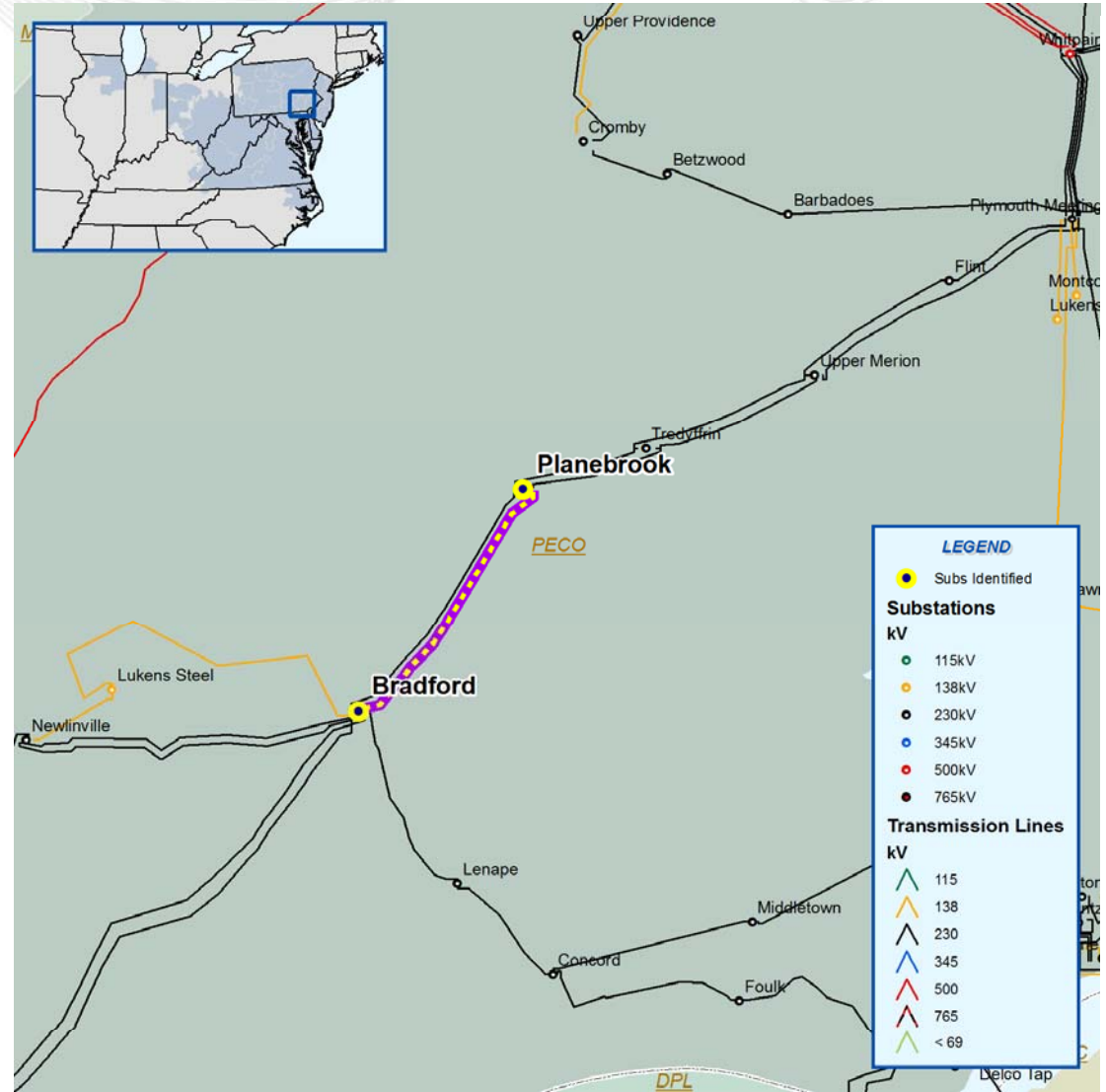


- The following lines have been overloaded for N-1-1 thermal analysis
  - Bayside – Burton 115 kV
  - Bayside – Long Creek 115 kV
  - Burton – Davis 115 kV
  - Davis – Greenwich 115 kV
  - Landstown – Princess Anne 115 kV
  - Bains Store – Long Creek 115 kV
  - Bains Store – VA Beach 115 kV
- For the loss of the contingency combination seen below:
  - Lynnhaven – VA Beach 230 kV + VA Beach 230/115 kV XFMRs 1 and 2
  - Landstown – Princess Anne 115kV + Princess Anne – London 115kV + London – Pendleton 115 kV
- Proposed Solution:
 

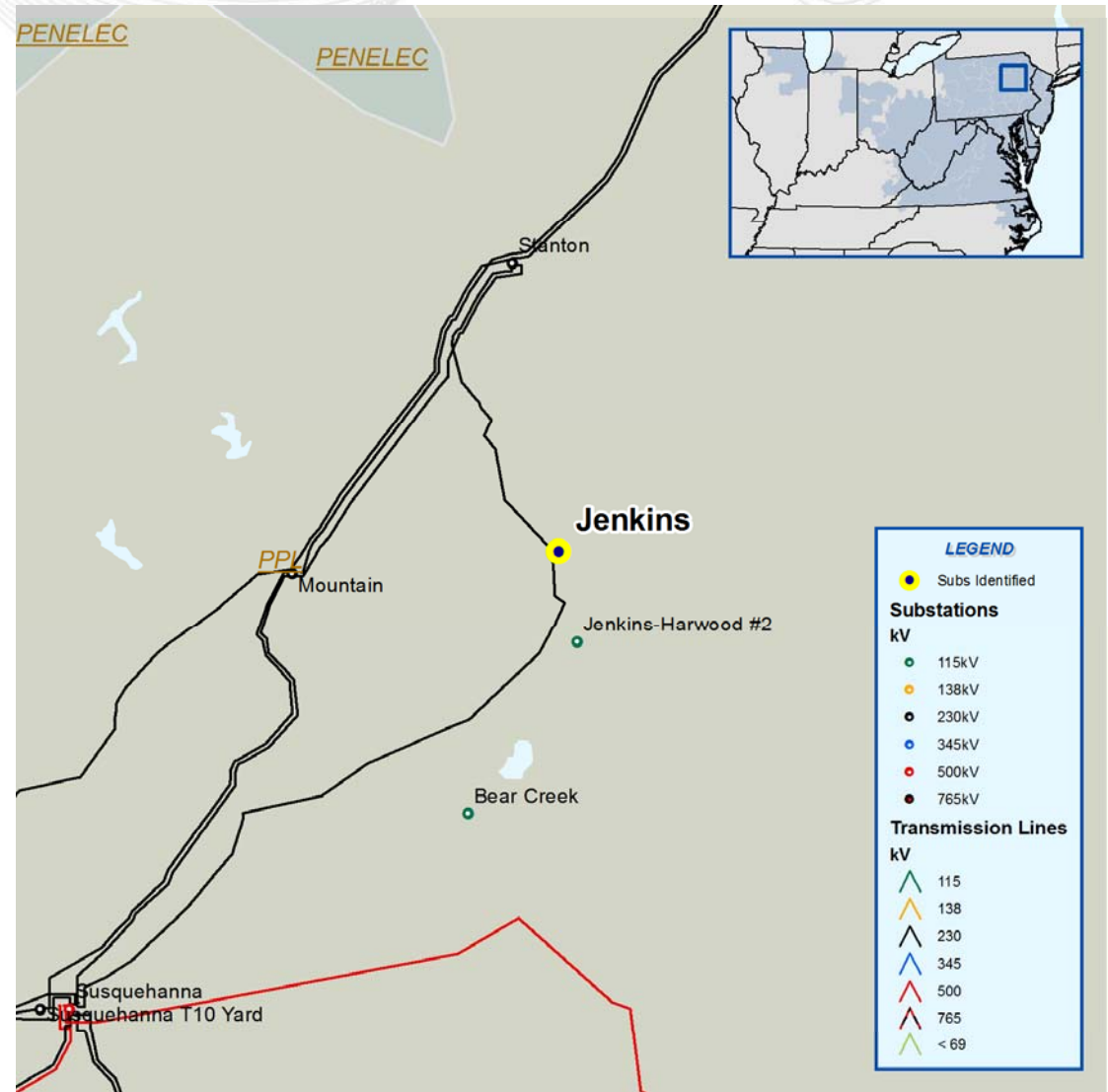
Rebuild the existing 115 kV corridor between Landstown – VA Beach sub for a double ckt (230 kV and 115 kV) Move some load to 230 kV line(b1071)
- Estimated Project Cost: \$25 M
- Required IS Date: 6/1/2012

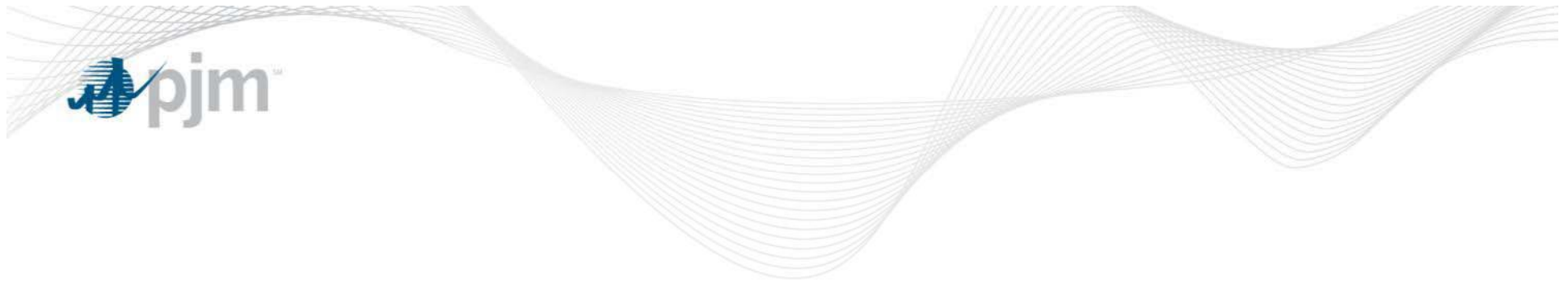


- N-1-1 Voltage Violation
- Voltage collapse / loss of Planebrook - Bradford 220-02 230 kV line, Planebrook - Tredyffrin 220-24 230 kV line, Planebrook 230/35 kV TX #1 + loss of Planebrook - Bradford 220-31 230 kV line, Planebrook - Tredyffrin 220-09 230 kV line, Planebrook 230/69 kV XFMR #9, Planebrook 230/35 kV XFMR #3
- Proposed Solution:  
Install 2 new 230 kV breakers at Planebrook (on the 220-02 line terminal and on the 230 kV side of the #9 transformer)
- Estimated Project Cost:  
\$1.3 M
- Required IS Date: 6/1/2014



- N-1-1 Voltage Violation
- Voltage drop violation at Jenkins 230 kV bus / loss of Jenkins-Stanton #1 230 kV line, Jenkins 230/69 kV transformer #1, Stanton 230/69 kV transformer #3 + loss of Jenkins-Stanton #2 230 kV line, Jenkins 230/69 kV transformer #2, Stanton 230/69 kV transformer #1
- Proposed Solution:
  - Install motor operators on the Jenkins 230 kV '2W' disconnect switch
  - Build out Jenkins Bay 3 and have MOD '3W' operated as normally open
  - The proposed solution will allow the Jenkins 230/69 kV transformer #1 to be restored before the second contingency
- Estimated Project Cost: \$1.0 M
- Required IS Date: 6/1/2014





## Baseline Network Upgrade Cost Allocation



# Baseline Network Upgrade Cost Allocation

## COST ALLOCATION LEGEND

<u>Short Name</u>	<u>Full Name</u>
PEN	Pennsylvania Electric Company
APS	Allegheny Power
PPL	PPL Electric Utilities Corporation
ME	Metropolitan Edison Company
JC	Jersey Central Power and Light Company
PS	Public Service Electric and Gas Company
AEC	Atlantic City Electric Company
PE	PECO Energy Company
BGE	Baltimore Gas and Electric Company
DPL	Delmarva Power and Light Company
PEP	Potomac Electric Power Company
RE	Rockland Electric Company
CE	Commonwealth Edison Company
AEP	AEP East Zone
DAY	The Dayton Power and Light Company
DL	Duquesne Light Company
DOM	Virginia Electric and Power Company
NEP	Neptune Regional Transmission System, LLC
ECP	East Coast Power, LLC





# Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost (\$M)	AEC	AEP	APS	CE	DAY	DL	PEN
b1072	Modify the existing EMS load shedding scheme at Cedar to additionally sense the loss of both Cedar 230/69 kV transformers and shed load accordingly.	AEC	0	100						
b1032.1	Construct a new 345/138kV station on the Marquis-Bixby 345kV line near the intersection with Ross - Highland 69kV	AEP	50		89.97			10.03		
b1032.2	Construct two 138kV outlets to Delano 138kV station and to Camp Sherman station	AEP			89.97			10.03		
b1032.3	Convert Ross - Circleville 69kV to 138kV	AEP			89.97			10.03		
b1032.4	Install 138/69kV transformer at new station and connect in the Ross - Highland 69kV line	AEP			89.97			10.03		
b1033	Add a third delivery point from AEP's East Danville Station to the City of Danville.	AEP	1.6		100					
b1034.1	Establish new South Canton - West Canton 138kV line (replacing Torrey - West Canton) and Wagenhals - Wayview 138kV	AEP	28		96.01	0.62	0.19	0.44	0.13	2.61
b1034.2	Loop the existing South Canton - Wayview 138kV circuit in-and-out of West Canton	AEP			96.01	0.62	0.19	0.44	0.13	2.61
b1034.3	Install a 345/138kV 450 MVA transformer at Canton Central	AEP			96.01	0.62	0.19	0.44	0.13	2.61
b1034.4	Rebuild/reconductor the Sunnyside - Torrey 138kV line	AEP			96.01	0.62	0.19	0.44	0.13	2.61



# Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost (\$M)	AEP
b1035	Establish a third 345kV breaker string in the West Millersport Station. Construct a new West Millersport – Gahanna 138kV circuit. Miscellaneous improvements to 138kV transmission system.	AEP	28	100
b1036	Upgrade terminal equipment at Poston Station and update remote end relays	AEP	1.4	100
b1037	Sag check Bonsack–Cloverdale 138 kV, Cloverdale–Centerville 138kV, Centerville–Ivy Hill 138kV, Ivy Hill–Reusens 138kV, Bonsack–Reusens 138kV and Reusens–Monel–Gomingo–Joshua Falls 138 kV.	AEP	3	100
b1038	Check the Crooksville - Muskingum 138 kV sag and perform the required work to improve the emergency rating	AEP	1	100
b1039	Perform a sag study for the Madison – Cross Street 138 kV line and perform the required work to improve the emergency rating	AEP	0.15	100
b1040	Rebuild an 0.065 mile section of the New Carlisle – Olive 138 kV line and change the 138 kV line switches at New Carlisle	AEP	1	100
b1041	Perform a sag study for the Moseley - Roanoke 138 kV to increase the emergency rating	AEP	1.05	100
b1042	Perform sag studies to raise the emergency rating of Amos – Poca 138kV	AEP	0.055	100
b1043	Perform sag studies to raise the emergency rating of Turner - Ruth 138kV	AEP	0.02	100



# Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost (\$M)	AEP
b1044	Perform sag studies to raise the emergency rating of Kenova – South Point 138kV	AEP	0.067	100
b1045	Perform sag studies of Tri State - Darrah 138 kV	AEP	0.662	100
b1046	Perform sag study of Scottsville – Bremo 138kV to raise the emergency rating	AEP	0.35	100
b1047	Perform sag study of Otter Switch - Altavista 138kV to raise the emergency rating	AEP	0.05	100
b1048	Reconductor the Bixby - Three C - Groves and Bixby - Groves 138 kV tower line	AEP	5.9	100
b1049	Upgrade the risers at the Riverside station to increase the rating of Benton Harbor – Riverside 138kV	AEP	0.1	100
b1050	Rebuilding and reconductor the Bixby – Pickerington Road - West Lancaster 138 kV line	AEP	12.5	100
b1051	Perform a sag study for the Kenzie Creek – Pokagon 138 kV line and perform the required work to improve the emergency rating	AEP	0.15	100
b1052	Unsix-wire the existing Hyatt - Sawmill 138 kV line to form two Hyatt - Sawmill 138 kV circuits	AEP	3.1	100
b1053	Perform a sag study and remediation of 32 miles between Claytor and Matt Funk.	AEP	1.6	100



# Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost (\$M)	APS	BGE	DOM	PEP
b0347.16	Upgrade (per ABB inspection) Harrison 500 kV breaker 'HL-3'	APS	0.06	100			
b1027	Increase the size of the shunt capacitors at Enon 138 kV	APS	4.2	100			
b1028	Raise three structures on the Osage - Collins Ferry 138 kV line to increase the line rating	APS	0.4	100			
b1025	Construct a new 502 Junction - Osage 138 kV line	APS	4.2	100			
b1016	Rebuild Graceton - Bagley 230 kV as double circuit line using 1590 ACSR. Terminate new line at Graceton with a new circuit breaker.	BGE	16.5	2.02	75.22	16.1	6.66
b1029	Upgrade wire sections at Wagner on both 110534 and 110535 115 kV circuits. Reconfigure Lipins Corner substation	BGE	0.1		100		
b1030	Move the Hillen Rd substation from circuits 110507/110508 to circuits 110505/110506	BGE	0.2		100		
b1031	Replace wire sections on Westport - Pumphrey 115 kV circuits #110521, 110524, 110525, and 110526	BGE	0.2		100		
b1055	Upgrade wire drops at Center 115 kV on the Center – Westport 115 kV circuit	BGE	0.2		100		
b1083	Upgrade wire sections at Mays Chapel	BGE	0.1		100		



# Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost (\$M)	BGE	CE	DAY
b1084	Extend circuit 110570 from Deer Park to Northwest, and other substation work at Deer Park	BGE	5	100		
b1085	Upgrade substation wire conductors at Lipins Corner	BGE	1.5	100		
b1086	Build a new 115 kV switching station between Orchard St. and Monument St.	BGE	26	100		
b1054	Change relay settings on Byron – Wempletown 345 kV to bring relay trip setting up to 115% of Rate C	CE	0.005		100	
b1063	Add two 30 MVAR capacitor banks at Sidney 69 kV station	DAY	0.6			100
b1064	Add a 30 MVAR capacitor bank at Eldean 69 kV station	DAY	0.4			100
b1066	Install a new 30 MVAR shunt at Amsterdam 69 kV station	DAY	0.4			100
b1067	Install a new 30 MVAR shunt at Logan 69 kV station	DAY	0.4			100
b1068	Install a new 30 MVAR shunt at Darby 69 kV station	DAY	0.4			100
b1077	Reconductor East Sidney-Shelby 138 kV	DAY	0.532			100
b1078	Reconductor Greene - Alpha 138 kV	DAY	1.63			100
b1079	Perform sag study on Bath - Trebein 138 kV line to ensure clearance for rating increase	DAY	0			100
b1062	Add 2nd 345/138 kV transformer at Shelby	DAY	7			100
b1065.1	Install a new Shelby 138/69 kV transformer at Shelby station	DAY	5			100
b1065.2	Install a 69 kV line between Shelby 69kV station and Blue Jacket 69 kV station	DAY	7.5			100
b1065.3	Install a new 30 MVAR capacitor bank at Blue Jacket 69 kV station	DAY	0.4			100



# Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost (\$M)	DL	DOM	JC	ME
b1080	Restudy rating of Arsenal – Highland 138 kV underground line	DL	0	100			
b1081	Increase rating by forced cooling on Brunot Island – Brady 138 kV line	DL	0	100			
b1057	Raise set point voltages at Remington and Gordonsville 115 kV busses by 3 kV	DOM	0		100		
b1056	Build a 2nd Shawboro – Elizabeth City 230kV line	DOM	22		100		
b1058	Add a third 230/115 kV transformer at Suffolk substaion	DOM	6		100		
b1071	Rebuild the existing 115 kV corridor between Landstown – Va Beach Substation for a double circuit arrangement (230 kV & 115 kV)	DOM	25		100		
b1076	Replace existing North Anna 500-230kV transformer with larger unit	DOM	16		100		
b1087	Cannon Branch 230-115 kV with larger transformer	DOM	4		100		
b1075	Replace the West Wharton – Franklin –Vermont D931 and J932 115 kV line conductors with 1590 45/7 ACSR wire between the tower structures 78 and 78-B	JC	0.07			100	
b1061	Replace existing Yorkana 230/115 kV transformer banks 1 and 4 with a single, larger transformer similar to transformer bank #3	ME	4.2				100



# Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost (\$M)	JC	NEP	PE	PEN	PPL	ECP	PS	RE
b1073	Install 2 new 230 kV breakers at Planebrook (on the 220-02 line terminal and on the 230 kV side of the #9 transformer)	PE	1.3			100					
b1059	Replace a CRS relay at Hooversville 115 kV station	PEN	0				100				
b1060	Replace a CRS relay at Rachel Hill 115 kV station	PEN	0				100				
b1021	Install a new (#4) 138/69 kV transformer at Wescosville	PPL	4.179					100			
b1074	Install motor operators on the Jenkins 230 kV '2W' disconnect switch and build out Jenkins Bay 3 and have MOD '3W' operated as normally open	PPL	1					100			
b1013	Replace Linden 138 kV breaker '7PB'	PS	0.5							100	
b1017	Reconductor South Mahwah - Waldwick 345 kV J-3410 circuit	PS	11.45	29.53	1.4				0.44	66.05	2.58
b1018	Reconductor South Mahwah - Waldwick 345 kV K-3411 circuit	PS	11.45	29.71	1.41				0.44	65.87	2.57
b1082	Install 230/138 kV transformer at Bergen substation	PS	22.6				16.52			80.29	3.19



# Transmission Expansion Advisory Committee Sub-Regional RTEP Projects

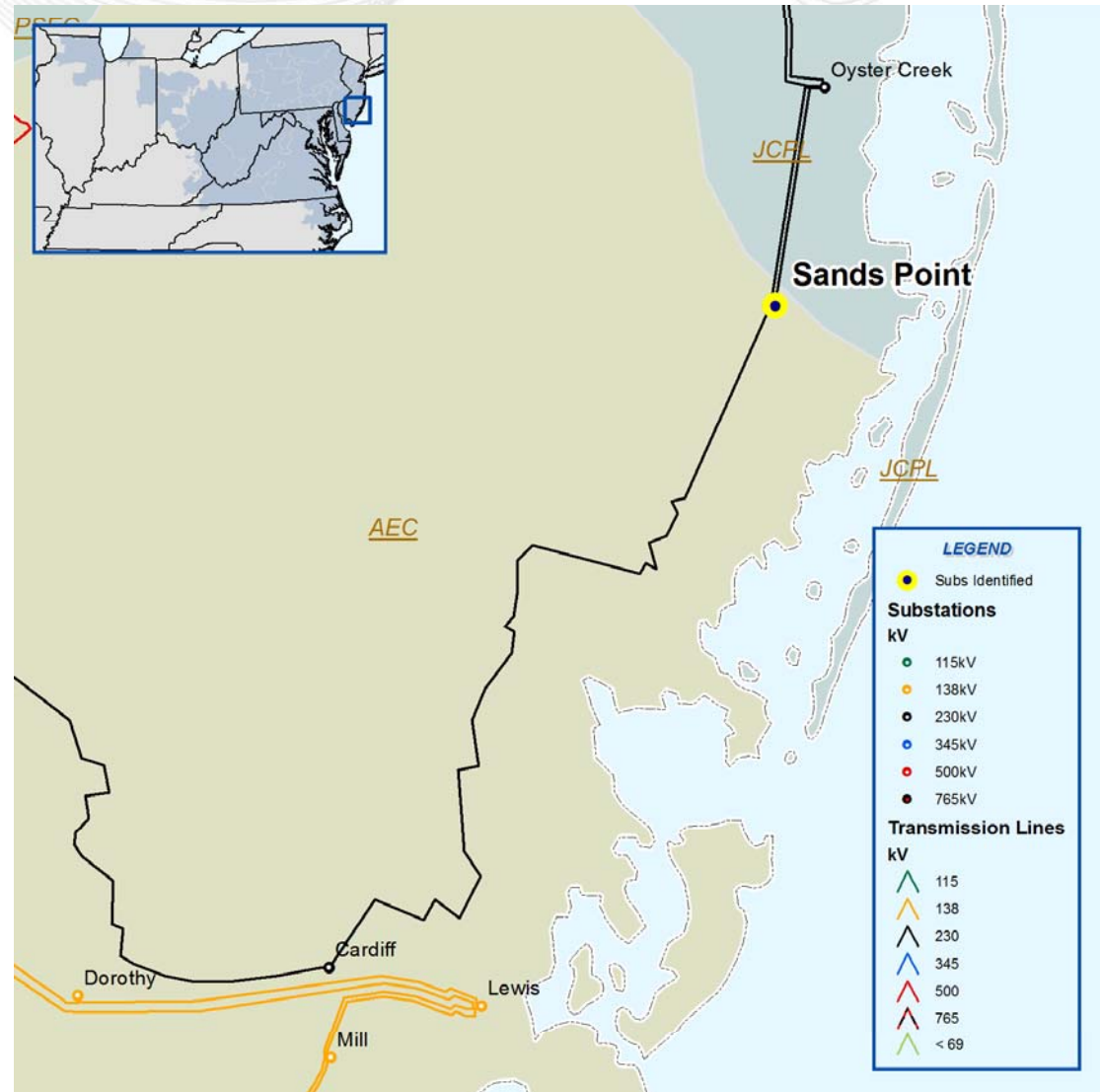
October 22, 2009



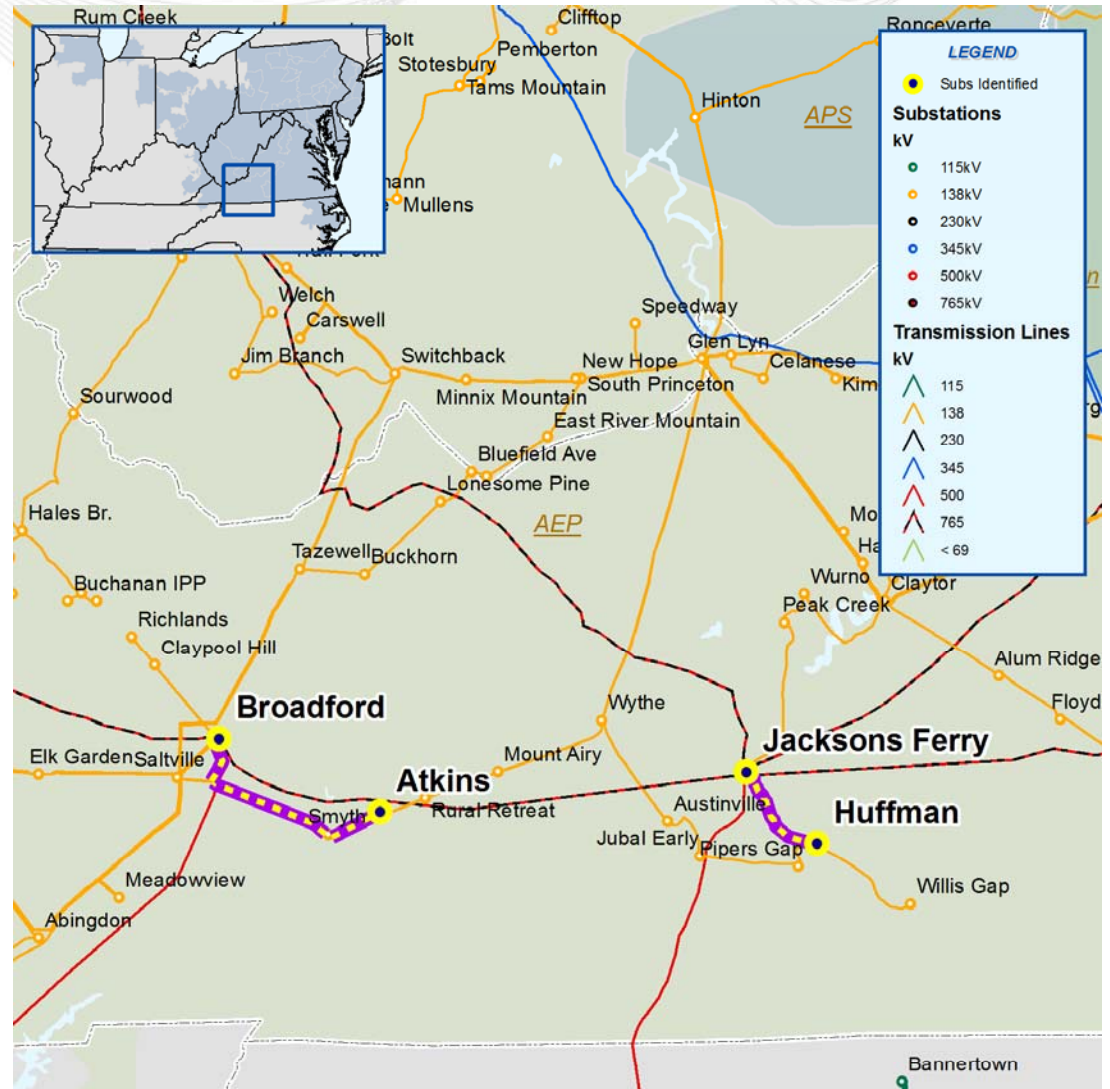


# Baseline Reliability Update

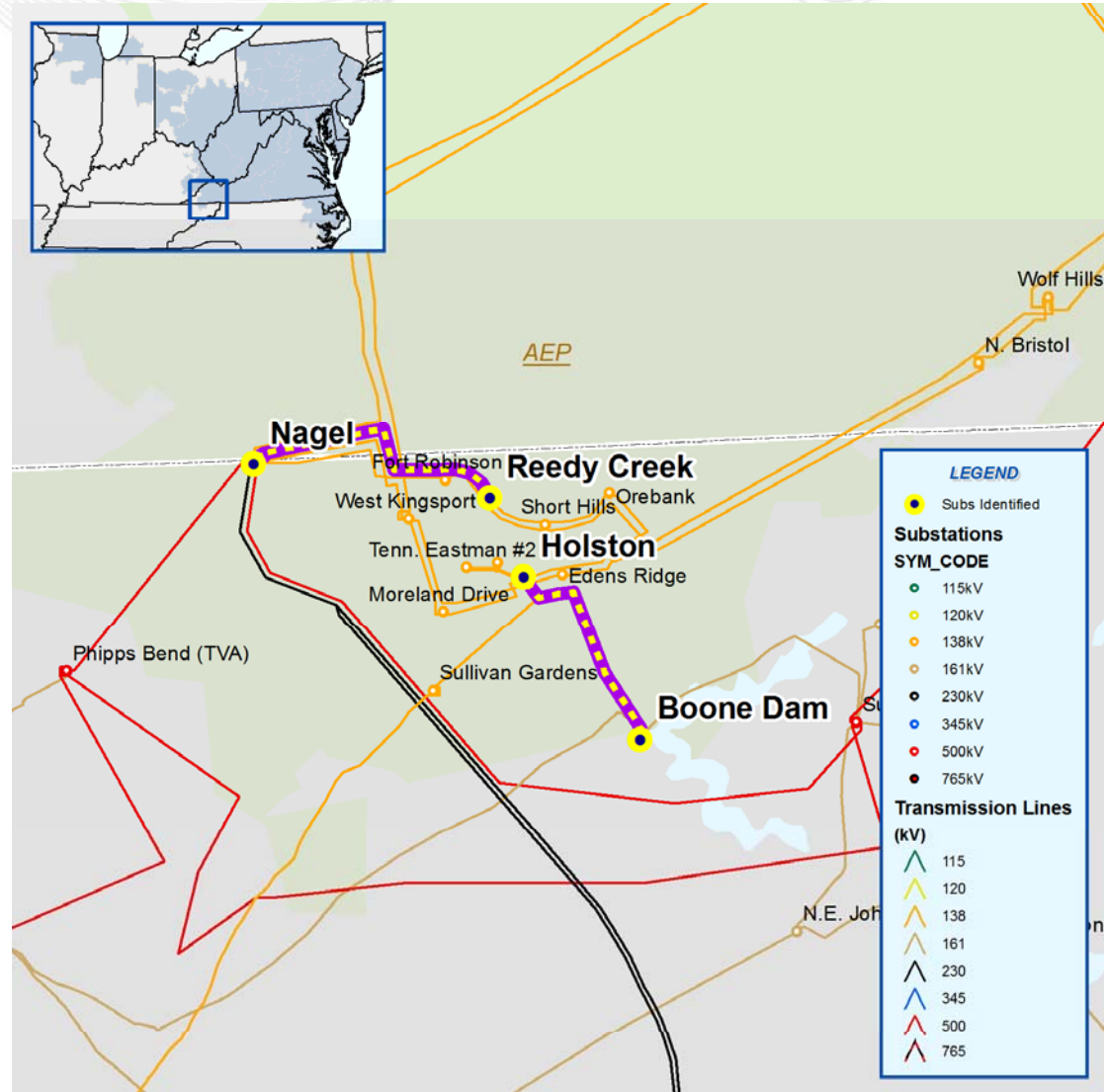
- N-1-1 Voltage Violation
- Voltage collapse / loss of Cedar 230/69 kV transformer #8 + loss of Cedar 230/69 kV transformer #9
- There is an existing EMS load shedding scheme at Cedar (Sands Point) which senses loss of both 230 kV sources to Cedar substation and sheds load as necessary
- Proposed Solution: Modify the existing EMS load shedding scheme at Cedar to additionally sense the loss of both Cedar 230/69 kV transformers and shed load accordingly
- Estimated Project Cost: \$0 M
- Required IS Date: 6/1/2014



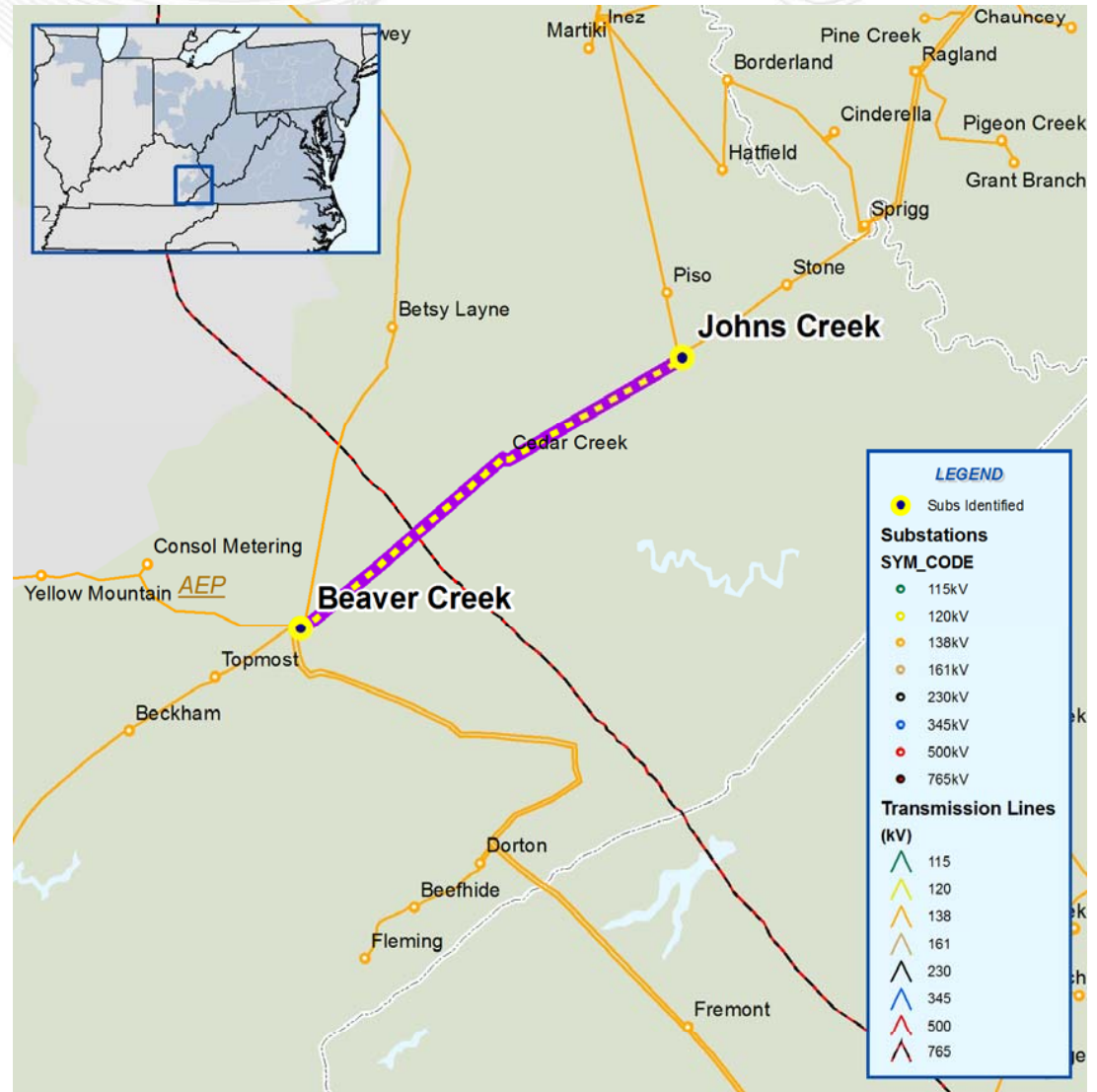
- N-1-1 voltage violation
- Voltage violations at Progress Park and Wythe stations for the loss of Adkins-Broadford 138 kV circuit and Huffman-Jacksons Ferry 138 kV circuit
- Proposed Solution:  
Add 28.8 Mvar 138 kV capacitor bank at Huffman and 43.2 Mvar 138 kV Bank at Jubal Early and 52.8 Mvar 138 kV Bank at Progress Park Stations
- Estimated Cost:  
\$2.4 M
- Required IS Date:  
6/1/2014



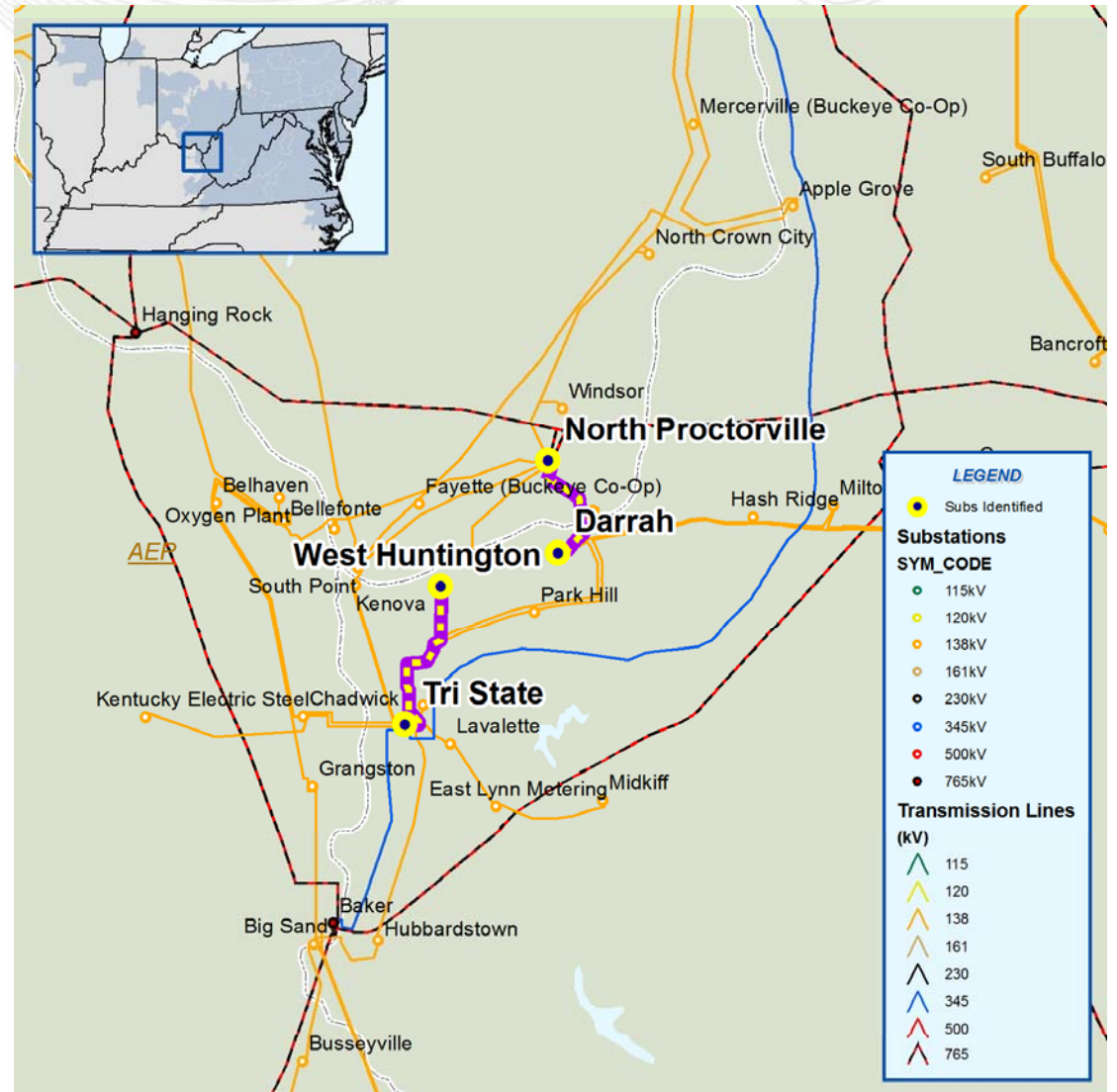
- N-1-1 Voltage violations
- Voltage violations at Sullivan Gardens Reedy Creek Short Hills and Holston Stations for the loss of Nagle-Reedy Creek 138 kV circuit and Boone Dam-Holston 138 kV circuit
- Proposed Solution:  
Add 28.8 Mvar 138 kV capacitor bank at Sullivan Gardens and 52.8 Mvar 138 kV Bank at Reedy Creek Stations
- Estimated Cost:  
\$2 M
- Required IS Date:  
6/1/2014



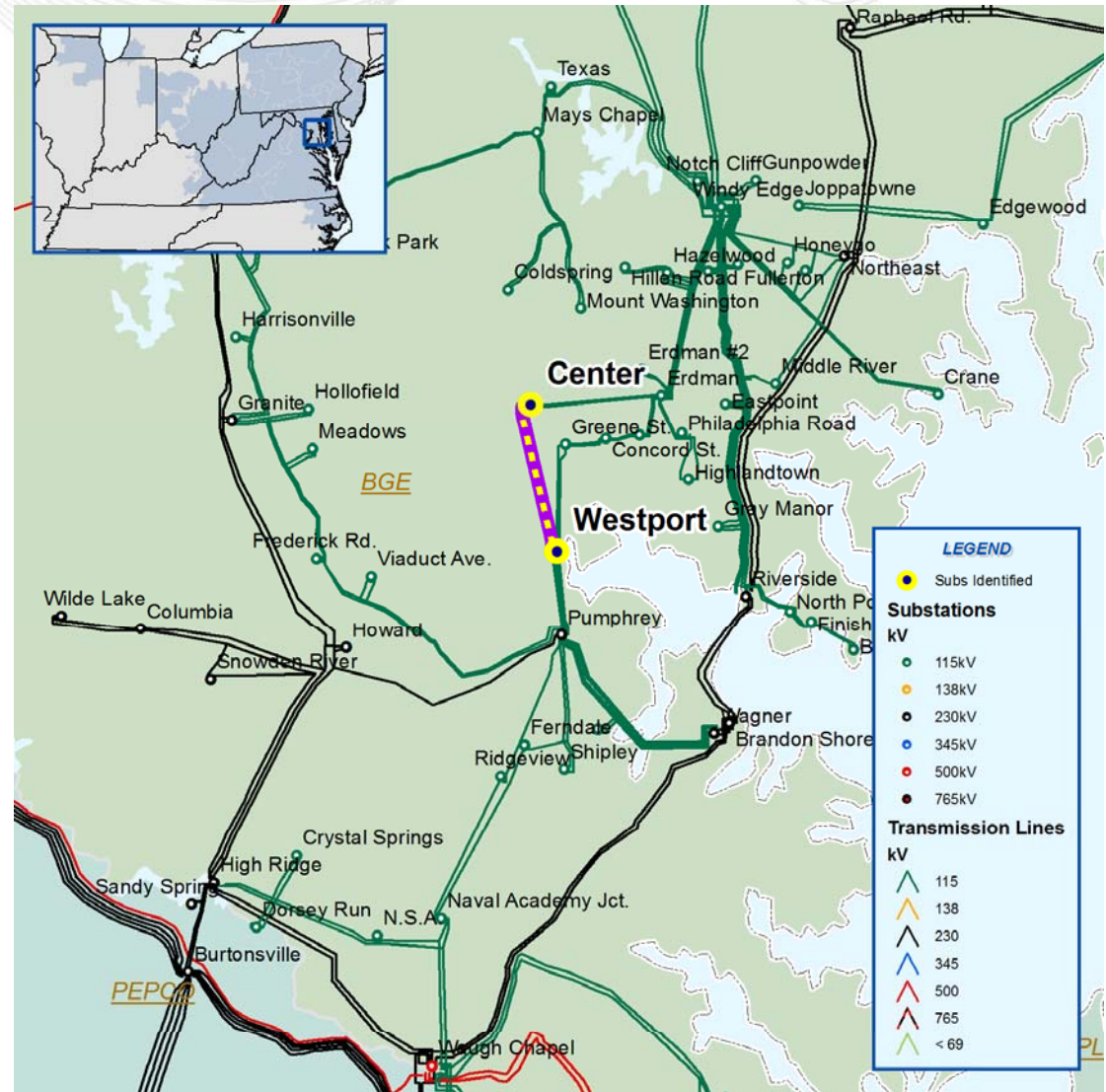
- N-1-1 voltage violations
- Low voltage violations in Beaver Creek, Morgan Fork, and Johns Creek areas for the loss of Beaver Creek-Morgan Fork and Beaver Creek-Johns Creek 138 kV Circuits results
- Proposed Solution:  
Add a 43.2 MVAR capacitor bank at the Morgan Fork 138 kV Station
- Estimated Cost:  
\$0.8 M
- Required IS Date:  
6/1/2014



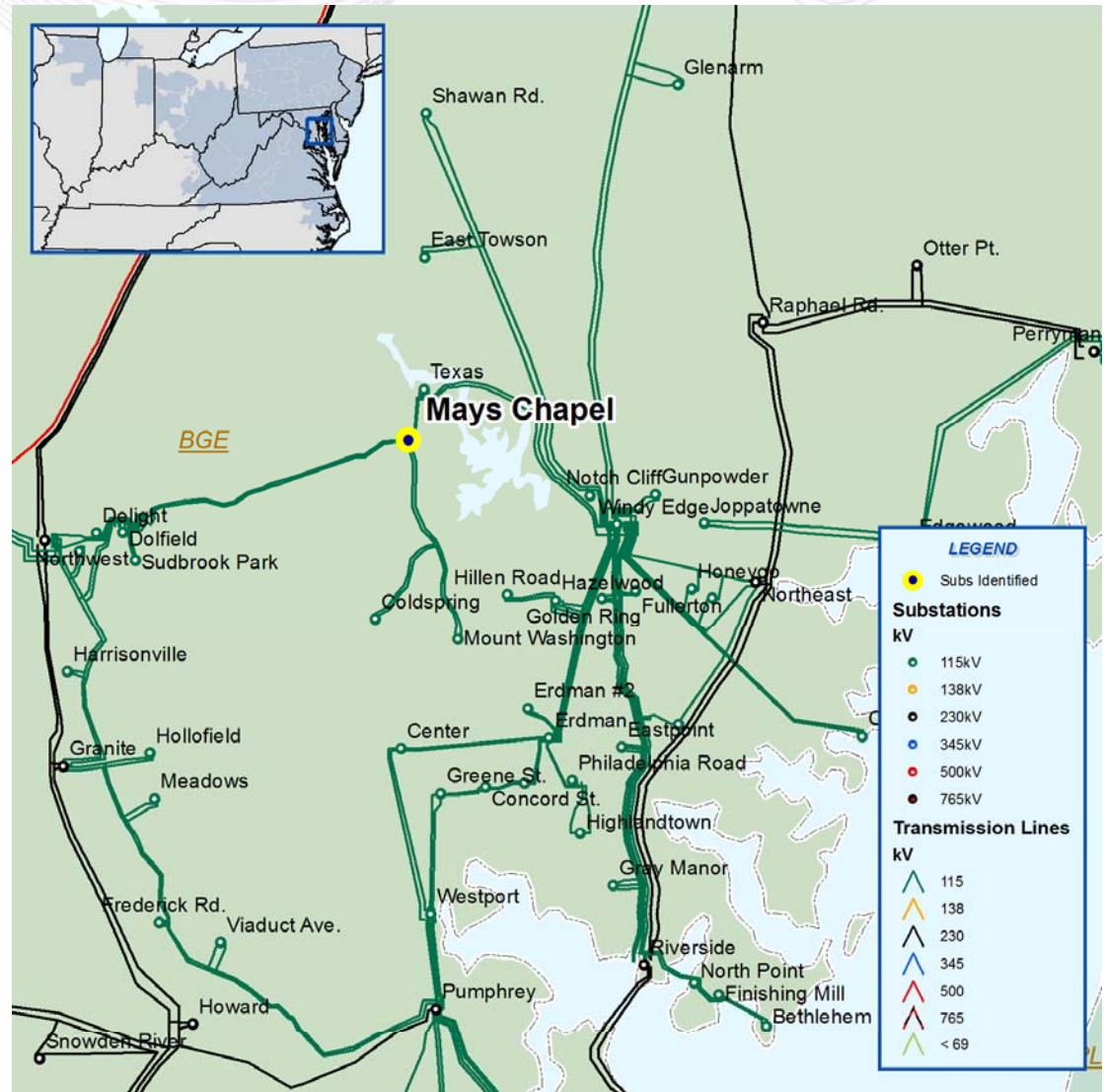
- N-1-1 voltage violation
- Low voltage violations at Darrah, North Proctorville, Tristate West, and Huntington areas for the loss of Darrah - North Proctorville and Tristate West Huntington 138 kV Circuits
- Proposed Solution: Add a 64.8 MVAR capacitor bank at the West Huntington 138 kV Station
- Estimated Cost: \$0.8 M
- Required IS Date: 6/1/2014



- Generation deliverability violation
- The Westport – Center 115 kV circuit 110552 is overloaded for tower contingency that takes out the Westport – Pumphrey 115 kV circuits 110521 and 110526
- Proposed Solution:  
Upgrade wire drop at Center 115 kV substation on the Center – Westport 115 kV circuit (B1055)
- Estimated Cost:  
\$0.2 M
- Required IS Date:  
6/1/2011

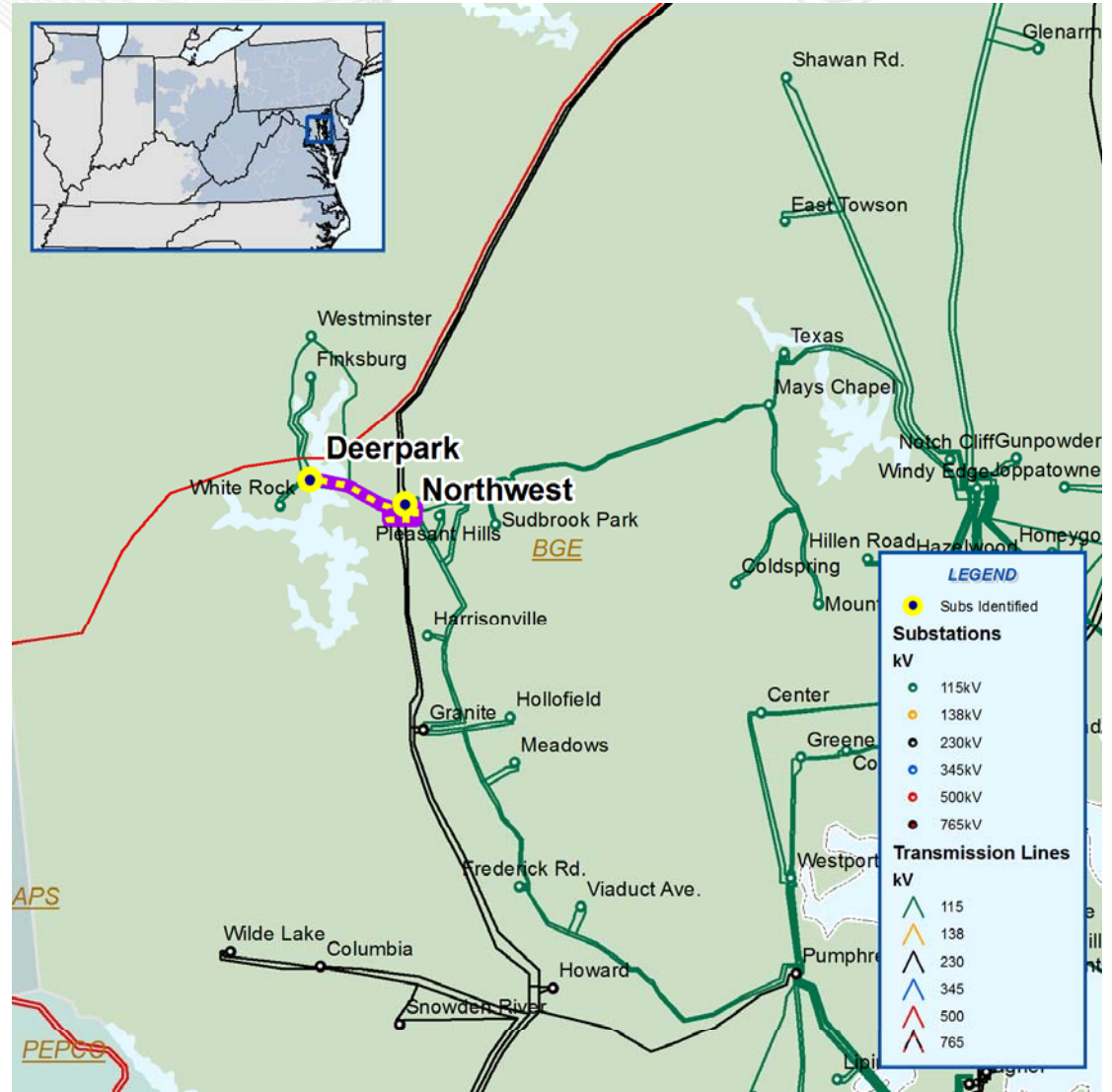


- N-1-1 Thermal Violation
- Overload of Mays Chapel – Mount Washington 115kV line for the loss of one of the pair lines (110701 & 110702)
- Proposed Solution: Upgrade wire sections at Mays Chapel. The new rating will be 260/300 SN/SE MVA
- Estimated Cost: \$0.1 M
- Required IS Date: 6/1/2014

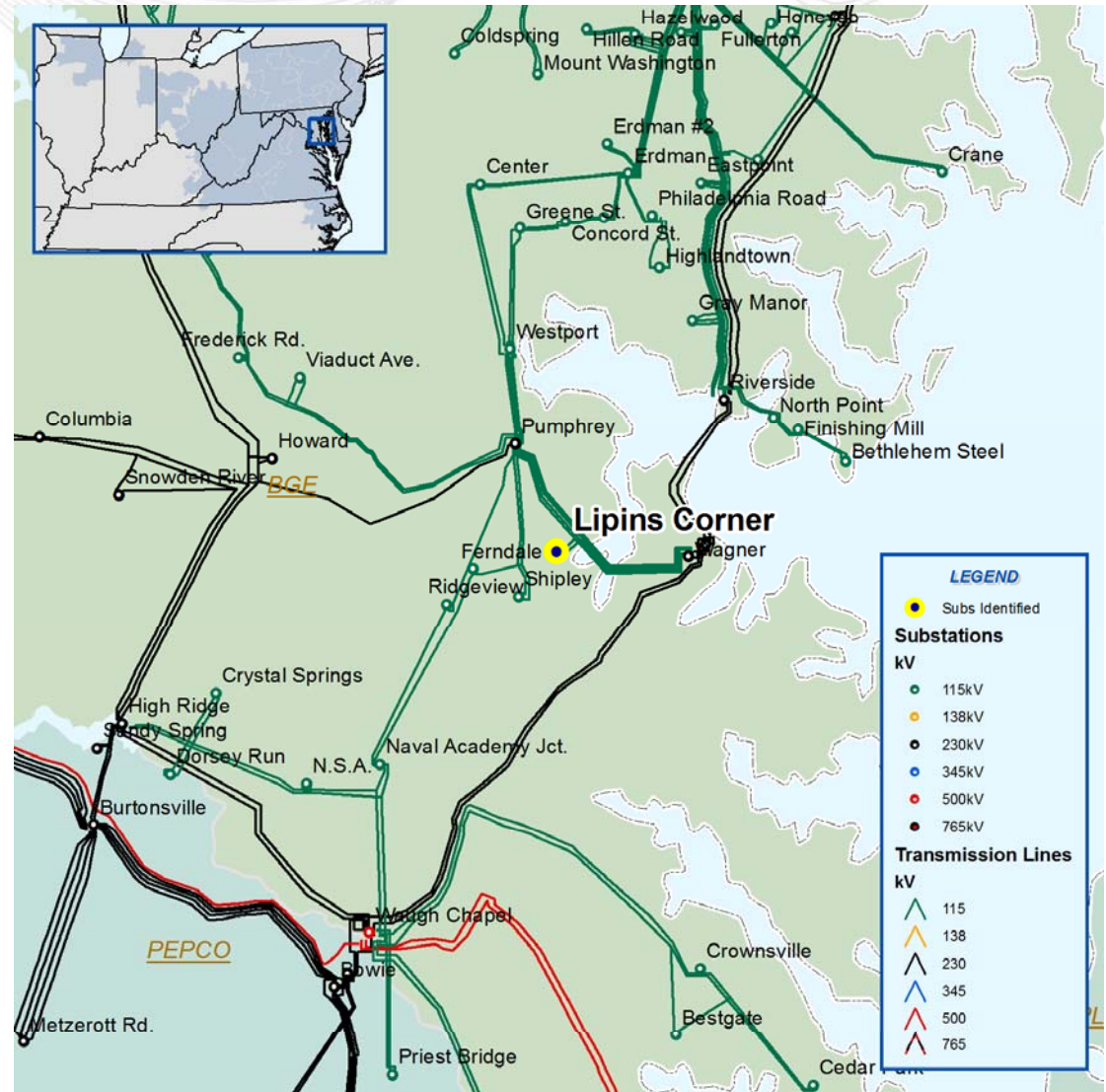




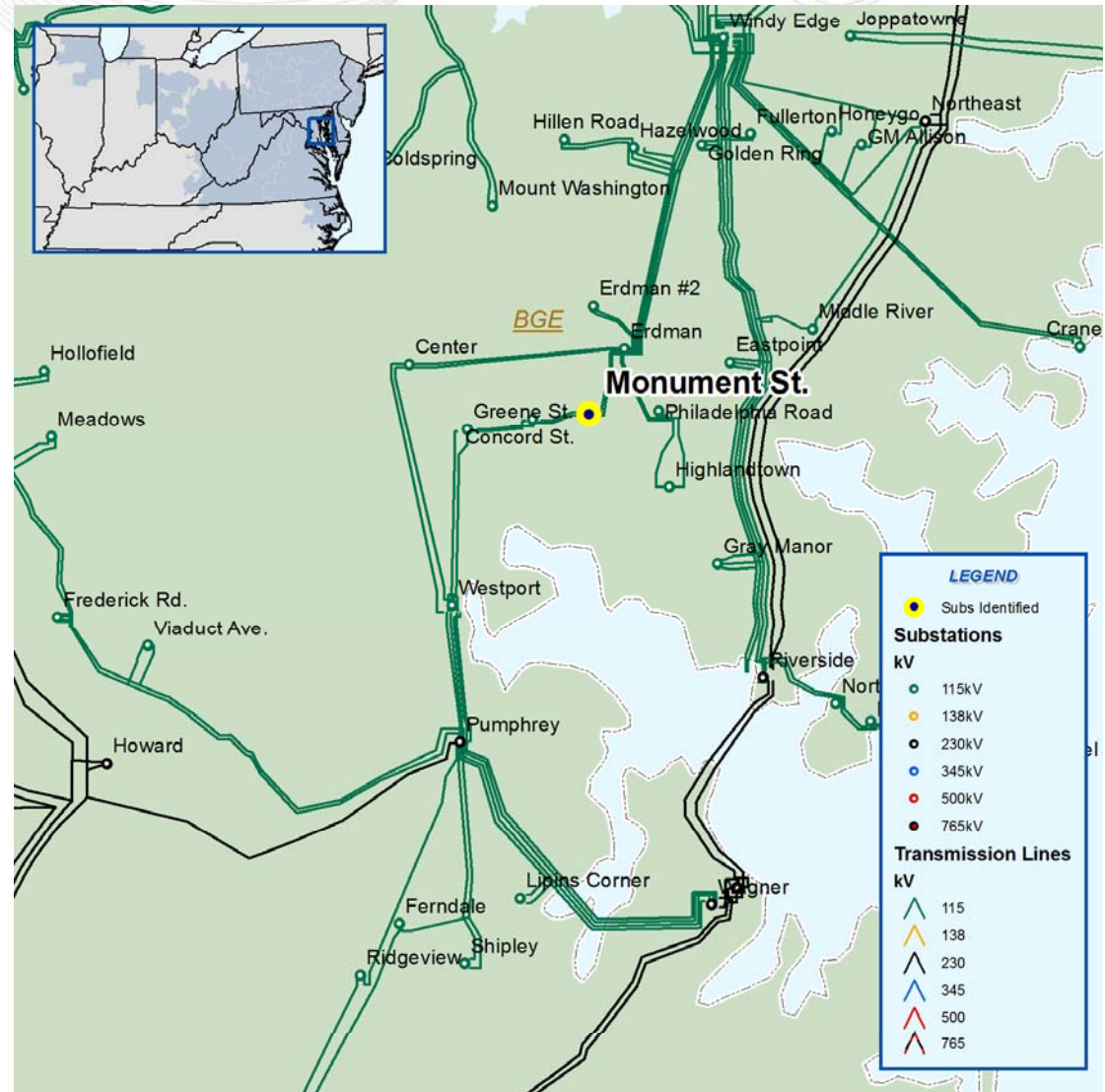
- N-1-1 Thermal Violation
- Overload of Harrisonville – Granite 115kV line for the loss of Northwest 230-5 230/115kV Transformer + loss of Northwest 230-4 230/115kV Transformer
- Proposed Solution:  
 Extend circuit 110570 from Deer Park to Northwest and terminate to an abandoned position  
 At Deer Park Tap, remove the tap connecting the Deer Park from the through transmission section of circuit 110560 from Pleasant Hills to Northwest.  
 Retire the section of 110560 from Deer Park to Deer Park Tap and existing Deer Park breaker
- Estimated Cost: \$5.0 M
- Required IS Date:  
6/1/2014



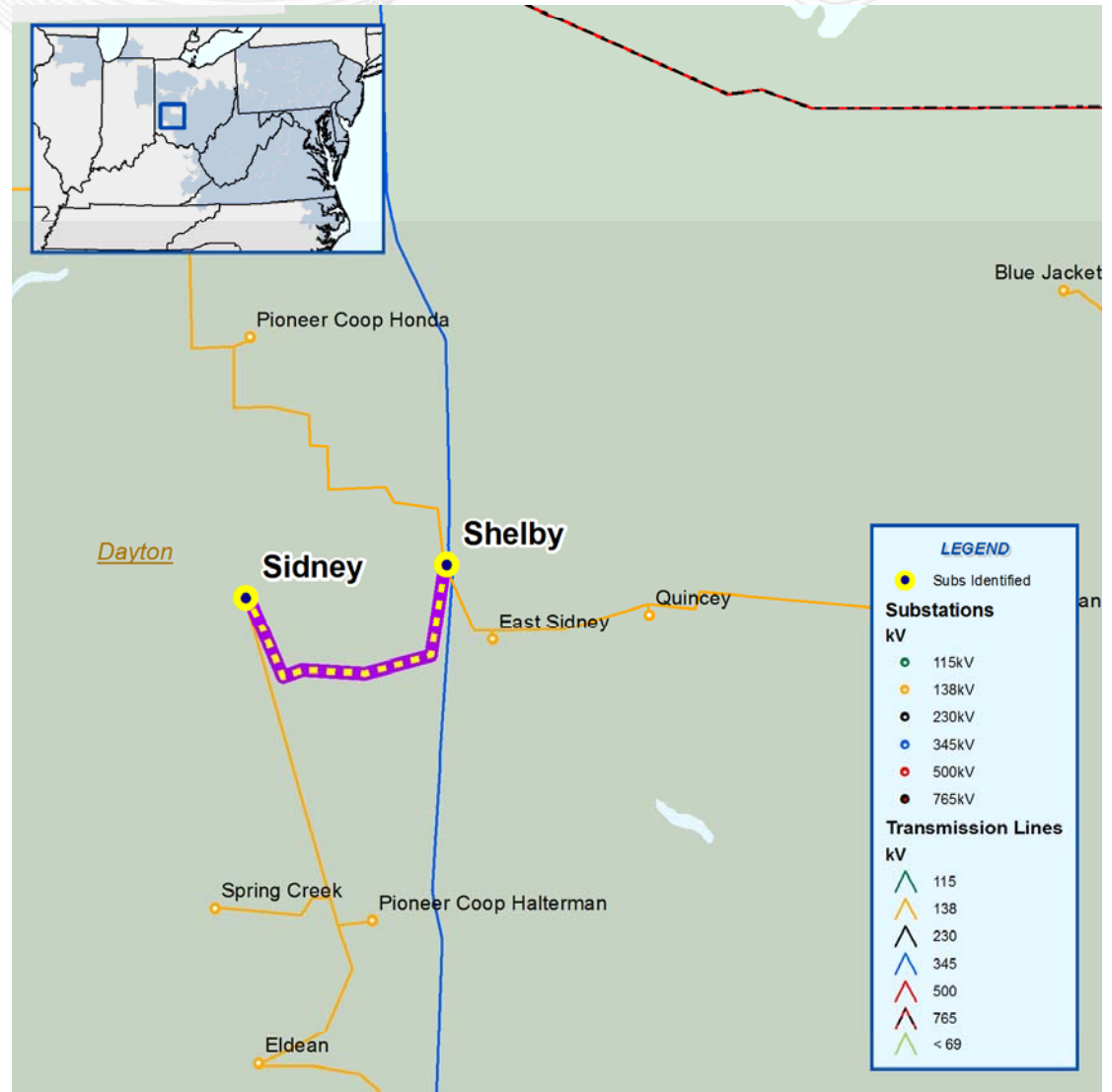
- N-1-1 Thermal Violation
- Overloads of Solley – Lipins 115kV line and Wagner – Solley 115kV line for the loss of Pumphrey –Wagner CKT 110535 and CKT 110534 respectively
- Proposed Solution:  
Upgrade substation wire conductors at Lipins Corner. The new section rating will be 275/311 MVA SN/SE, limited by 1200 A disconnect switches at Lipins Corner
- Estimated Cost: \$1.5 M
- Required IS Date: 6/1/2014



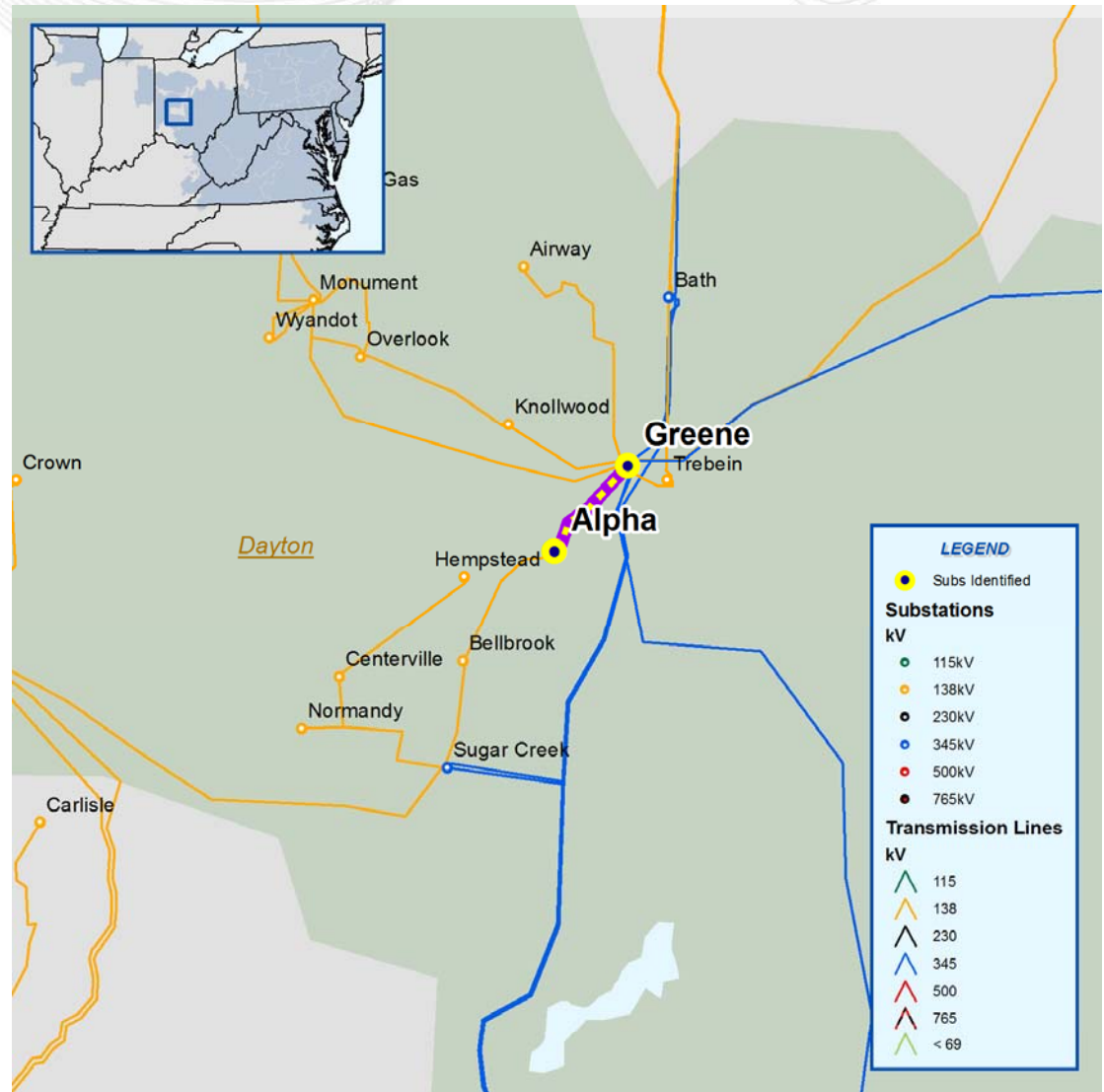
- N-1-1 Thermal Violation
- Overloads of Monument St Erdman 115kV line and Concord St. – Monument St. 115kV line for the loss of Westport – Greene St. 110554 115kV line + loss of Westport – Greene St 110553 115kV line
- Proposed Solution:  
Build a new 115 kV switching station between Orchard Street and Monument Street
- Estimated Cost: \$26.0 M
- Required IS Date:  
6/1/2014



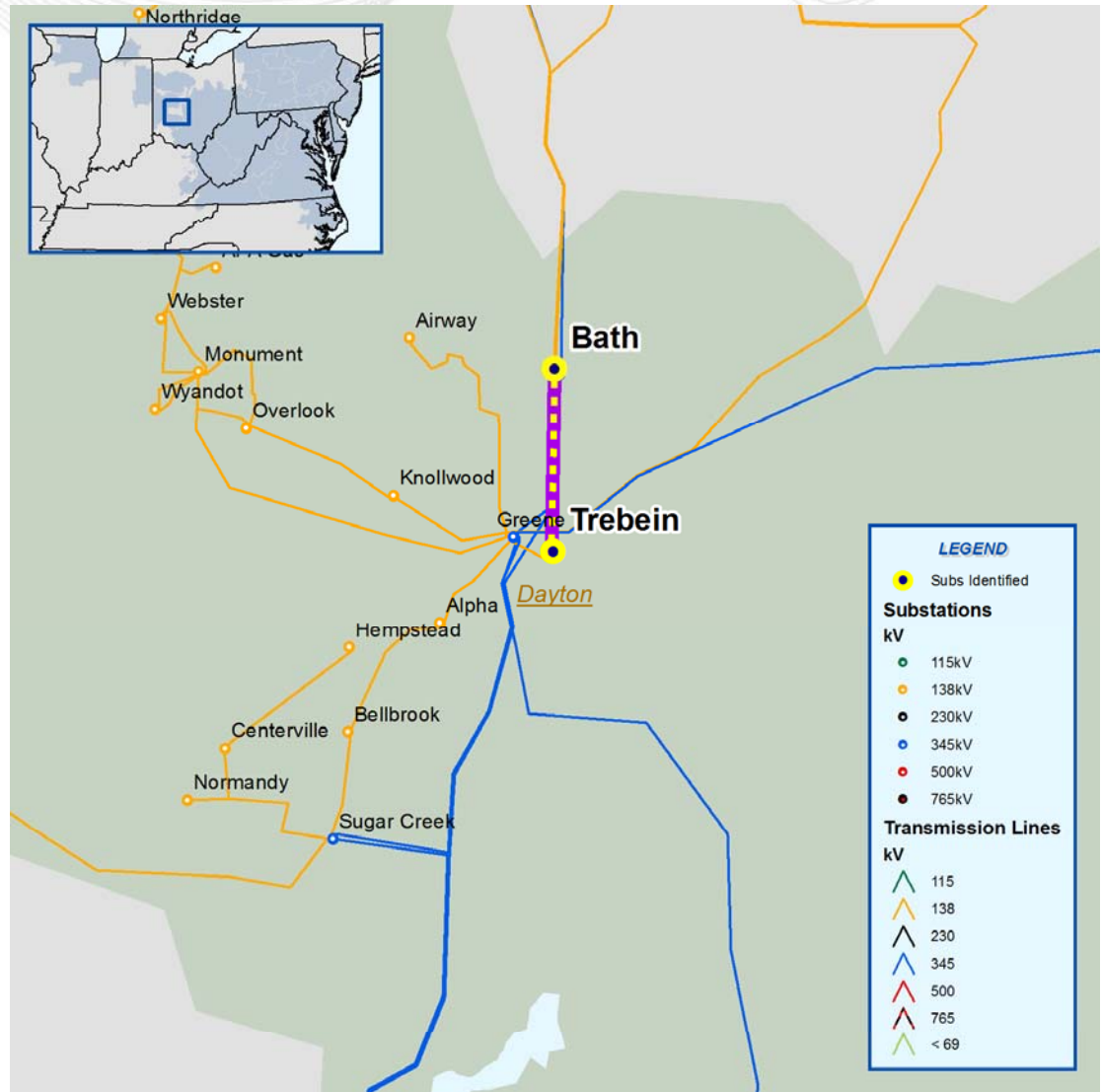
- N-1-1 Thermal Violation
- Sidney - Shelby 138 kV line for the loss of Darby 138/69 kV transformer and Urbana 138/69 kV transformer
- Proposed Solution: Reconductor E.Sidney-Shelby 138 kV
- Estimated Project Cost: \$0.532 M
- Required IS Date: 6/1/2014



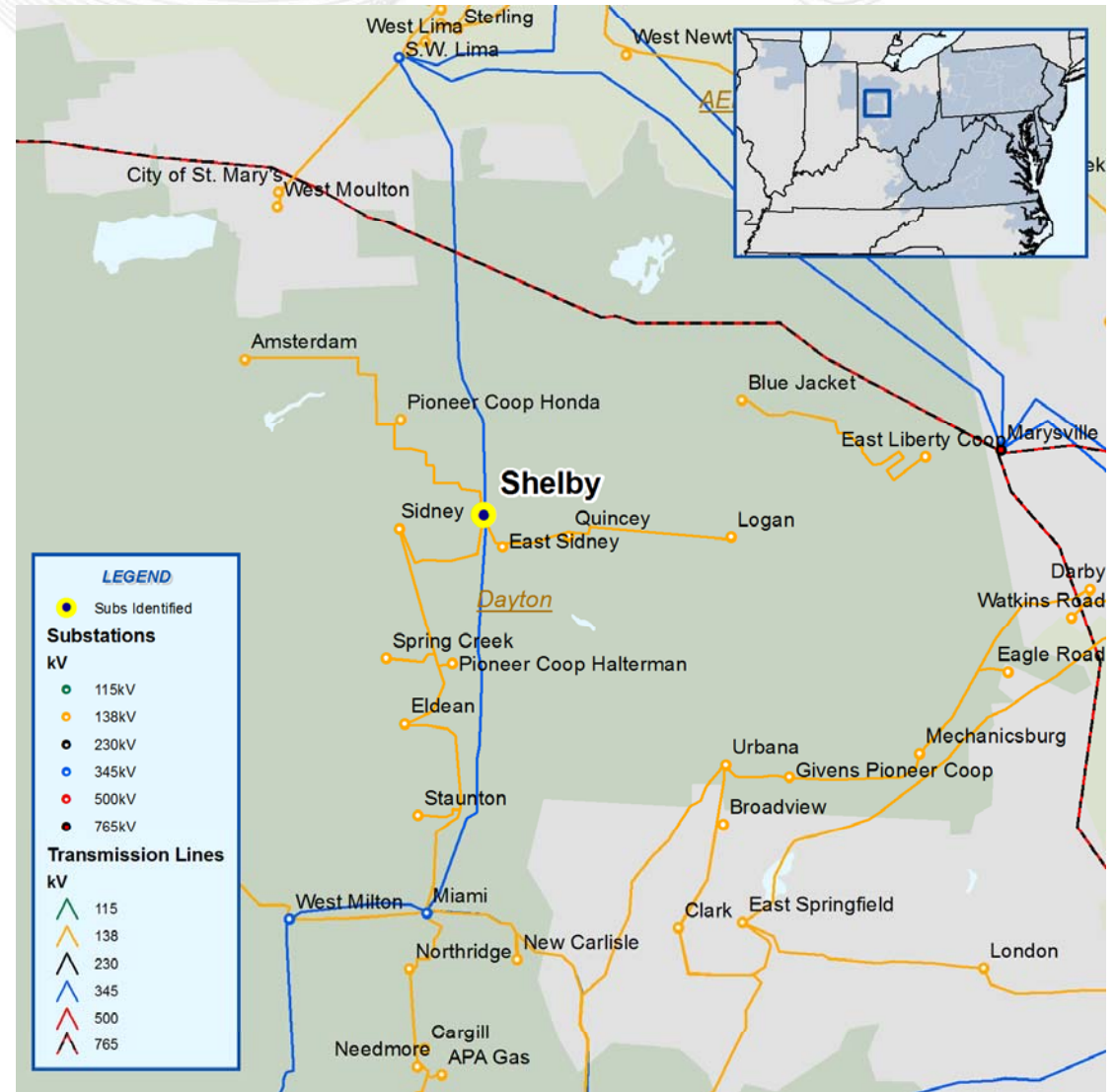
- N-1-1 Thermal Violation
- Greene - Alpha 138 kV line for the loss of Greene 345/138 transformer 1 and Greene 345/138 kV transformer #2
- Proposed Solution: Reconductor Greene - Alpha 138 kV
- Estimated Project Cost: \$1.63 M
- Required IS Date: 6/1/2014



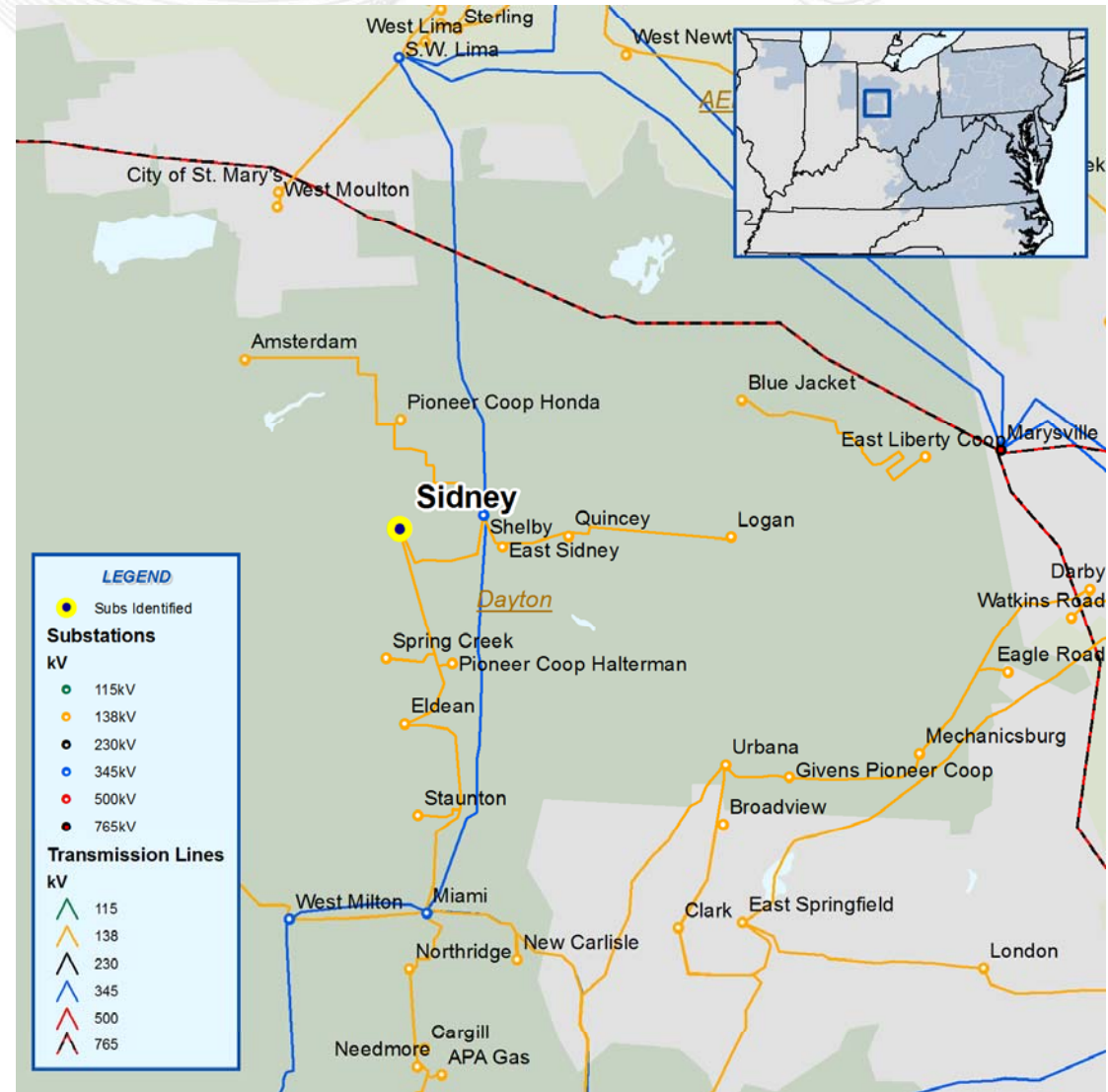
- N-1-1 Thermal violation
- Bath - Trebein 138 kV line for the loss of Bath - Miami 345 kV line and Bath 345/138 kV transformer
- Proposed Solution: Perform sag study on Bath - Trebein 138 kV line to ensure clearance for rating increase
- Estimated Project Cost: \$0.0 M
- Required IS Date: 6/1/2014



- N-1-1 voltage violation
- Low Voltage magnitude violation at Shelby 138 kV / loss of Shelby 345/138 kV transformer + losses of Eldean-Staunton Tap 138 kV line and Staunton Tap – Miami 138 kV line
- Proposed Solution:  
Add 2<sup>nd</sup> 345/138 kV transformer at Shelby (B1062)
- Estimated Project Cost:  
\$7 M
- Required IS Date:  
6/1/2014

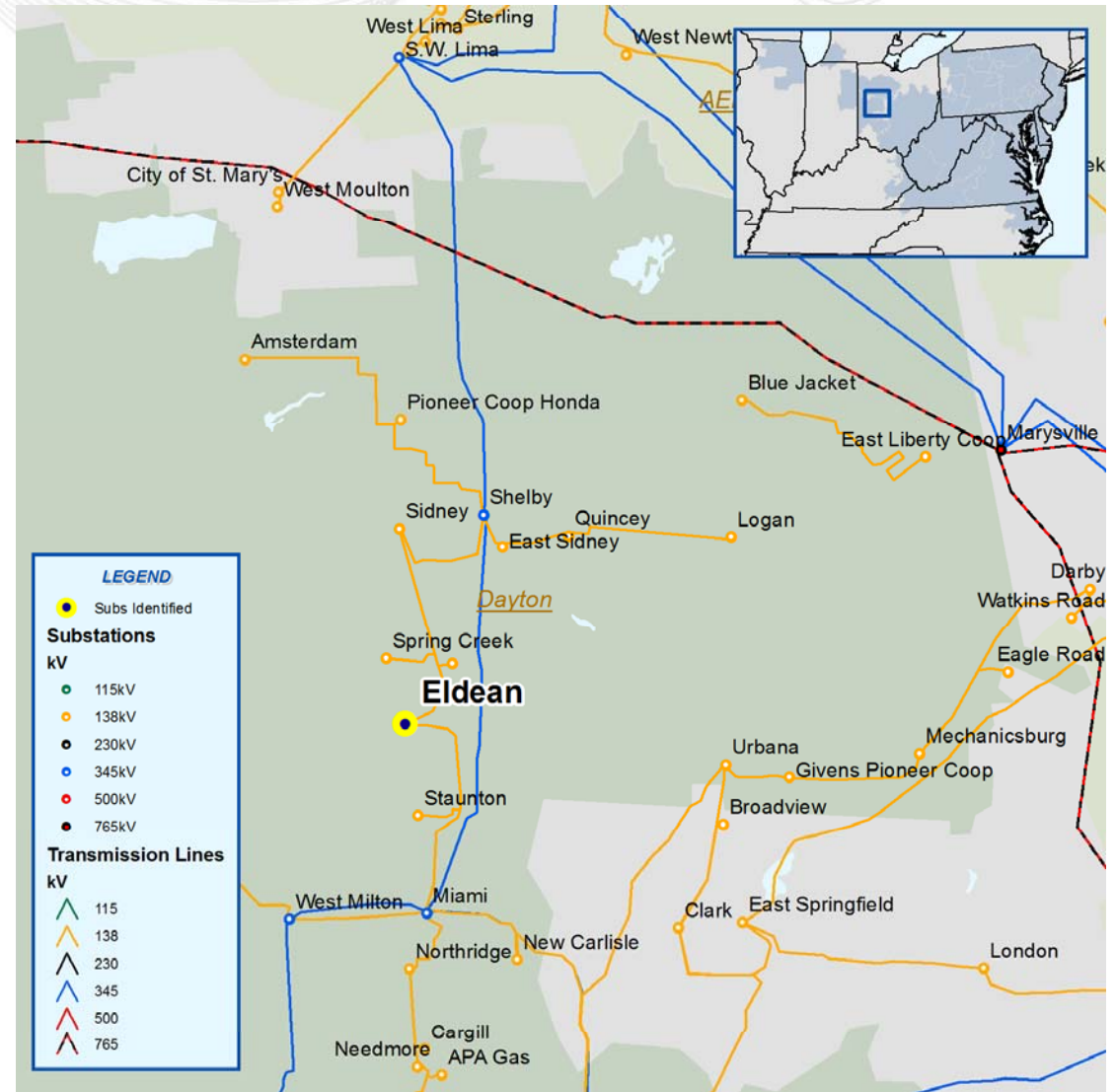


- N-1-1 voltage violation
- Low Voltage magnitude violation at Sidney 138 kV / loss of Shelby 345/138 kV transformer + losses of Eldean-Staunton Tap 138 kV line and Staunton Tap – Miami 138 kV line
- Proposed Solution:  
Add two 30 MVAR capacitor banks at Sidney 69 kV station (B1063)
- Estimated Project Cost: \$0.6 M
- Required IS Date: 6/1/2014

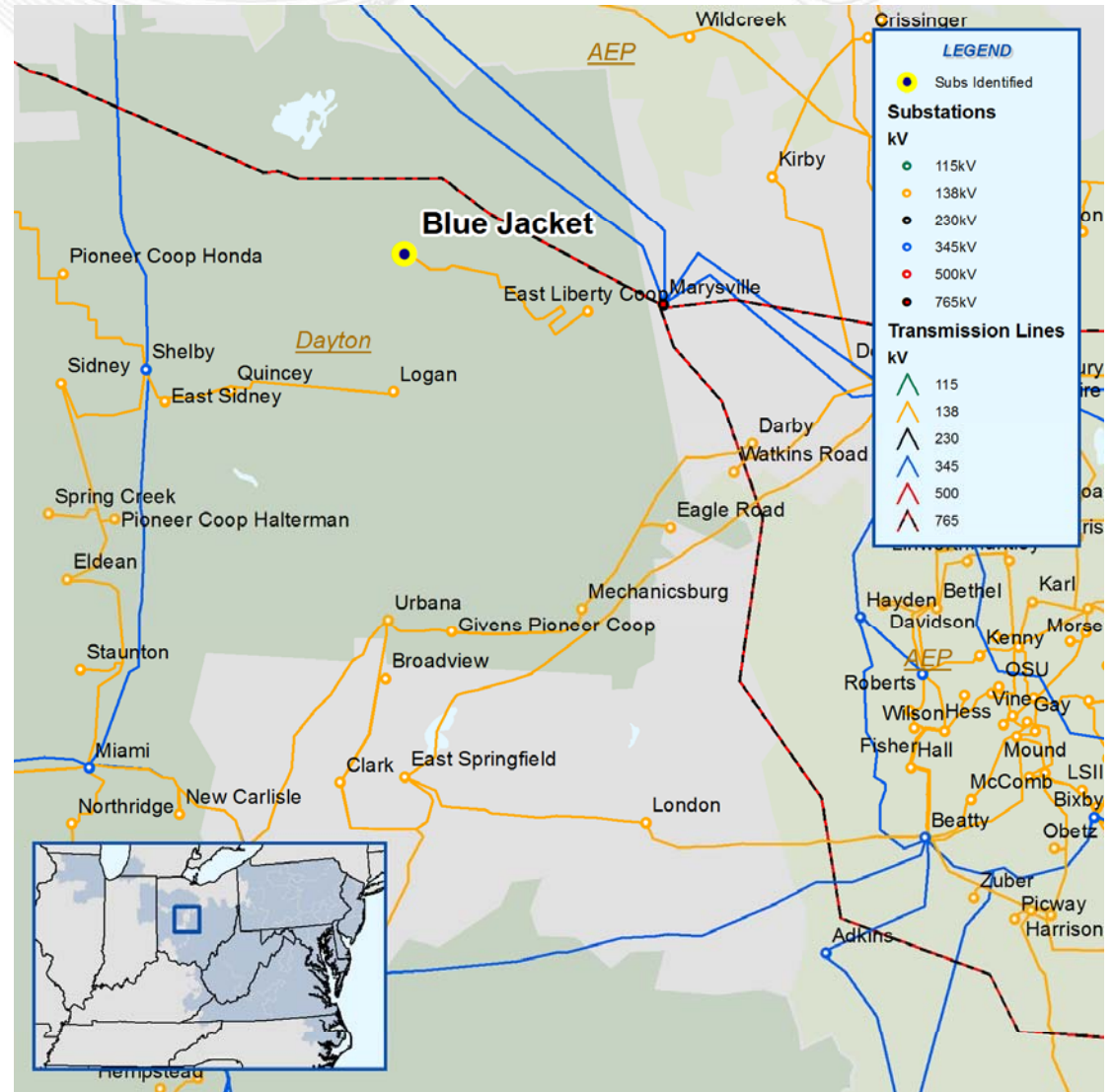




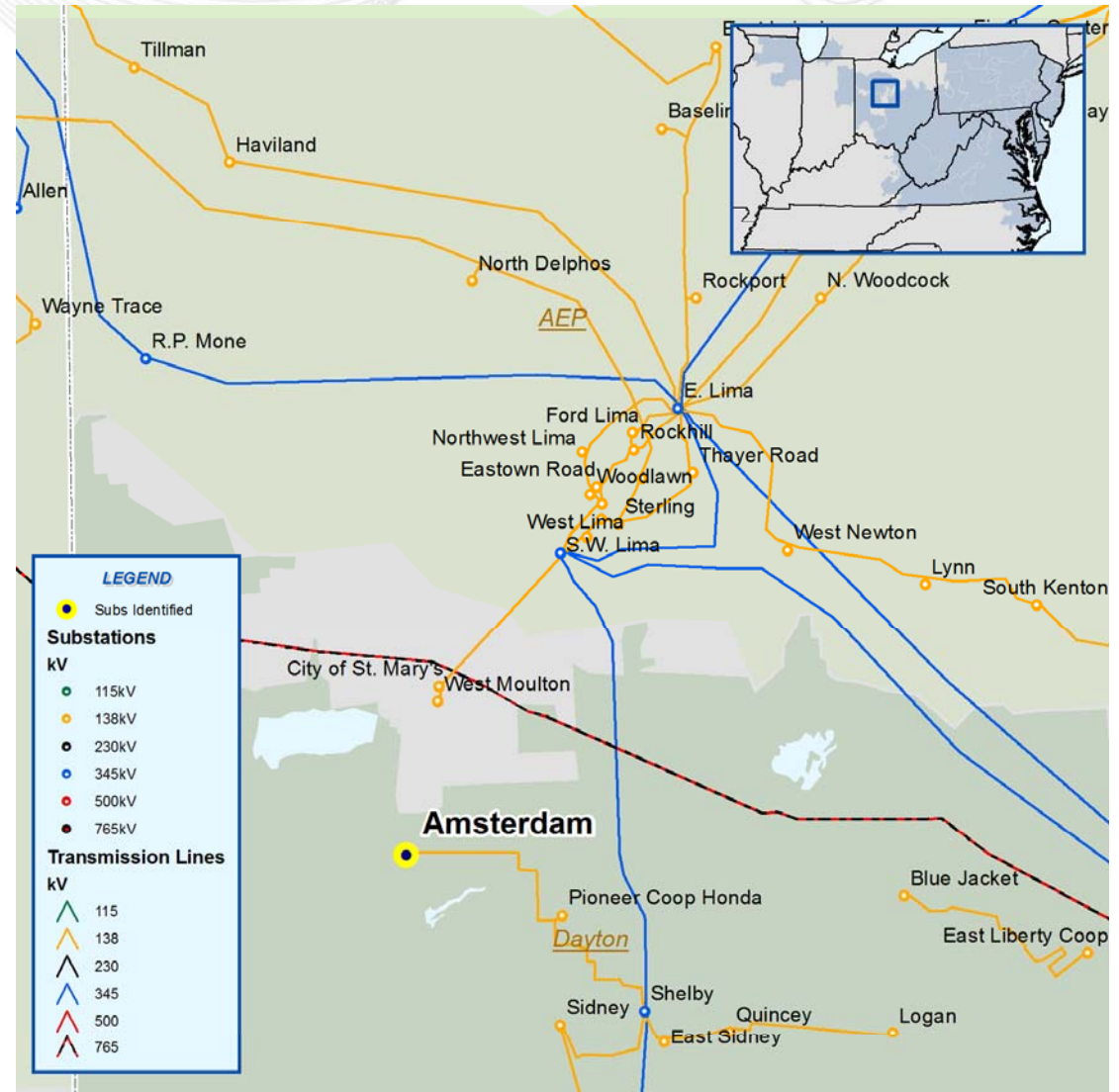
- N-1-1 voltage violation
- Low Voltage magnitude violation at Eldean 138 kV / loss of Shelby 345/138 kV transformer + losses of Eldean-Staunton Tap 138 kV line and Staunton Tap – Miami 138 kV line
- Proposed Solution:  
Add a 30 MVAR capacitor bank at Eldean 69 kV station (B1064)
- Estimated Project Cost: \$0.4 M
- Required IS Date: 6/1/2014



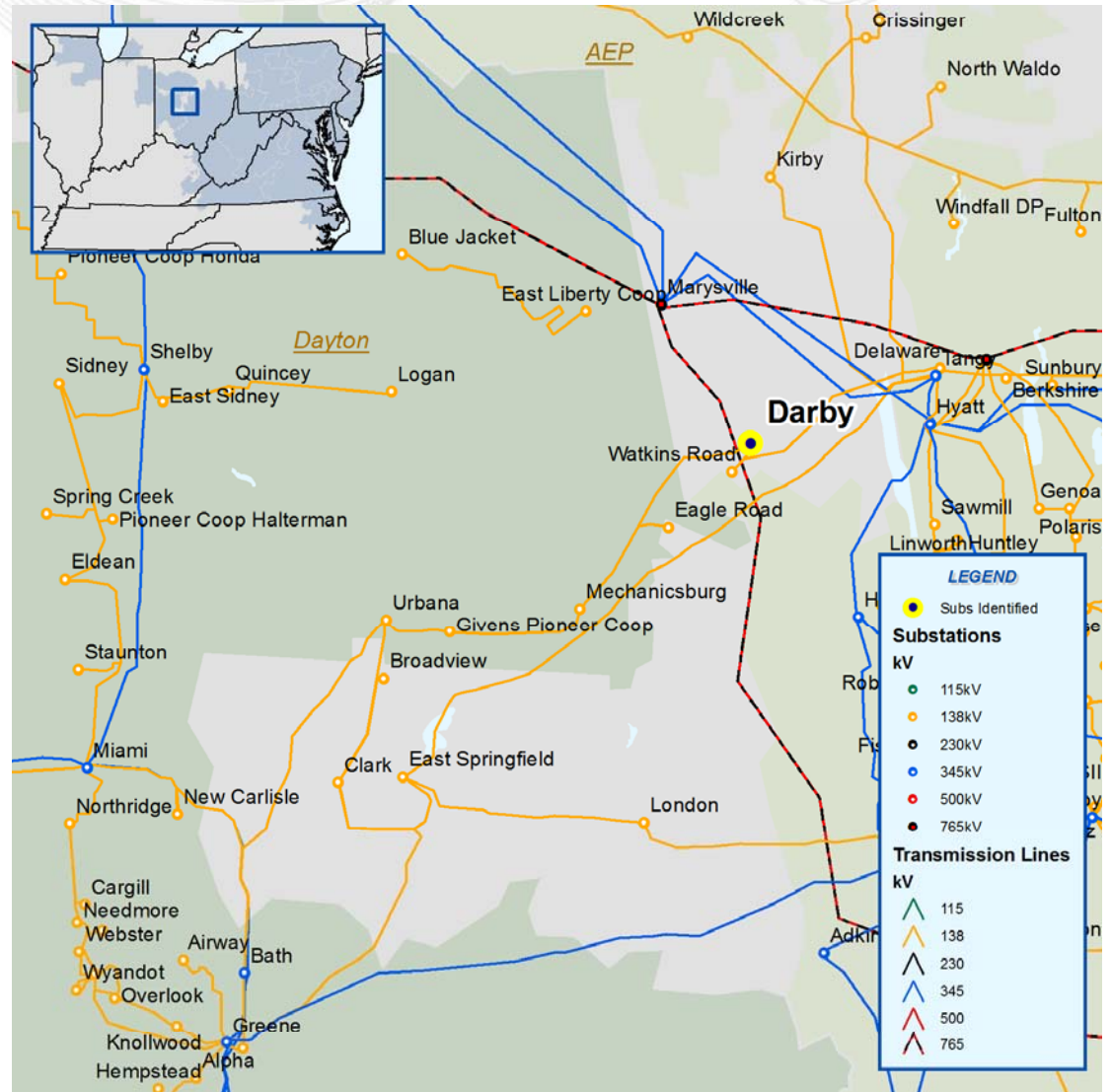
- N-1-1 voltage violation
- Low Voltage magnitude violation at Blue Jacket 138 kV / loss of Darby 138/69 kV transformer + losses of Quincy – E. Sidney 138 kV line, E. Sidney – Shelby 138 kV line, and Quincy – Logan 138 kV line
- Proposed Solution:  
Install a new Shelby 138/69 kV transformer at Shelby station (B1065.1, B1065.2, B1065.3)
- Estimated Project Cost: \$5 M
- Required IS Date: 6/1/2014



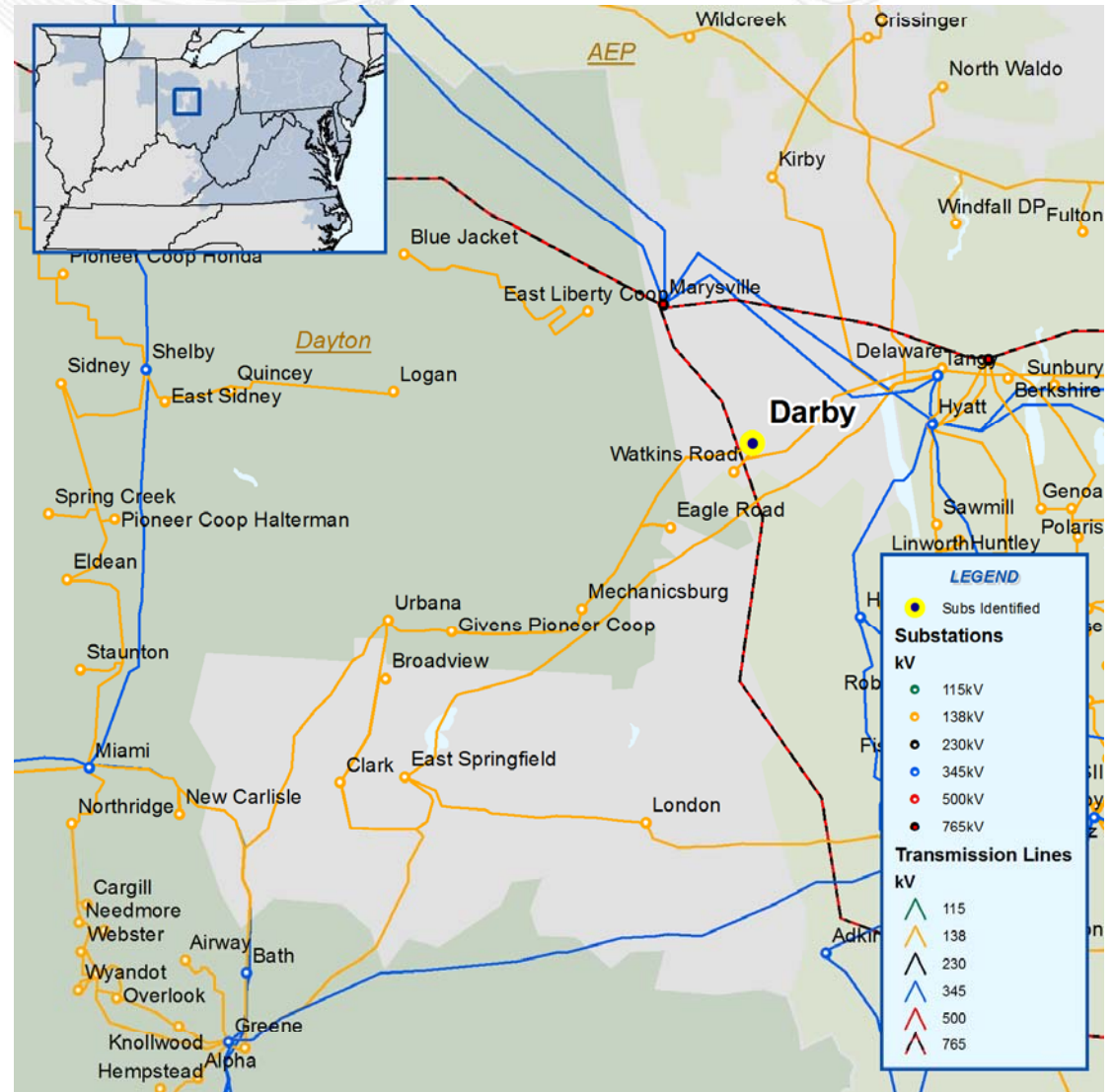
- N-1-1 voltage violation
- Low Voltage magnitude violation at Amsterdam 138 kV / loss of Southwest Lima – Shawnee Road 138 kV line and Shawnee Road – Lima Ordnance Junction 138 kV line + losses of Southwest Lima – West Moulton 138 kV line
- Proposed Solution: Install a new 30 MVAR shunt at Amsterdam 69 kV station (B1066)
- Estimated Project Cost: \$0.4 M
- Required IS Date: 6/1/2014



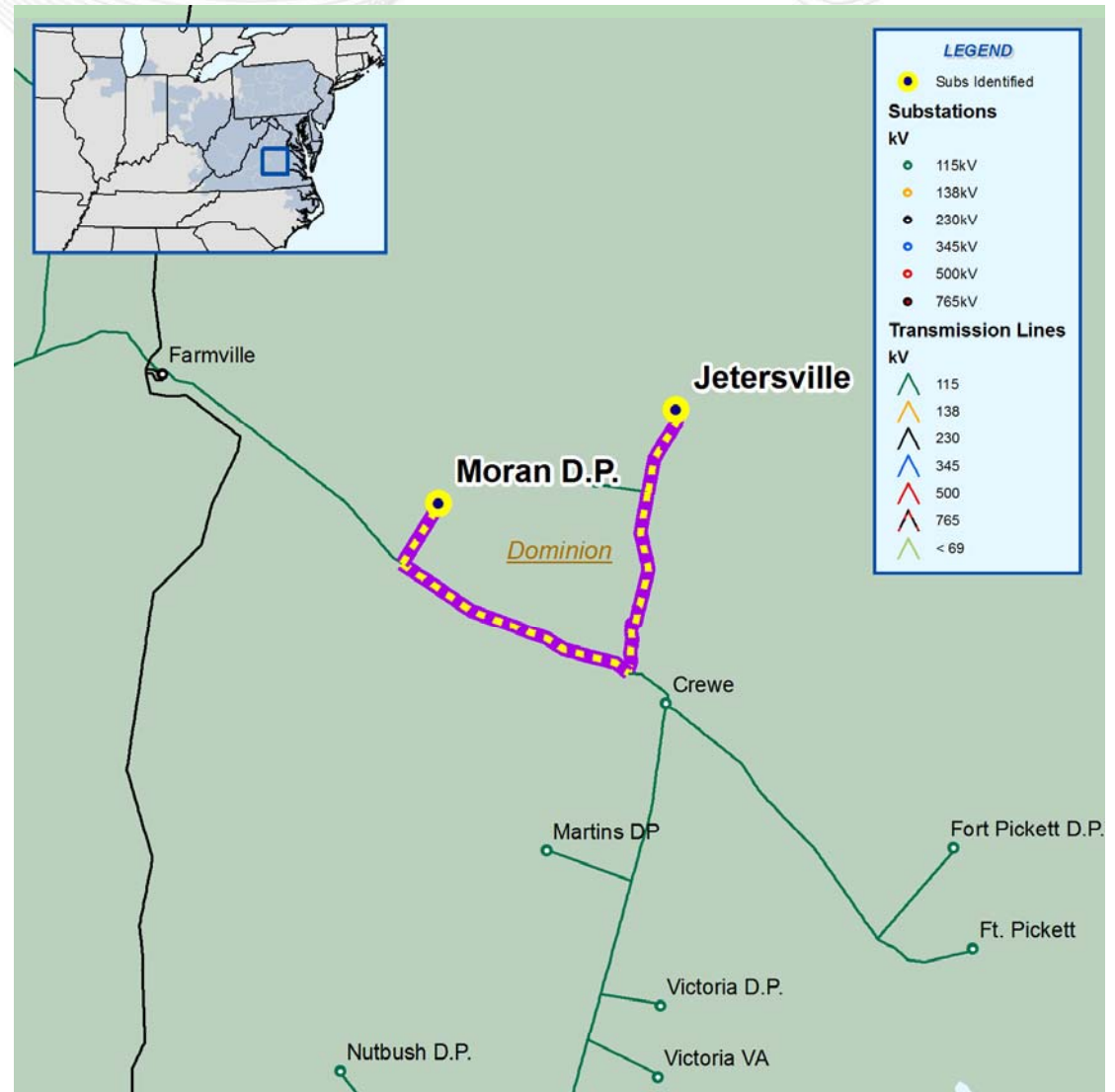
- Voltage drop violation at Logan 138 kV station / loss of Darby 138/69 kV transformer + loss of Urbana 138/69 kV transformer
- Proposed Solution: Install a new 30 MVAR shunt at Logan 69 kV station (B1067)
- Estimated Project Cost: \$0.4 M
- Required IS Date: 6/1/2014



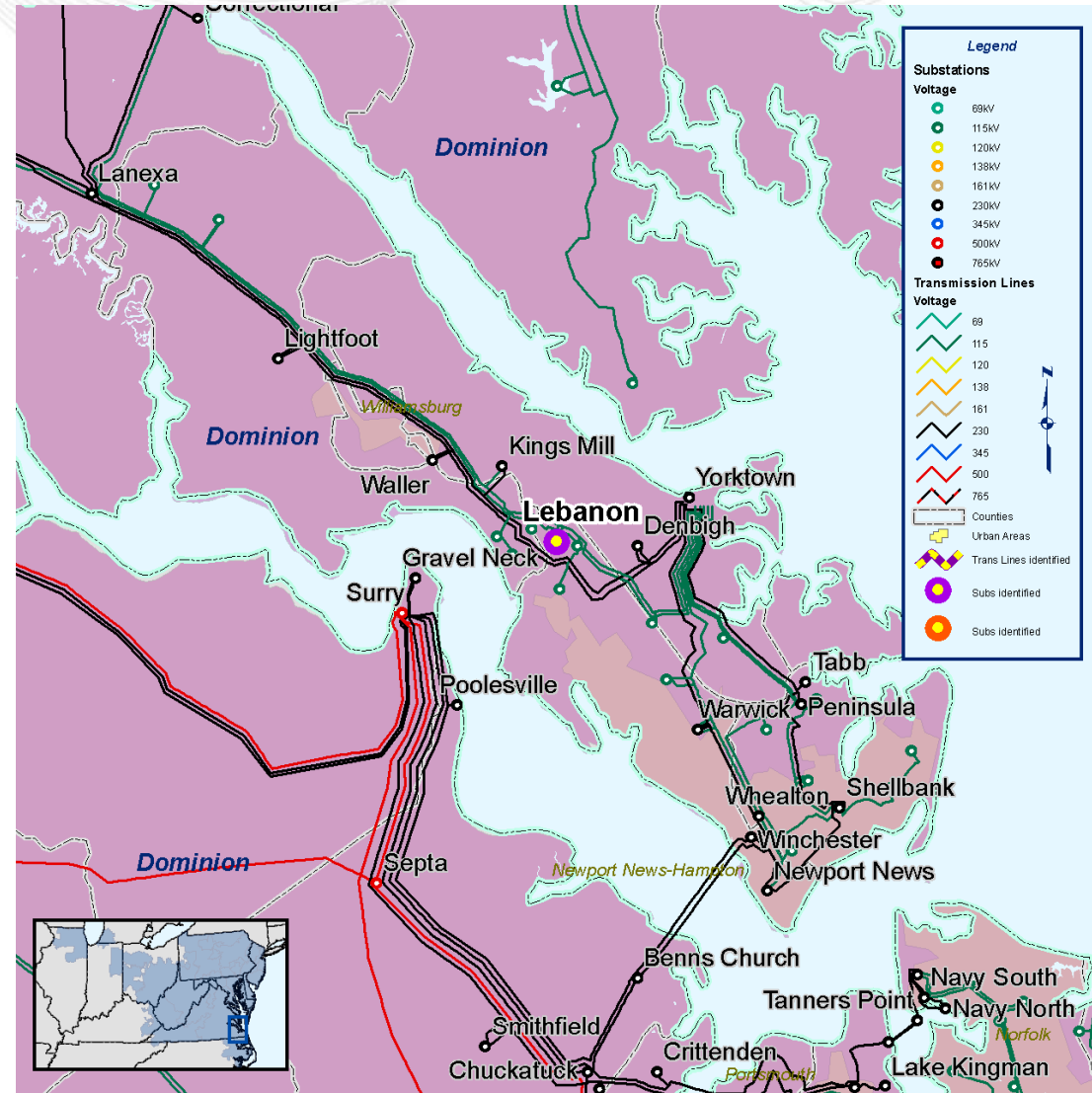
- N-1-1 voltage violation
- Voltage drop violation at Darby 138 kV station / loss of Centerburg – Conesville 138 kV line + loss of Hyatt – Delaware 138 kV line
- Proposed Solution: Install a new 30 MVAR shunt at Darby 69 kV station (B1068)
- Estimated Project Cost: \$0.4 M
- Required IS Date: 6/1/2014



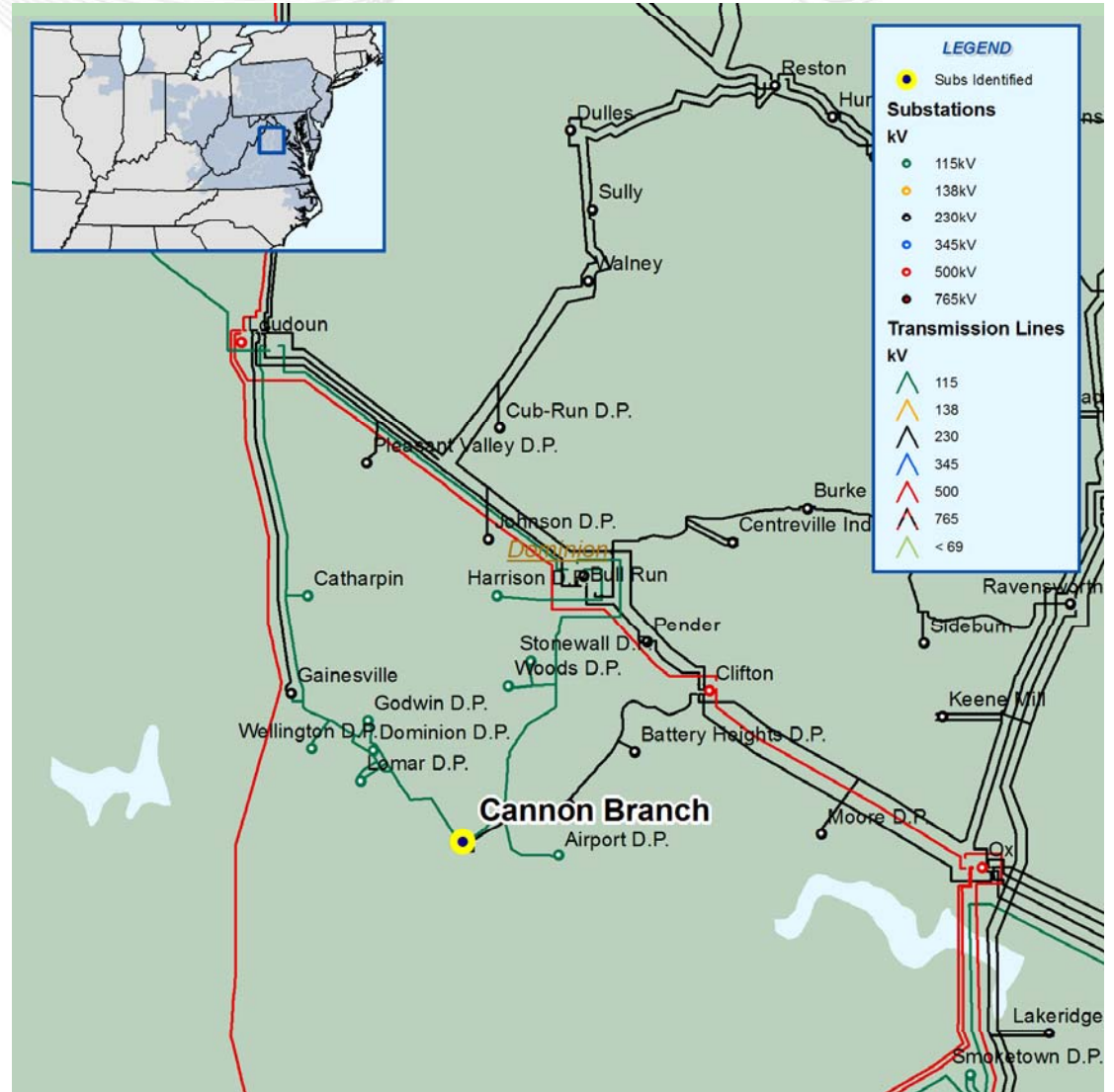
- Baseline Project b0330
- Jetersville – Moran 115 kV overloads for the outage of Gen 1 at Jetersville 115 kV
- Proposed solution: Install breaker at Crewe 115 kV and shift load from line 158 to line 98
- Estimated cost: \$0.5 M
- Expected IS date: June 2011
- Project cancelled due to other projects in the area



- Loss of the Yorktown to Lanexa 115 kV line results in low voltage at Grafton and Lebanon
- Solution: Install 29.7 MVAR capacitor at Lebanon (b0778)
- Previous IS date: 5/1/2012
- New IS date: 5/1/2018
- Lower load forecast
- Estimated Cost: \$0.5 M

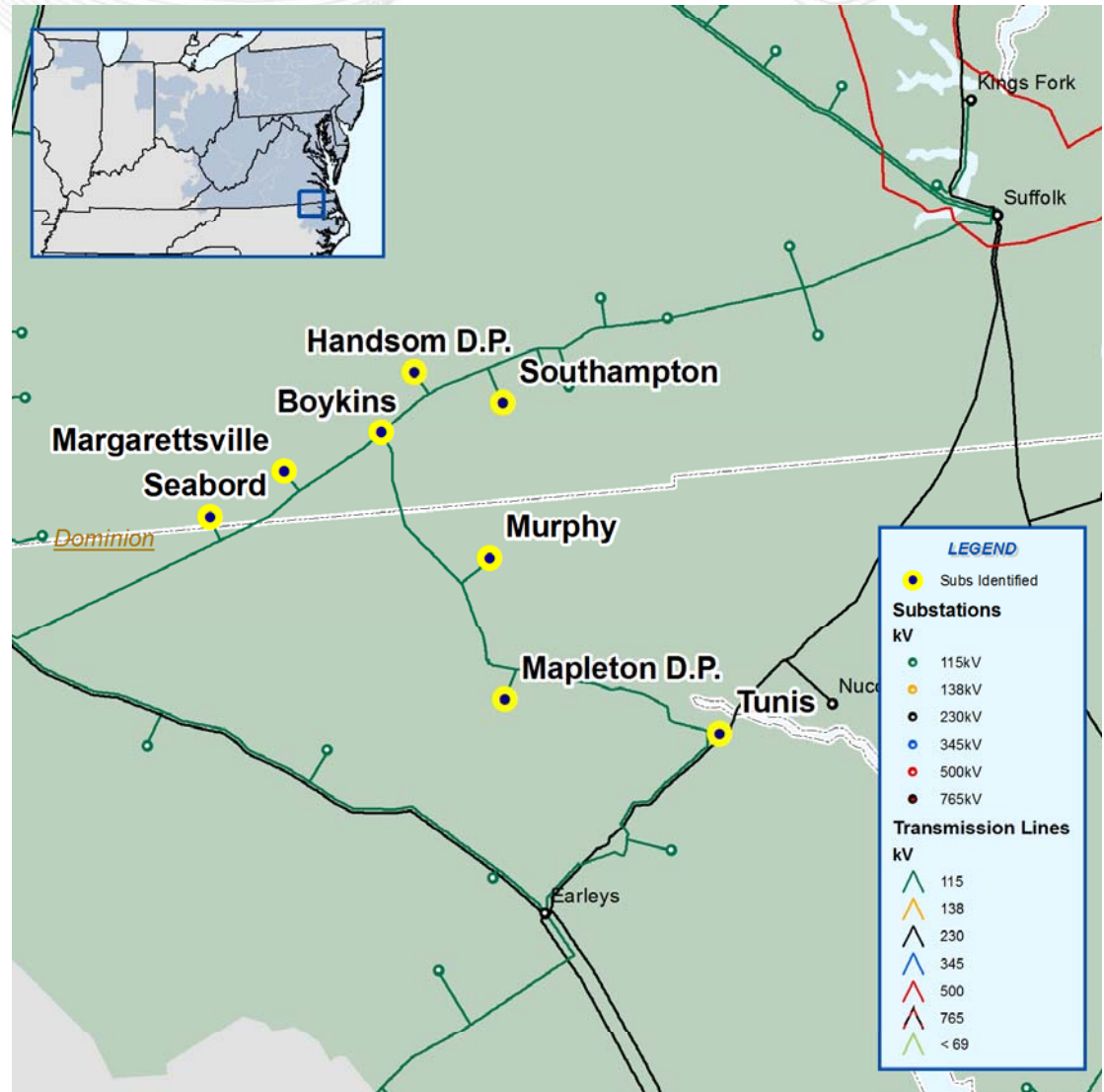


- The Cannon Branch 230-115 kV transformer overloads for the loss of source to the Gainesville to Lomar 115 kV line
- Solution: Replace Cannon Branch 230-115 kV with larger transformer (b1087)
- Estimated cost: \$4.0 M
- IS date: 6/1/2014

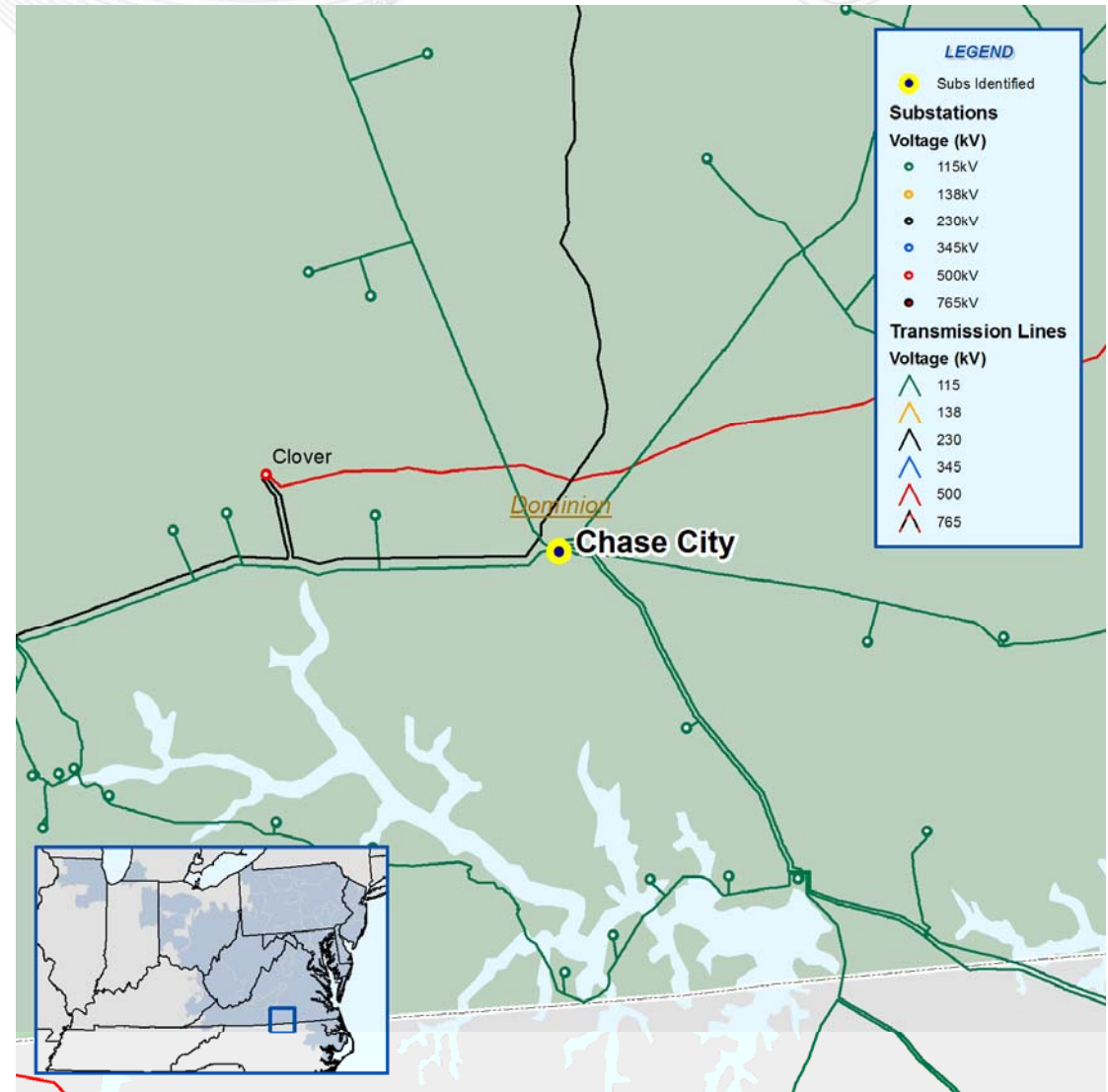




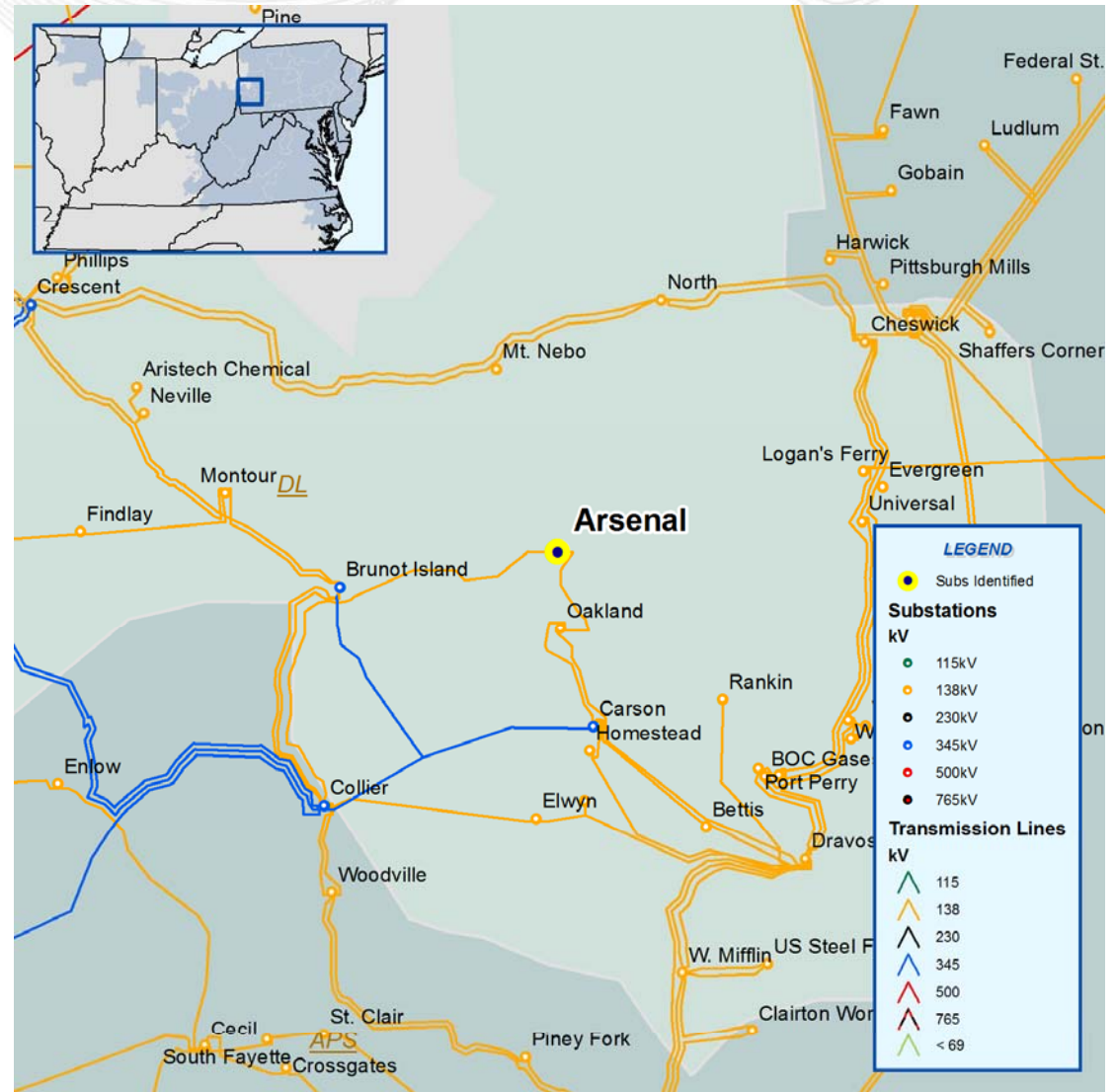
- The following busses have been overloaded for N-1-1 Voltage Low Magnitude analysis
  - Handsom 115 kV
  - S Hampt115 kV
  - Boykins 115 kV
  - Mapletn115 kV
  - Margtsv 115 kV
  - Murphys 115 kV
  - Seabord115 kV
  - Tunis 115 kV
- For the loss of the contingency combination seen below:
  - Suffolk 230/115 kV XFMR #1
  - Suffolk 230/115 kV XFMR #2
- Proposed Solution:
  - Add a third 230/115 kV XFMR at Suffolk substaion (b1058)
- Estimated Project Cost: \$6 M
- Required IS Date: 6/1/2014



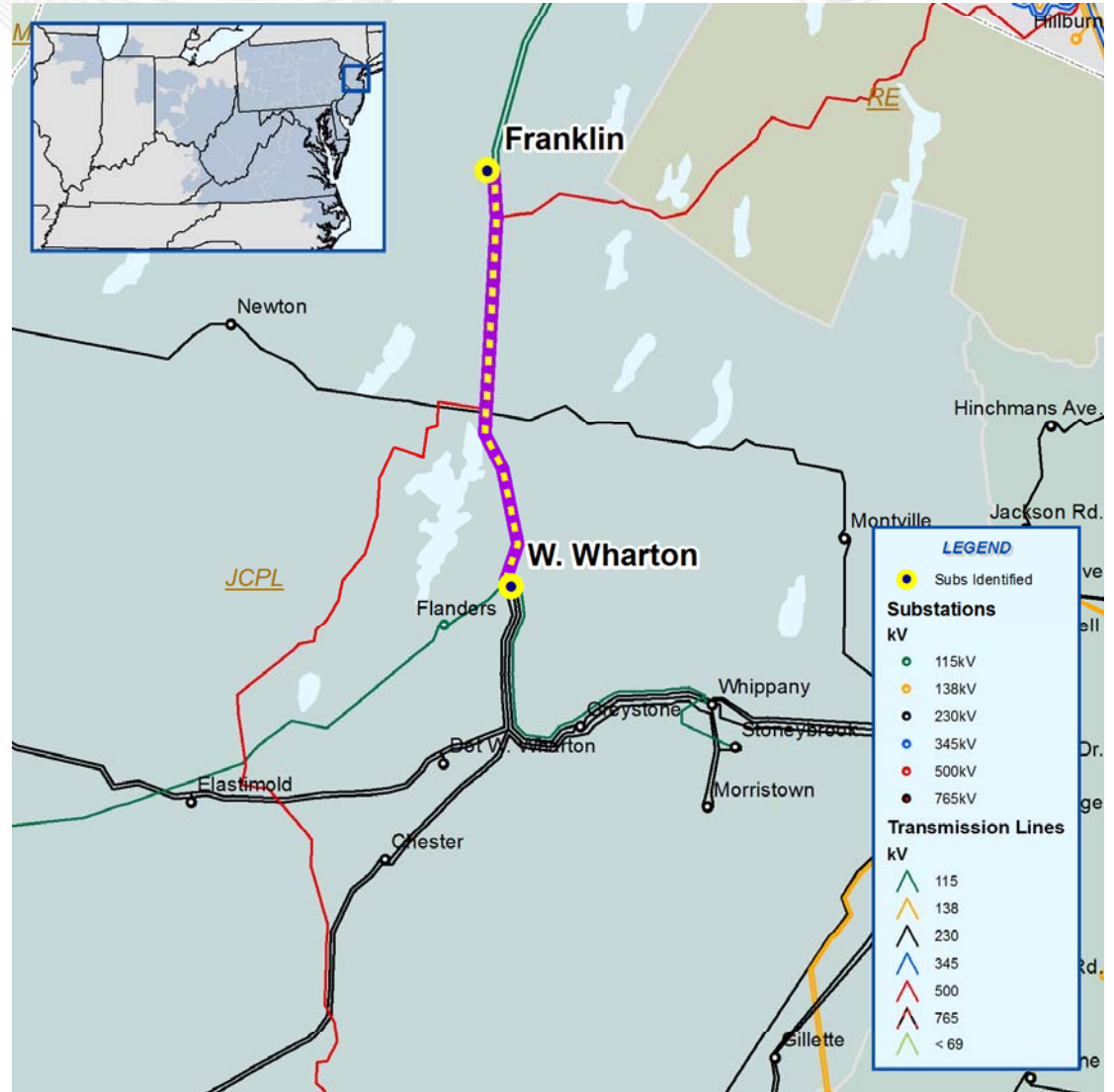
- Chase City 115 kV bus overloads due to area network upgrades involving Chase City – Crewe 115 kV and Chase City – Clarksville 115 kV (b0335 & b0785)
- Solution: Reconductor Chase City 115 kV bus and add a new tie breaker
- Cost Estimate: \$2.4 M
- Expected IS date: June 2010



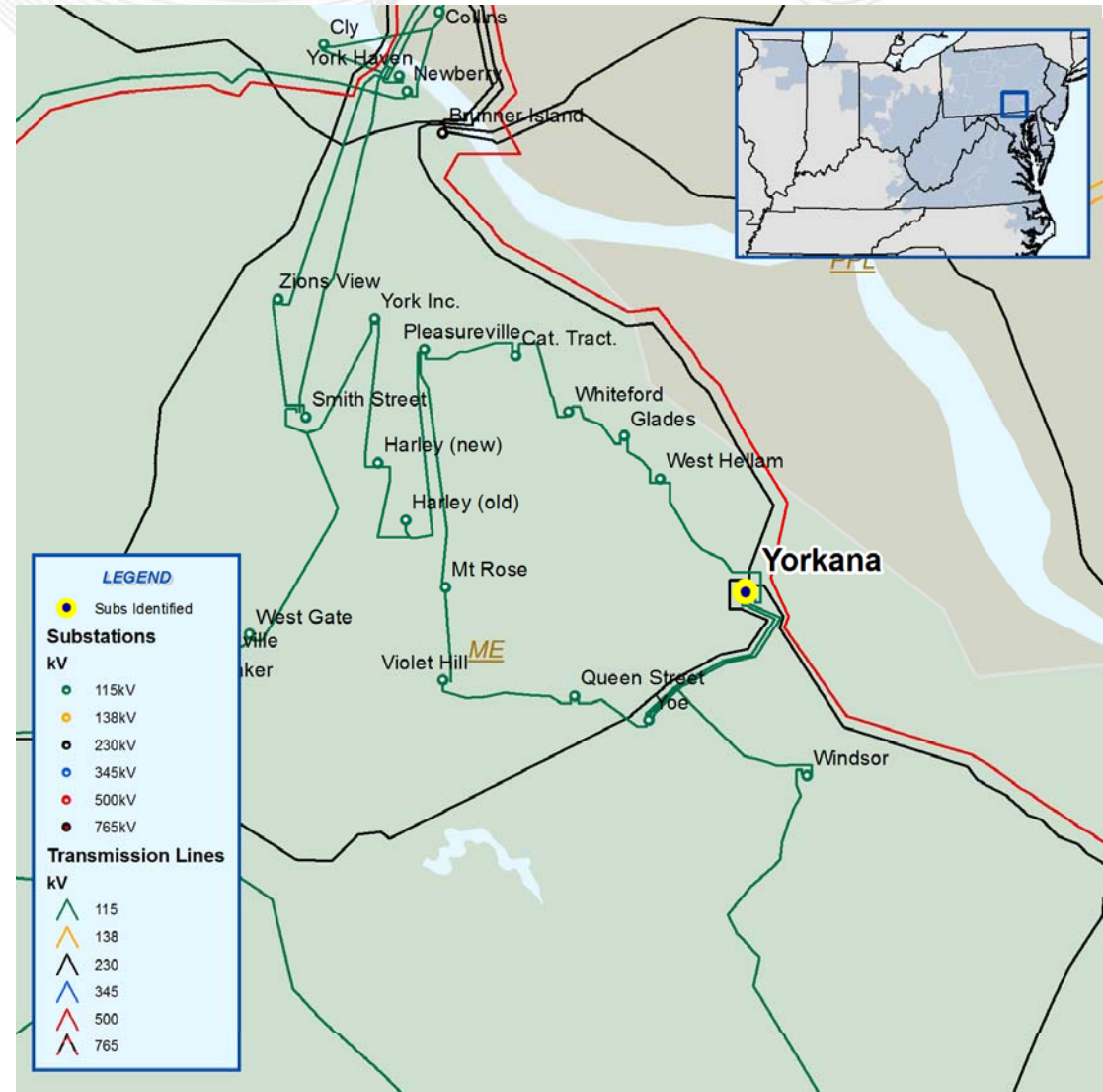
- N-1-1 thermal violation
- Arsenal - Highland 138 kV line for the loss of Logans Ferry 345/138 kV transformer and Remove 580 MW unit from Cheswick
- Proposed Solution: Restudy rating of Arsenal – Highland 138 kV underground line
- Estimated Project Cost: \$0.0 M
- Required IS Date: 6/1/2014



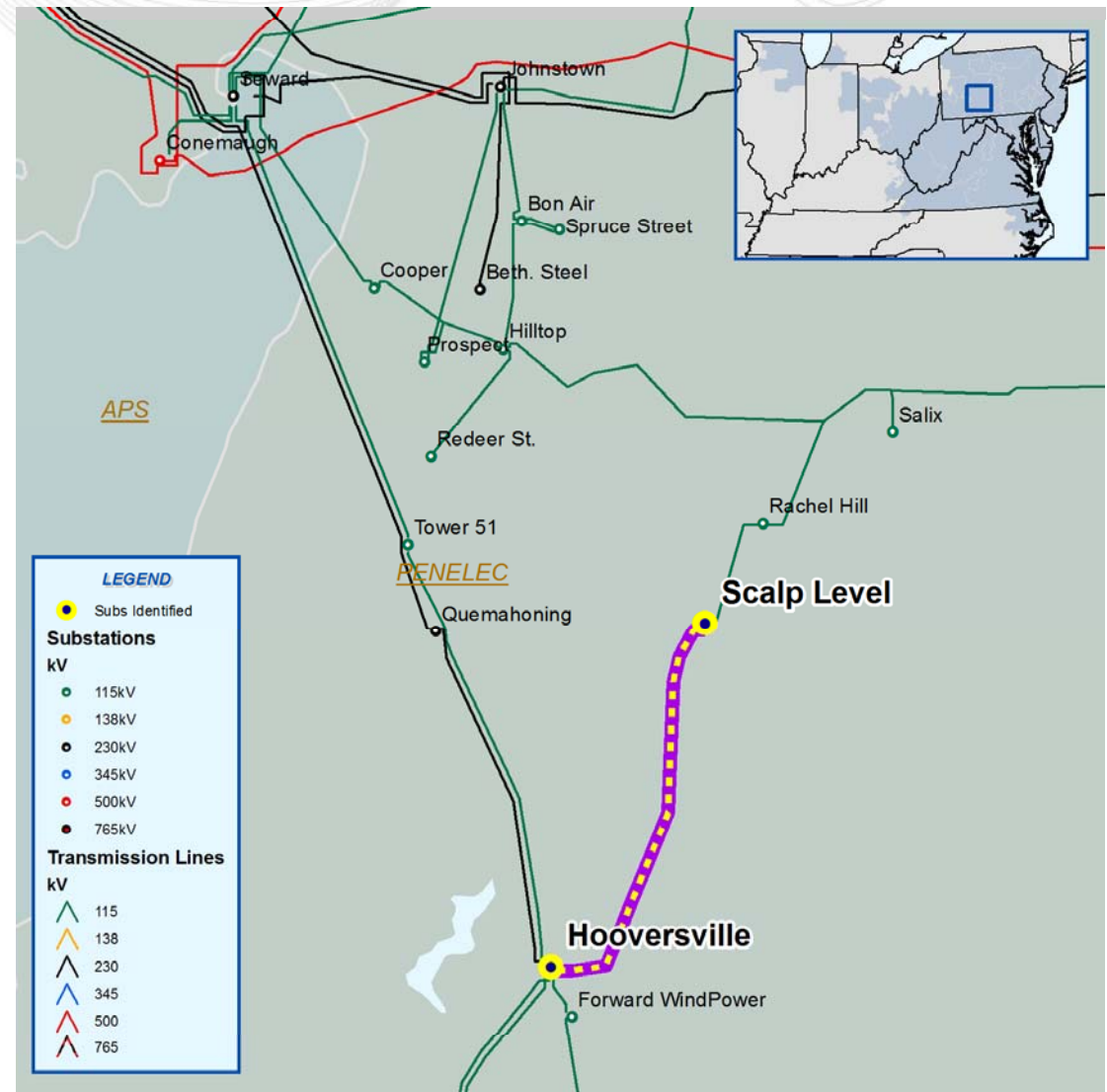
- Generation deliverability violation
- The West Wharton – Franklin 115 kV (J932) circuit is overloaded for a loss of the West Wharton – Franklin 115 kV (D931) circuit
- Proposed Solution:  
Replace West Wharton – Franklin – Vermont D931 and J932 115 kV line conductors with 1590 45/7 ACSR wire between the tower structures 78 and 78-B (B1075)
- Estimated Cost:  
\$0.065 M
- Required IS Date:  
6/1/2011



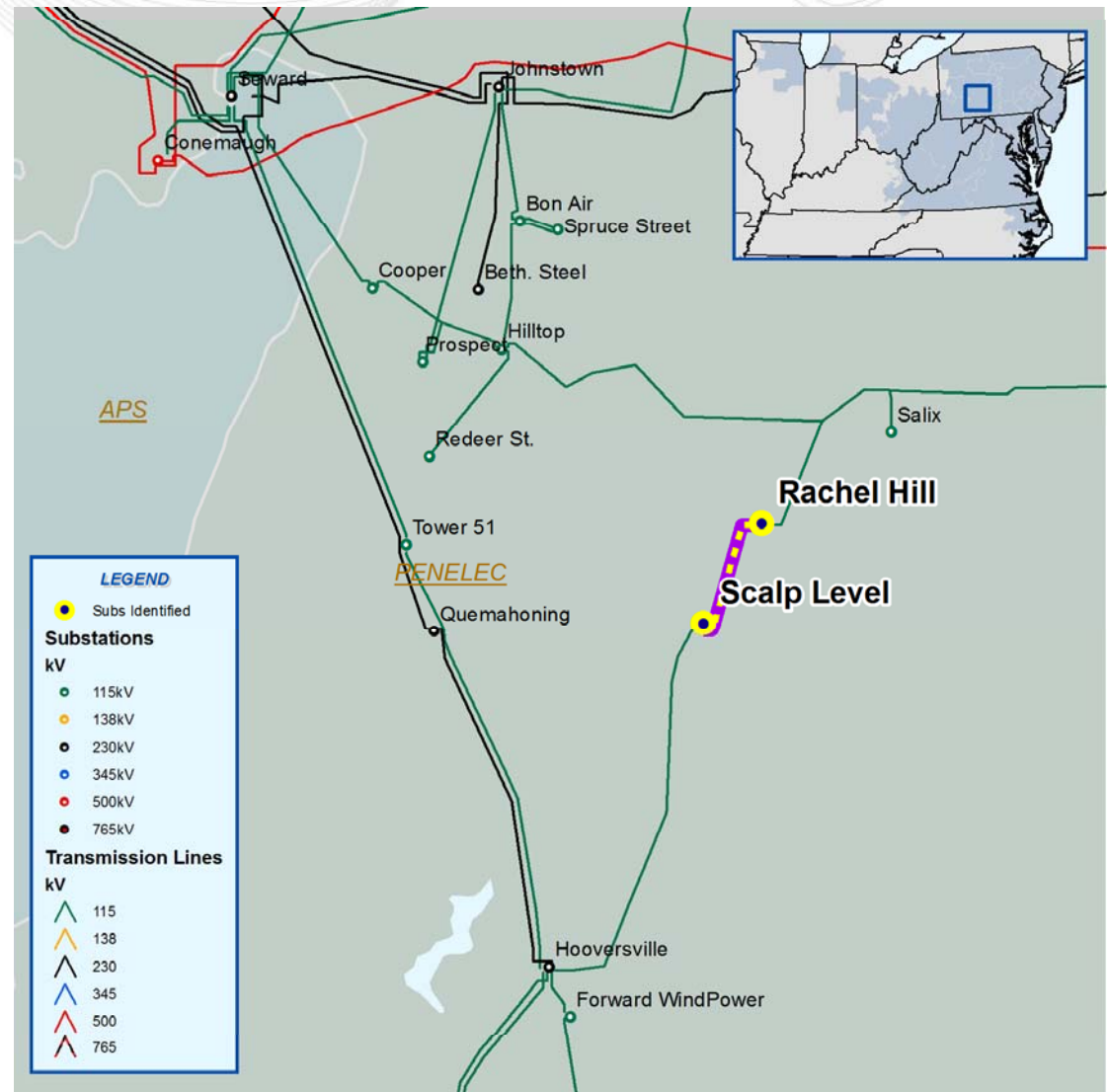
- N-1-1 Thermal Violation
- Yorkana 230/115 kV transformer bank #1 / loss of Yorkana 230/115 kV transformer bank #3 + Basecase
- Proposed Solution: Replace existing Yorkana 230/115 kV transformer banks 1 and 4 with a single, larger transformer similar to transformer bank #3 (b1061)
- Estimated Project Cost: \$4.2 M
- Required IS Date: 6/1/2014



- N-1-1 Thermal Violation
- Scalp Level – Hooversville 115 kV line is overloaded for the loss of Johnstown 230 kV bus + loss of Cooper – Seward 115 kV line
- Proposed Solution: Replace a CRS relay at Hooversville (b1069)
- Estimated Project Cost: \$0.0659
- Required IS Date: 6/1/2014



- N-1-1 Thermal Violation
- Scalp Level – Rachel Hill 115 kV line is overloaded for the loss of Cooper – Seward 115 kV line + loss of Johnstown 230 kV bus
- Proposed Solution: Replace a CRS relay at Rachel Hill (b1070)
- Estimated Project Cost: \$0.0659
- Required IS Date: 6/1/2014



- N-1-1 Thermal Violation
- Normal overload on the East Rutherford – Athenia 138 kV circuit for the loss of the Bergen GT unit + basecase
- Proposed Solution: Install a 230/138 kV transformer at Bergen substation (B1082)
- Estimated Cost: \$22.6 M
- Required IS Date: 6/1/2014

