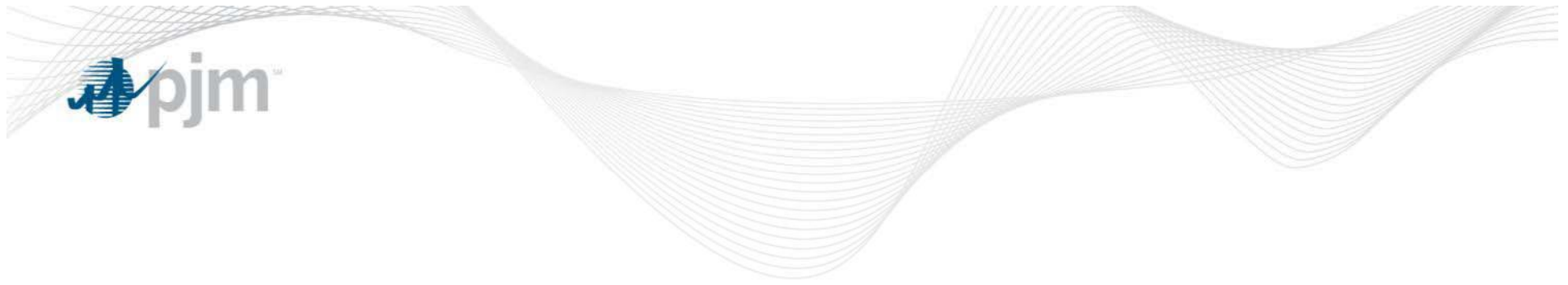




Transmission Expansion Advisory Committee

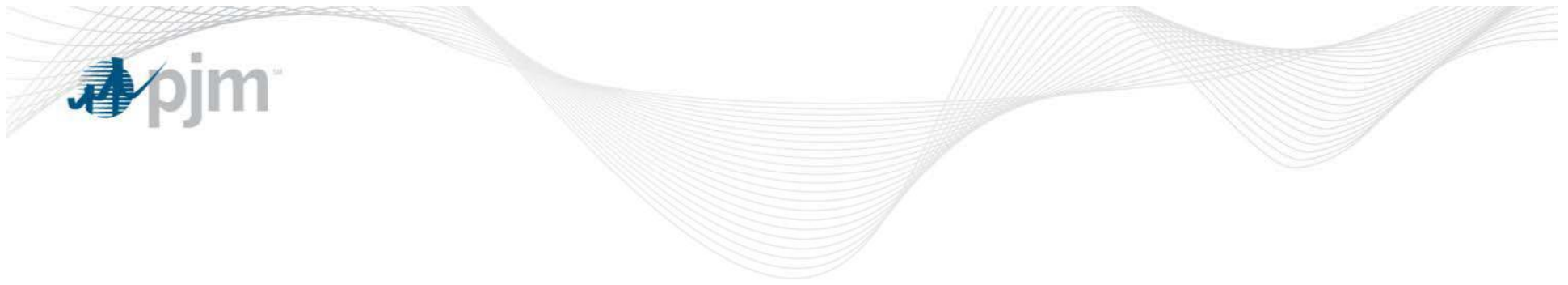
February 10, 2010



RTEP Sensitivity Studies

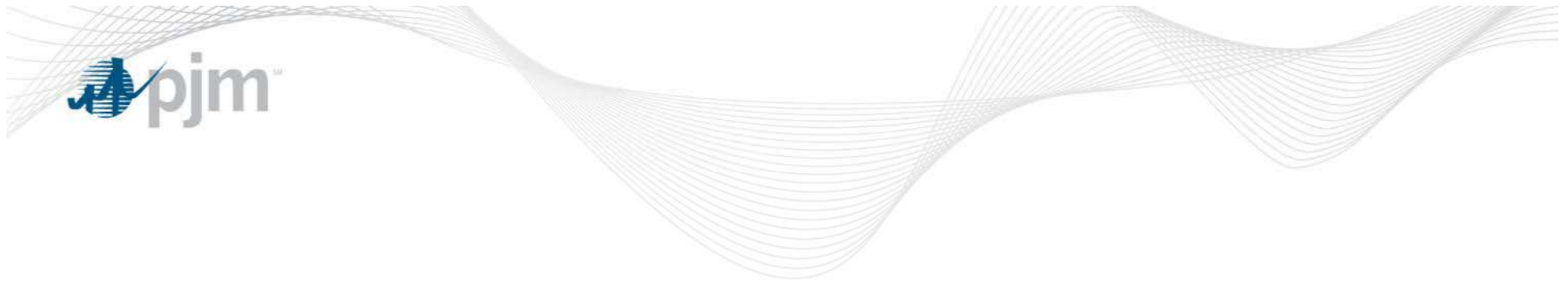
- **Load Sensitivity Study Ideas**
 - Load forecast
 - Use different econometric projections to establish varying load forecast
 - DR and EE
 - Use state projections for DR/EE
 - Vary existing DR forecasts – 33%, 66% of forecast values
- **Generation Sensitivity Study Ideas**
 - “At Risk” Generation
 - Generation that has not cleared in recent RPM auctions
 - Generation in a carbon constrained world
 - Revenue adequacy at risk generation
 - Generation that has been in-service for 40 years or more

- **Generation Sensitivity Study Ideas**
 - Renewable resource integration
 - Use data from the interconnection queue to displace “at risk” generation noted on the previous page
- **Other Sensitivity Study Suggestions**
 - Loop flows
 - CETO input assumption sensitivities
- **Next Steps**
 - Continue to develop the various scenarios and scope of analysis and study methods



2010 RTEP Assumptions

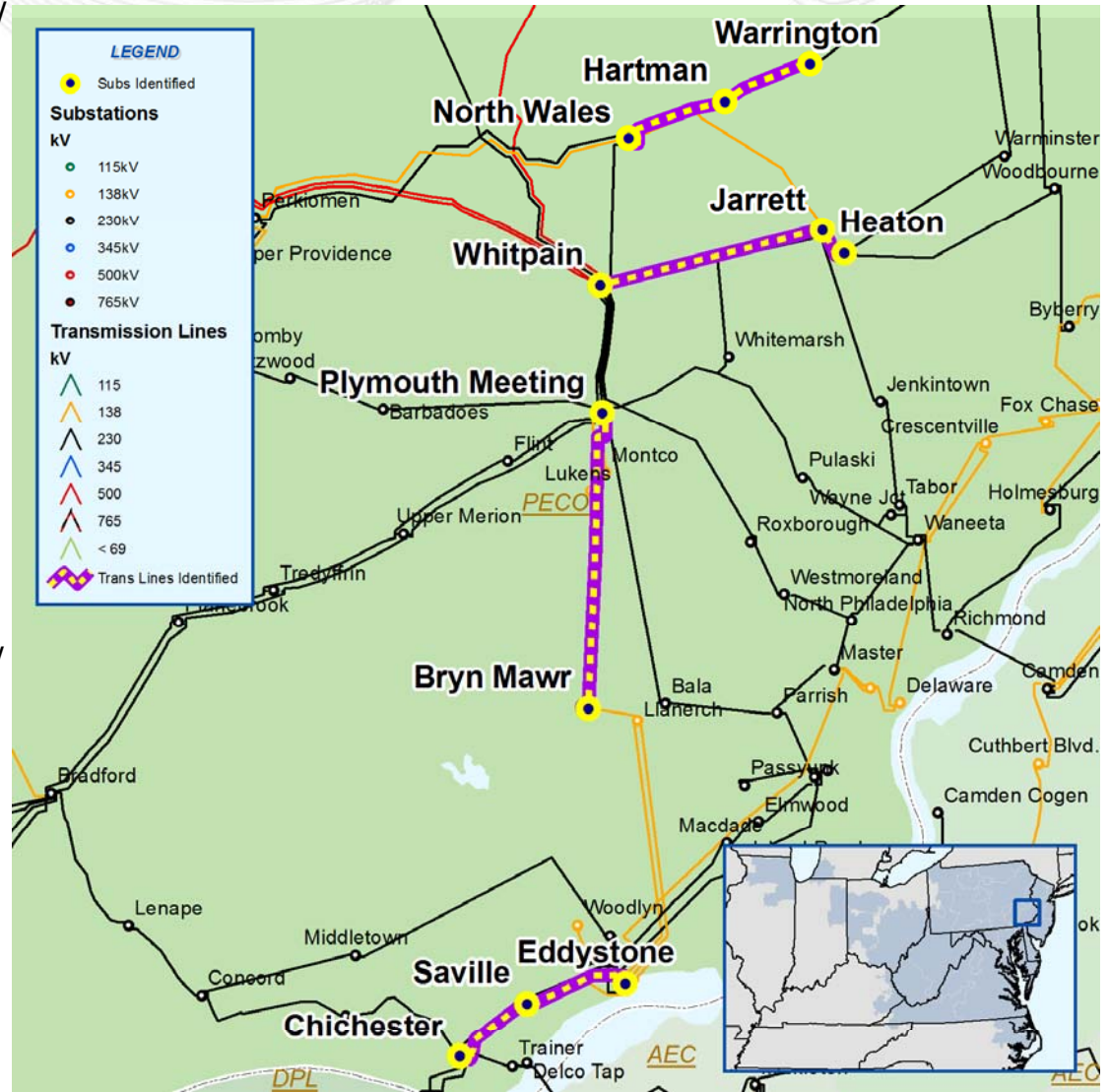
- 2010 RTEP assumptions were reviewed at the January TEAC
- Stakeholders requested additional detail on generation and interchange
- Spreadsheets with detailed information on generation and interchange were posted with these meeting materials.



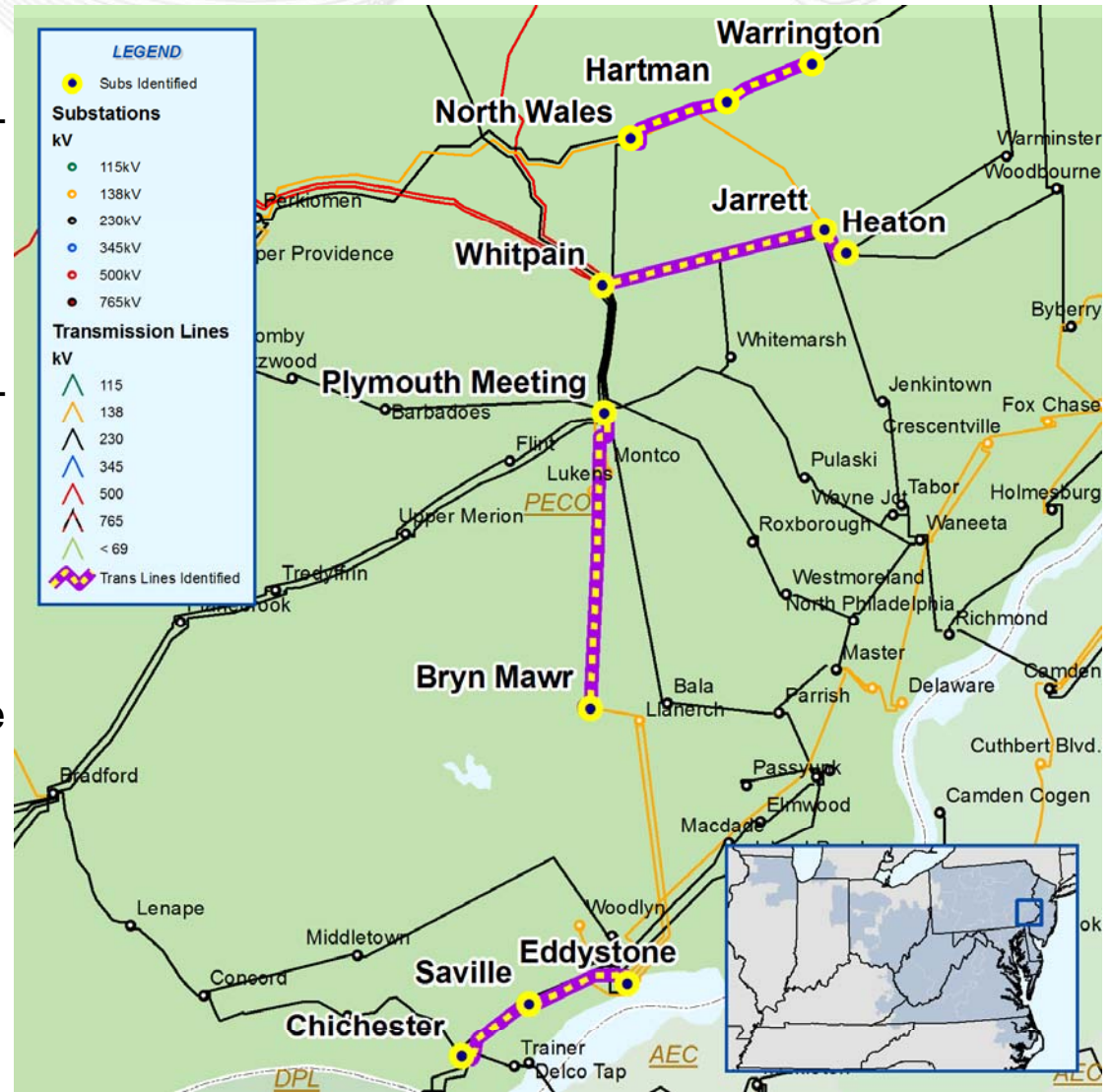
Exelon Generation Retirements

- In December 2009 Exelon notified PJM of their intent to retire the Eddystone 1&2 units and the Cromby 1&2 units in the PECO Energy Transmission zone
- Proposed deactivation date is May 31, 2011
- PJM staff has been evaluating the impact of the proposed deactivation
- The following slides detail the violations in 2011 if all four units were to retire

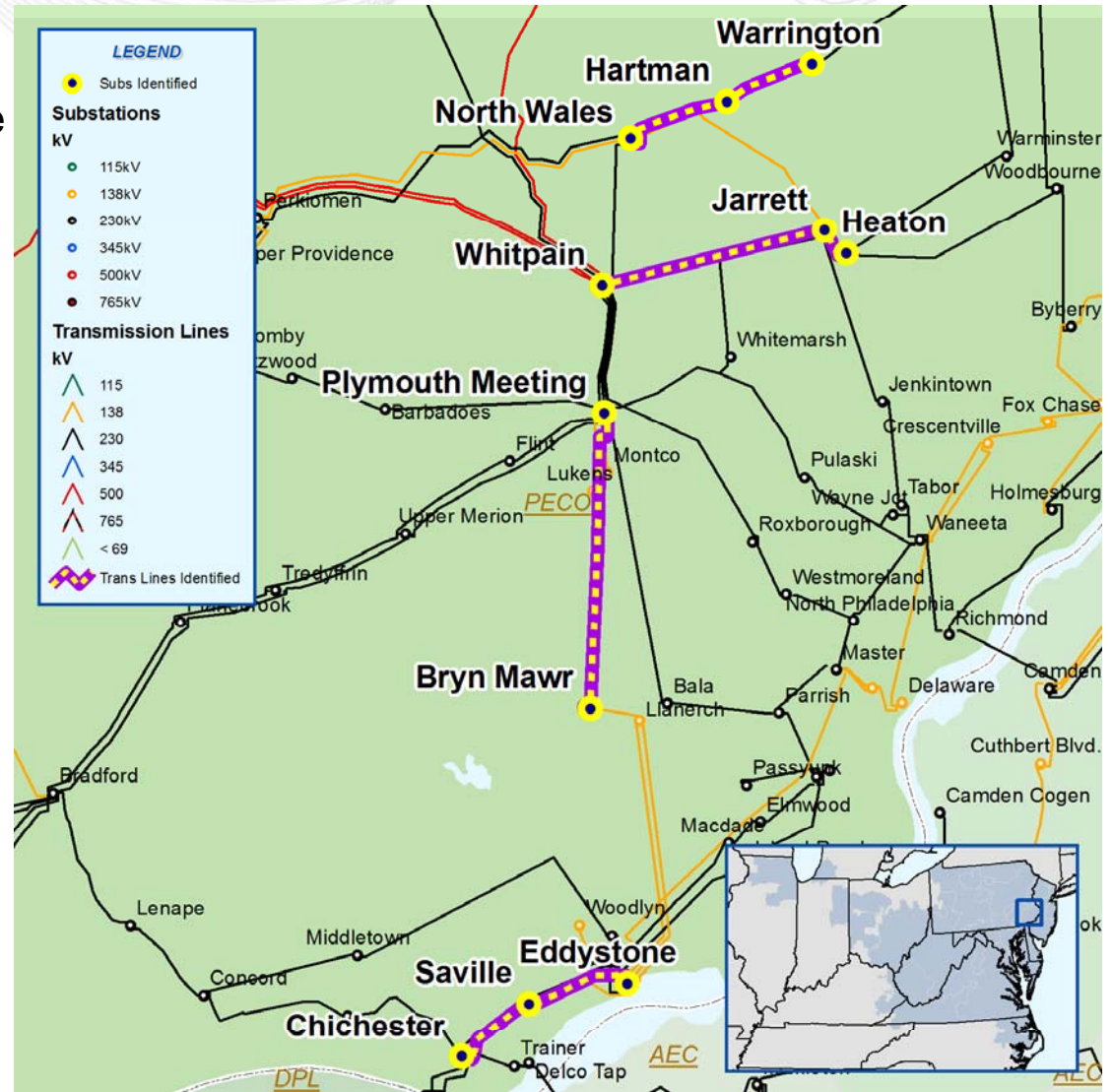
- Chichester – Saville 230 kV line / loss of Macdade – Ridley – Morton 230 kV line (220-46) + loss of Island Road – Eddystone 230 kV line (220-23)
- Chichester 230/138 kV transformer / loss of Macdade – Ridley – Morton 230 kV line (220-46) + loss of Island Road – Eddystone 230 kV line (220-23)
- Eddystone – Saville 138 kV line / loss of Macdade – Ridley – Morton 230 kV line (220-46) + loss of Island Road – Eddystone 230 kV line (220-23)



- Plymouth Meeting – Bryn Mawr 138 kV line / loss of Chichester 230/138 kV transformer (CHICH-T9) + Basecase
- Plymouth Meeting – Bryn Mawr 138 kV line / loss of Chichester 230/138 kV transformer (CHICH-T9) + Eddystone – Master 138 kV line (130-43)
- Jarrett – Whitpain 230 kV line / loss of North Wales – Hartman 230 kV line (220-71) + Basecase

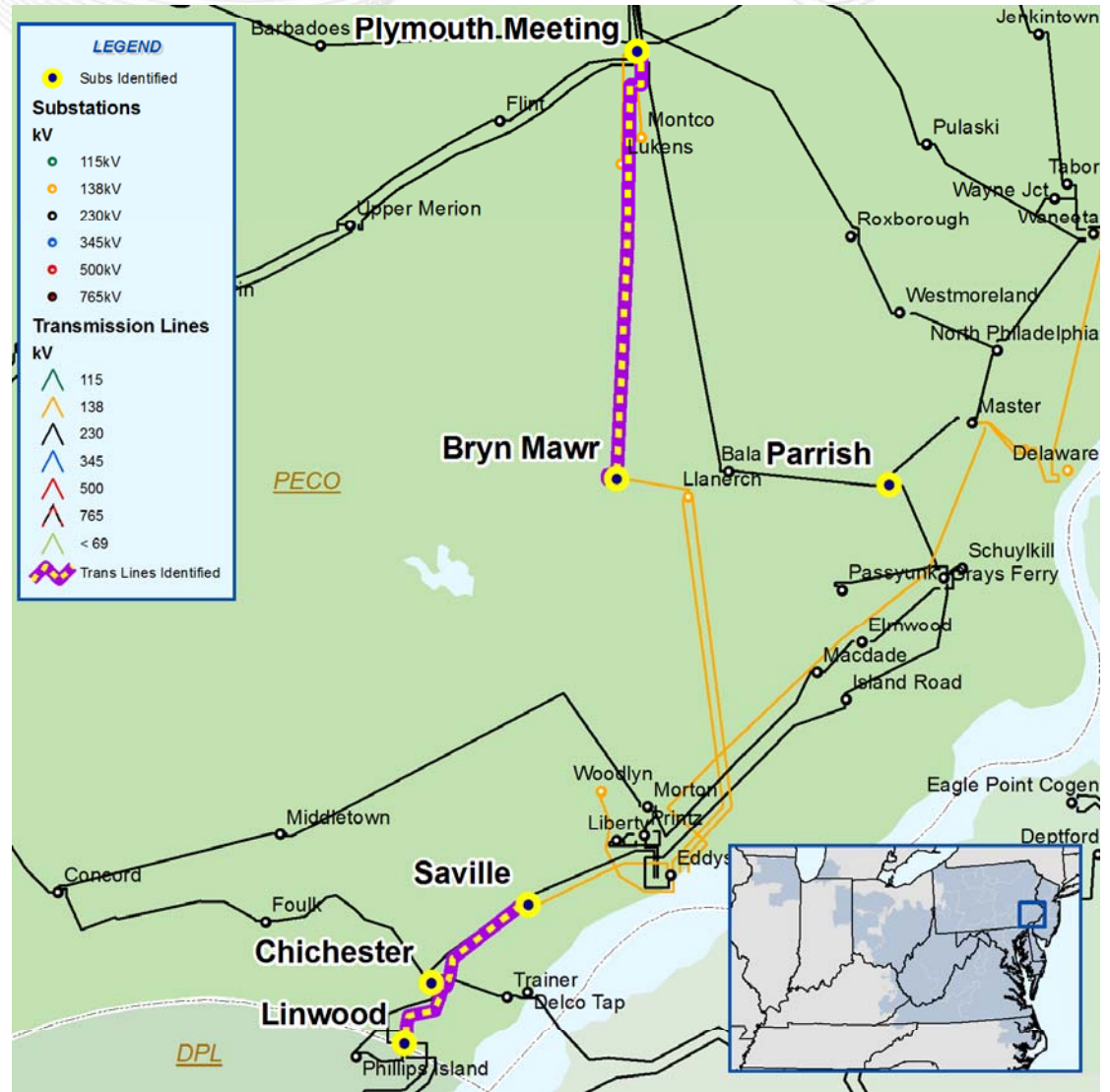


- Jarrett – Heaton 230 kV line / loss of North Wales – Hartman 230 kV line (220-71) + Basecase
- Hartman – Warrington 230 kV line / loss of Jarrett – Whitpain 230 kV line (220-52) + Basecase
- Hartman – Warrington 230 kV line / loss of Emilie – Neshaminy 138 kV line (130-25) + loss of Jarrett – Whitpain 230 kV line (220-52)



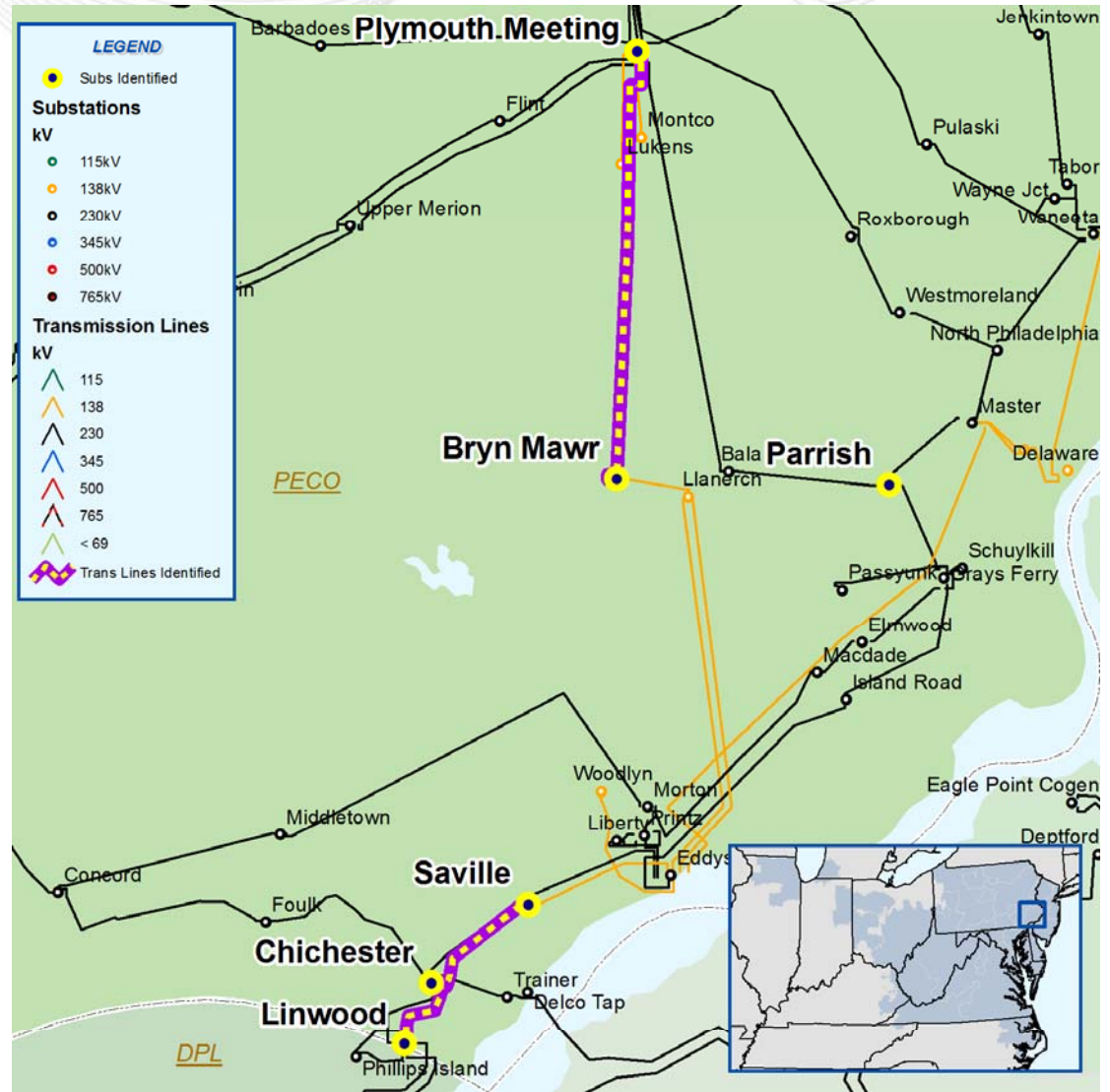
Generation Deliverability / Common Mode Outage Violations

- Linwood – Chichester ‘220-39’ 230 kV line / single contingency (‘220-43’) loss of Linwood – Chichester ‘220-43’ 230 kV line and Phillips island generating units CT2, CT3, and ST
- Linwood – Chichester ‘220-43’ 230 kV line / single contingency (‘220-39’) loss of Linwood – Chichester ‘220-39’ 230 kV line and Phillips island generating units CT2, CT3, and ST
- Plymouth Meeting – Bryn Mawr 138 kV line / bus contingency (‘CHI230B1’) loss of Chichester bus section 1



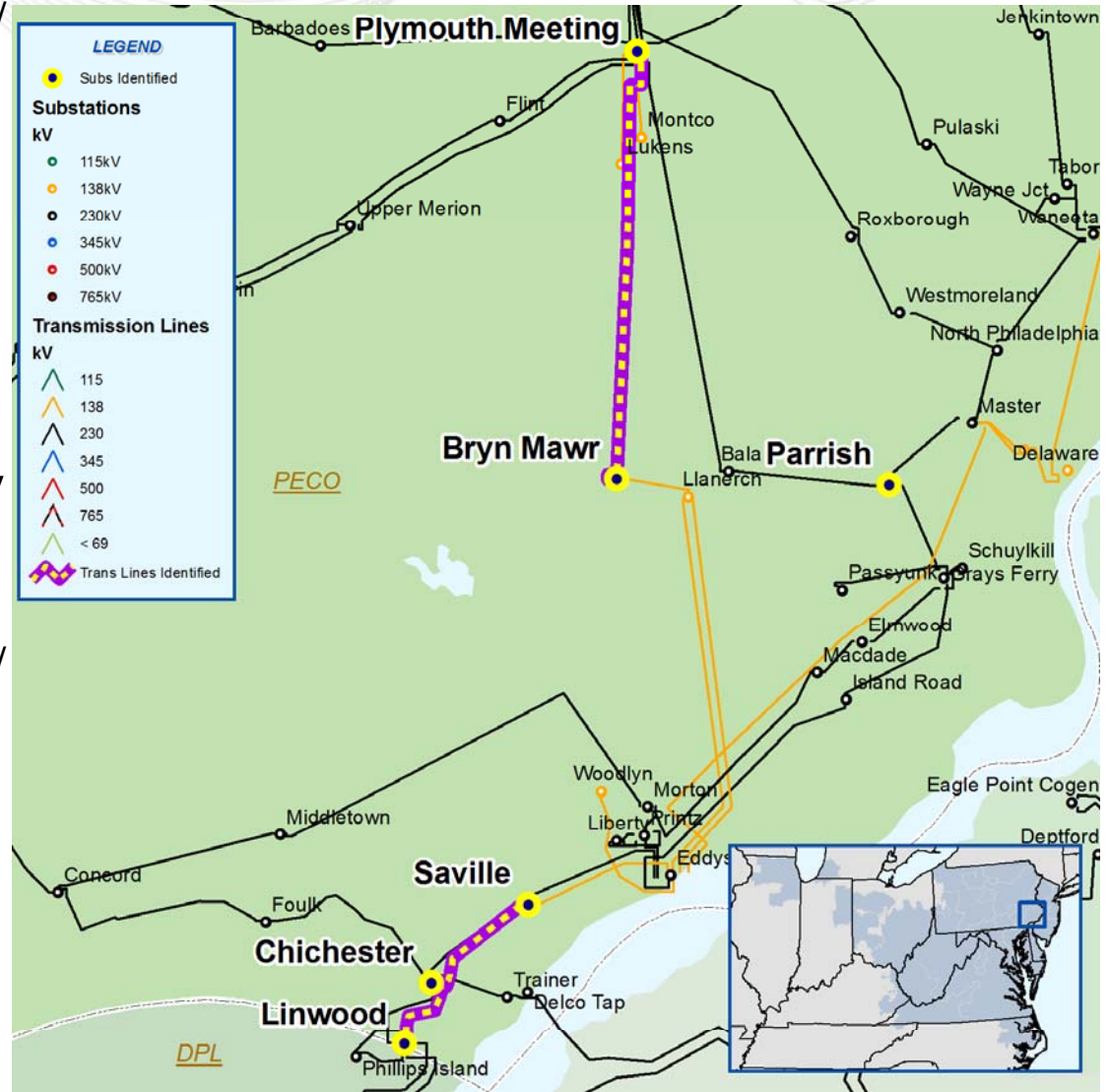
Common Mode Outage Violations

- Plymouth Meeting – Bryn Mawr
 138 kV line / line fault with stuck
 breaker contingency
 ('CHICH045') loss of Chichester
 – Foulk 230 kV line and Foulk
 230/13.8 kV transformer #2 as
 well as Chichester bus section 1
 due to the Chichester stuck
 breaker '045'
- Plymouth Meeting – Bryn Mawr
 138 kV line / line fault with stuck
 breaker contingency
 ('CHICH785') loss of the
 Chichester 230/138 kV
 transformer and Chichester
 138/69 kV transformer s #7 & 8



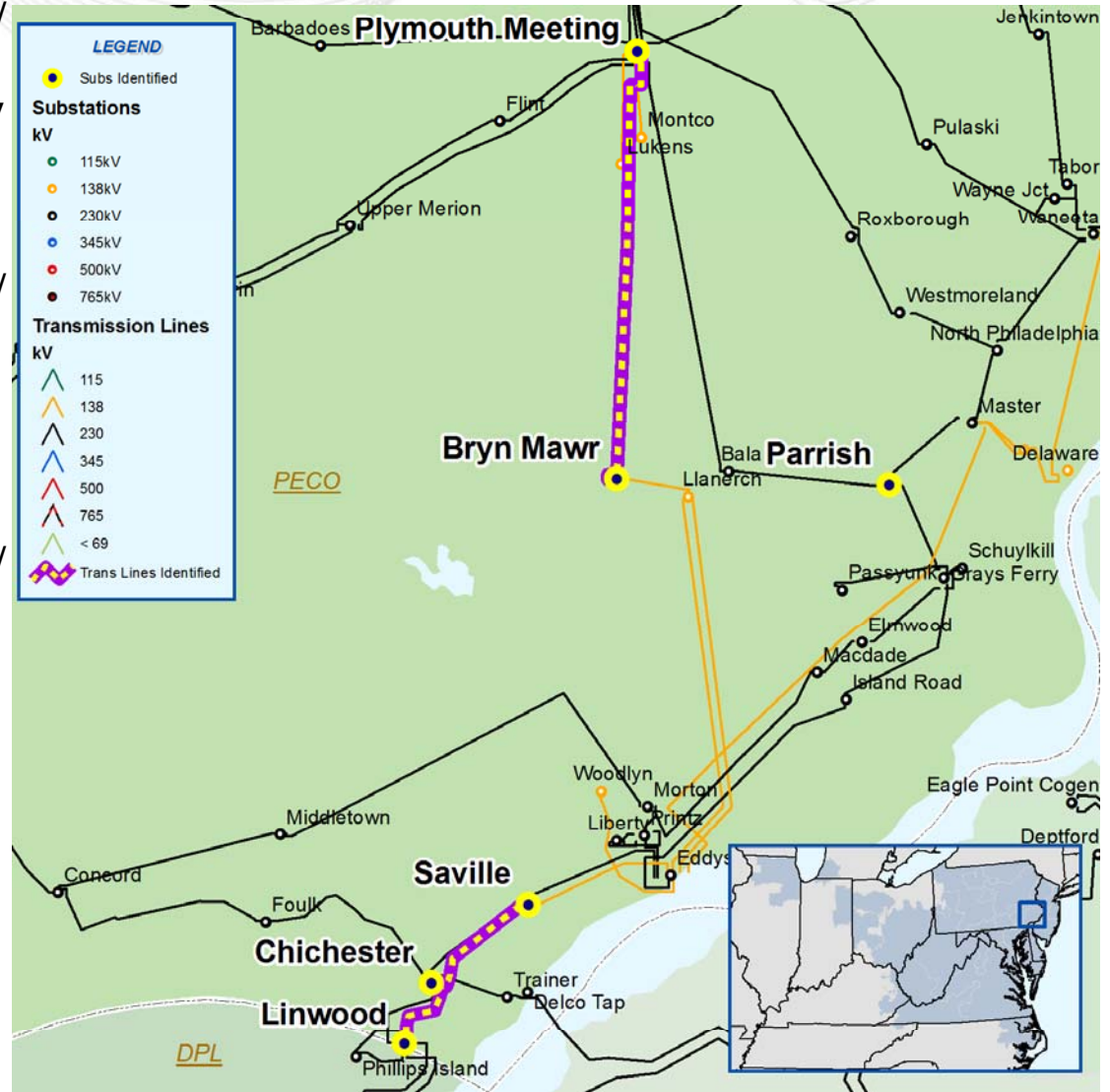
Common Mode Outage Violations

- Chichester – Saville 138 kV line / line fault with stuck breaker contingency ('GRAYS275') loss of Grays Ferry – Tunnel 230 kV line due to Grays Ferry stuck breaker '275'
- Chichester – Saville 138 kV line bus contingency ('PLYM138B') loss of Plymouth Meeting 138 kV bus
- Chichester – Saville 138 kV line / line fault with stuck breaker contingency ('GRAYS275') loss of Grays Ferry – Tunnel 230 kV line due to Grays Ferry stuck breaker '275'



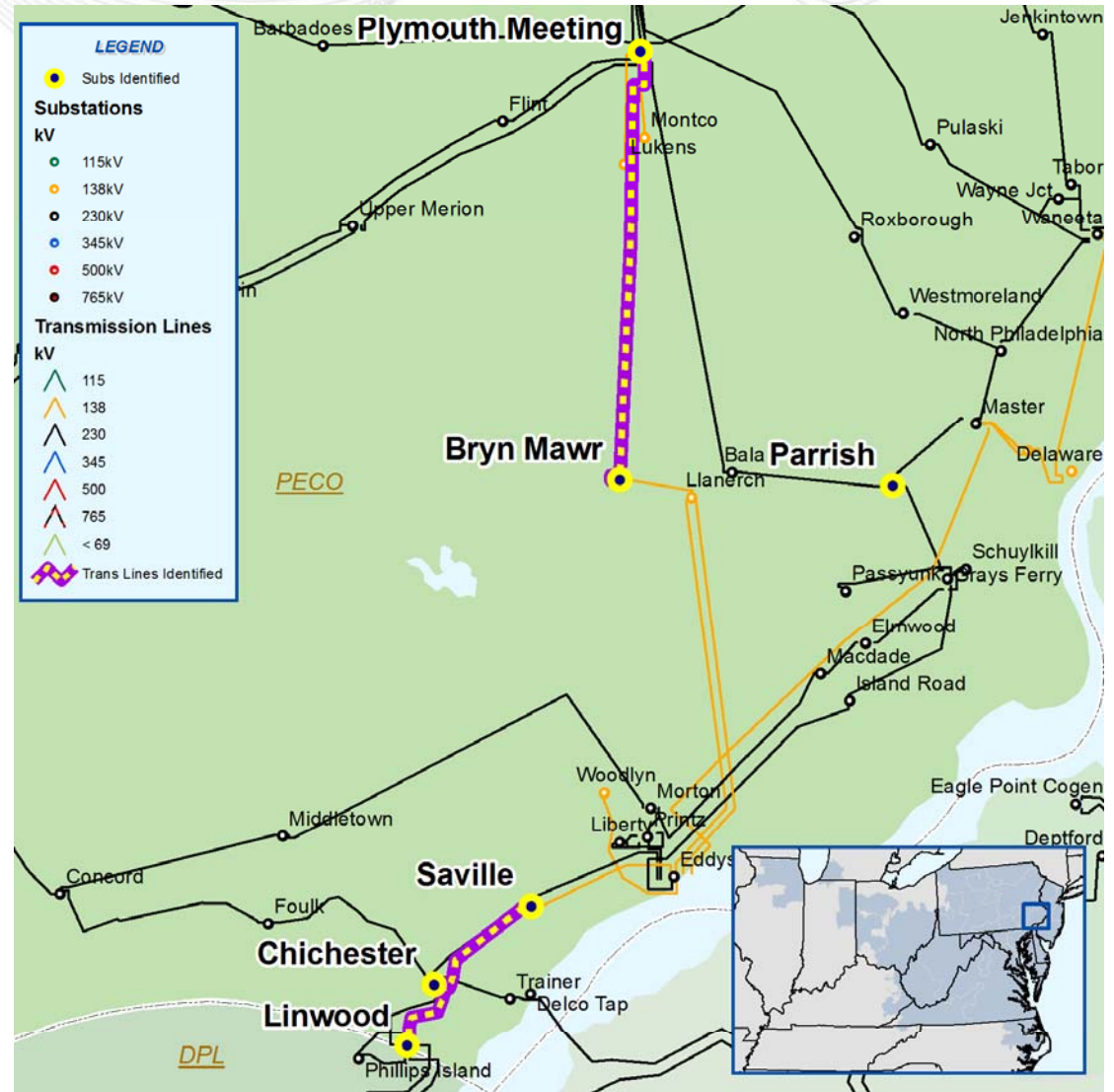
Generation Deliverability / Common Mode Outage Violations

- Chichester – Saville 138 kV line / bus contingency ('PLYM138B') loss of Plymouth Meeting 138 kV bus
- Chichester – Saville 138 kV line / single contingency ('220-27B') loss of Gays Ferry – Tunnel 230 kV line
- Chichester – Saville 138 kV line / Basecase



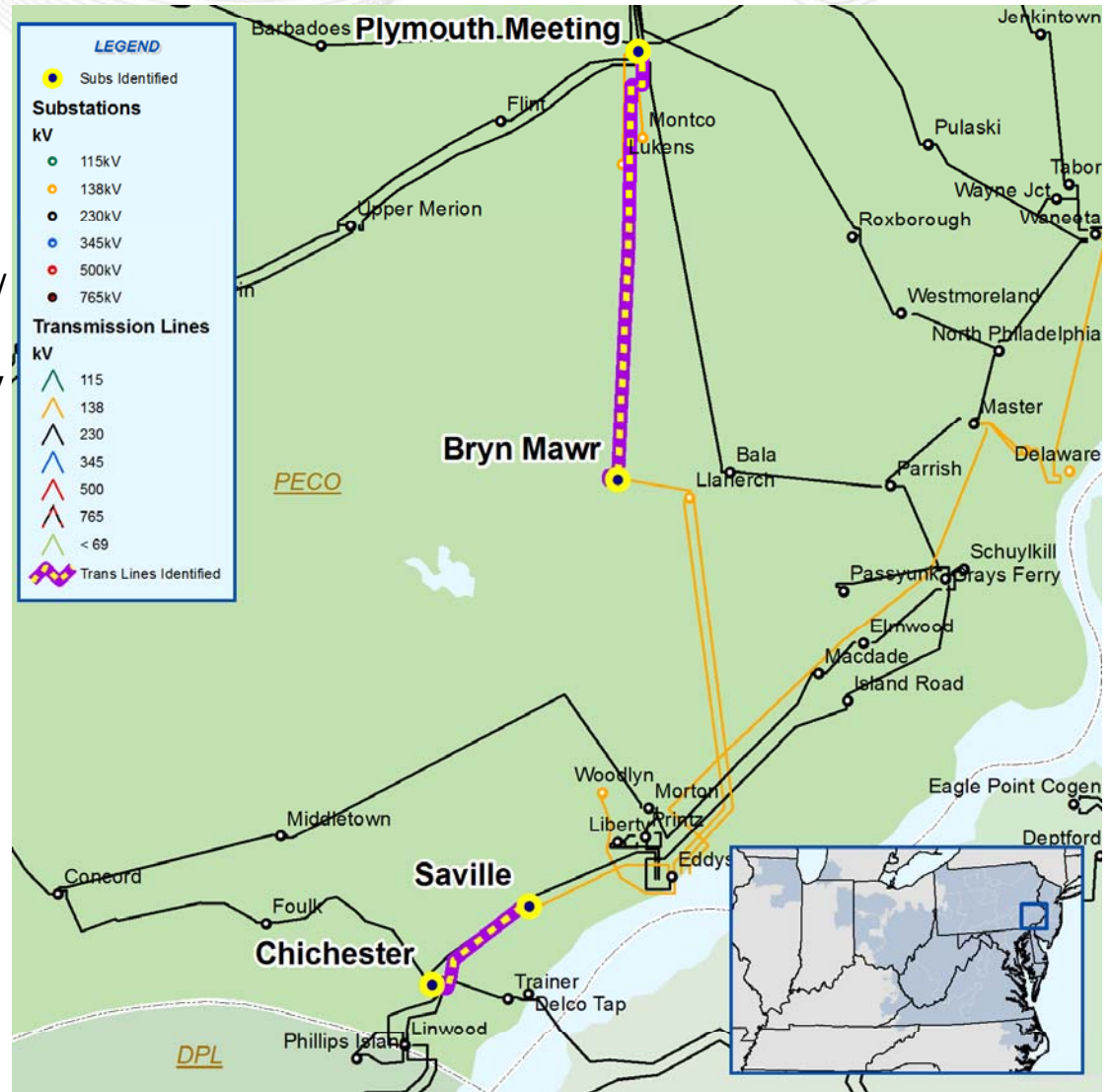
Generation Deliverability Violations

- Tunnel – Parrish 230 kV line /single contingency ('PJM89_A') loss of New Freedom – East Windsor 500 kV
- Tunnel – Parrish 230 kV line/ Basecase

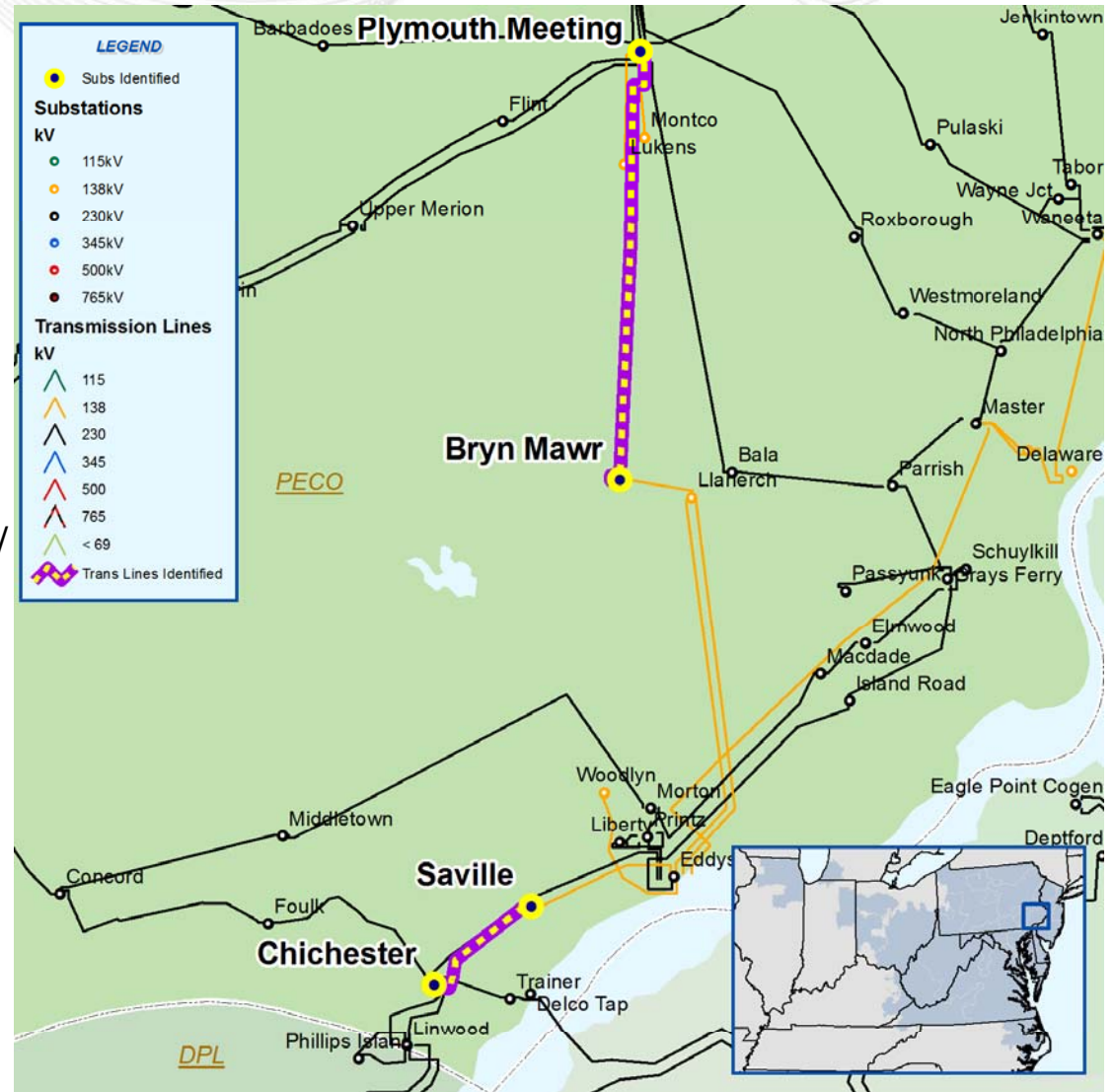


Baseline Thermal Study Violations

- Plymouth Meeting – Bryn Mawr 138 kV line / bus contingency ('CHI230B1') loss of Chichester bus section 1
- Chichester – Saville 138 kV line / bus contingency ('PLYM138B') loss of Plymouth Meeting 138 kV bus

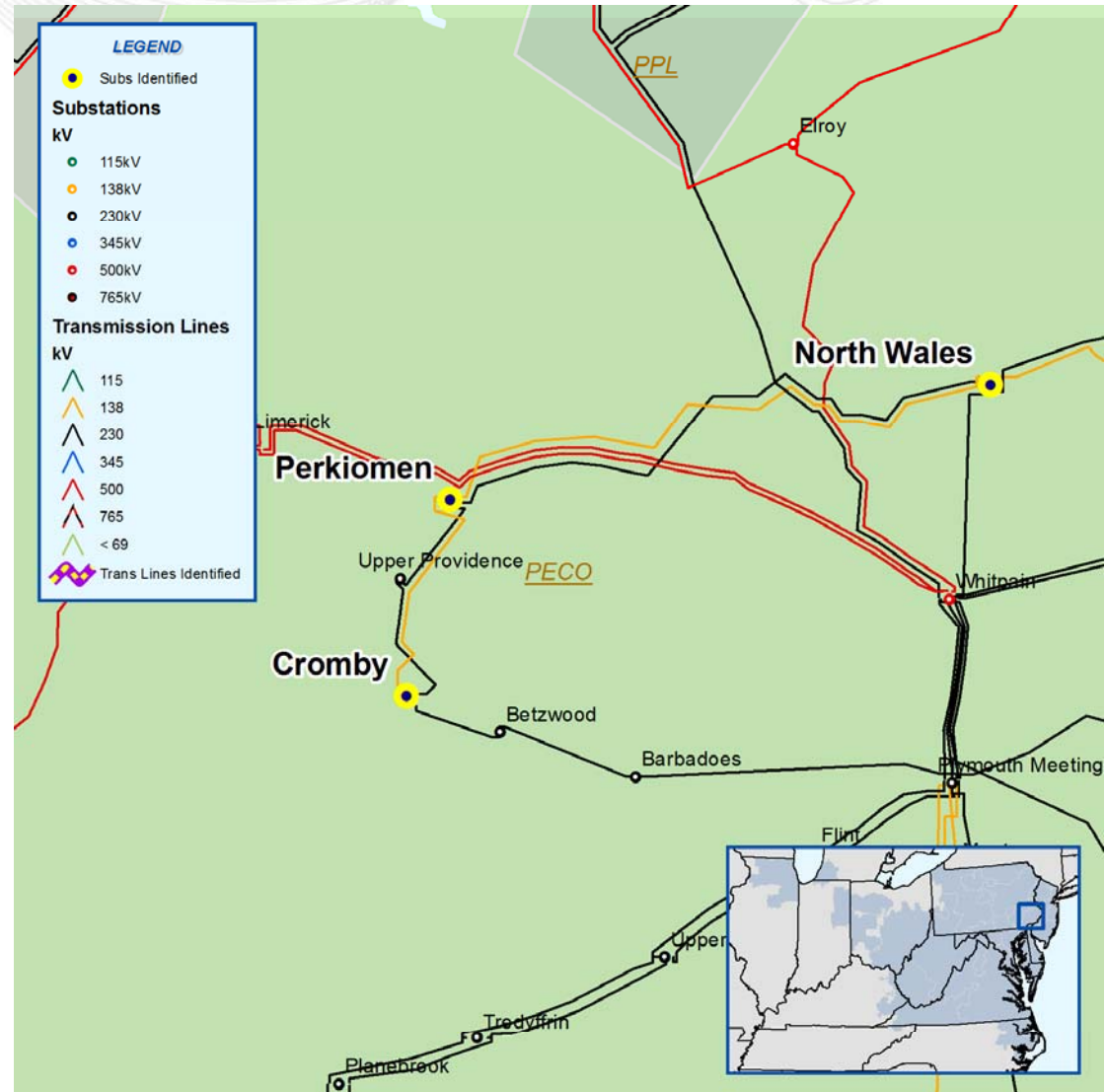


- Plymouth Meeting – Bryn Mawr 138 kV line / line fault with stuck breaker contingency ('CHICH045') loss of Chichester – Foulk 230 kV line and Foulk 230/13.8 kV transformer #2 as well as Chichester bus section 1 due to the Chichester stuck breaker '045'
- Chichester – Saville 138 kV line / line fault with stuck breaker contingency ('GRAYS275') loss of Grays Ferry – Tunnel 230 kV line due to Grays Ferry stuck breaker '275'



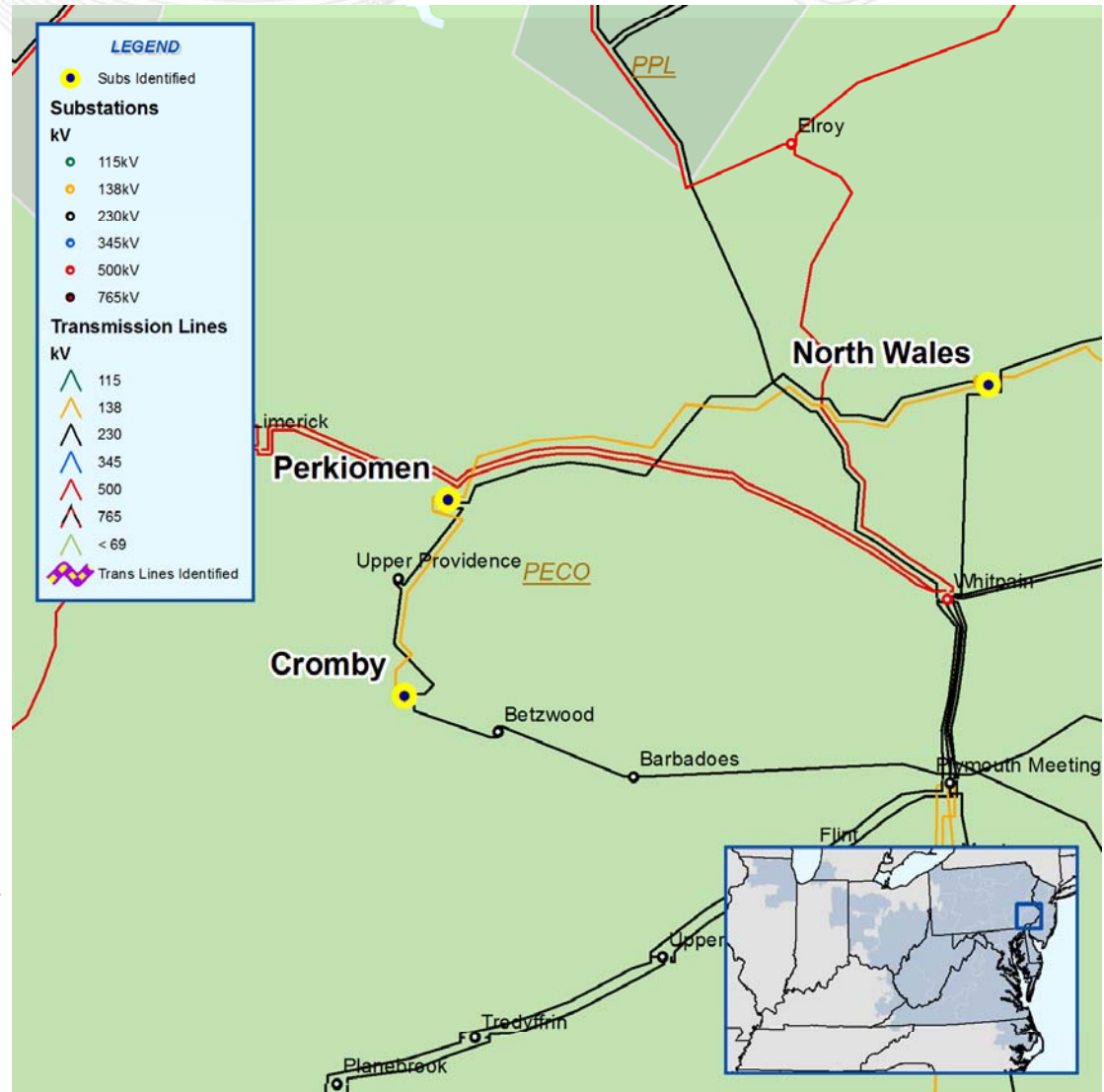
Baseline Voltage Study Violations

- Cromby 138 kV station low voltage violation / bus contingency ('HEAT138B') loss of Heaton 138 kV station bus section 2
- North Wales 138 kV station low voltage violation / bus contingency ('HEAT138B') loss of Heaton 138 kV station bus section 2
- Perkiomen 138 kV station low voltage violation / bus contingency ('HEAT138B') loss of Heaton 138 kV station bus section 2
- Cromby 138 kV station voltage drop violation / bus contingency ('HEAT138B') loss of Heaton 138 kV station bus section 2



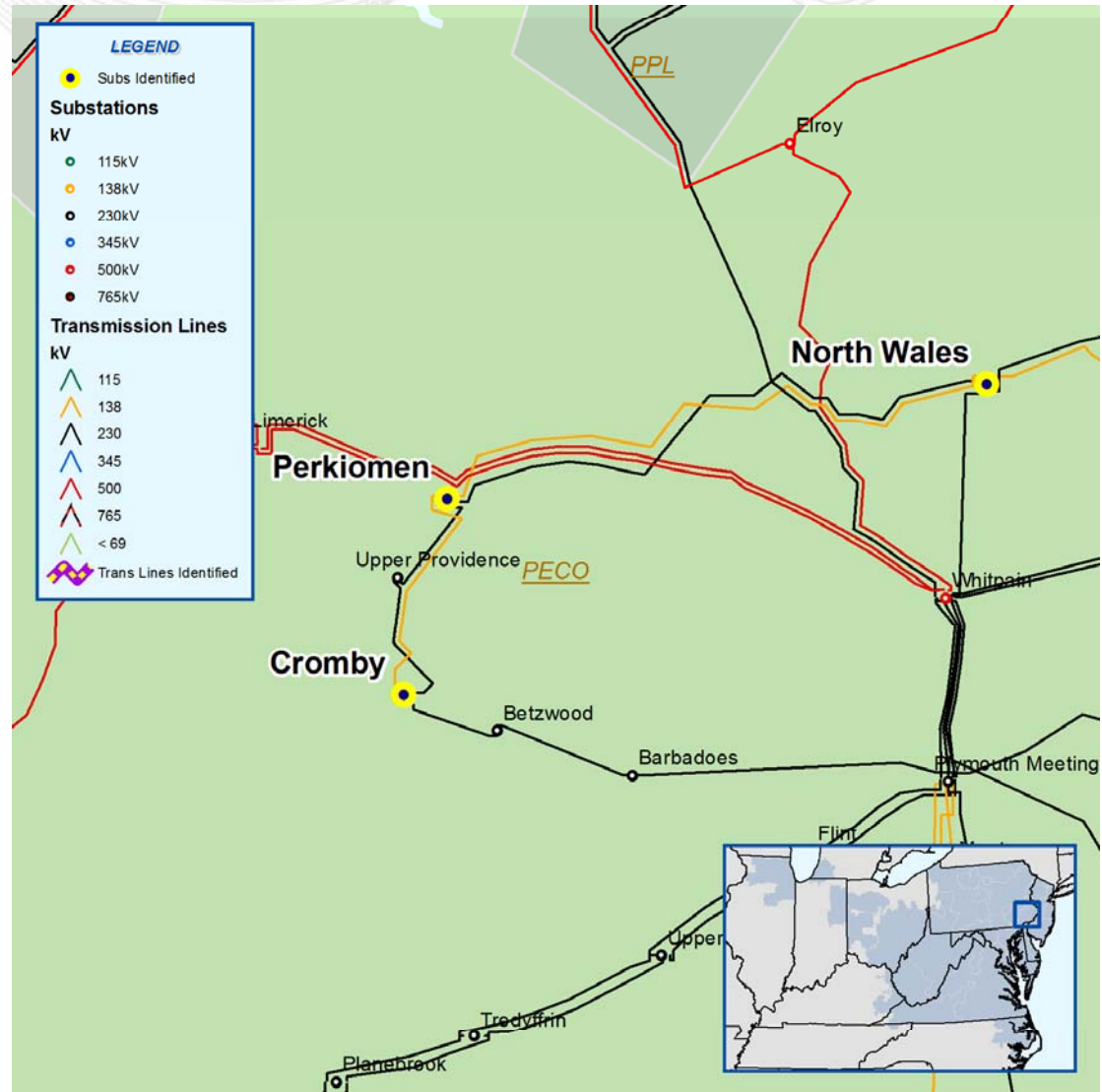
Baseline Voltage Study Violations

- North Wales 138 kV station voltage drop violation / bus contingency ('HEAT138B') loss of Heaton 138 kV station bus section 2
- Perkiomen 138 kV station voltage drop violation / bus contingency ('HEAT138B') loss of Heaton 138 kV station bus section 2
- Cromby 138 kV station low voltage violation / line fault with stuck breaker contingency ('HEAT0805') loss of Heaton – Woodbourne 230 kV line with stuck breaker 805
- North Wales 138 kV station low voltage violation / line fault with stuck breaker contingency ('HEAT0805') loss of Heaton – Woodbourne 230 kV line with stuck breaker 805



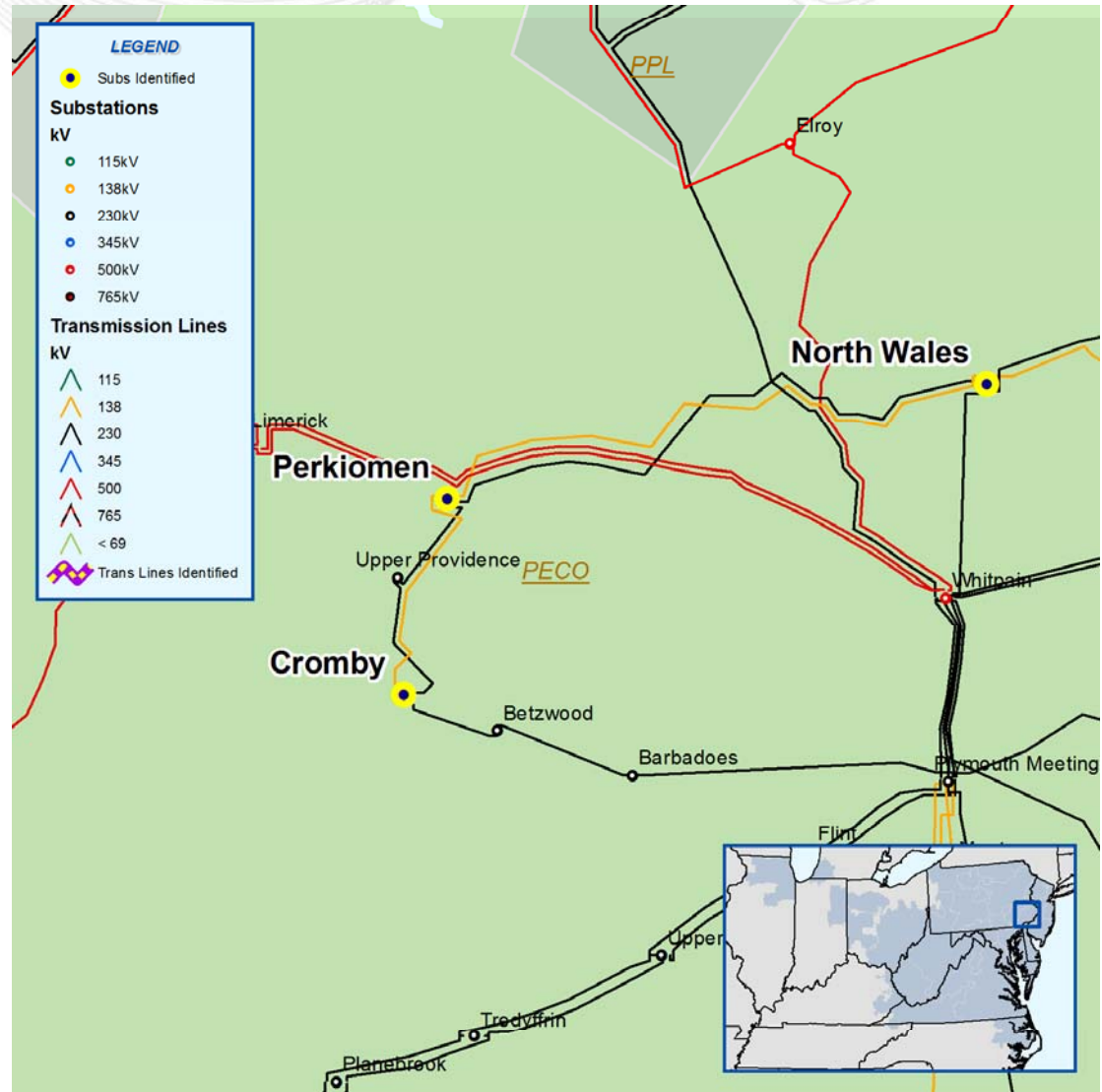
Baseline Voltage Study Violations

- Perkiomen 138 kV station low voltage violation / line fault with stuck breaker contingency ('HEAT0805') loss of Heaton – Woodbourne 230 kV line with stuck breaker 805
- Cromby 138 kV station voltage drop violation / line fault with stuck breaker contingency ('HEAT0995') loss of Heaton – Woodbourne 230 kV line with stuck breaker 995



Baseline Voltage Study Violations

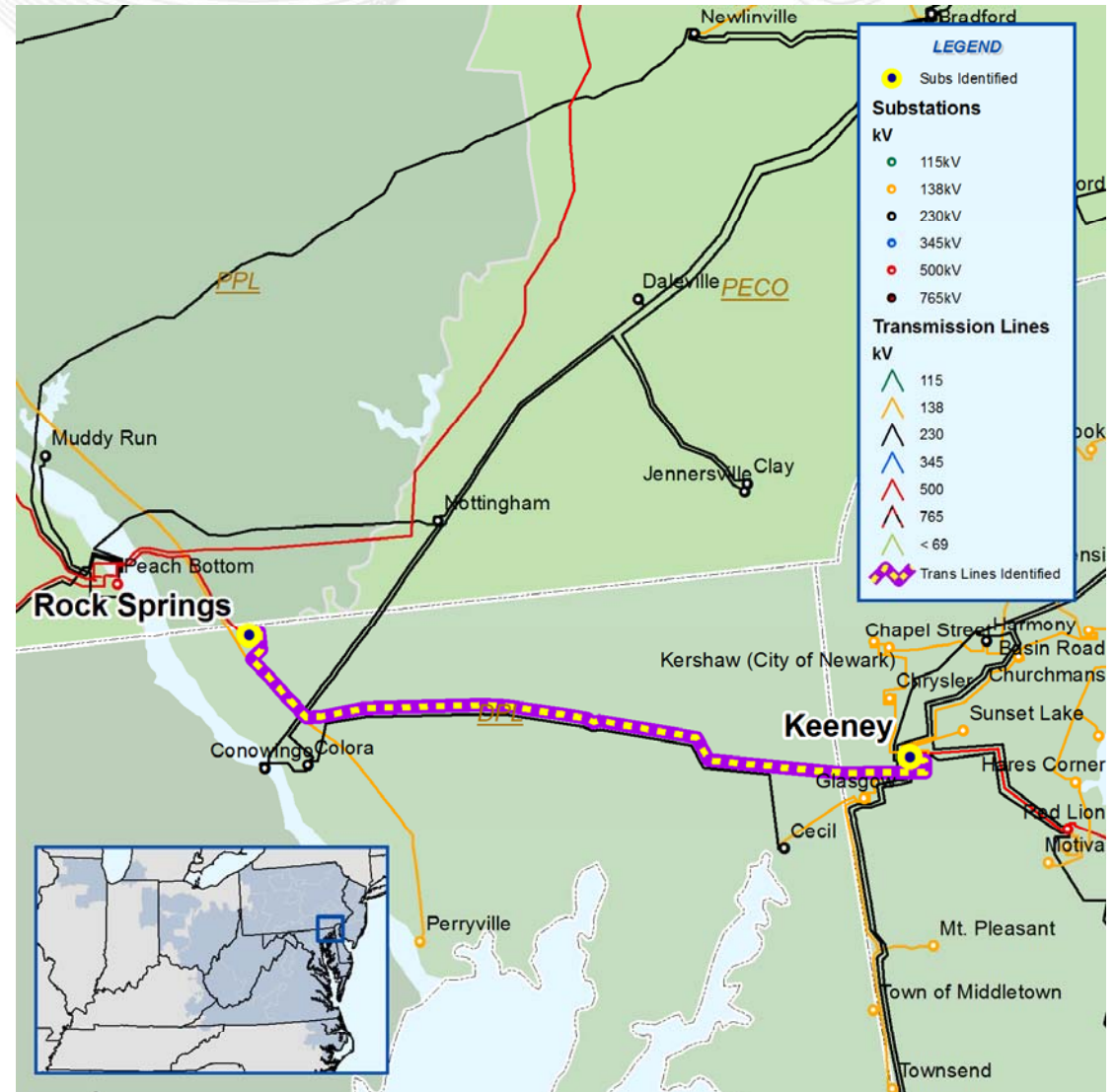
- North Wales 138 kV station voltage drop violation / line fault with stuck breaker contingency ('HEAT0995') loss of Heaton – Woodbourne 230 kV line with stuck breaker 995
- Perkiomen 138 kV station voltage drop violation / line fault with stuck breaker contingency ('HEAT0995') loss of Heaton – Woodbourne 230 kV line with stuck breaker 995





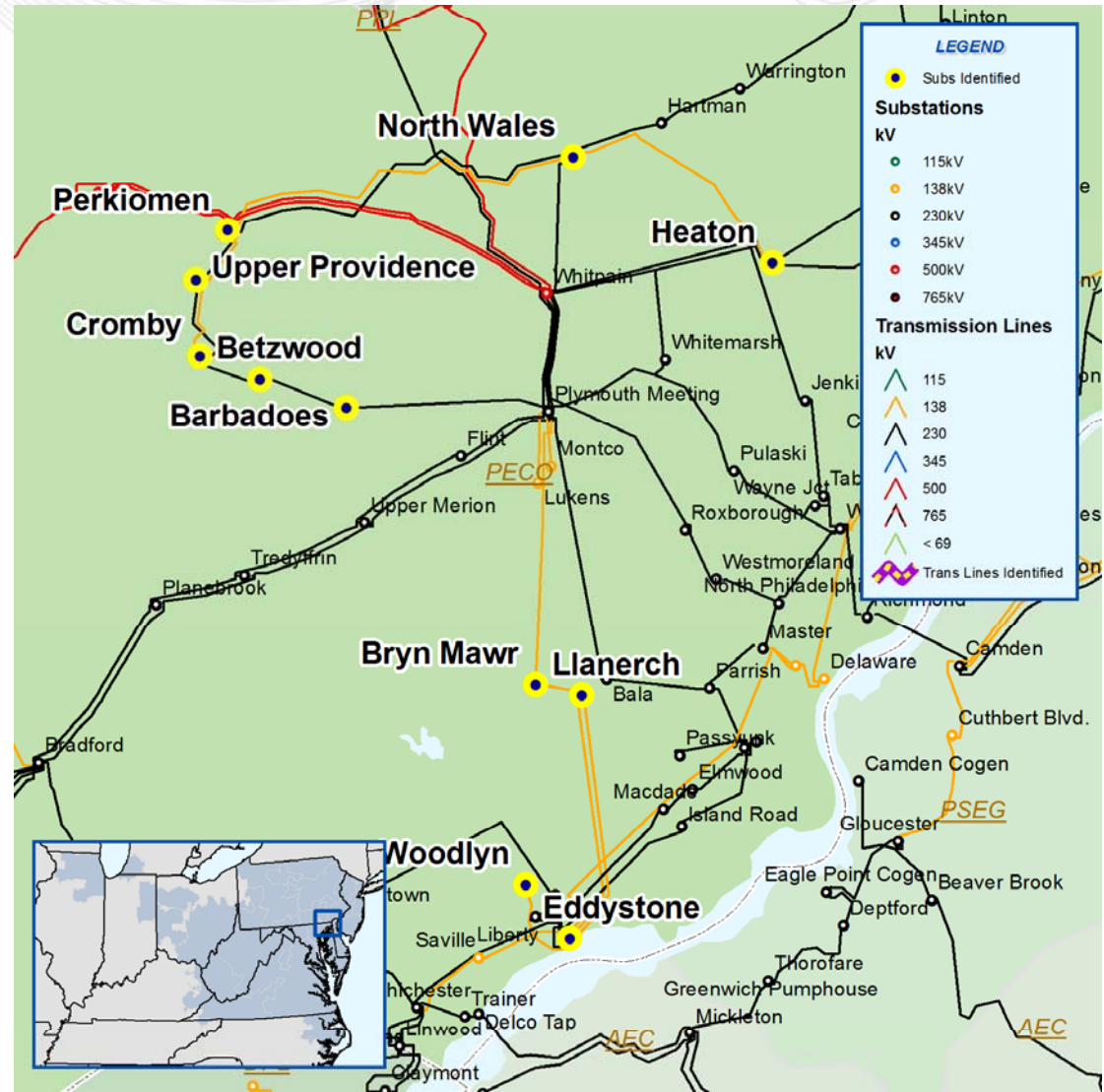
CETO Voltage Study Violations

- Mid-Atlantic load deliverability
- Voltage violation for the loss of Rock Springs – Keeny 500 kV



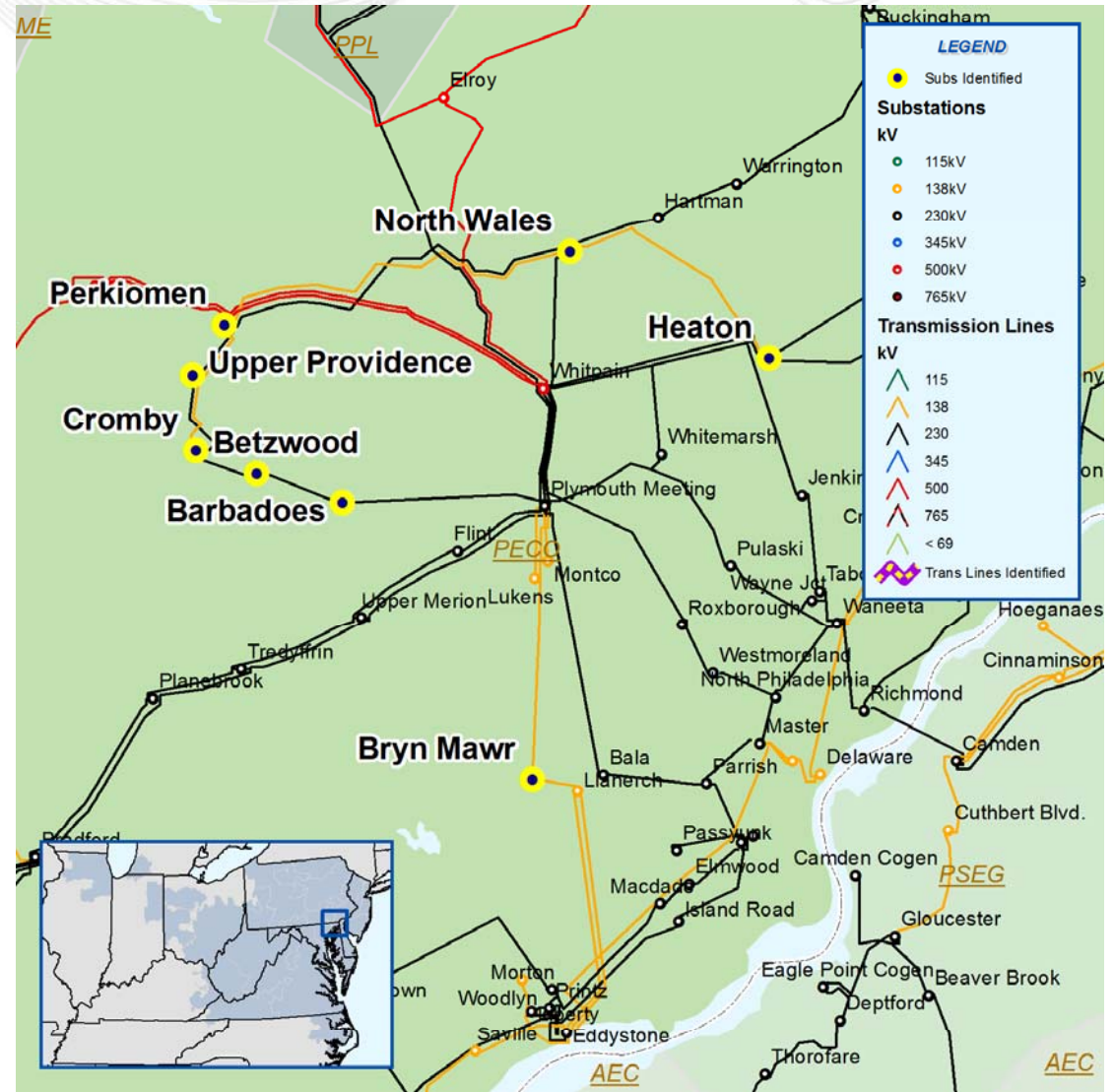
N-1-1 Voltage Study Violations - Low Voltage Violations

- Numerous low voltage violations at the stations hi-lighted on the map for various contingencies



N-1-1 Voltage Study Violations - Voltage Drop Violations

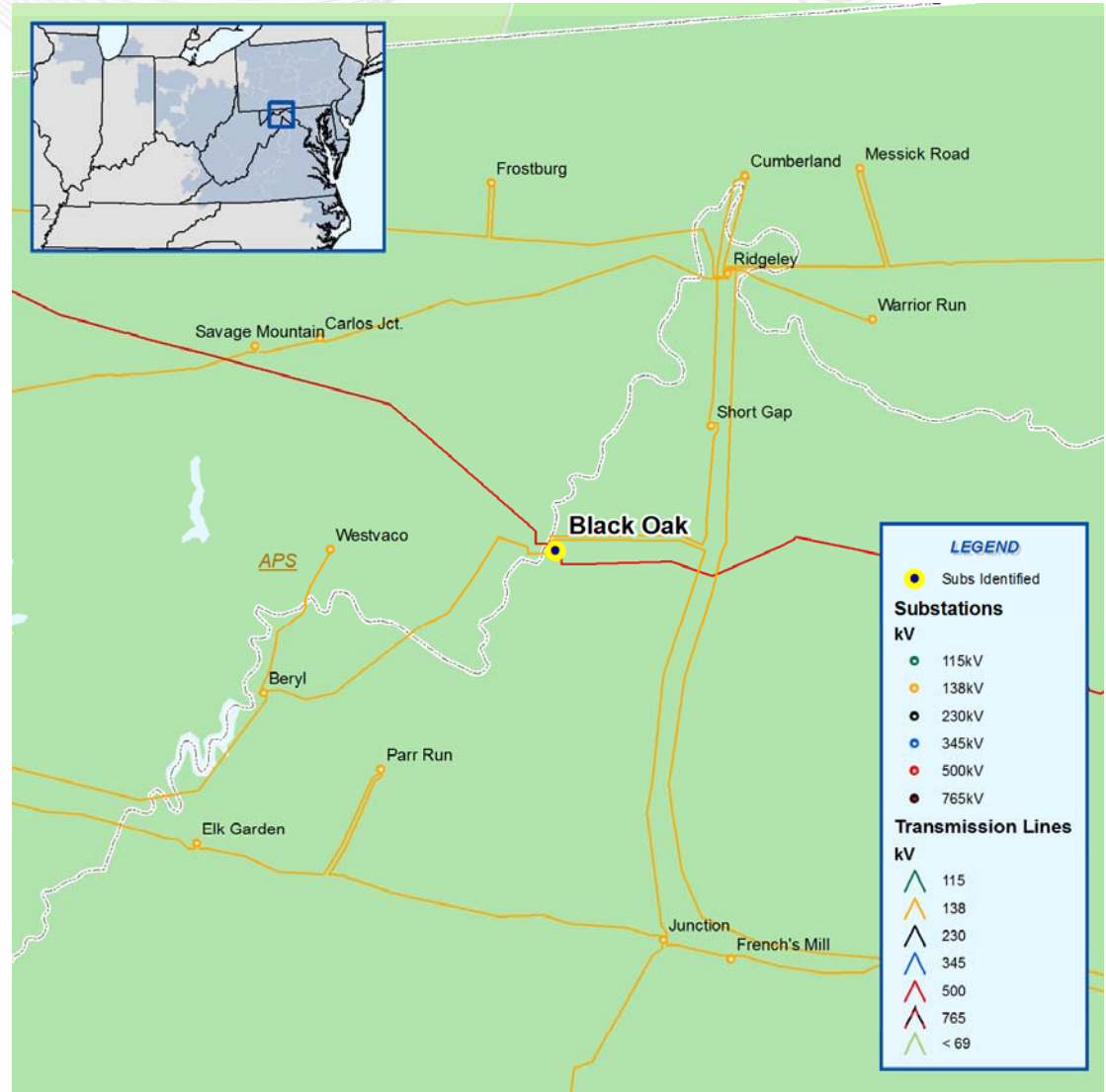
- Numerous voltage drop violations at the stations highlighted on the map for various contingencies





Baseline Reliability Update

- Overload on Black Oak 500/138kV transformer for the loss of Hatfield – Black Oak 500 kV in Generation Deliverability test
- Install a second Black Oak 500/138kV transformer and associated substation equipment (B1171.1)
- Cost :\$ 15 M
- Required IS Date : 06/01/2013



- Installation of the 2nd Black Oak 500/138kV transformer increases the thermal loading on Albright to Black Oak 138 kV. The circuit is overloaded for the loss of Hatfield – Black Oak 500 kV
- Rebuild the 138kV line between Albright and Black Oak (41.32 miles) with 954 ACSR (B1171.2)
- Cost :\$ 50 M
- Required IS Date : 06/01/2013



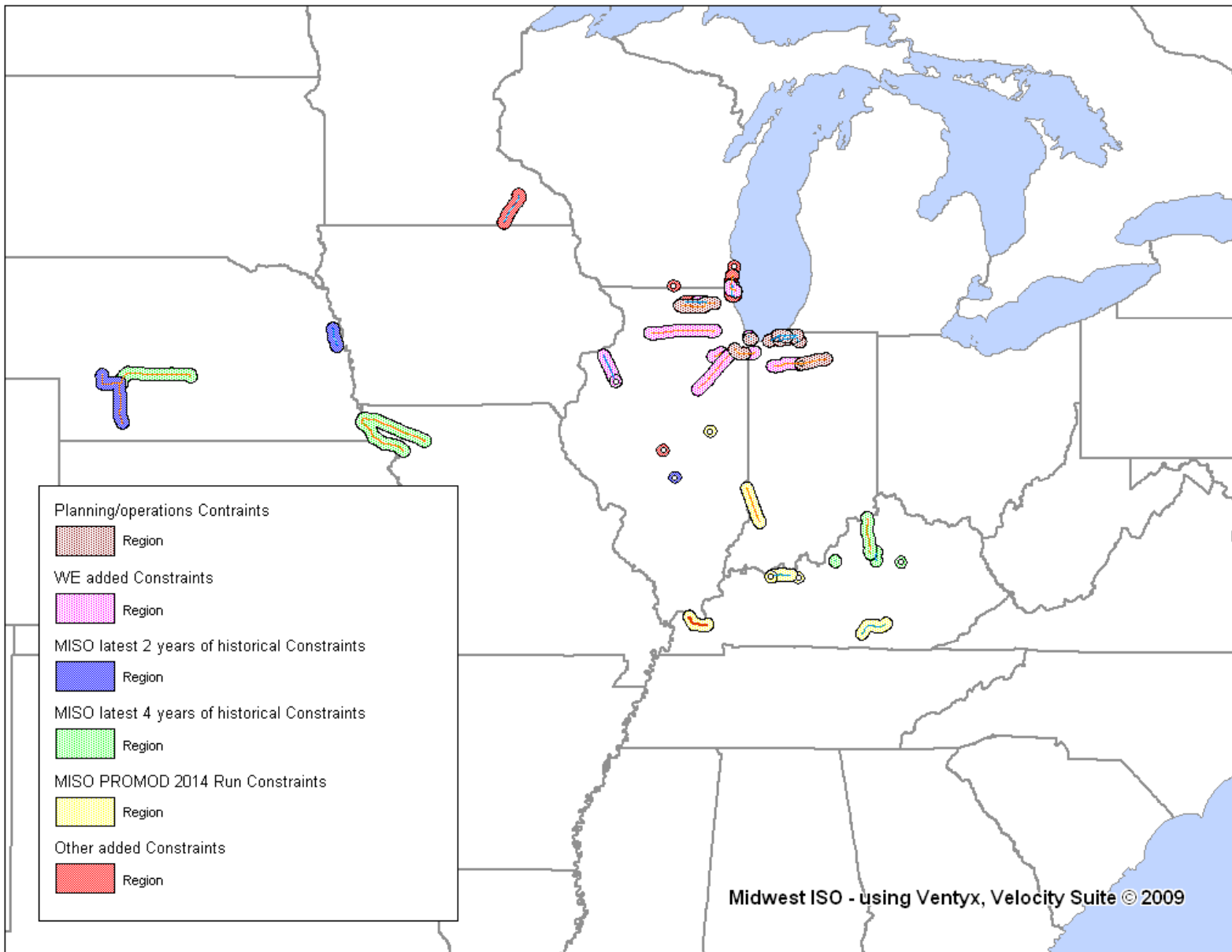


IPSAC Update
MISO / PJM
Cross Border Congested Flowgate Study

- Address Cross Border non-reliability planning issues per JOAs and Order 890 provisions
- Identify potential projects that are eligible for tariff-based Cross Border Market Efficiency Project (CBMEP) treatment
- Identify potential projects that may be eligible for Midwest ISO or PJM internal tariff treatment as economic projects
- Identify other potential solutions and their values that may be participant funded
- Coordinate with existing internal RTO initiatives and studies, such as the Midwest ISO Regional Generation Outlet Study, to leverage potential solutions.

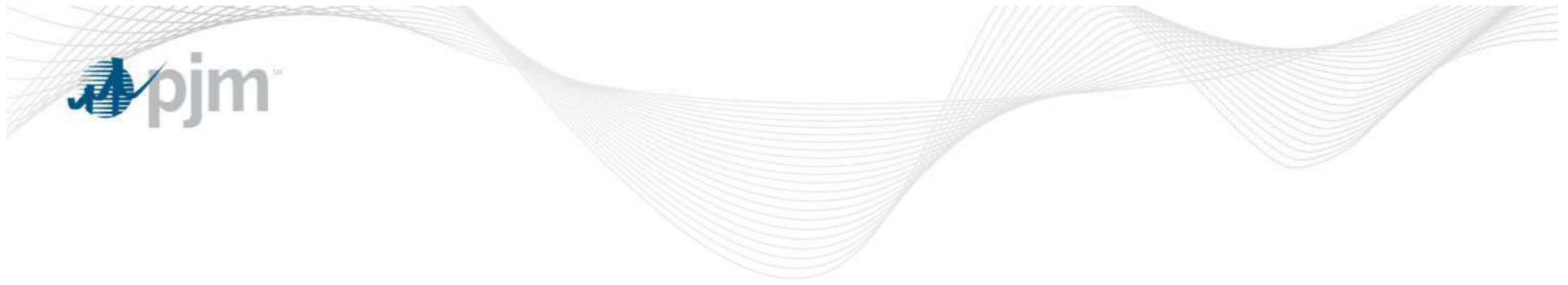
- The sources of the candidate list of flowgates are:
 - PJM review of Market-To-Market flowgates with the highest and persistent market impacts.
 - MISO RT market Top 44 congested flowgates based on the total binding hours from April 2005 to April 2009
 - MISO RT market Top 25 congested flowgates based on the total binding hours or total shadow prices from April 2007 to April 2009
 - Top 50 congested flowgates based on the total binding hours or total shadow prices from MISO 2014 PROMOD case
 - “Lake Michigan area” flowgates proposed by We Energies, Edison Mission Energy and Exelon PowerTeam.

- Potential transmission upgrades to resolve priority FG will be jointly identified.
- Solution development will consider plans from ongoing planning processes (e.g RGOS) as potential solutions.
- Potential plans will be tested for CBMEP eligibility
- Study results and modeling data will be made available to combined stakeholders subject to applicable confidentiality and CEII provisions



Midwest ISO - using Ventyx, Velocity Suite © 2009

Number	Task	Targeted Deadlines	Lead
1	Form the study team and identify planning contacts from each RTO	January 22nd	<u>Chuck L. Jay C, David T. Digaunto C, Ming N</u>
2	Collect binding constraints and prioritize the binding constraints for this study	January 22nd	RTOs
3	Finalize the study scope and form the Technical Review Group (TRG)	January 26th	TRG
4	2010 PROMOD case benchmark	February 15th	RTOs
5	Build the 2015 power flow case and PROMOD case	February 15th	RTOs
6	Initial PROMOD runs and PROMOD case adjustment to make the case fit for this study	March 15th	MISO
7	Pick the binding constraints to be studied	March 31st	TRG
7a	Calculate GLDFs of each proposed FG	March 31st	RTOs
8	PROMOD runs to determine the potential economic benefit by removing each studied constraints	April 16th	MISO
9	Design and refine the transmission upgrade options to relieve the binding constraints. PROMOD runs to determine the economic benefits	May 31st	TRG
10	Reliability analysis	June 18th	RTOs
11	Determine the set of transmission upgrade options for next step test	July 9th	TRG
12	Test the transmission upgrade options in ARR feasibilities (LTTR/LTFTR) studies and deliverability studies	July 9th	RTOs
13	Propose final set of transmission upgrade options and determine cost sharing methodology	July 31 st , 2010	RTOs



2010 RTEP Next Steps

- Finalize 2015 base case
- Continue to refine sensitivity studies
- Subregional RTEP Meetings

Comments or Questions?