Transmission Expansion Advisory Committee

November 18, 2009

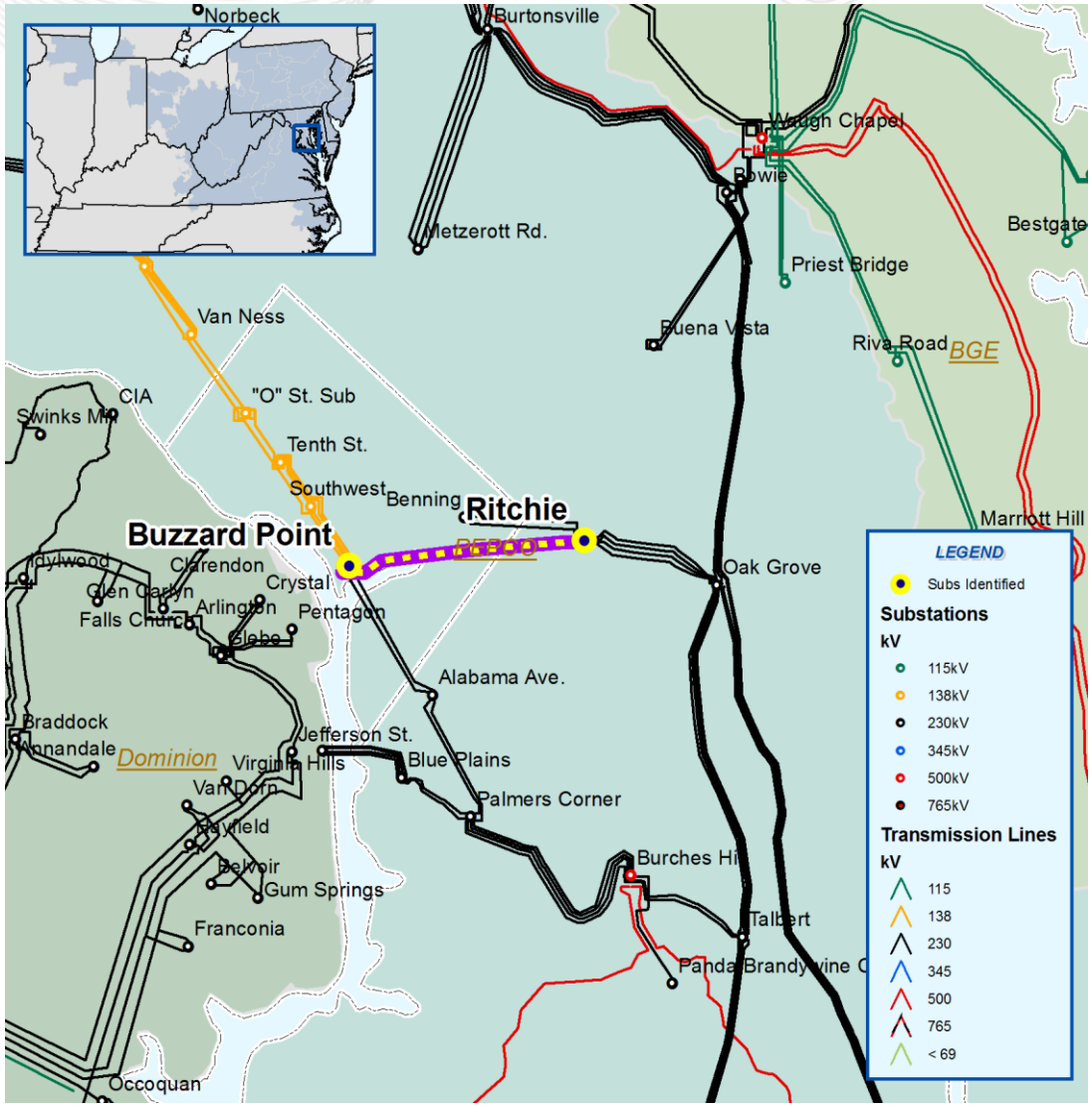
Baseline Reliability Update

PEPCO Transmission Zone

- **N-1-1 thermal overloads** of Ritchie 060 – Ritchie 851 230/138 kV Transformer and Buzzard 138 – Ritchie 851 138 kV line for the loss of Burches Hill – Palmers Corner – Alabama Ave CKT 23089 230kV line + loss of Palmers Corner – Alabama Ave CKT 23088 230kV line.
- **Proposed Solution:**

  -Convert the 138kV line from Buzzard 138-Ritchie 851 to a 230kV line which will increase the rating to 404MVA Normal/470MVA Emergency & 542MVA Emergency with one circuit in the same trench out.

  -Remove 230/138kV Transformer at Ritchie and install a spare 230 /138kV Transformer at Buzzard Pt. (b1125)
- **Estimated Cost**: $56 M
- **Expected IS Date**: 6/01/2014

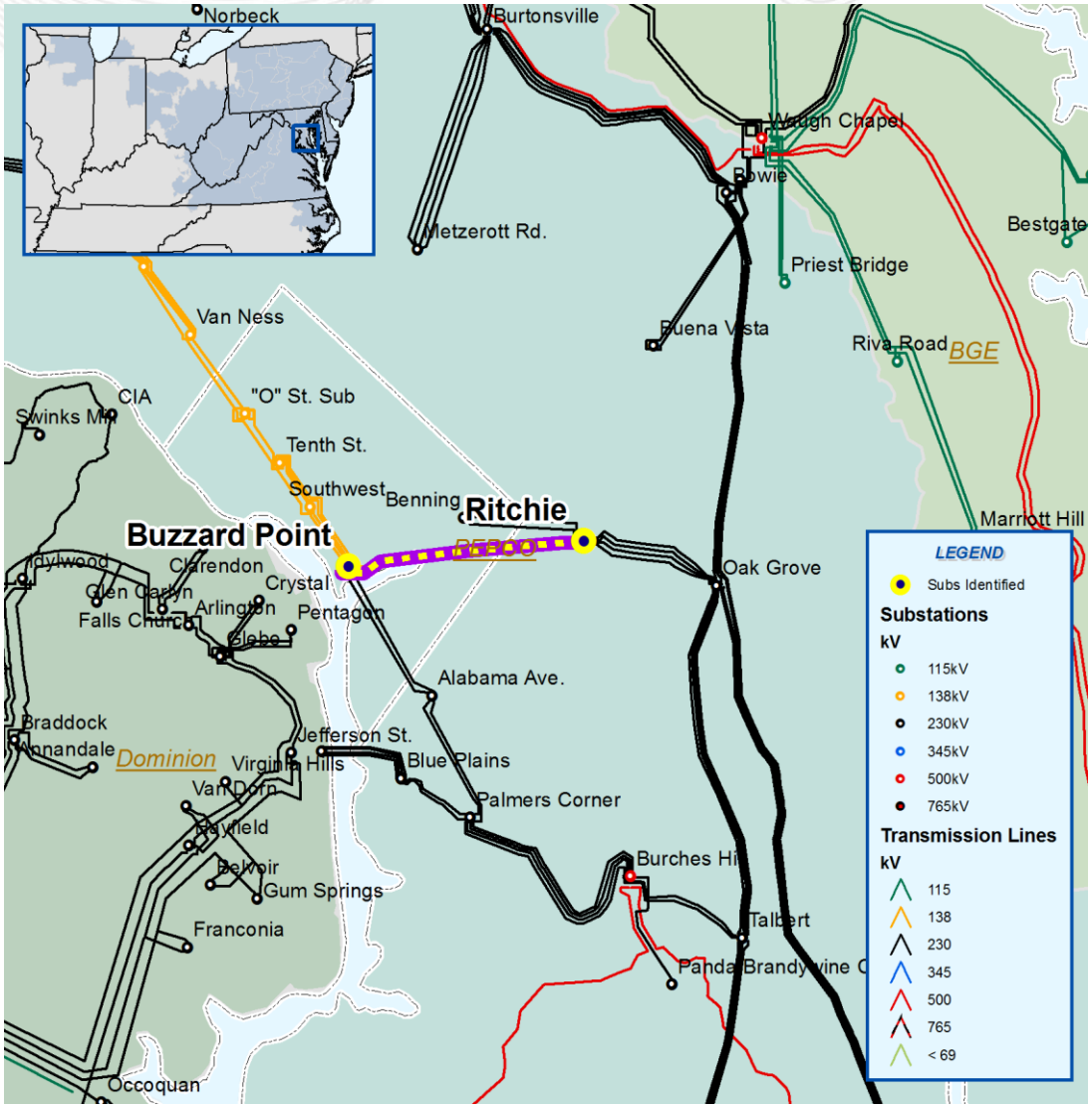


PEPCO Transmission Zone

- **N-1-1 thermal overloads** of Buzzard 016 – Ritchie 059 230kV line for the loss of Burches Hill – Palmers Corner – Alabama Ave CKT 23089 230kV line + loss of Burches Hill – Palmers Corner – Alabama Ave CKT 23090 230kV line & Palm90-Palm69 230/69kV Transformer.
- **Proposed Solution**:

  - Upgrade the 230kV line from Buzzard 016 - Ritchie 059 which will increase the rating to 404 MVA Normal/470 MVA Emergency & 542 MVA Emergency with one circuit in the same trench out. (b1126)

- **Estimated Cost**: $39 M
- **Expected IS Date**: 6/01/2014



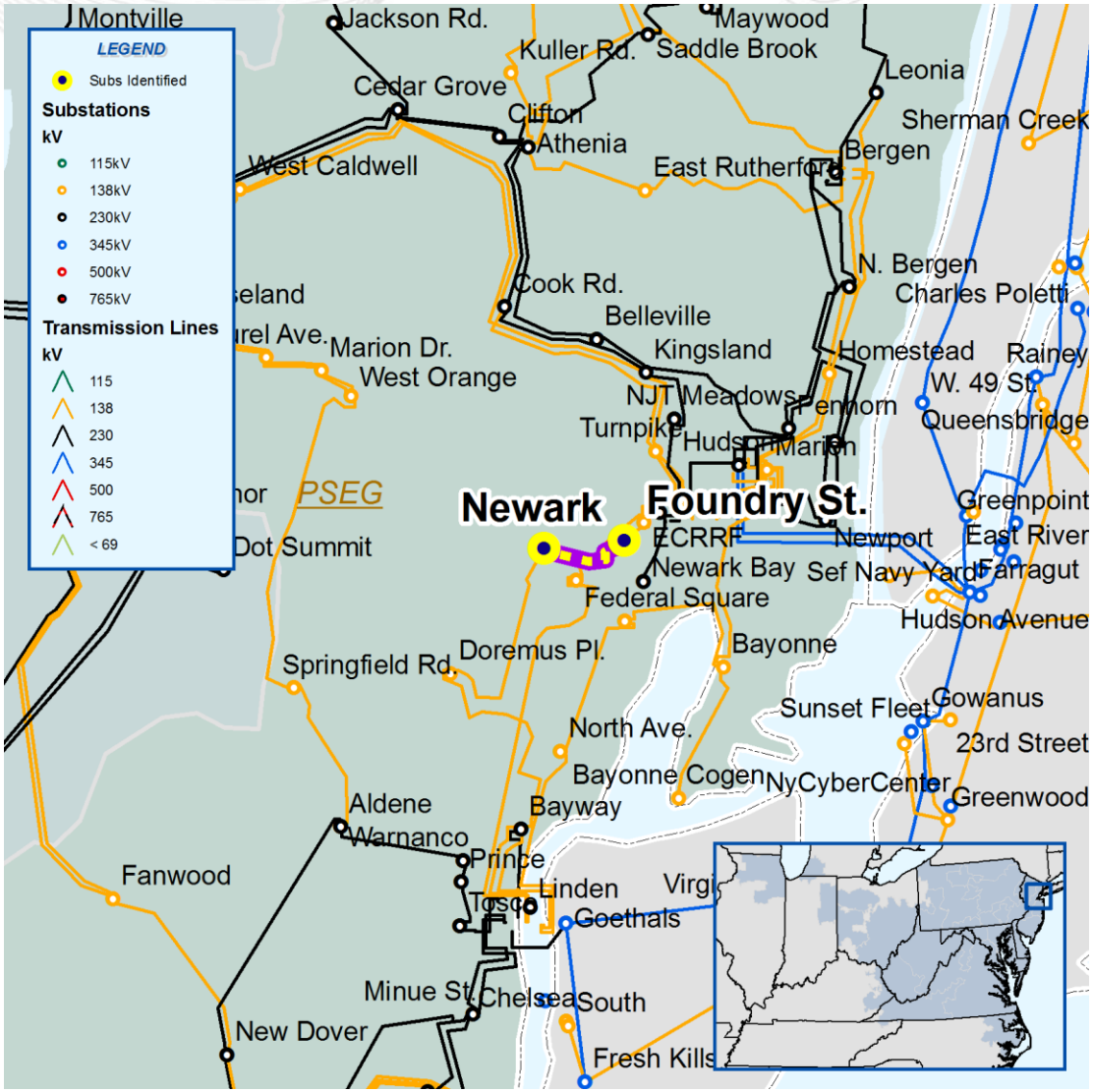
PSEG Transmission Zone

- Baseline Voltage Violation
- Voltage drop violation in the Newark and Foundry St. 138 kV vicinity for a line fault stuck breaker contingency that takes out the Bayway – Federal Square and Bayway – Doremus Place 138 kV circuits.
- Proposed Solution:

  Re-configure the Bayway 138 kV substation and install three new 138 kV breakers (b1098).
- Estimated Cost:

  $15 M
- Expected IS Date:

  06/01/2014



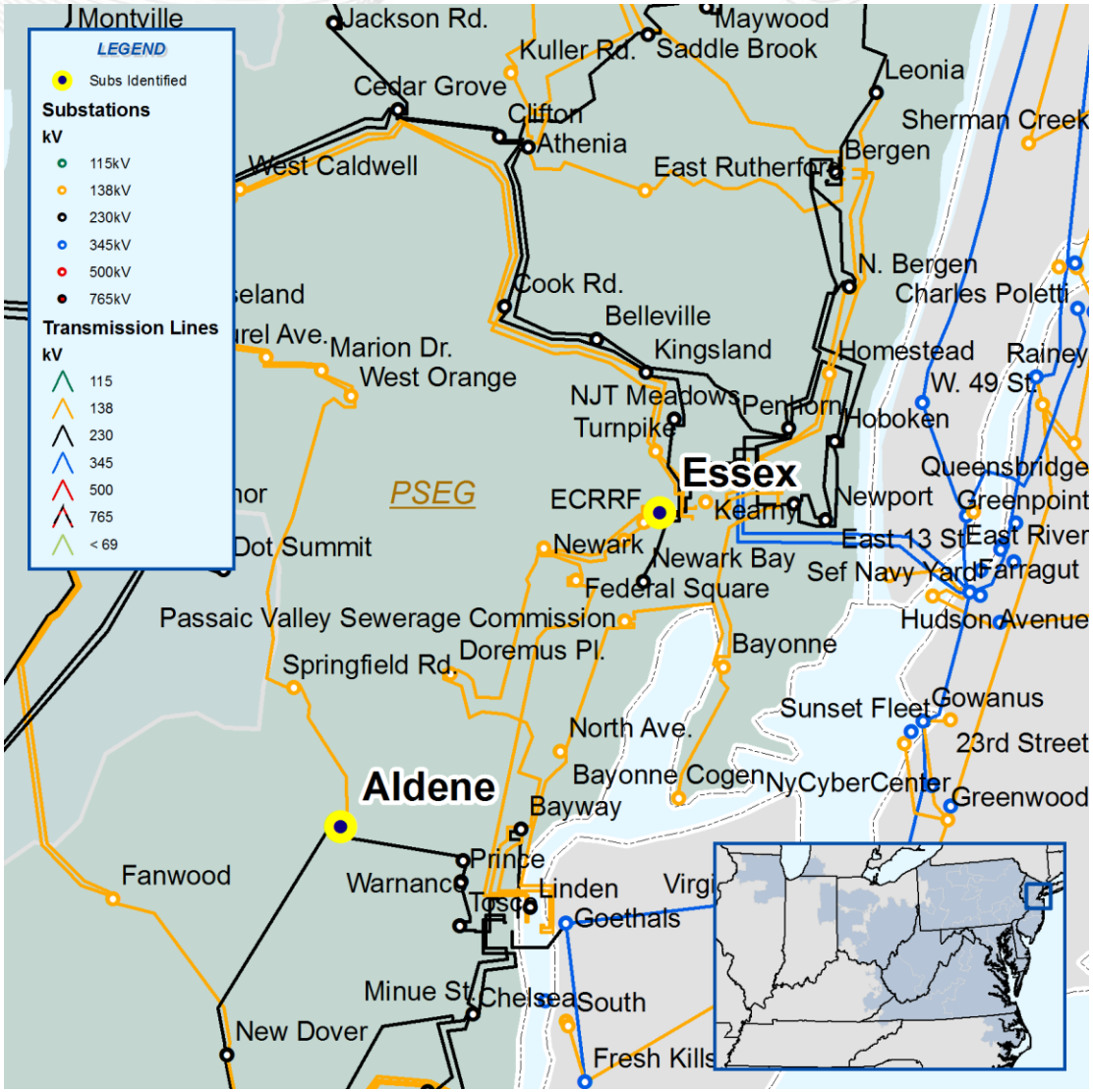
PSEG Transmission Zone

- PSE&G Criteria Violation
- There are four 138 kV under ground cables serving the Newark area load. For the loss of any two of the circuits the remaining two circuits are loaded over their normal rating. PSEG criteria requires to apply rate A (normal) rating for a loss of underground cable due to the extended time required to repair the cable.
- Proposed Solution:

  Build a new 230 kV substation by tapping the Aldene – Essex circuit and install three 230/26 kV transformers, and serve some of the Newark area load from the new station (b1099).
- Estimated Cost:

  $137 M
- Expected IS Date:

  06/01/2012



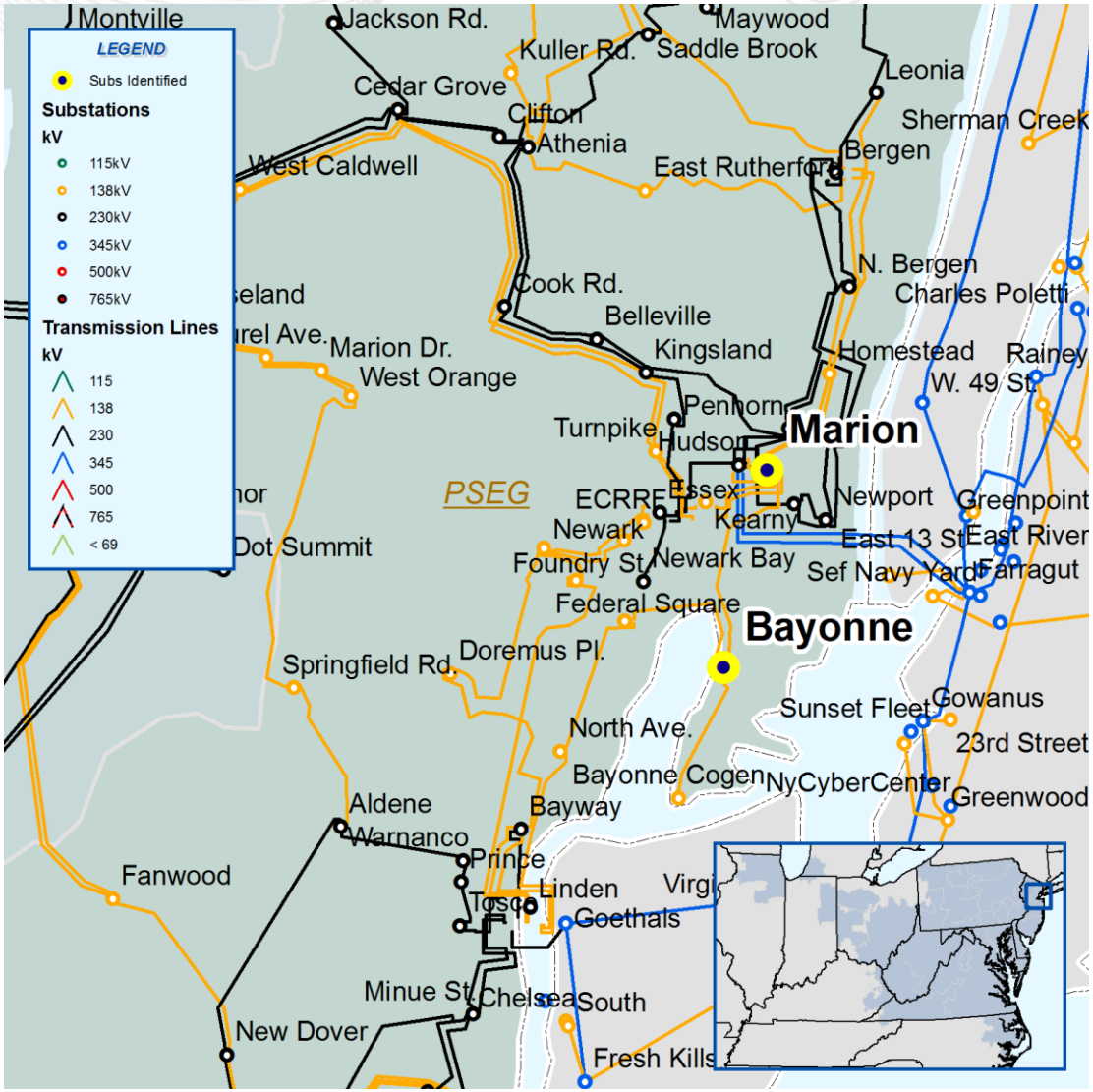
PSEG Transmission Zone

- PSE&G Criteria Violation
- There are two 138 kV underground cables serving the Bayonne area load. For the loss of both circuits under N-1-1 test, the load will be dropped and there are no distribution facilities to supply the load. Due to the extended time required to repair the cables, the load will be out of service for more than 24 hours and therefore violating PSEG planning criteria.
- Proposed Solution:

  Build a new 138 kV circuit from Bayonne to Marion substation (b1100).
- Estimated Cost:

  $100 M
- Expected IS Date:

  06/01/2013



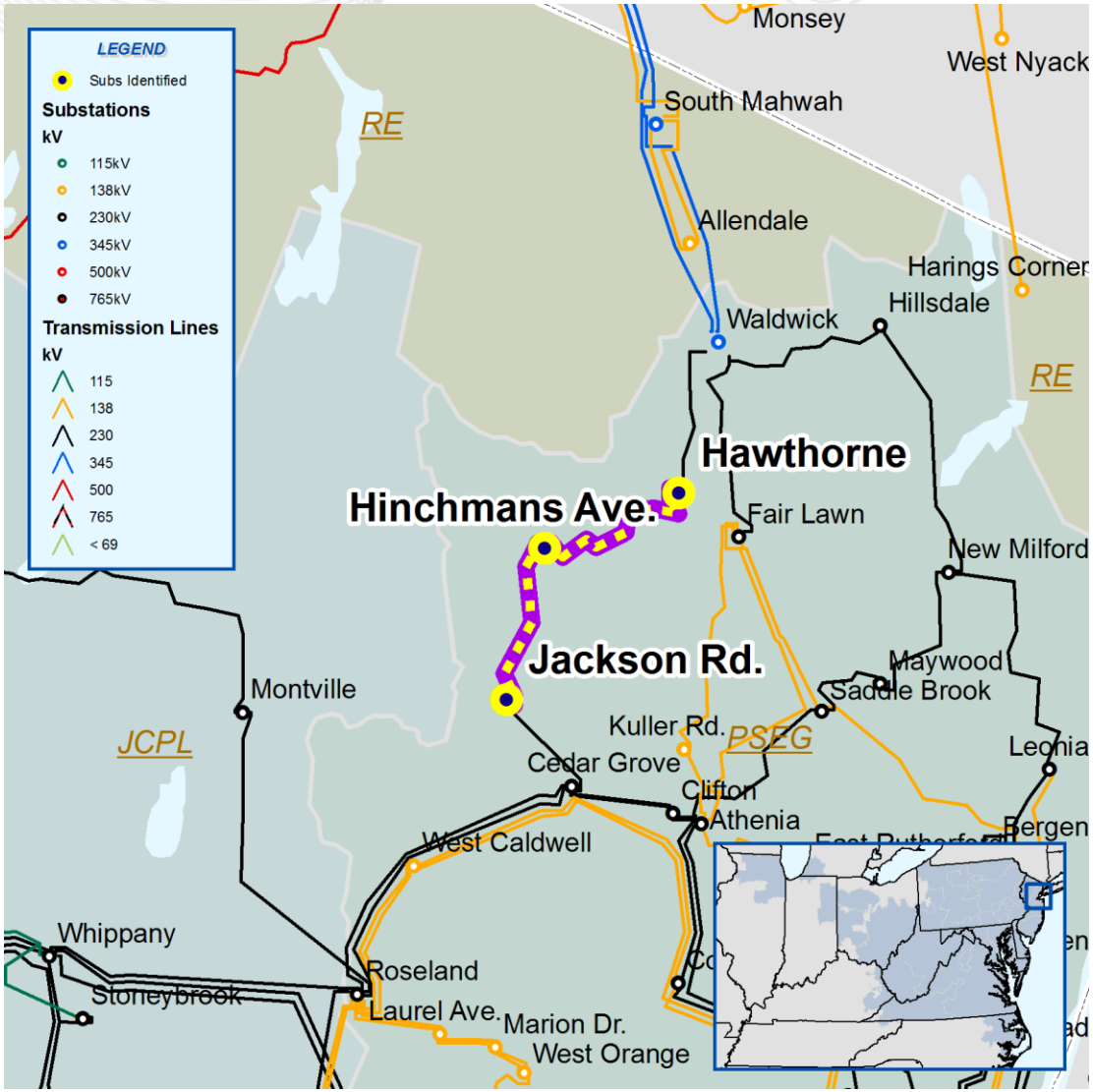
PSEG Transmission Zone

- PSE&G Criteria Violation
- There are two 138 kV under ground cables serving the Jackson Road, Hinchman and Howthorne area load. For the loss of both circuits under N-1-1 test, the load will be dropped and there are no distribution facilities to supply the load. Due to the extended time required to repair the cables, the load will be out of service for more than 24 hours and therefore violating PSEG planning criteria.
- Proposed Solution:

  Re-configure the Cedar Grove substation with breaker and half scheme and build a new 69 kV circuit from Cedar Grove to Hinchman (b1101).
- Estimated Cost:

  $100 M
- Expected IS Date:

  06/01/2012



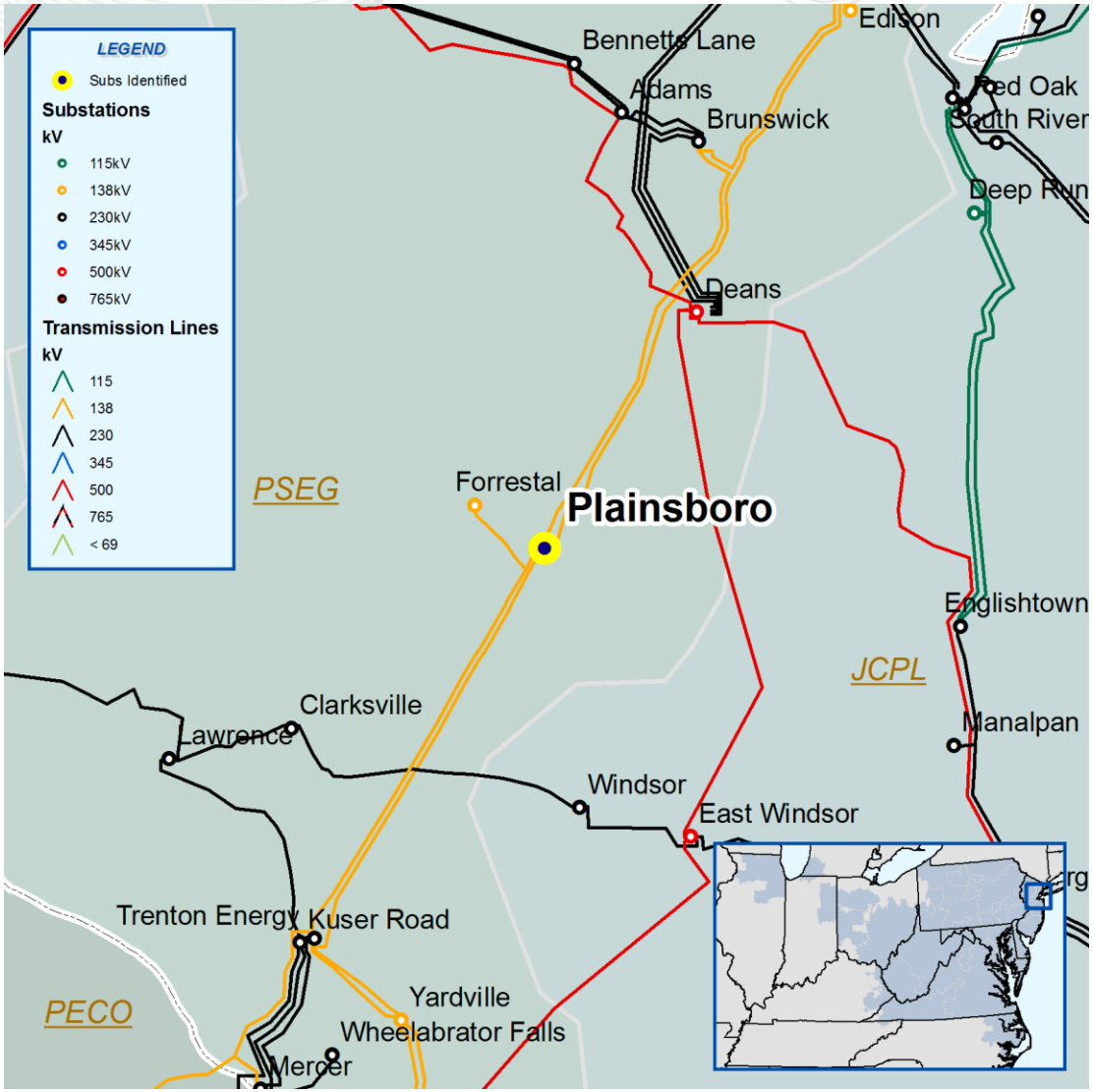
PSEG Transmission Zone

- Supplemental project
- Any contingency event in the Plainsboro vicinity will result in a loss both Plainsboro 230/138 kV transformers.
- Proposed Solution:

  Re-locate the Plainsboro 230/13 kV transformer # 1 to the N-1340 (Forrestal – Brunswick 138 KV) circuit (s0171).
- Estimated Cost:

  $1.5 M
- Expected IS Date:

  06/01/2011



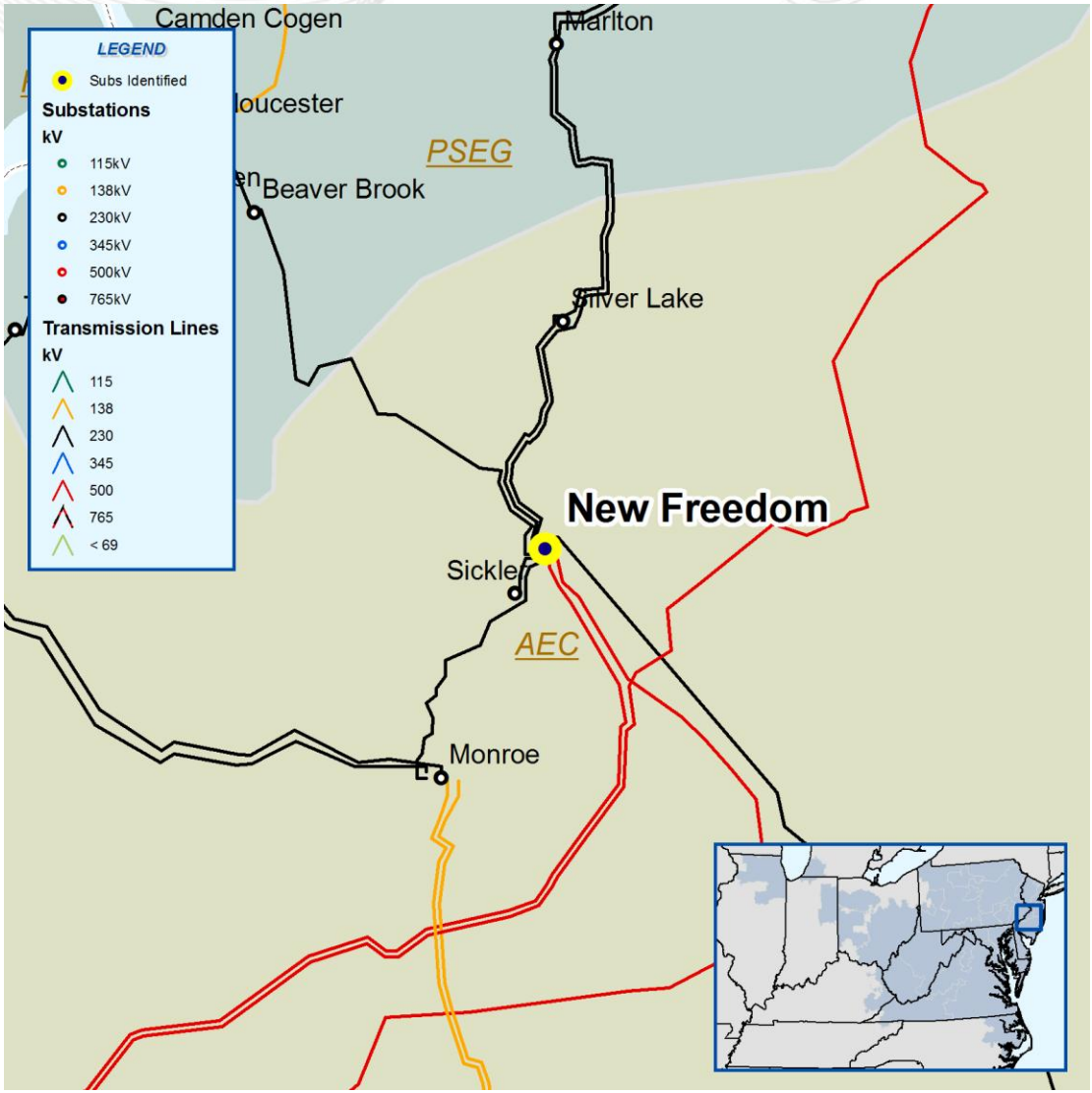
PSEG Transmission Zone

- Supplemental project

  Install a new 230 kV circuit breaker at New Freedom substation to facilitate maintenance and switching (s0173).
- Estimated Cost:

  $5.0 M
- Expected IS Date:

  06/01/2014



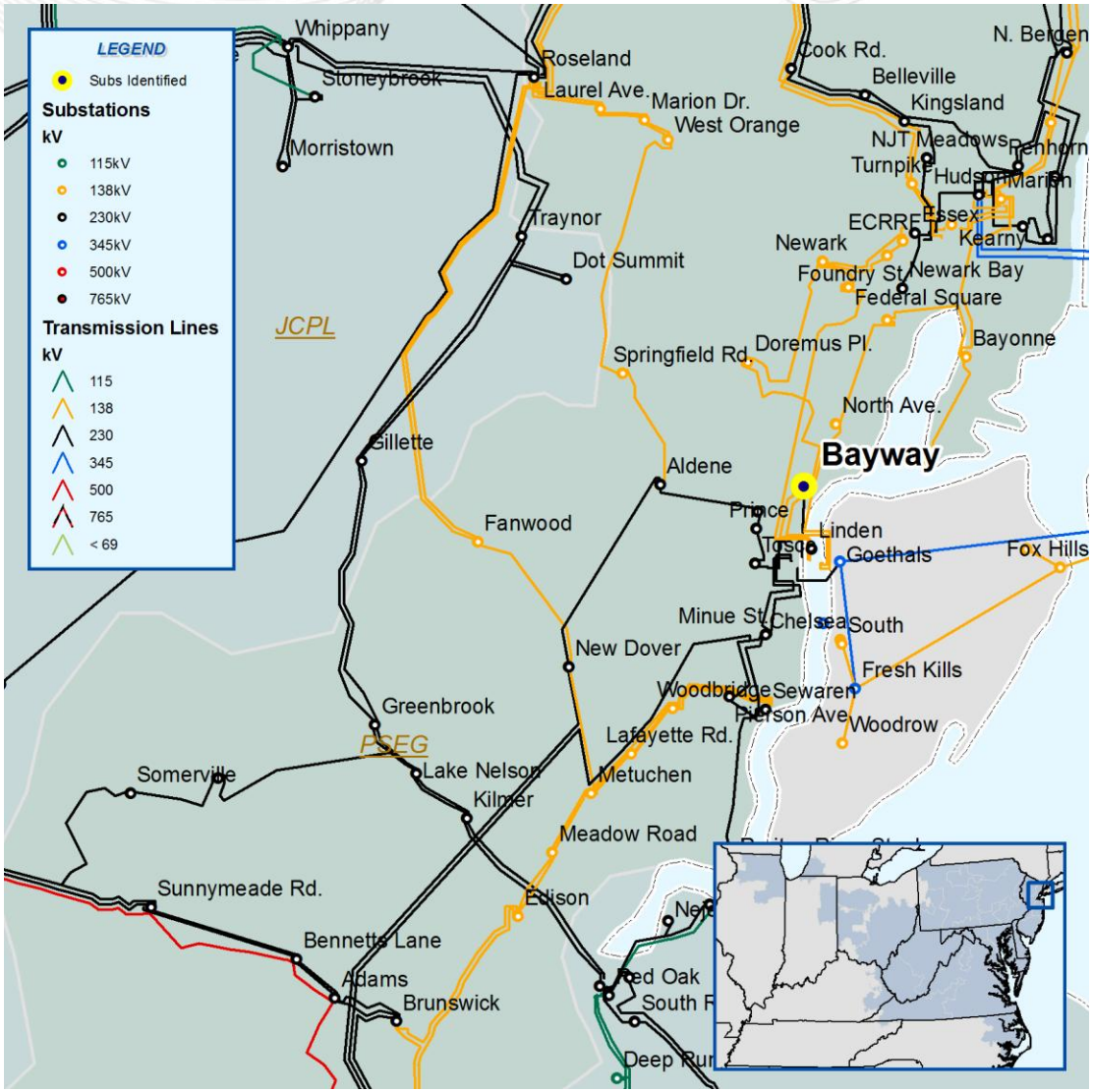
PSEG Transmission Zone

- Supplemental project
- The Bayway distribution station serves a vital customer, Newark Liberty International Airport, which has experienced several interruptions of normal service over the years.
- Proposed Solution:

  Install a new 138/26 kV transformer at Bayway substation and build a new distribution line from Bayway to Newark Airport (s0174).
- Estimated Cost:

  $25 M
- Expected IS Date:

  06/01/2012



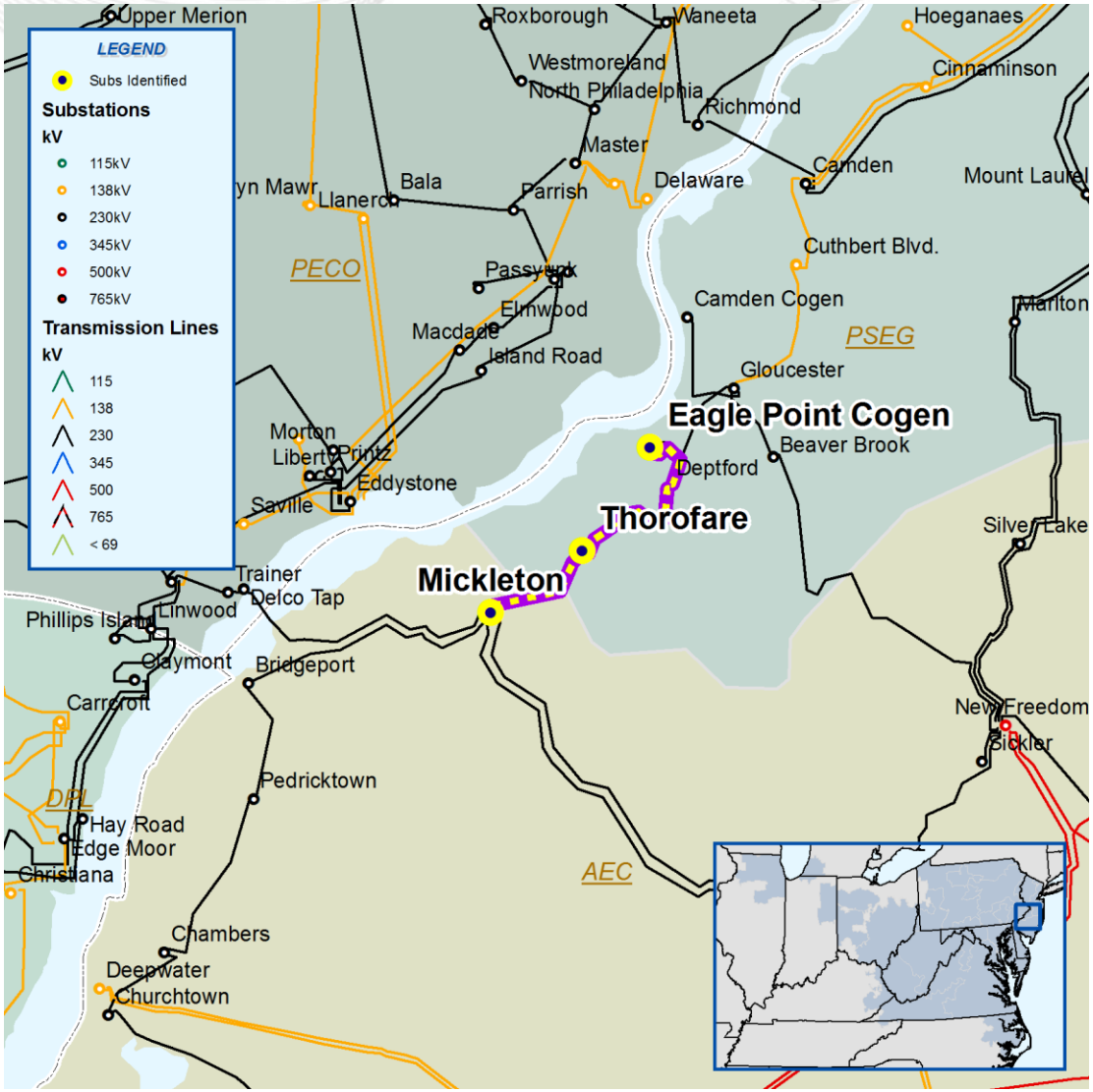
PSEG Transmission Zone

- Supplemental project
- Any contingency event in the Thorofare vicinity will result in a loss of both Thorofare 230/13 kV transformers. The station have limited inter-station ties to pickup the load following an outage.
- Proposed Solution:

  Install 230 kV circuit breaker at Thorofare substation between the two 230/13 kV transformers (s0172).
- Estimated Cost:

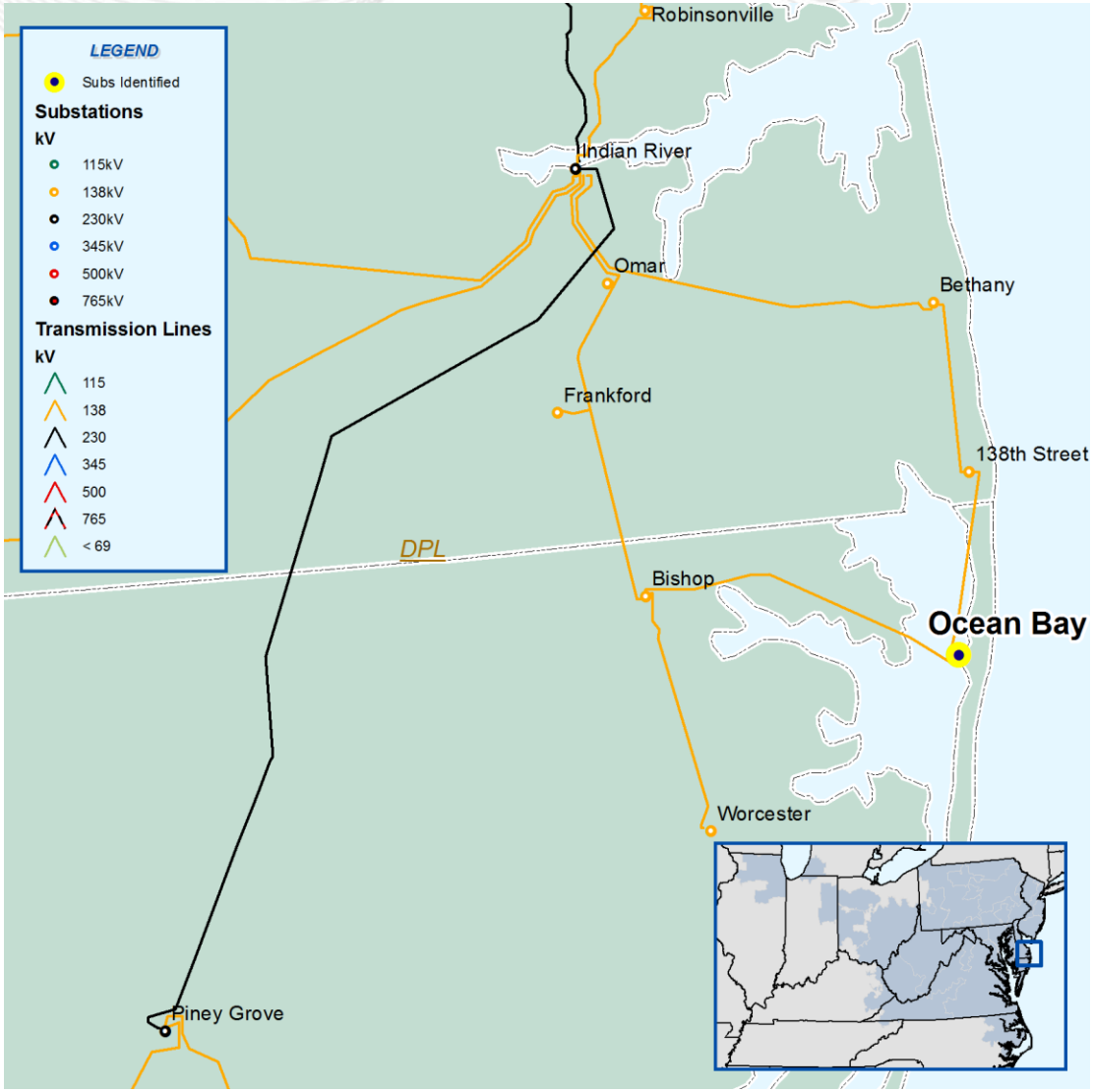
  $1.5 M
- Expected IS Date:

  06/01/2011



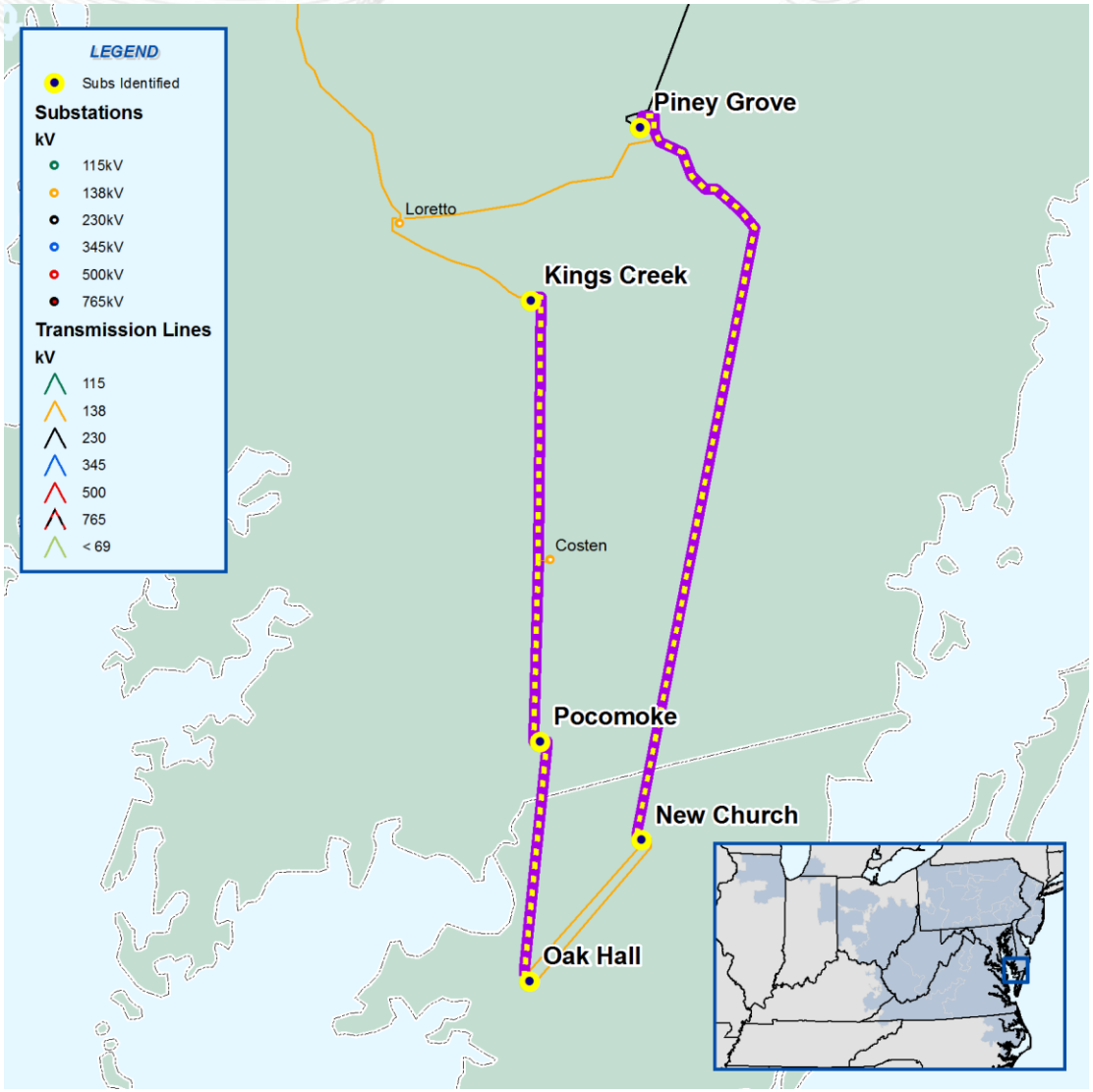
DPL Transmission Zone

- Baseline Project b0875 Cancelled
- Original violation: Low voltage magnitude and voltage drop violations as well as non-convergence for various N-1-1 contingencies in Ocean Bay area
- Proposed solution: Install 30 MVAR capacitor at Ocean Bay 138 kV station
- Project cancelled because installation of a 50 MVAR SVC in the Beach area (b0876) resolves the problem
- Expected IS date: 06/01/2013



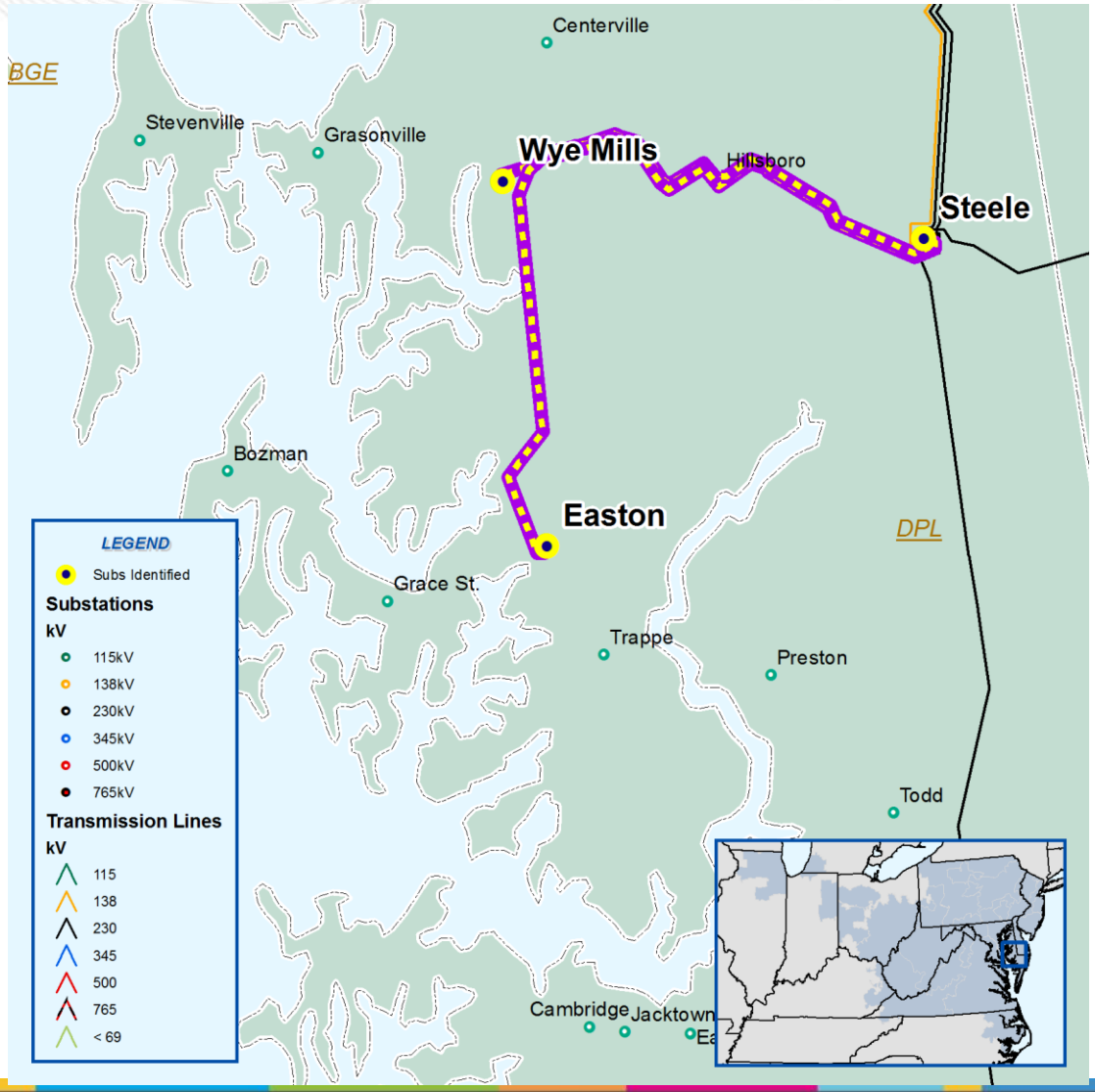
DPL Transmission Zone

- Baseline project b0878 (Wattsville-Piney Grove 138 kV line) cancelled due to lower load forecast
- Original driver: Low voltage magnitude and voltage drop violations as well as non-convergence for the following N-1-1 contingencies:
  - -Loss of Pocomoke-Kings Creek138 kV line + loss of Piney-N.Church 138 kV line
  - -Loss of Pocomoke-Oak Hall138 kV line + loss of Piney-N.Church 138 kV line
- Estimated cost: $41.6 M
- Original IS date was: 06/01/2013



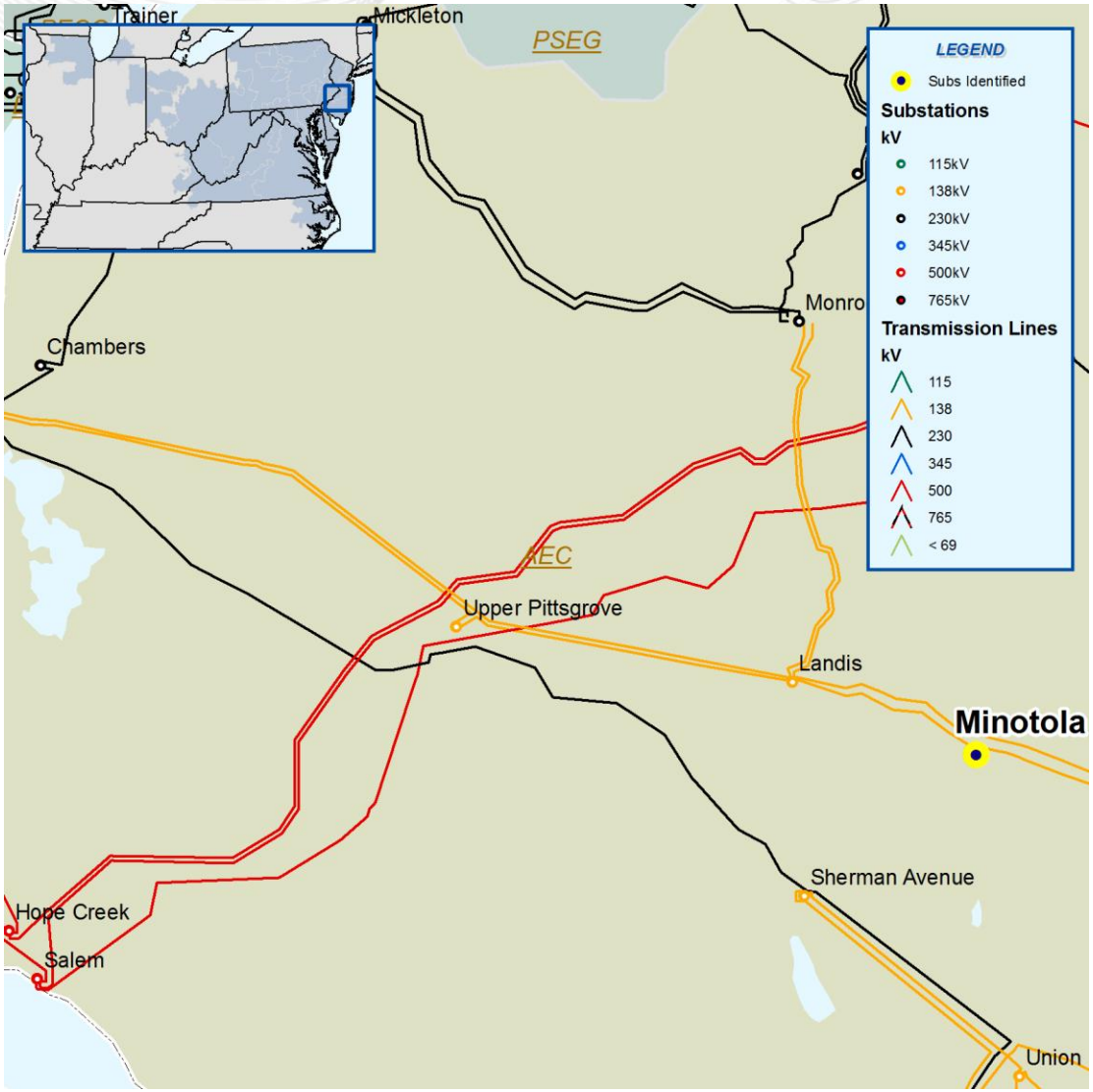
DPL Transmission Zone

- Baseline Project b0879
- Low voltage magnitude and voltage drop violations as well as non-convergence for the loss of Steel to Easton 138 kV line and the loss of Steel to Wye Mills 138 kV line
- Proposed solution in 2013 and 2014:
  - Apply a special protection scheme (load drop at Stevensville and Grasonville) (b0879.1)
  - Estimated cost: $50 K
  - Expected IS date: 06/01/2013
- Build a new Wye Mills – Church 138 kV line
- Estimated cost: $35.4 M
- Expected IS date: 06/01/2015



AE Transmission Zone

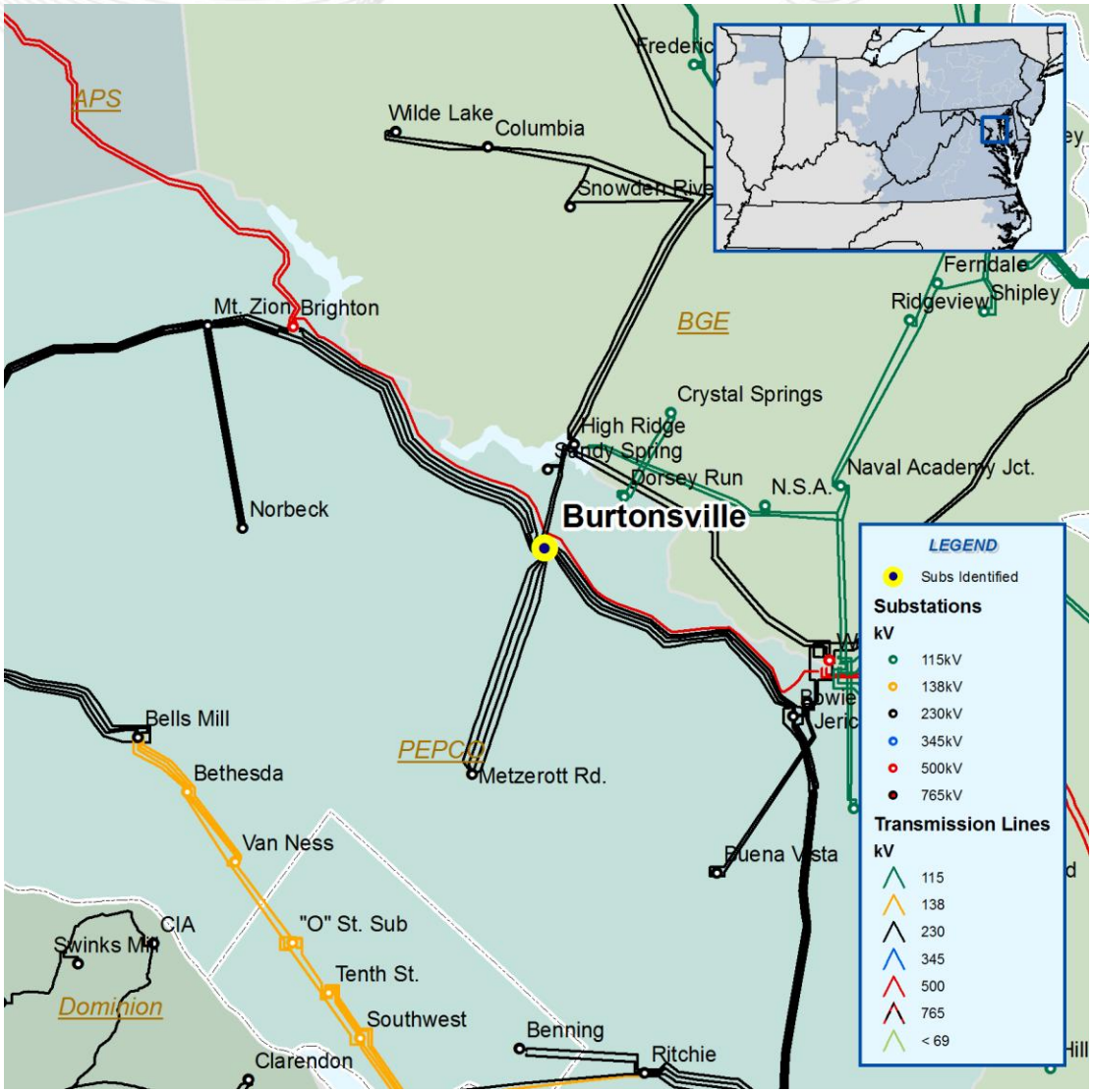
- Cancel project b0872, Build a new Lincoln-Landis 138 kV line
- Low voltage magnitude and voltage drop violations in the Lincoln, Landis, and Sherman areas for several 138 kV line contingency combinations
- Proposed Solution: Build a new Lincoln-Minitola 138 kV line (b1127)
- Expected IS date: 06/01/2013
- Estimated Cost: $12.5 M



2014 Short Circuit Baseline Analysis

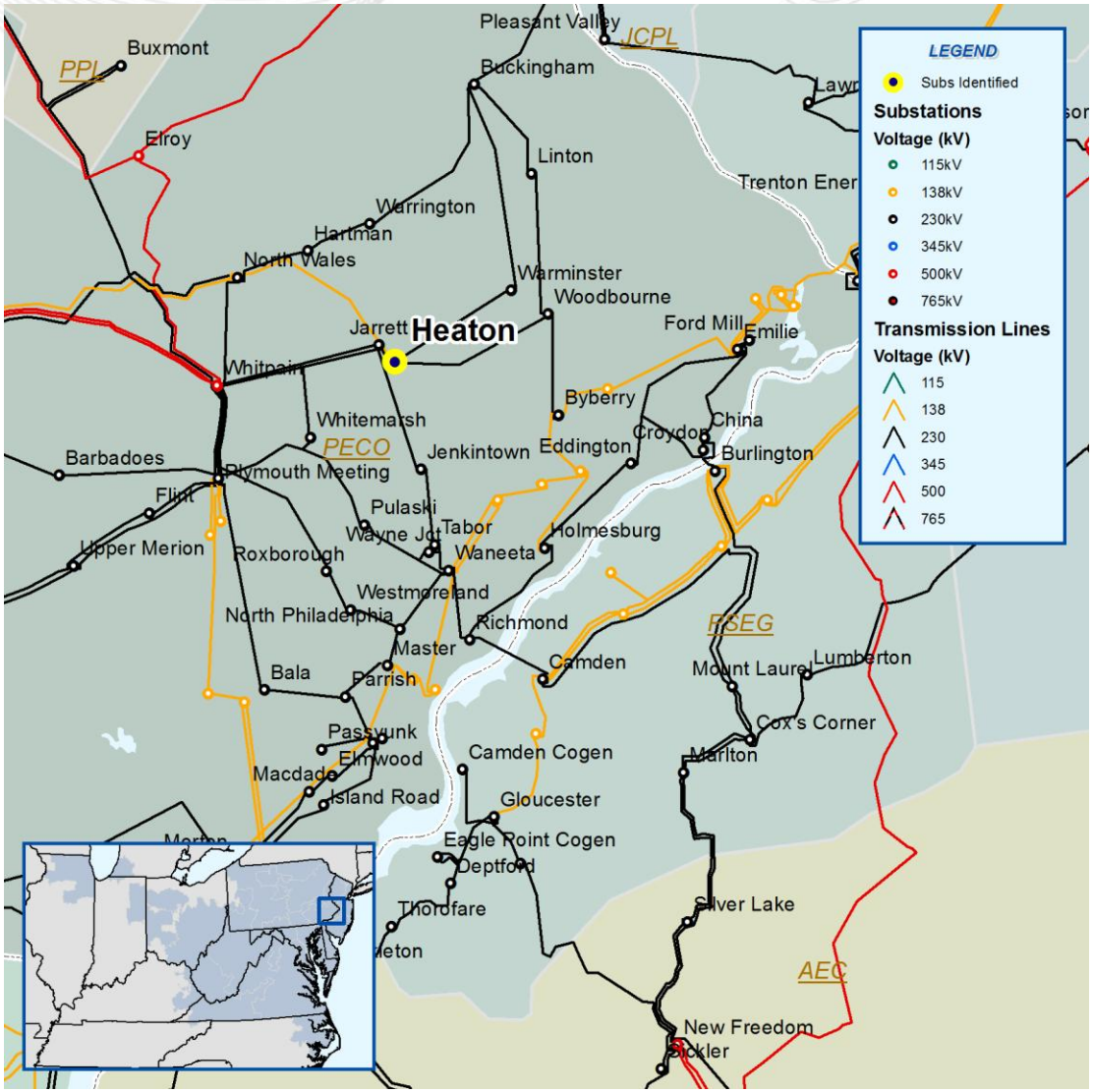
PEPCO Transmission Zone

- Replace Burtonsville 230kV breaker ‘1C’ (b1104)
- Replace Burtonsville 230kV breaker ‘2C’ (b1105)
- Replace Burtonsville 230kV breaker ‘3C’ (b1106)
- Replace Burtonsville 230kV breaker ‘4C’ (b1107)
- Estimated Project Cost :$ 1.375 M per breaker
- Required IS Date : 06/01/2014



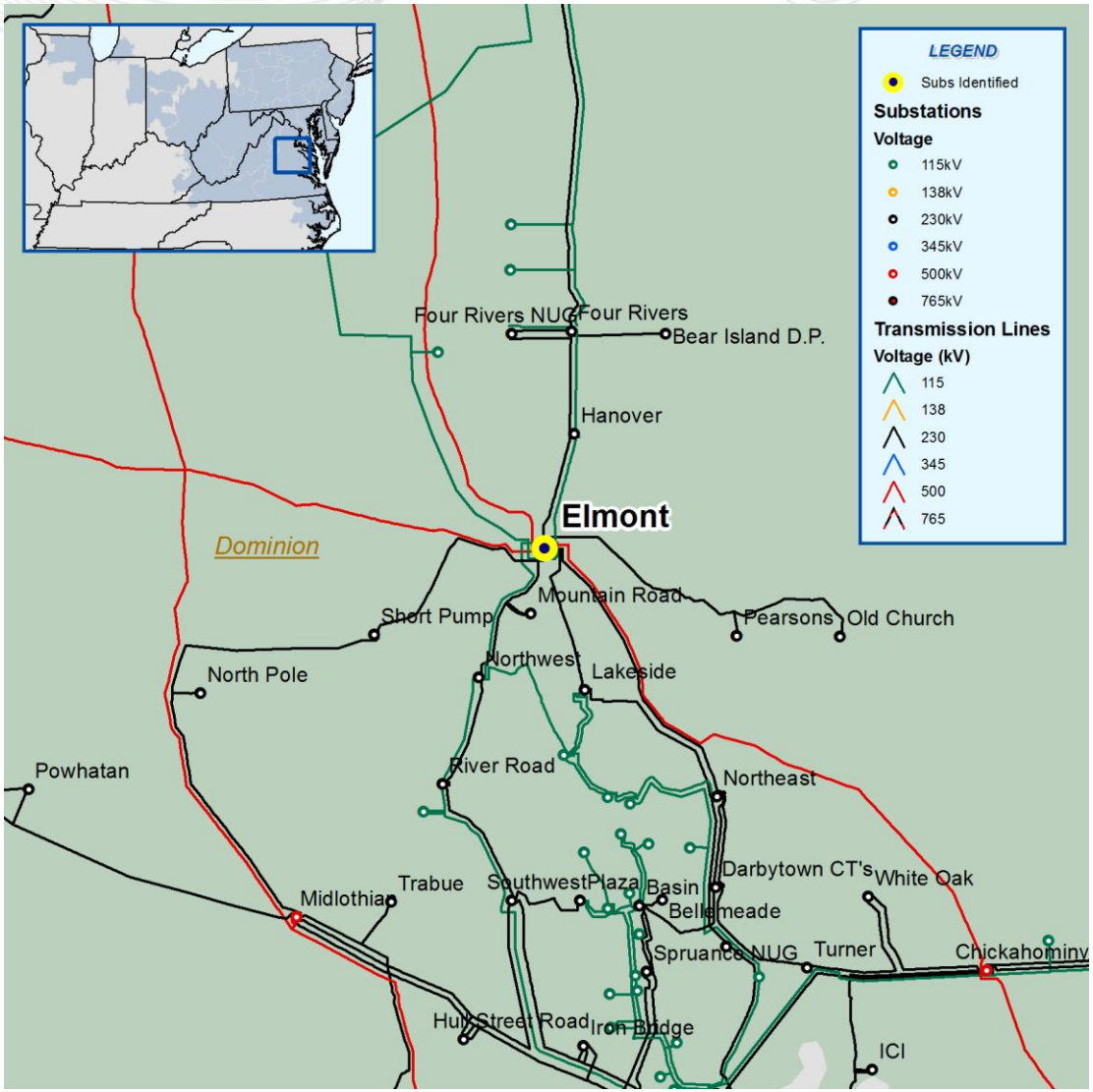
PECO Transmission Zone

- The following breaker upgrade is driven by the new 2nd 230/138 kV XFMR and 35 MVAR CAP at Heaton 138 kV bus (b0842)
- Replace Heaton 138kV breaker '150' (b0842.1)
- Estimated Project Cost: $0.239 M
- Required IS Date : 06/01/2013



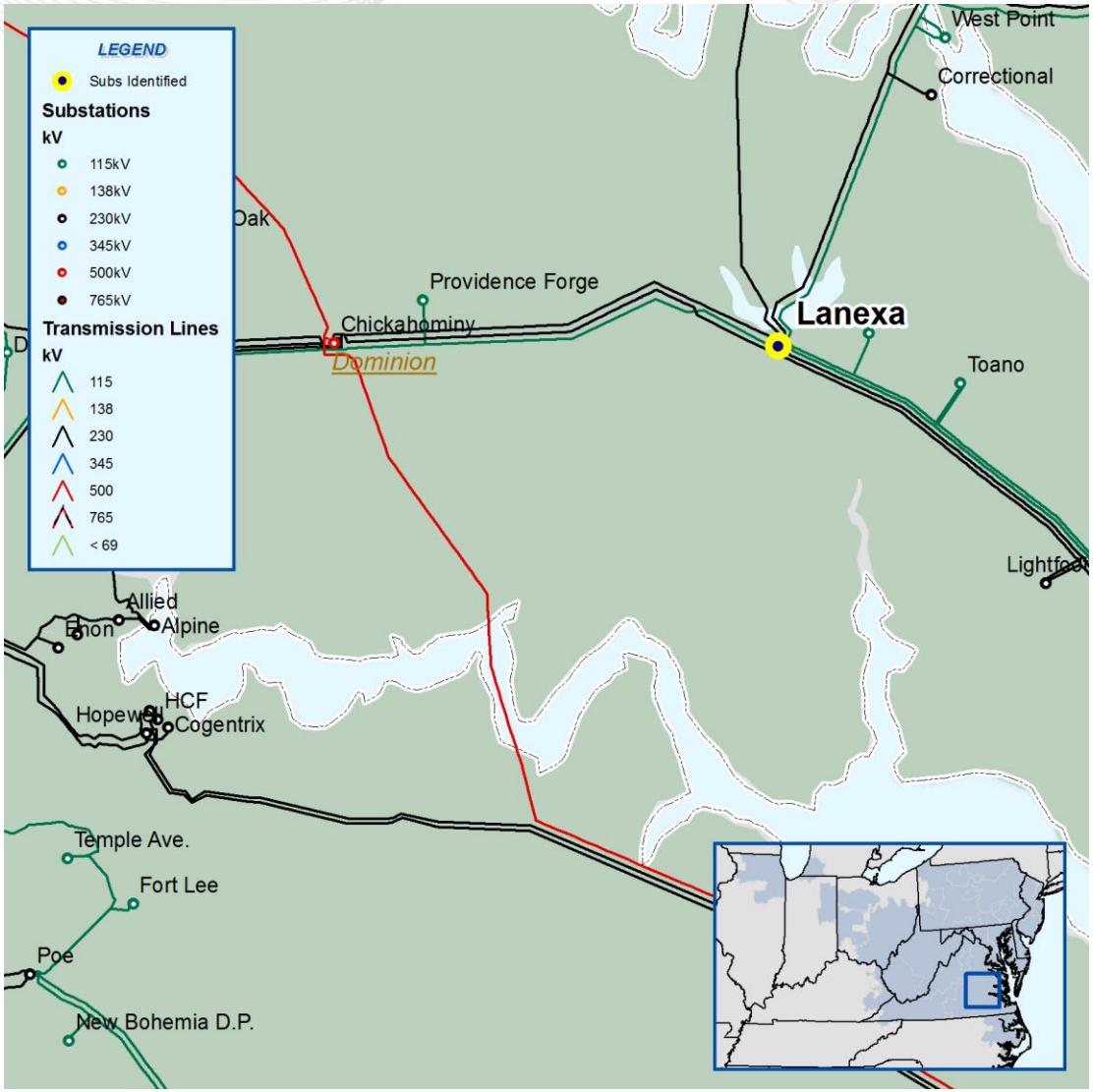
Dominion Transmission Zone

- The following breaker upgrade is driven by the new second Elmont 230/115 kV autotransformer (b0772)
- Replace Elmont 115kV breaker '7392' (b0772.1)
- Estimated Project Cost : $ 0.158 M
- Required IS Date : 06/01/2010



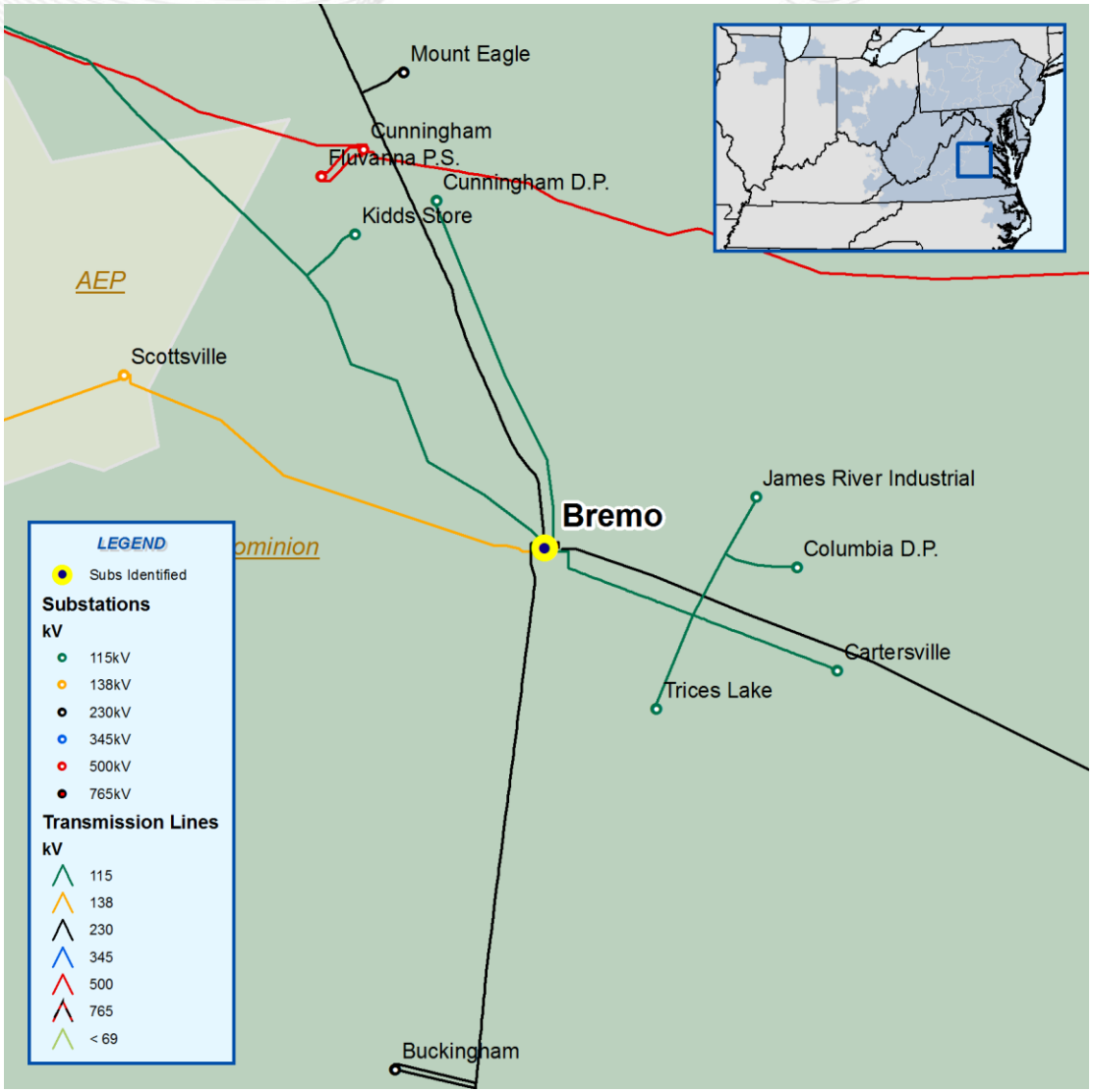
Dominion Transmission Zone

- The following breaker upgrades are driven by the new second 230/115 kV autotransformer at Lanexa (b0770)
- Replace Lanexa 115kV breaker ‘8532’ (b0770.1)
- Replace Lanexa 115kV breaker ‘9232’ (b0770.2)
- Estimated Project Cost : $ 0.158 M per breaker
- Required IS Date : 06/01/2010



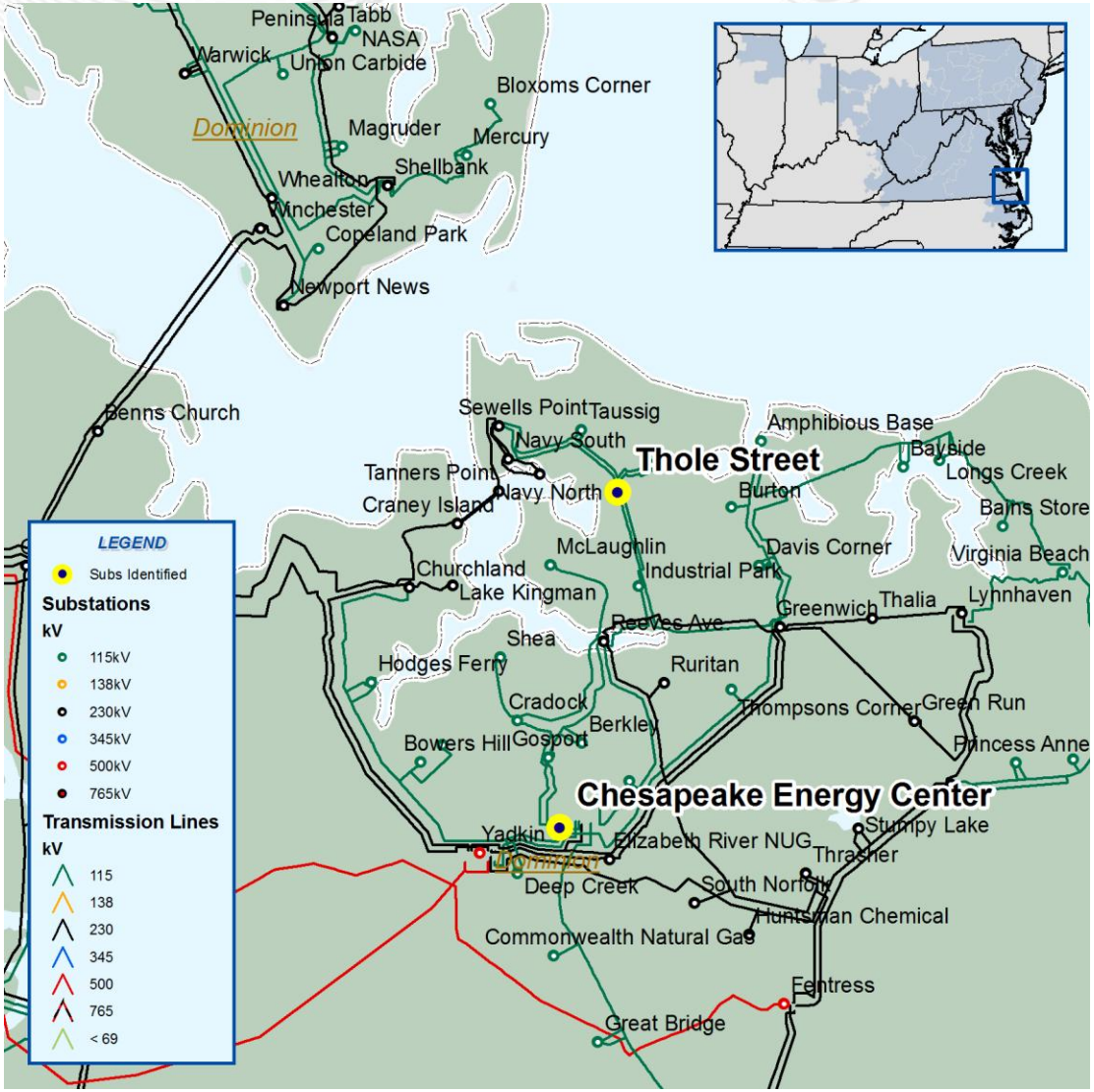
Dominion Transmission Zone

- Replace Bremo 115kV breaker ‘9122’ (b1102)
- Replace Bremo 115kV breaker ‘822’ (b1103)
- Estimated Project Cost :$ 0.158 M per breaker
- Required IS Date : 06/01/2014



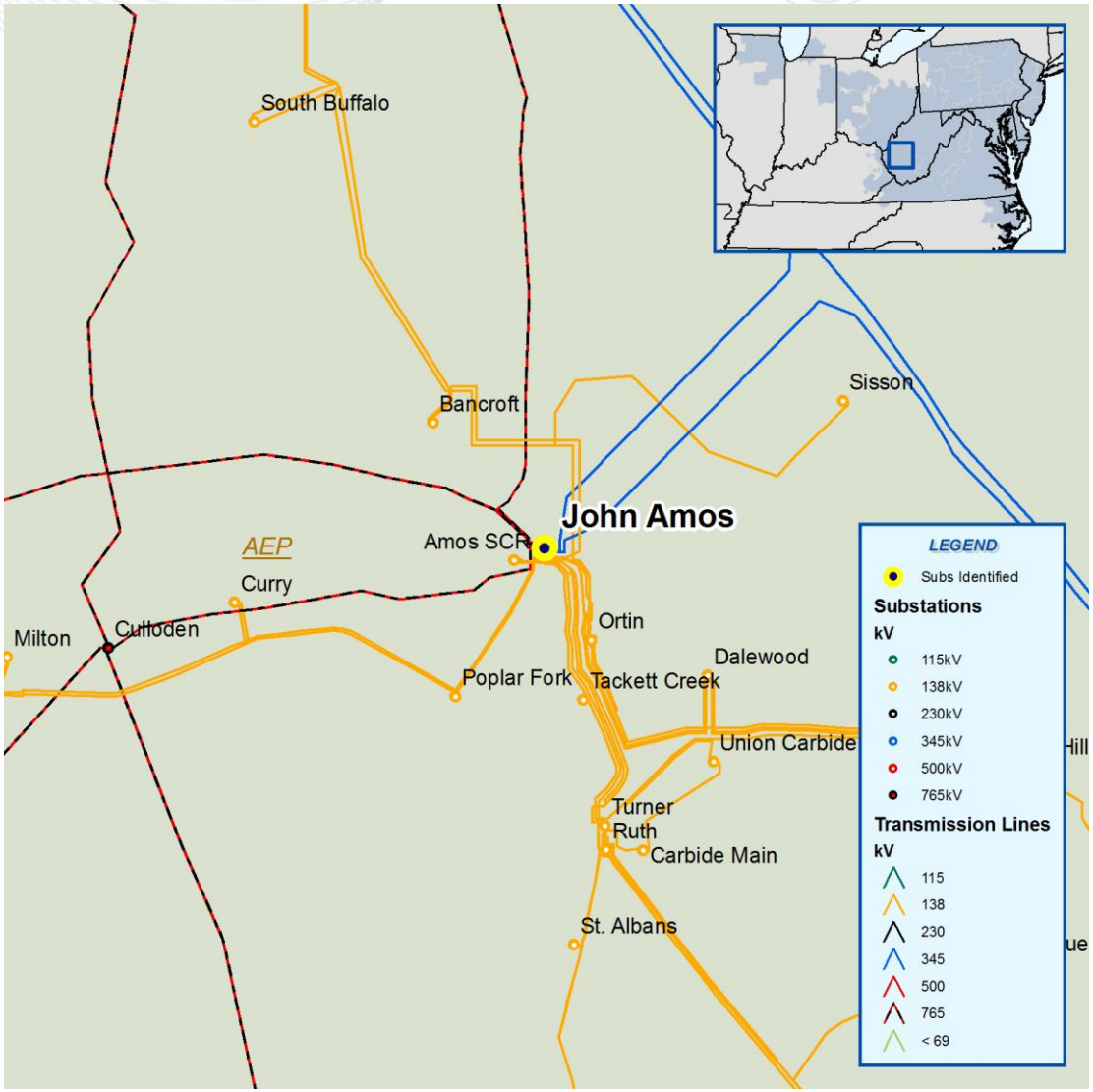
Dominion Transmission Zone

- The following breaker upgrades are driven by the Carson-Suffolk 500 kV line, second Suffolk 500/230 #2 transformer, Suffolk-Fentress 230kV line (b0329)
- Replace Thole Street 115kV breaker ’48T196’ (b0329.1)
- Replace Chesapeake 115kV breaker ‘T242’ (b0329.2)
- Replace Chesapeake 115kV breaker ‘8722’ (b0329.3)
- Replace Chesapeake 115kV breaker ‘16422’ (b0329.4)
- Estimated Project Cost :$ 0.158 M - $ 0.184 M per breaker
- Required IS Date : 06/01/2011



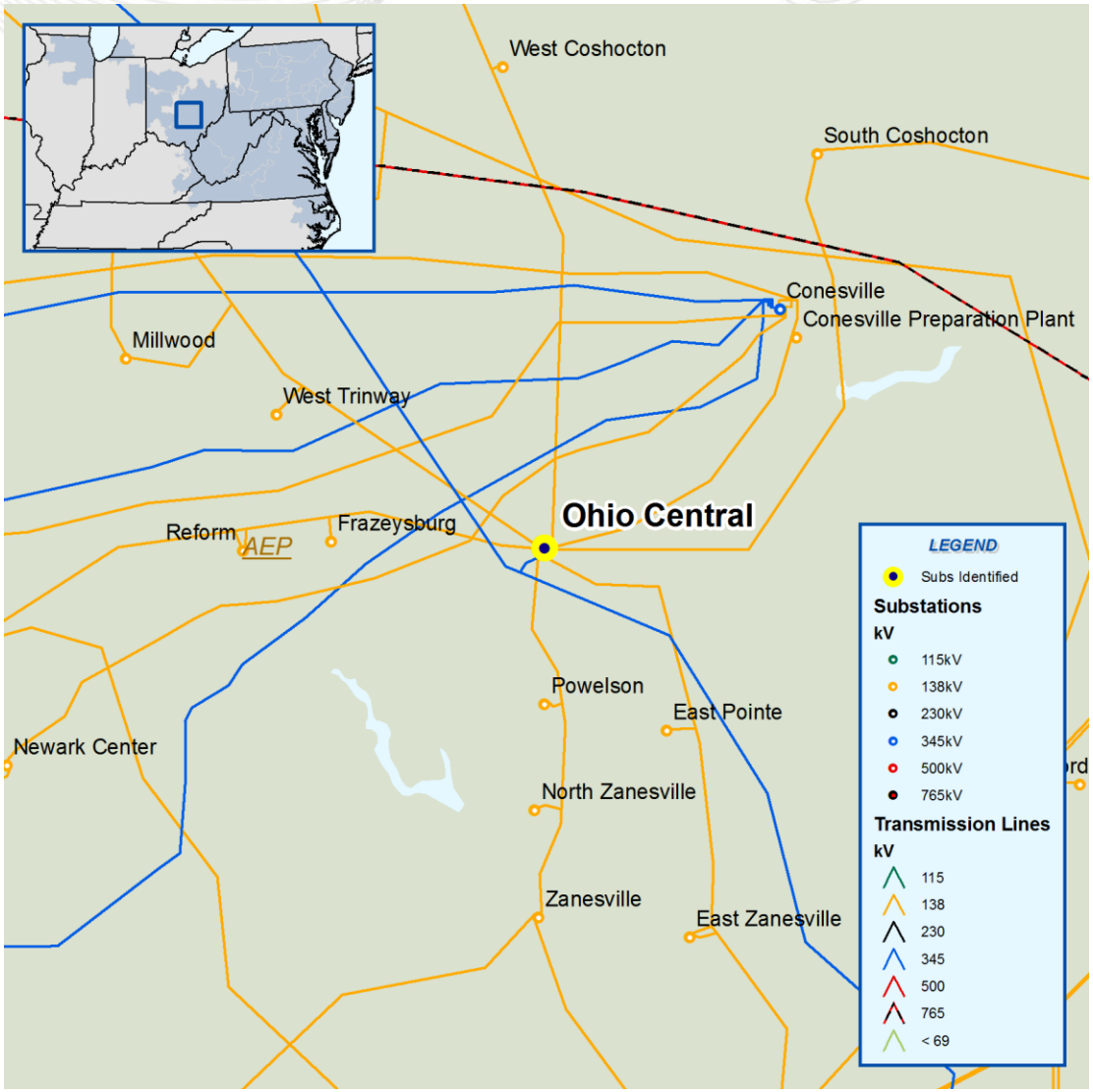
AEP Transmission Zone

- The following breaker upgrades are driven by PATH project (b0490)
- Replace the following Amos 138kV breakers:
  - ‘B’ (b0490.2)
  - ‘B1’ (b0490.3)
  - ‘C’ (b0490.4)
  - ‘C1’ (b0490.5)
  - ‘D’ (b0490.6)
  - ‘D2’ (b0490.7)
  - ‘E’ (b0490.8)
  - ‘E2’ (b0490.9)
- Estimated Project Cost :$ 0.8 M per breaker
- Required IS Date : 06/01/2014



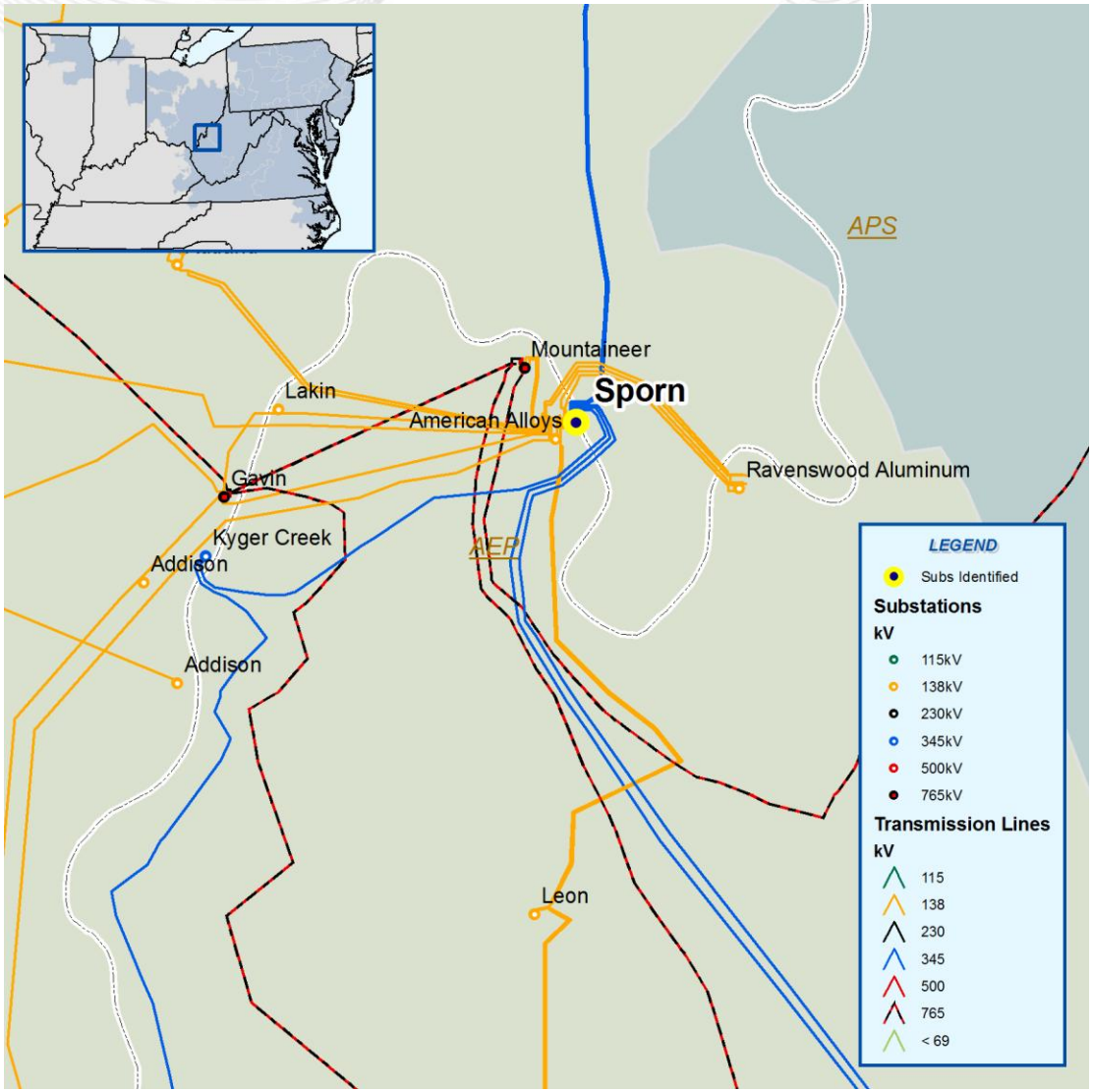
AEP Transmission Zone

- Replace Ohio Central 138kV breaker ‘C2’ (b1108)
- Replace Ohio Central 138kV breaker ‘D1’ (b1109)
- Estimated Project Cost : $ 0.8 M per breaker
- Required IS Date : 06/01/2014



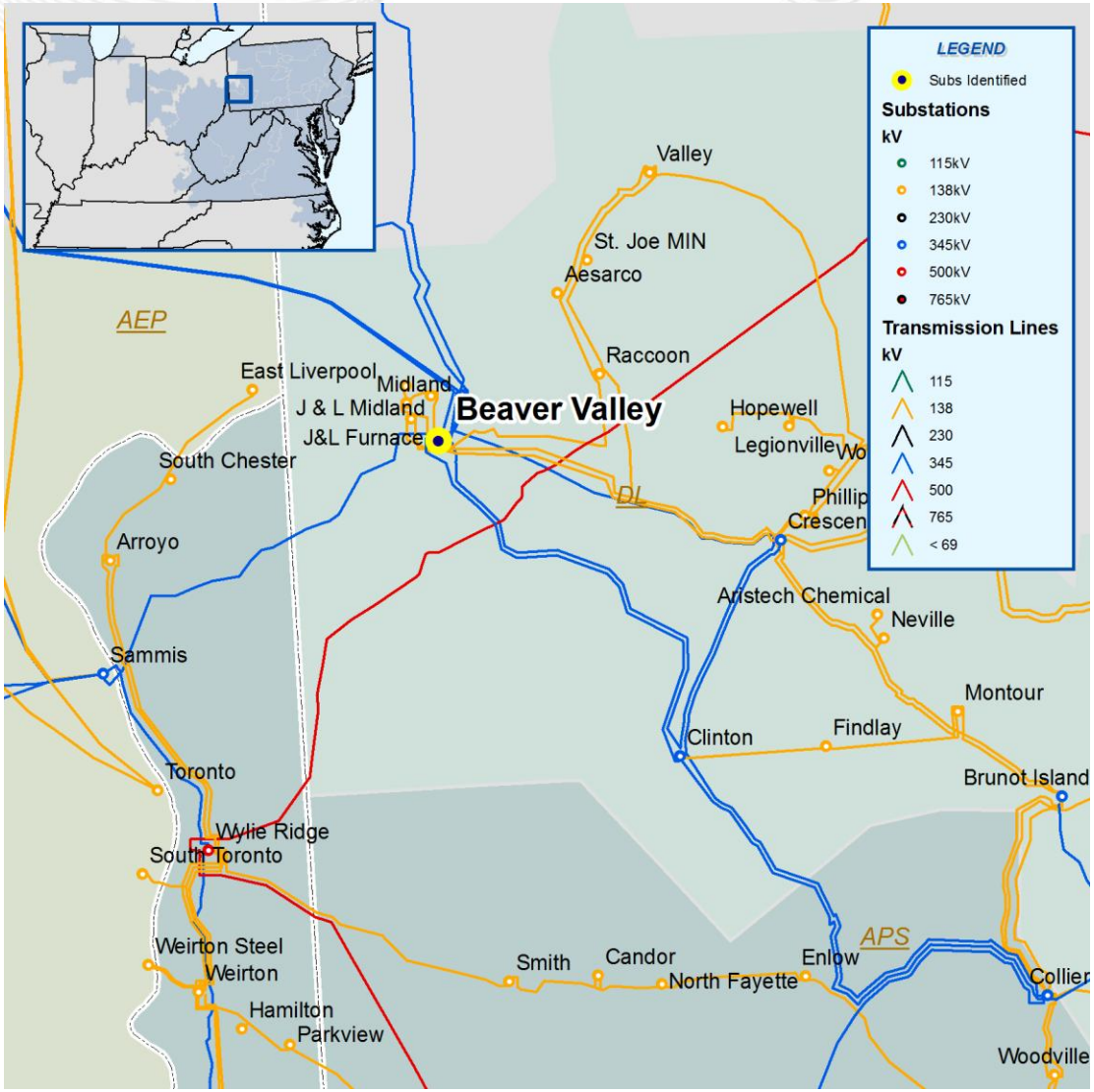
AEP Transmission Zone

- Replace Sporn A 138kV breaker ‘J’ (b1110)
- Replace Sporn A 138kV breaker ‘J2’ (b1111)
- Replace Sporn A 138kV breaker ‘L’ (b1112)
- Replace Sporn A 138kV breaker ‘L1’ (b1113)
- Replace Sporn A 138kV breaker ‘L2’ (b1114)
- Replace Sporn A 138kV breaker ‘N’ (b1115)
- Replace Sporn A 138kV breaker ‘N2’ (b1116)
- Estimated Project Cost :$ 0.8 M per breaker
- Required IS Date : 06/01/2014



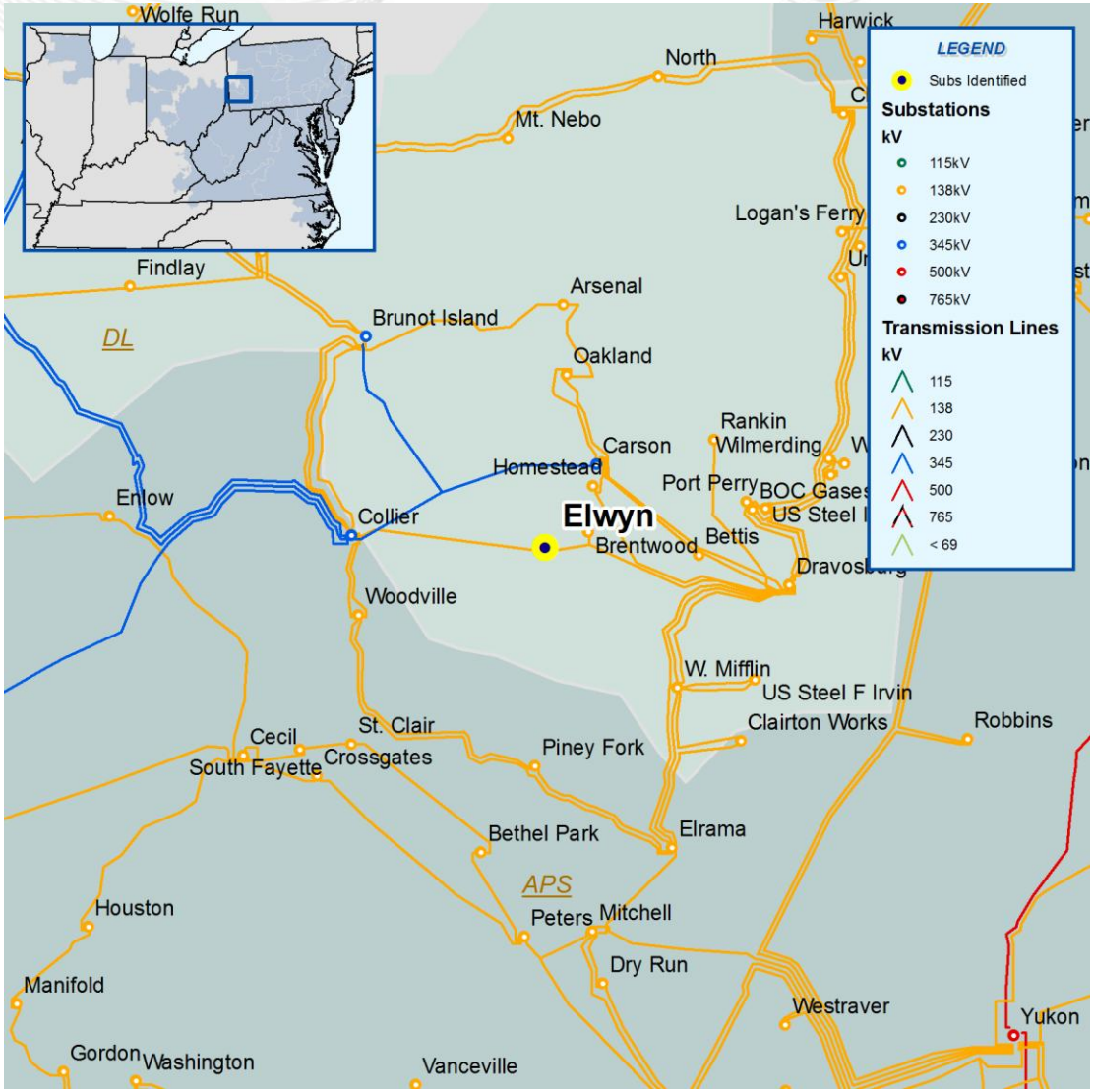
DUQ Transmission Zone

- Replace following Beaver Valley 138kV breakers:
  - '1A & 3A SS tfmr' (b1117)
  - '1B & 3B SS tfmr' (b1118)
  - '2B SS tfmr' (b1119)
  - 'Z30 Midland' (b1120)
  - 'Z33 J&L Midland' (b1121)
- Estimated Project Cost :$ 0.4 M per breaker
- Required IS Date : 06/01/2014



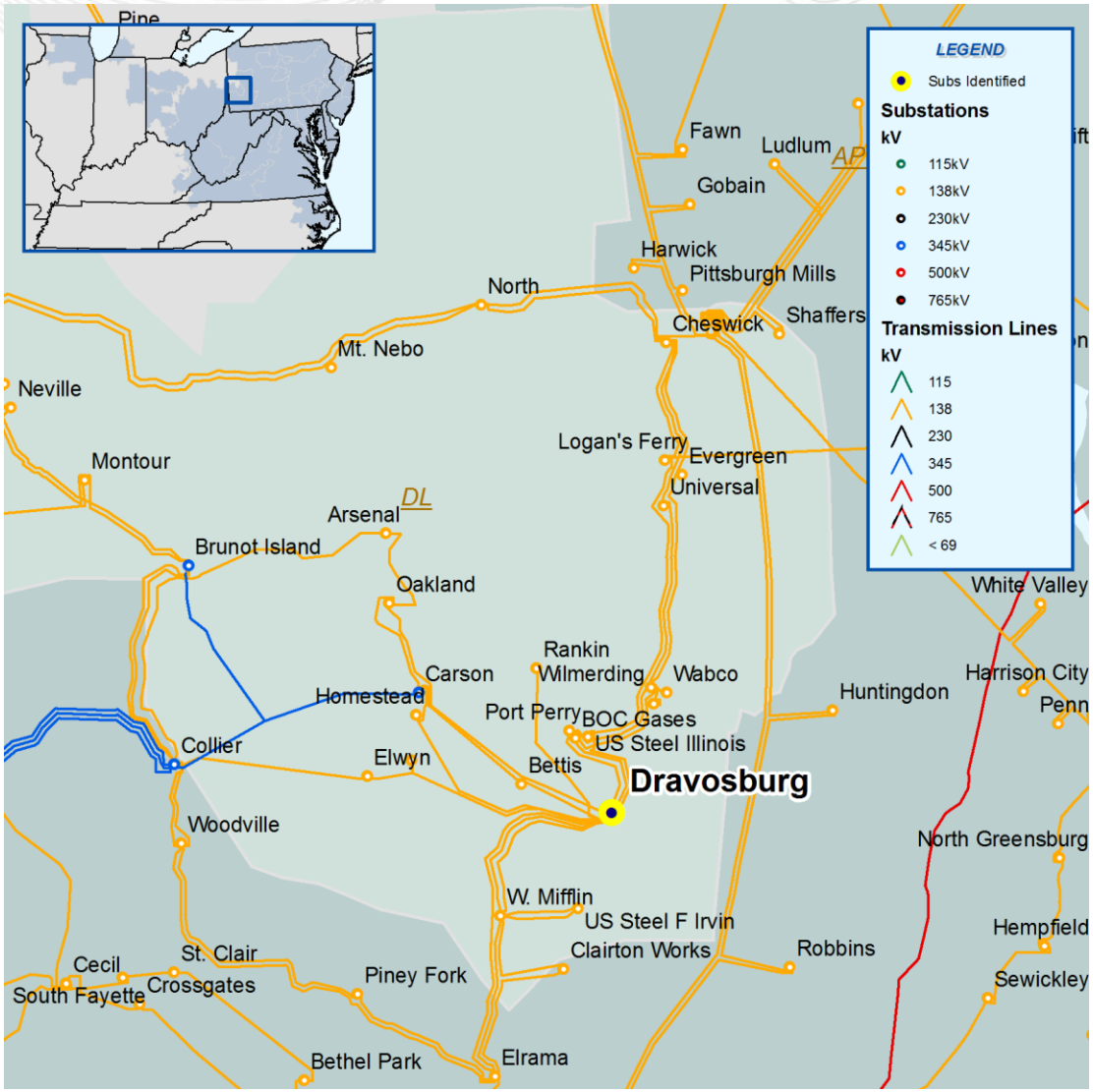
DUQ Transmission Zone

- Replace Elwyn 138kV breaker ‘Z62 Collier’ (b1122)
- Replace Elwyn 138kV breaker ‘1-2 138kV bus’ (b1123)
- Replace Elwyn 138kV breaker ‘2-3 138kV bus’ (b1124)
- Estimated Project Cost :$ 0.33 M per breaker
- Required IS Date : 06/01/2014



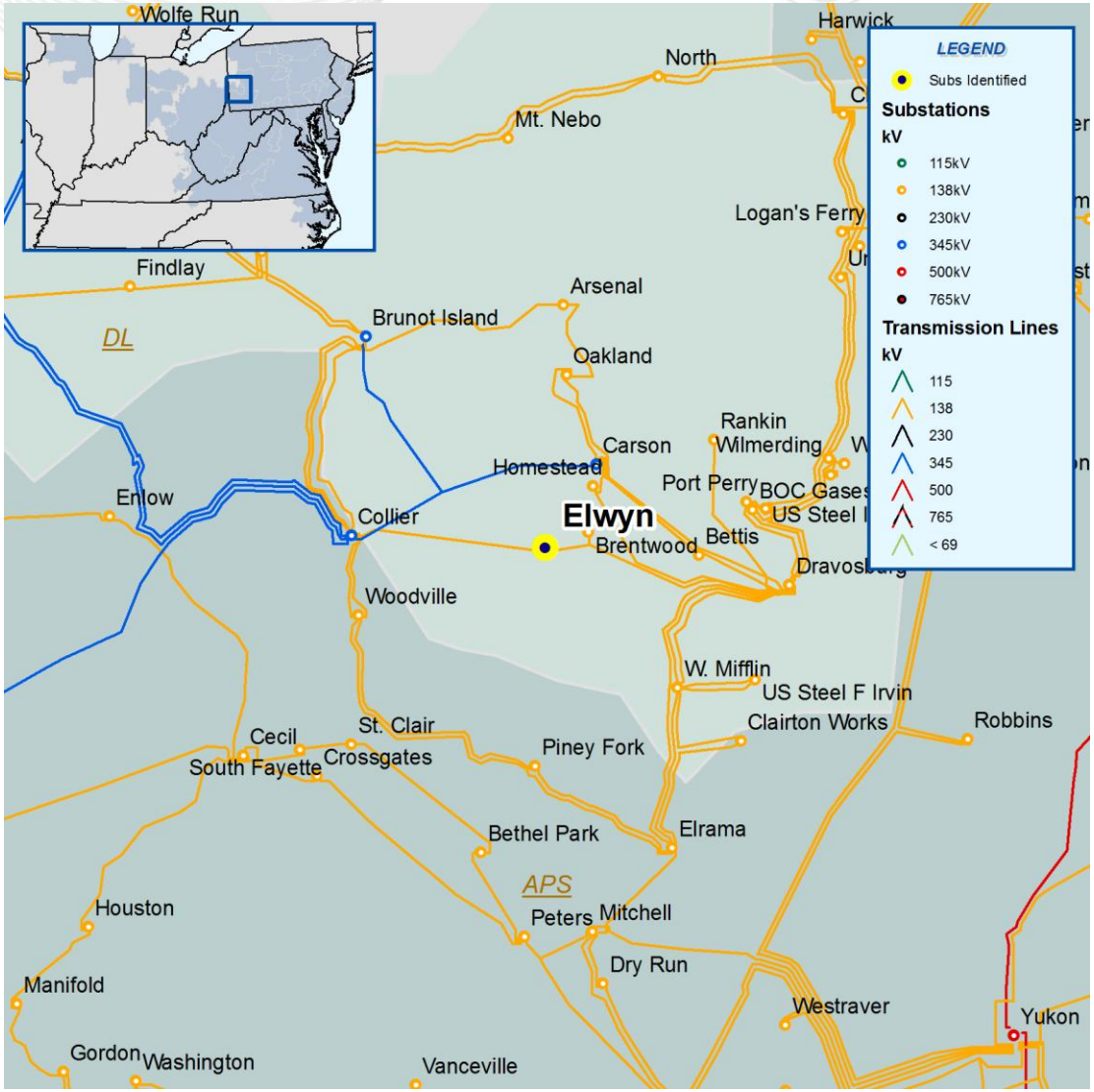
DUQ Transmission Zone

- The following breaker upgrades are driven by the new Underground Carson - Brady - Brunot Island 345 kV circuit (b0502)
- Replace the following Dravosburg 138kV breakers:
  - 'Z79 Illinois' (b502.1)
  - 'Z15 Elrama' (b502.2)
  - 'Z73 West Mifflin' (b502.3)
  - 'Z70 Elywn' (b502.4)
- Replace Elrama 138kV breaker '#1 69kV Autotfmr' (b502.5)
- Estimated Project Cost : $0.33 M - $0.35 M per breaker
- Required IS Date : 06/01/2013



DUQ Transmission Zone

- Supplemental Project
- Replace Elwyn 138kV breaker ‘Z70 Dravosburg’ (s0175)
- Estimated Project Cost : $ 0.33 M per breaker
- Required IS Date : 06/01/2014



Baseline Network Upgrade Cost Allocation

Baseline Network Upgrade Cost Allocation

COST ALLOCATION LEGEND

Short Name	Full Name
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	BGE	COM	DAY	DL	DPL	DOM	JC	ME	NEP	PE	PEN	PEP	PPL	PS	RE	ECP
b0431	Monroe Upgrade New Freedom strand bus	AEC	0.1	100																		
b1127	Build a new Lincoln-Minitola 138 kV line	AEC	12.5	100																		
b0490.2	Replace Amos 138kV breaker 'B'	AEP	0.8	1.89	17.3	6.02	4.95	14.97	2.5	2.02	2.85	13.61	4.5	2.18	0.49	6.31	2.06	4.82	5.37	7.61	0.31	0.24
b0490.3	Replace Amos 138kV breaker 'B1'	AEP	0.8	1.89	17.3	6.02	4.95	14.97	2.5	2.02	2.85	13.61	4.5	2.18	0.49	6.31	2.06	4.82	5.37	7.61	0.31	0.24
b0490.4	Replace Amos 138kV breaker 'C'	AEP	0.8	1.89	17.3	6.02	4.95	14.97	2.5	2.02	2.85	13.61	4.5	2.18	0.49	6.31	2.06	4.82	5.37	7.61	0.31	0.24
b0490.5	Replace Amos 138kV breaker 'C1'	AEP	0.8	1.89	17.3	6.02	4.95	14.97	2.5	2.02	2.85	13.61	4.5	2.18	0.49	6.31	2.06	4.82	5.37	7.61	0.31	0.24
b0490.6	Replace Amos 138kV breaker 'D'	AEP	0.8	1.89	17.3	6.02	4.95	14.97	2.5	2.02	2.85	13.61	4.5	2.18	0.49	6.31	2.06	4.82	5.37	7.61	0.31	0.24
b0490.7	Replace Amos 138kV breaker 'D2'	AEP	0.8	1.89	17.3	6.02	4.95	14.97	2.5	2.02	2.85	13.61	4.5	2.18	0.49	6.31	2.06	4.82	5.37	7.61	0.31	0.24
b0490.8	Replace Amos 138kV breaker 'E'	AEP	0.8	1.89	17.3	6.02	4.95	14.97	2.5	2.02	2.85	13.61	4.5	2.18	0.49	6.31	2.06	4.82	5.37	7.61	0.31	0.24
b0490.9	Replace Amos 138kV breaker 'E2'	AEP	0.8	1.89	17.3	6.02	4.95	14.97	2.5	2.02	2.85	13.61	4.5	2.18	0.49	6.31	2.06	4.82	5.37	7.61	0.31	0.24
b0840.1	Establish a new 138/69-34.5kV Station to interconnect the existing 34.5kV network	AEP	3.5		100																	

Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost ($M)	AEP
b1091	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	AEP	2.4	100
b1092	Add 28.8 MVAR 138 kV capacitor bank at Sullivan Gardens and 52.8 MVAR 138 kV Bank at Reedy Creek Stations	AEP	2	100
b1093	Add a 43.2 MVAR capacitor bank at the Morgan Fork 138 kV Station	AEP	0.8	100
b1094	Add a 64.8 MVAR capacitor bank at the West Huntington 138 kV Station	AEP	0.8	100
b1108	Replace Ohio Central 138kV breaker 'C2'	AEP	0.8	100
b1109	Replace Ohio Central 138kV breaker 'D1'	AEP	0.8	100
b1110	Replace Sporn A 138kV breaker 'J'	AEP	0.8	100
b1111	Replace Sporn A 138kV breaker 'J2'	AEP	0.8	100
b1112	Replace Sporn A 138kV breaker 'L'	AEP	0.8	100
b1113	Replace Sporn A 138kV breaker 'L1'	AEP	0.8	100
b1114	Replace Sporn A 138kV breaker 'L2'	AEP	0.8	100
b1115	Replace Sporn A 138kV breaker 'N'	AEP	0.8	100
b1116	Replace Sporn A 138kV breaker 'N2'	AEP	0.8	100

Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost ($M)	AEC	AEP	APS	BGE	COM	DAY	DL	DPL	DOM	JC	ME	NEP	PE	PEN	PEP	PPL	PS	RE	ECP
b0347.16	Upgrade (per ABB inspection) Harrison 500 kV breaker 'HL-3'	APS	0.06	1.89	17.3	6.02	4.95	14.97	2.5	2.02	2.85	13.61	4.5	2.18	0.49	6.31	2.06	4.82	5.37	7.61	0.31	0.24
b1022.1	Reconfigure the Peters to Bethel Park 138 kV line and Elrama to Woodville 138 kV line to create a 138 kV path from Woodville to Peters and a 138 kV path from Elrama to Bethel Park	APS	11.6			96.98				3.02												
b1022.3	Add static capacitors at Smith 138 kV	APS	Inc. in 11.6			96.98				3.02												
b1022.4	Add static capacitors at North Fayette 138 kV	APS	Inc. in 11.6			96.98				3.02												
b1022.5	Add static capacitors at South Fayette 138 kV	APS	Inc. in 11.6			96.98				3.02												
b1022.6	Add static capacitors at Manifold 138 kV	APS	Inc. in 11.6			96.98				3.02												
b1022.7	Add static capacitors at Houston 138 kV	APS	Inc. in 11.6			96.98				3.02												
b1023.1	Install a 500/138 kV transformer at 502 Junction	APS	27.2			100																
b1023.2	Construct a new Franklin - 502 Junction 138 kV line including a rebuild of the Whiteley - Franklin 138 kV line to double circuit	APS	17.1			100																
b1023.3	Construct a new 502 Junction - Osage 138 kV line	APS	4.2			100																
b1023.4	Construct Braddock 138 kV breaker station that connects the Charleroi - Gordon 138 kV line, Washington - Franklin 138 kV line and the Washington - Vanceville 138 kV line including a 66 MVAR capacitor	APS	15.1			100																

Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost ($M)	APS	COM	DL
b1097	Add a 138 kV bus tie CB and two other 138 kV CB's at Round Lake	COM	4.5		100	
b1022.2	Reconductor both Collier - Woodville 138 kV lines	DL	Inc. in 11.6	96.98		3.02
b0502.1	Replace Dravosburg 138kV breaker 'Z79 Illinois'	DL	0.33	6.74		93.26
b0502.2	Replace Dravosburg 138kV breaker 'Z15 Elrama'	DL	0.33	6.74		93.26
b0502.3	Replace Dravosburg 138kV breaker 'Z73 West Mifflin'	DL	0.35	6.74		93.26
b0502.4	Replace Dravosburg 138kV breaker 'Z70 Elywn'	DL	0.35	6.74		93.26
b0502.5	Replace Elrama 138kV breaker 'No.1 69kV Autotfmr'	DL	0.35	6.74		93.26
b1117	Replace Beaver Valley 138kV breaker '1A & 3A SS tfmr'	DL	0.4			100
b1118	Replace Beaver Valley 138kV breaker '1B & 3B SS tfmr'	DL	0.4			100
b1119	Replace Beaver Valley 138kV breaker '2B SS tfmr'	DL	0.4			100
b1120	Replace Beaver Valley 138kV breaker 'Z30 Midland'	DL	0.4			100
b1121	Replace Beaver Valley 138kV breaker 'Z33 J&L Midland'	DL	0.4			100
b1122	Replace Elywn 138kV breaker 'Z62 Collier'	DL	0.33			100
b1123	Replace Elywn 138kV breaker 'No.1-2 138kV bus'	DL	0.33			100
b1124	Replace Elywn 138kV breaker 'No.2-3 138kV bus'	DL	0.33			100

Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost ($M)	DOM
b0329.1	Replace Thole Street 115kV breaker '48T196'	DOM	0.158	100
b0329.2	Replace Chesapeake 115kV breaker 'T242'	DOM	0.184	100
b0329.3	Replace Chesapeake 115kV breaker '8722'	DOM	0.184	100
b0329.4	Replace Chesapeake 115kV breaker '16422'	DOM	0.184	100
b0770.1	Replace Lanexa 115kV breaker '8532'	DOM	0.158	100
b0770.2	Replace Lanexa 115kV breaker '9232'	DOM	0.158	100
b0772.1	Replace Elmont 115kV breaker '7392'	DOM	0.158	100
b1088	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	DOM	80	100
b1089	Install 2nd Burke to Sideburn 230 kV underground cable	DOM	4	100
b1090	Install a 150 MVAR 230 kV capacitor and one 230 kV breaker at Northwest	DOM	1.7	100
b1095	Reconductor Chase City 115 kV bus and add a new tie breaker	DOM	2.4	100
b1096	Construct 10 mile double ckt. 230kV tower line from Loudoun to Middleburg .	DOM	35	100
b1102	Replace Bremo 115kV breaker '9122'	DOM	0.158	100
b1103	Replace Bremo 115kV breaker '822'	DOM	0.158	100

Baseline Network Upgrade Cost Allocation

Project #	Project Description	TO	Cost ($M)	APS	PE	PEP	PS
b0842.1	Replace Heaton 138kV breaker '150'	PE	0.239		100		
b1104	Replace Burtonsville 230kV breaker '1C'	PEP	1.375			100	
b1105	Replace Burtonsville 230kV breaker '2C'	PEP	1.375			100	
b1106	Replace Burtonsville 230kV breaker '3C'	PEP	1.375			100	
b1107	Replace Burtonsville 230kV breaker '4C'	PEP	1.375			100	
b1125	Convert the 138kV line from Buzzard 138-Ritchie 851 to a 230kV line and Remove 230/138kV Transformer at Ritchie and install a spare 230/138kV transformer at Buzzard Pt	PEP	56	4.74		95.26	
b1126	Upgrade the 230kV line from Buzzard 016 - Ritchie 059	PEP	39	4.73		95.27	
b1098	Re-configure the Bayway 138 kV substation and install three new 138 kV breakers	PS	15				100
b1099	Build a new 230 kV substation by tapping the Aldene – Essex circuit and install three 230/26 kV transformers, and serve some of the Newark area load from the new station	PS	137				100
b1100	Build a new 138 kV circuit from Bayonne to Marion substation	PS	100				100
b1101	Re-configure the Cedar Grove substation with breaker and half scheme and build a new 69 kV circuit from Cedar Grove to Hinchman	PS	100				100

2010 RTEP Analysis Timeline

- 2015 base case development underway now
- Initial RTEP focus will be on 2015
- Retool of 2014 will be required to support backbone transmission line proceedings
- Retool of earlier years to follow completion of 2015 and 2014 retool analyses