# 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

- 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

# Proposed Generation Retirement

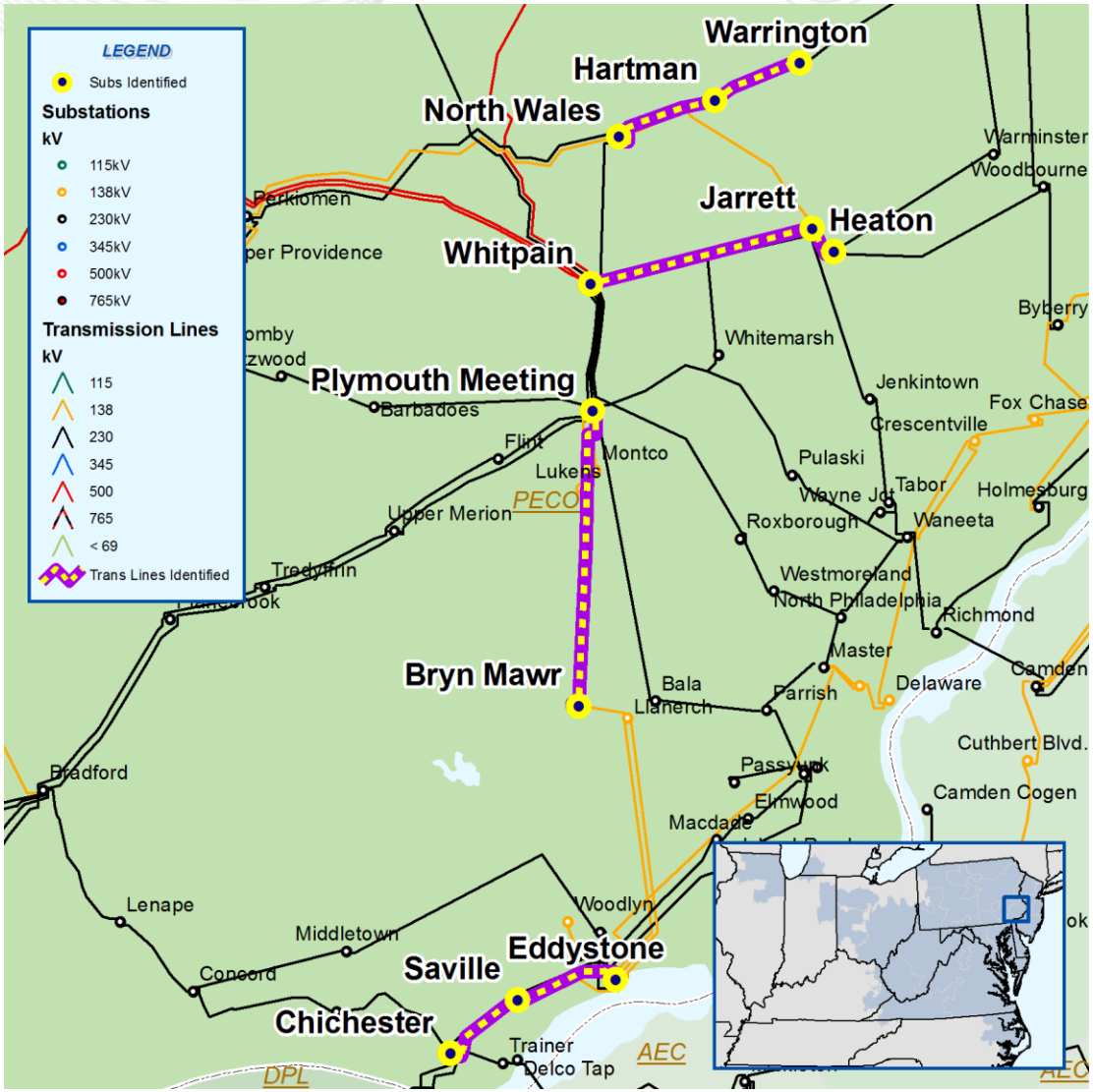
- In December 2009 Exelon notified PJM of their intent to retire the Eddystone 1&2 units and the Cromby 1&2 units in the PECO Energy Transmission zone
- Proposed deactivation date is May 31, 2011
- PJM staff has been evaluating the impact of the proposed deactivation
- The following slides detail the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

# N-1-1 Thermal Violations

- 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)

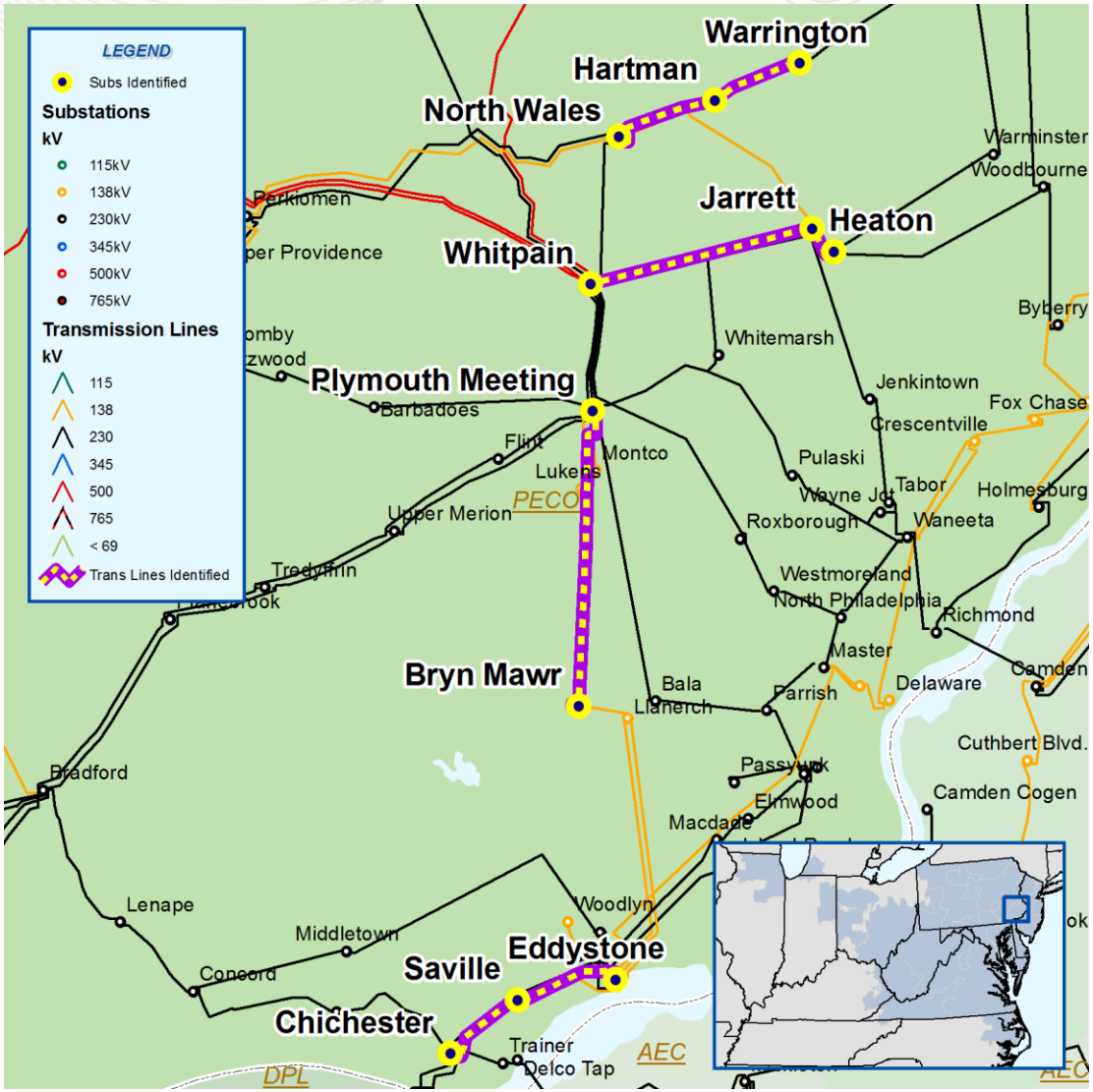
- Chichester 230/138 kV transformer / loss of Macdade – Ridley – Morton 230 kV line (220-46) + loss of Island Road – Eddystone 230 kV line (220-23)

- 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)



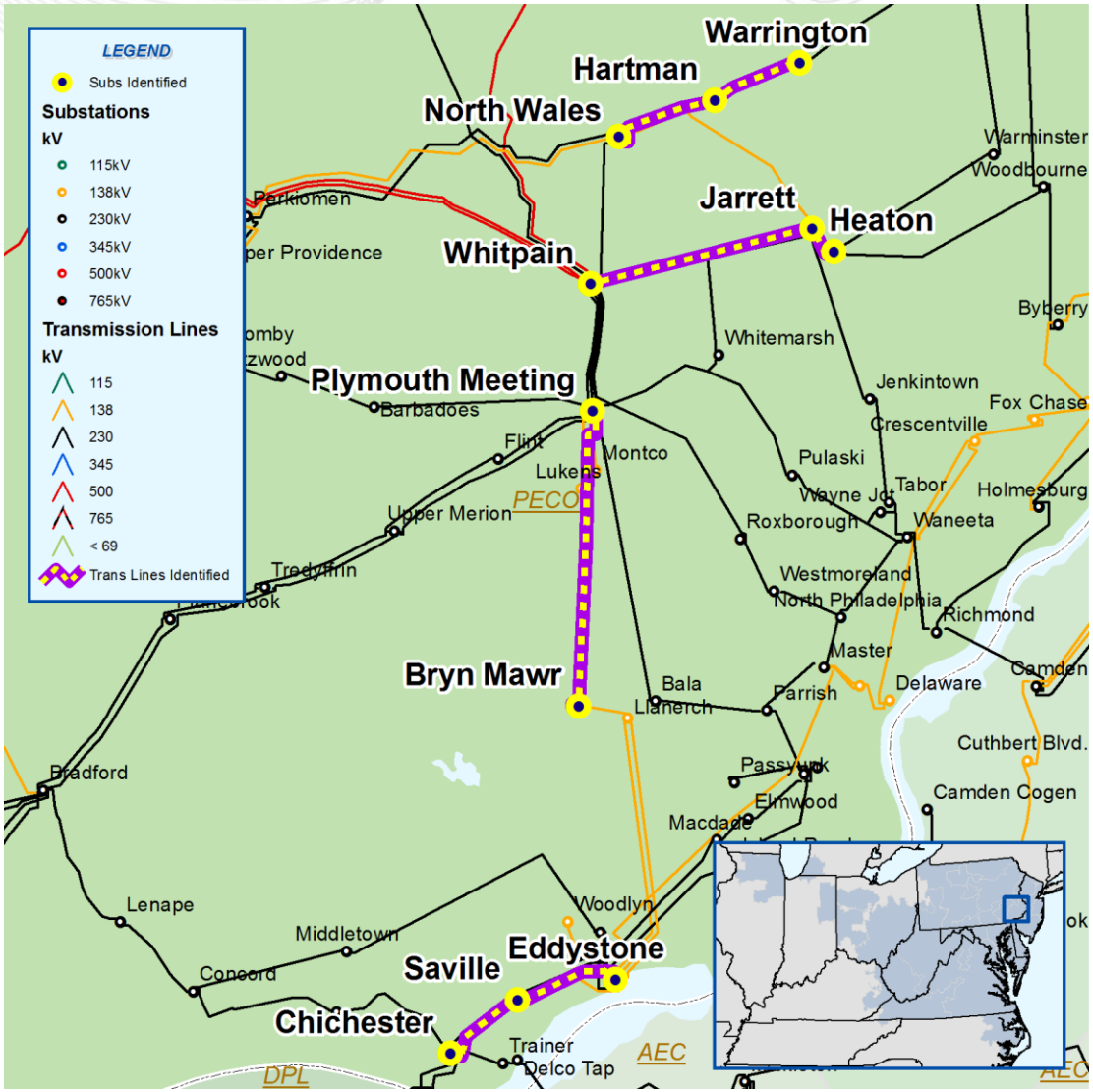
# N-1-1 Thermal Violations

- 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



# N-1-1 Thermal Violations

- 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)

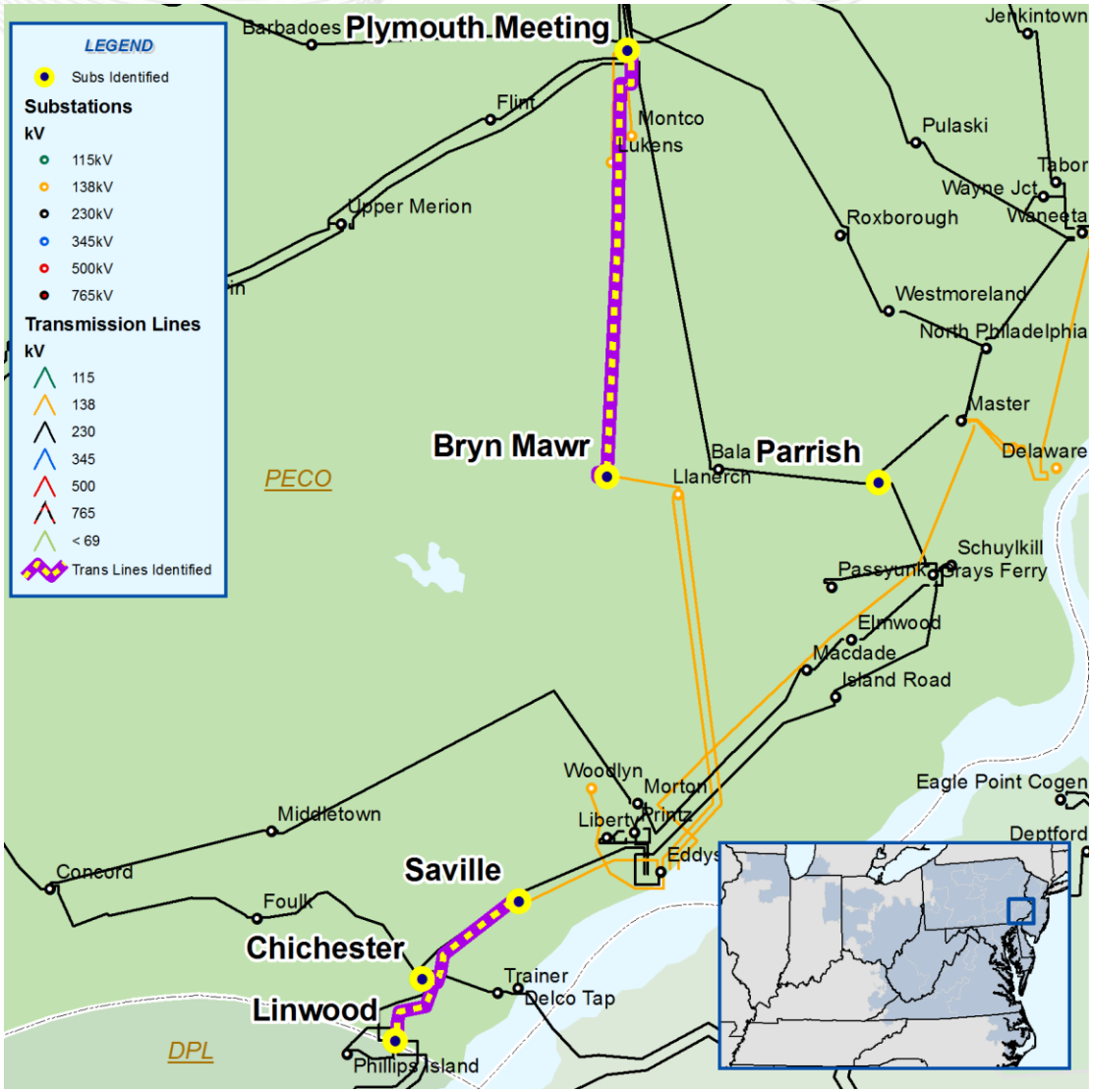


# Generation Deliverability / Common Mode Outage Violations

- Linwood – Chichester '220-39' 230 kV line / single contingency ('220-43') loss of Linwood – Chichester '220-43' 230 kV line and Philips 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 Philips island generating units CT2, CT3, and ST

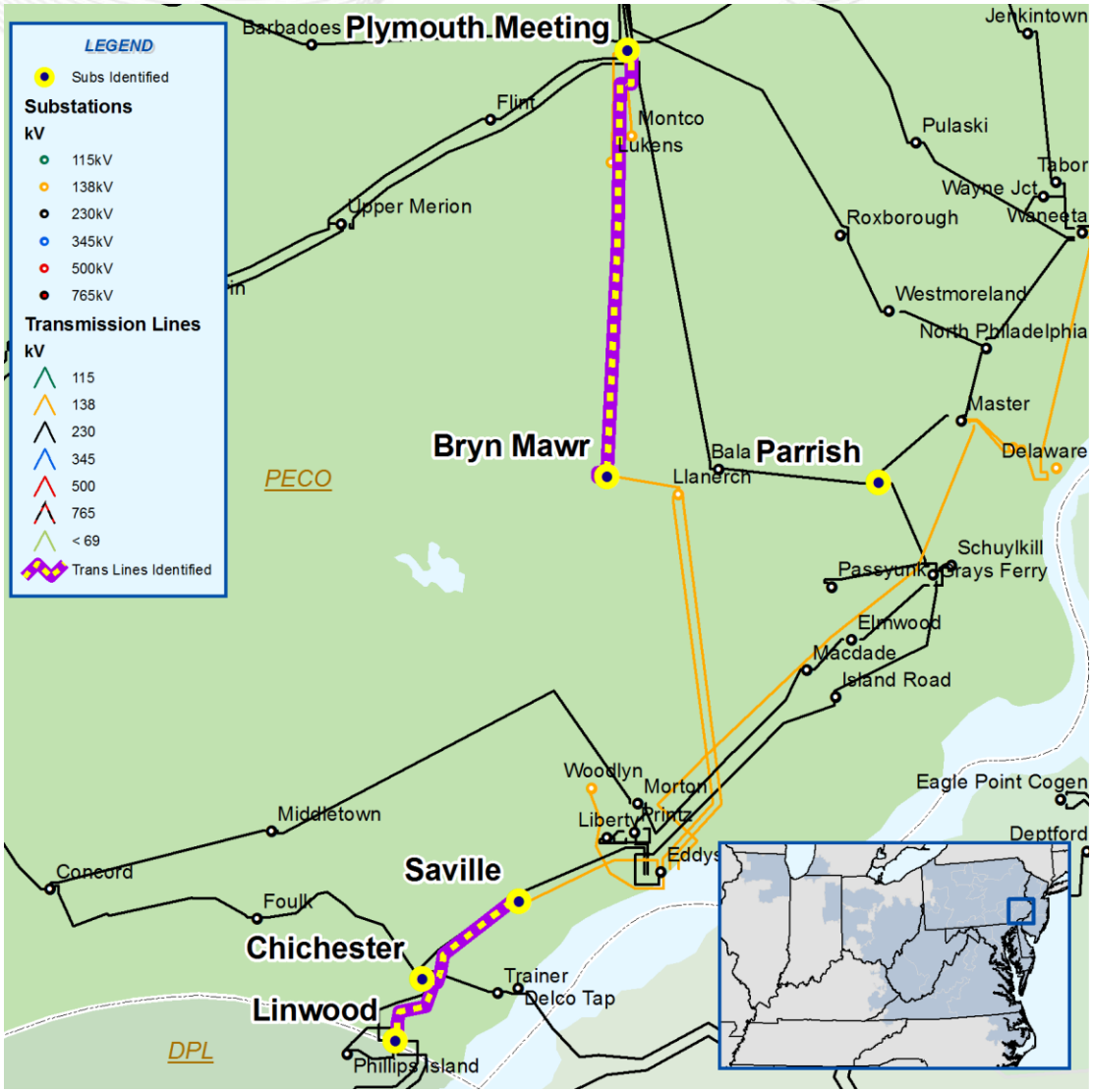
- Plymouth Meeting – Bryn Mawr 138 kV line / bus contingency ('CHI230B1') loss of Chichester bus section 1



# 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

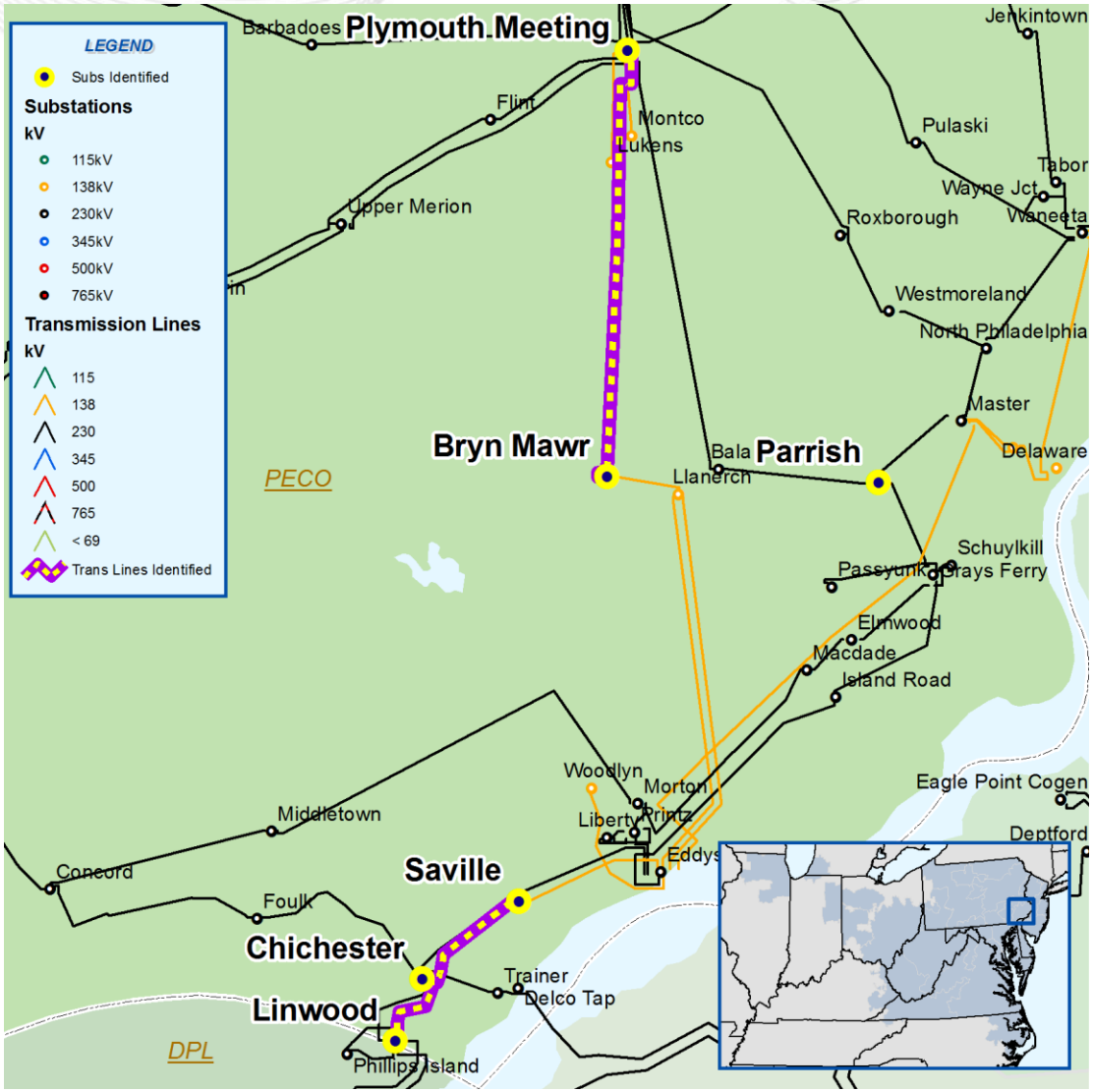


# Common Mode Outage Violations

- 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’

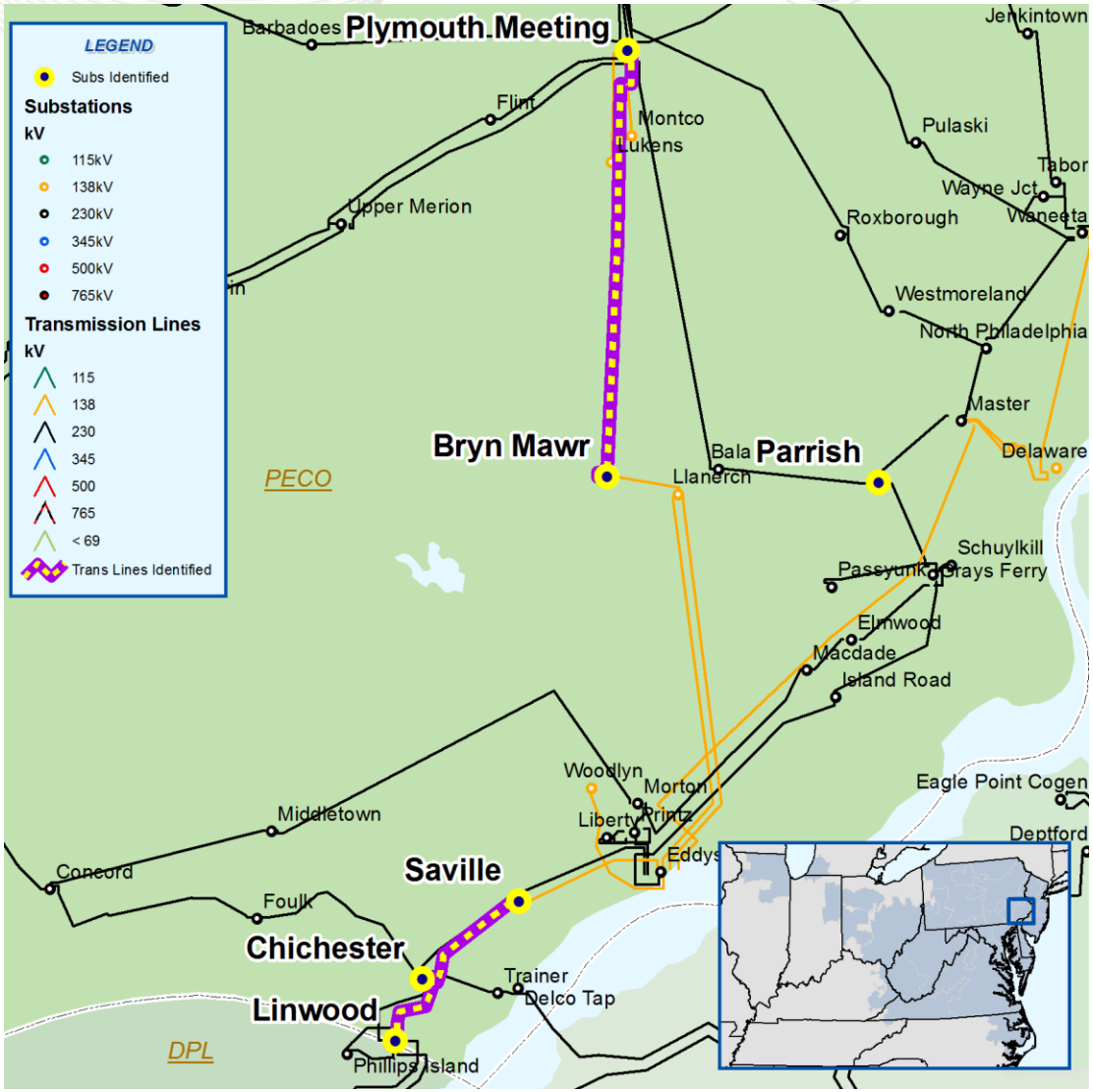
- Chichester – Saville 138 kV line bus contingency ('PLYM138B') loss of Plymouth Meeting 138 kV bus

- 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

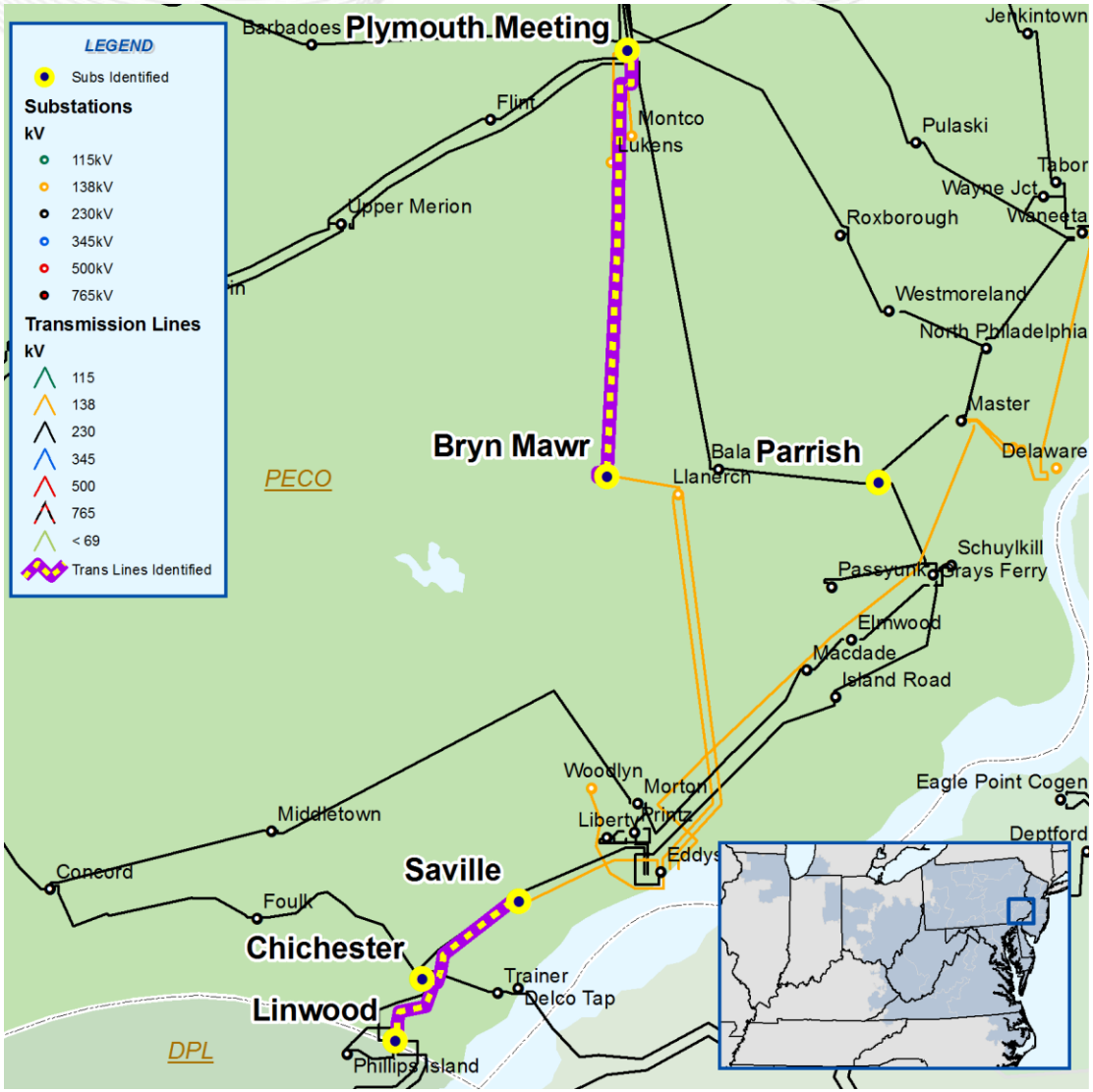
- Chichester – Saville 138 kV line / bus contingency ('PLYM138B') loss of Plymouth Meeting 138 kV bus
- Chichester – Saville 138 kV line / single contingency ('220-27B') loss of Gays Ferry – Tunnel 230 kV line
- Chichester – Saville 138 kV line / Basecase



# Generation Deliverability Violations

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

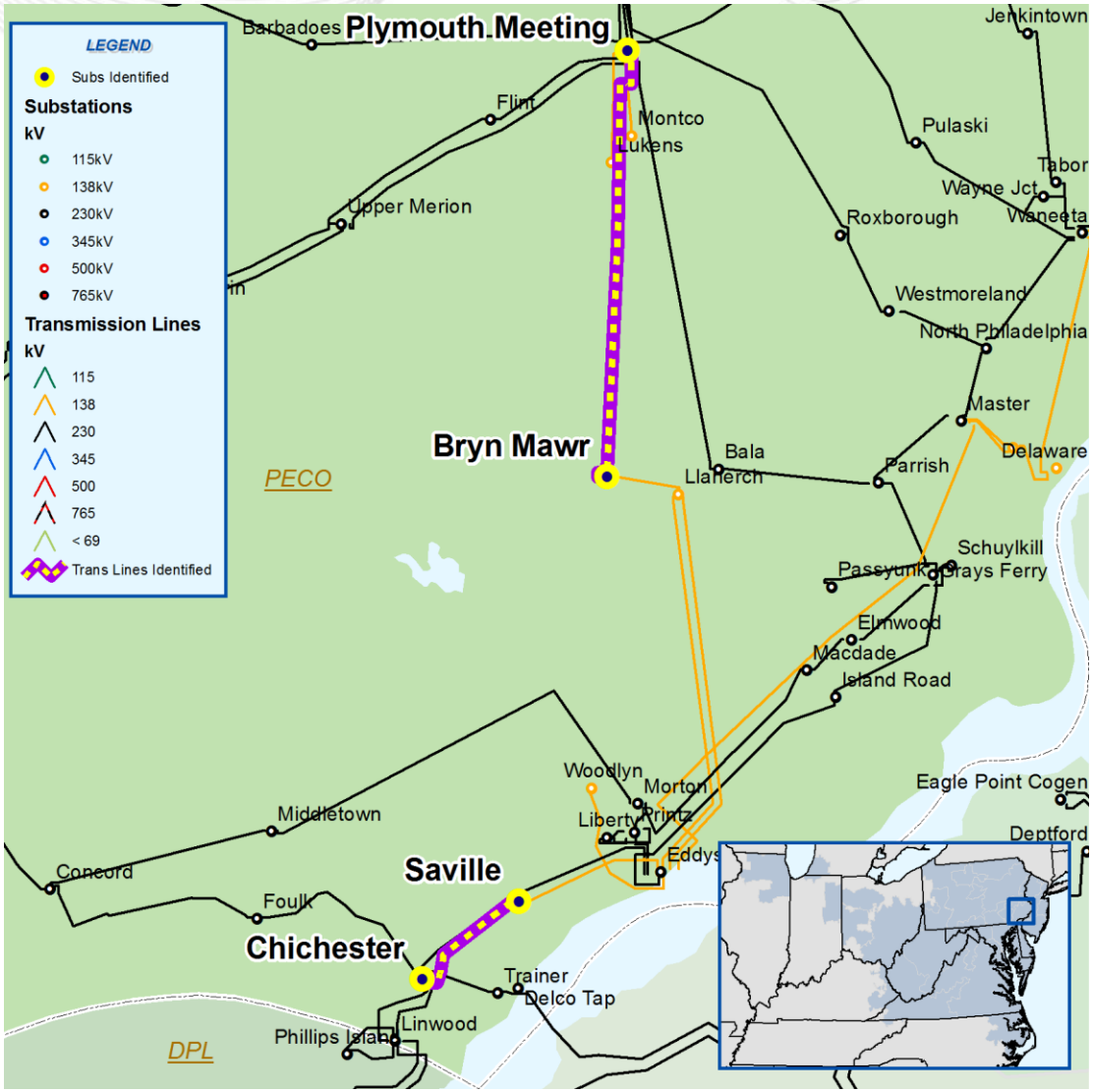
- Tunnel – Parrish 230 kV line/ Basecase



# Baseline Thermal Study Violations

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

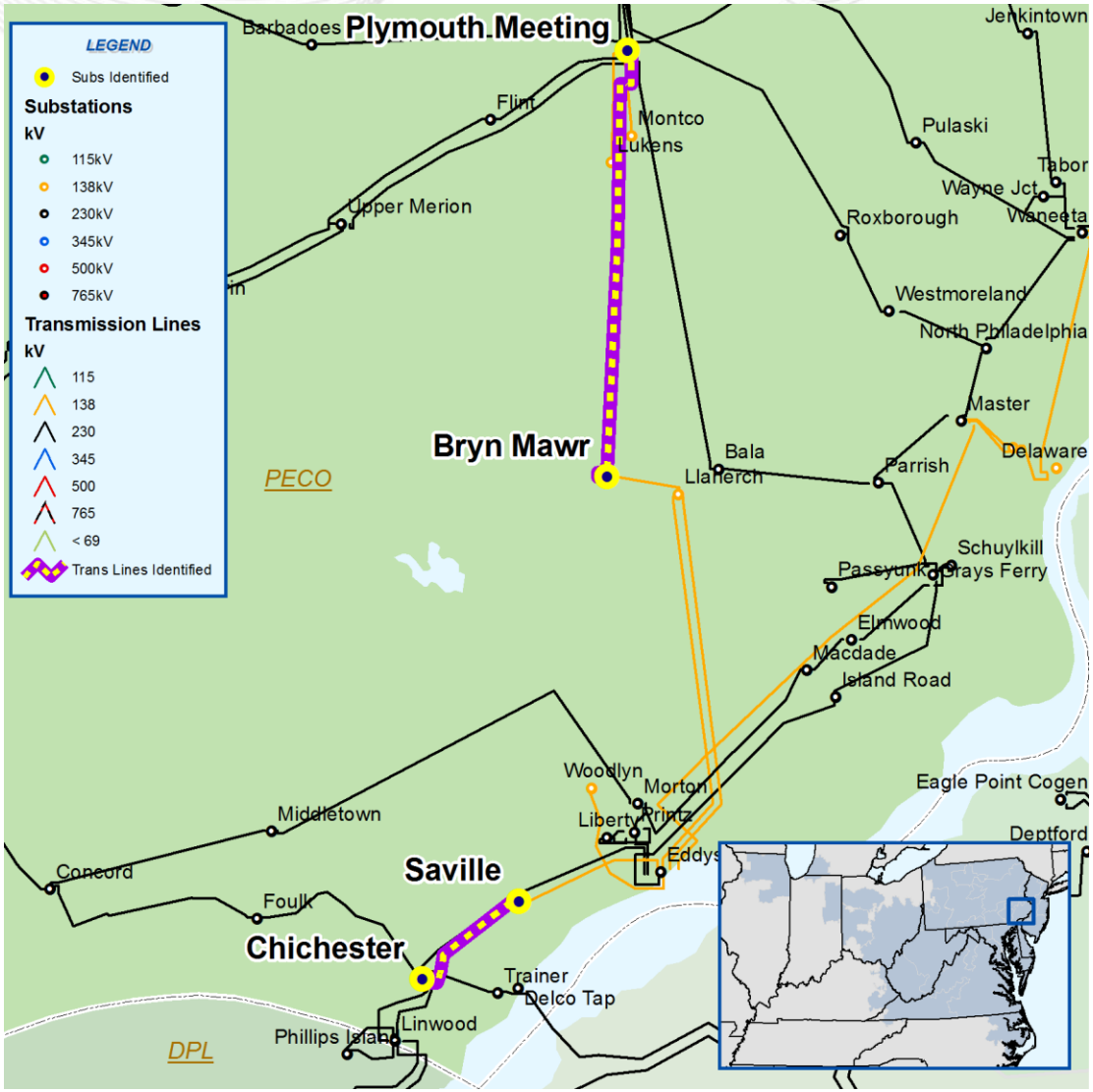
- Chichester – Saville 138 kV line / bus contingency ('PLYM138B') loss of Plymouth Meeting 138 kV bus



# Baseline Thermal Study Violations

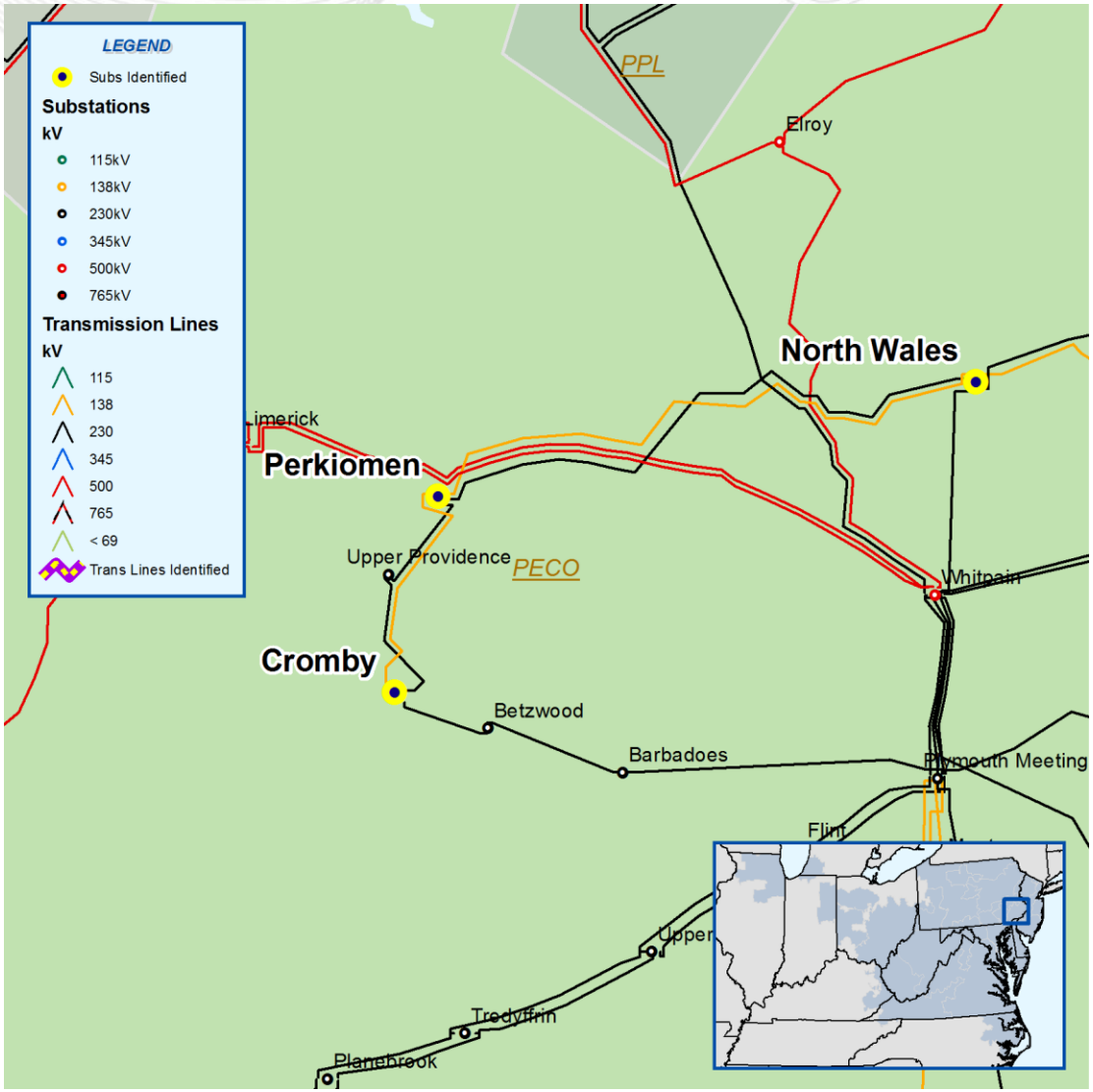
- Plymouth Meeting – Bryn Mawr 138 kV line / line fault with stuck breaker contingency ('CHICH045') loss of Chichester – Foulk 230 kV line and Foulk 230/13.8 kV transformer #2 as well as Chichester bus section 1 due to the Chichester stuck breaker '045'

- 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'



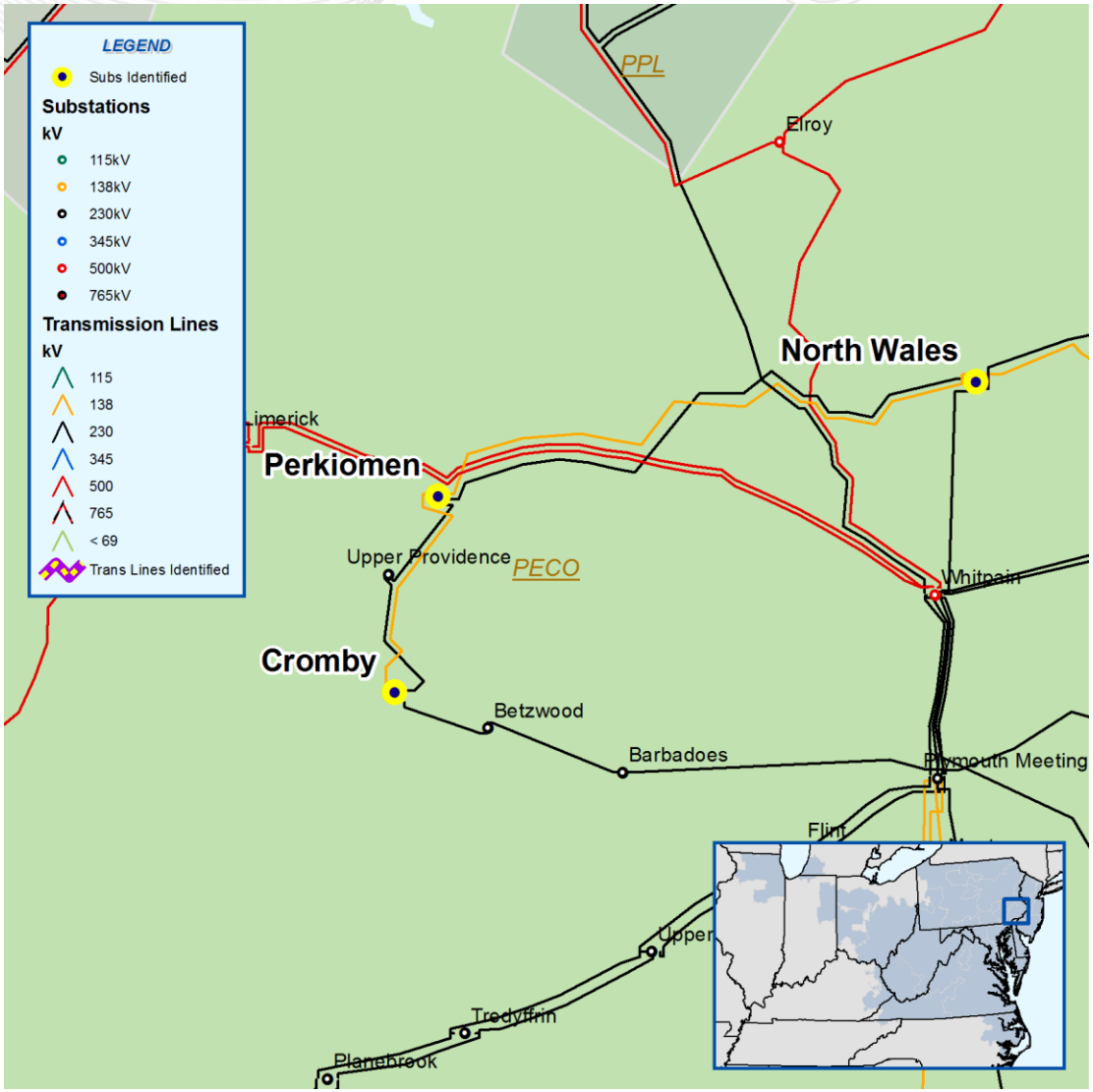
# Baseline Voltage Study Violations

- 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

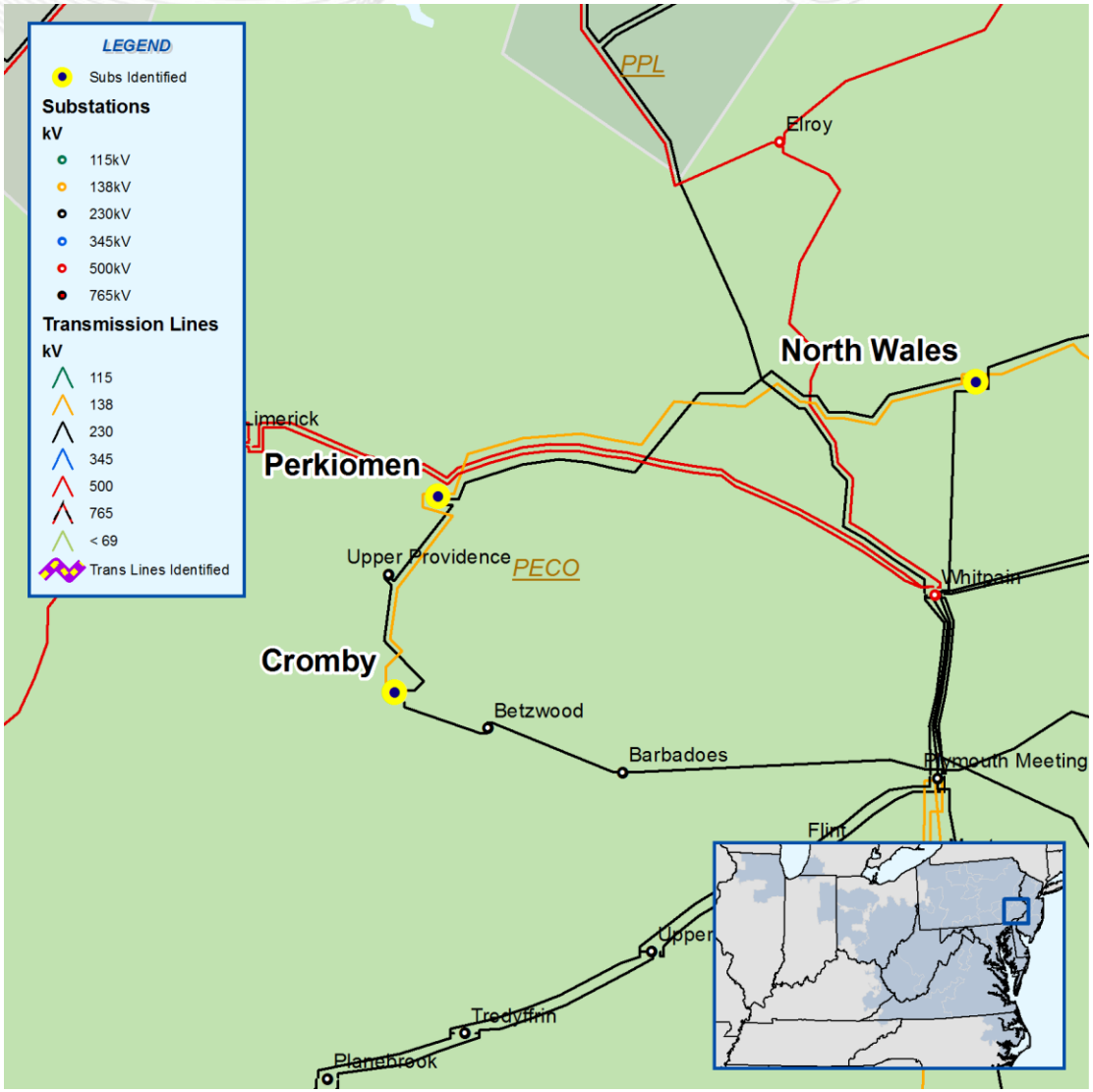
- North Wales 138 kV station voltage drop violation / bus contingency ('HEAT138B') loss of Heaton 138 kV station bus section 2
- Perkiomen 138 kV station voltage drop violation / bus contingency ('HEAT138B') loss of Heaton 138 kV station bus section 2
- Cromby 138 kV station low voltage violation / line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

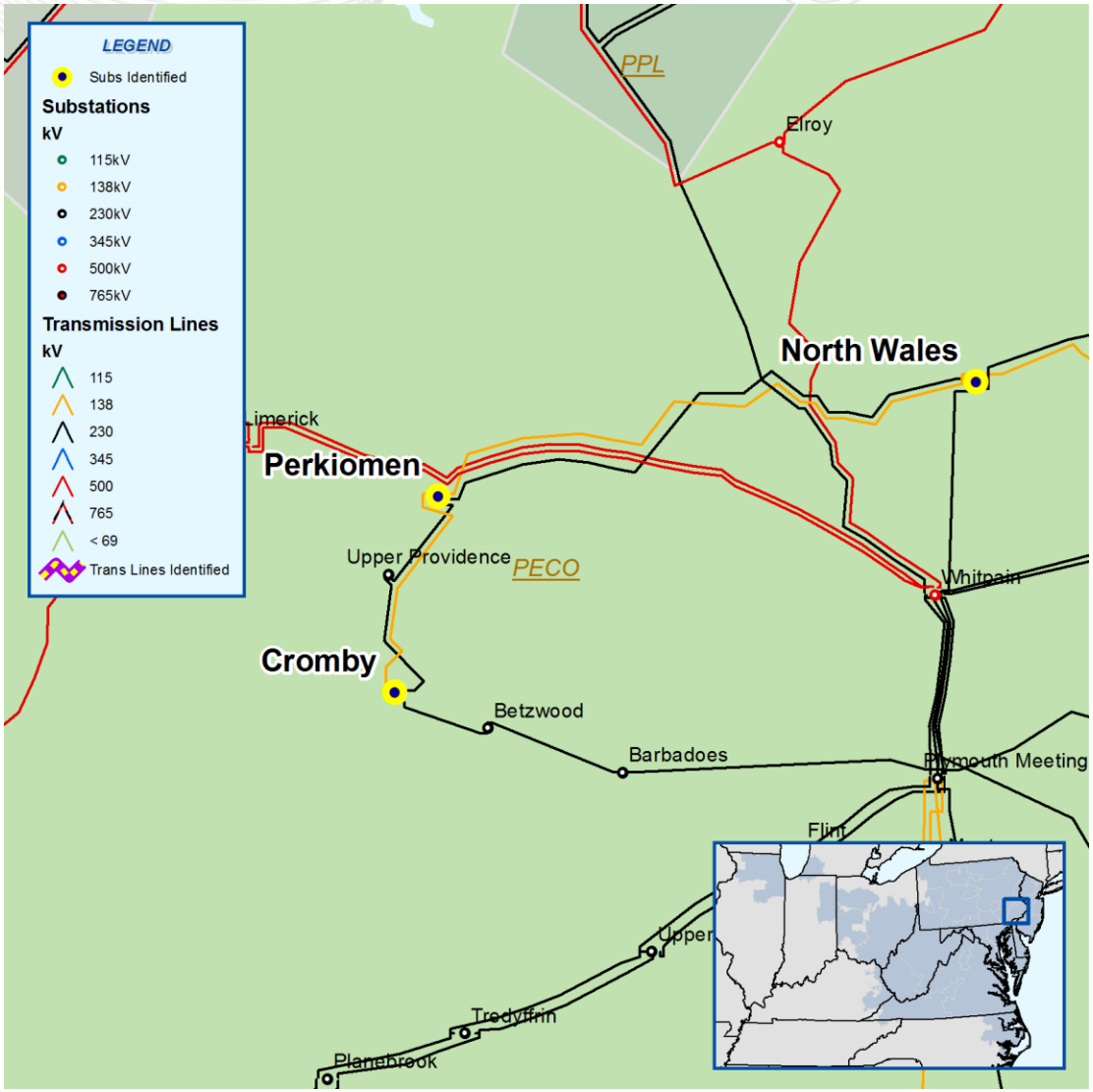
- Cromby 138 kV station voltage drop violation / line fault with stuck breaker contingency ('HEAT0995') loss of Heaton – Woodbourne 230 kV line with stuck breaker 995



# Baseline Voltage Study Violations

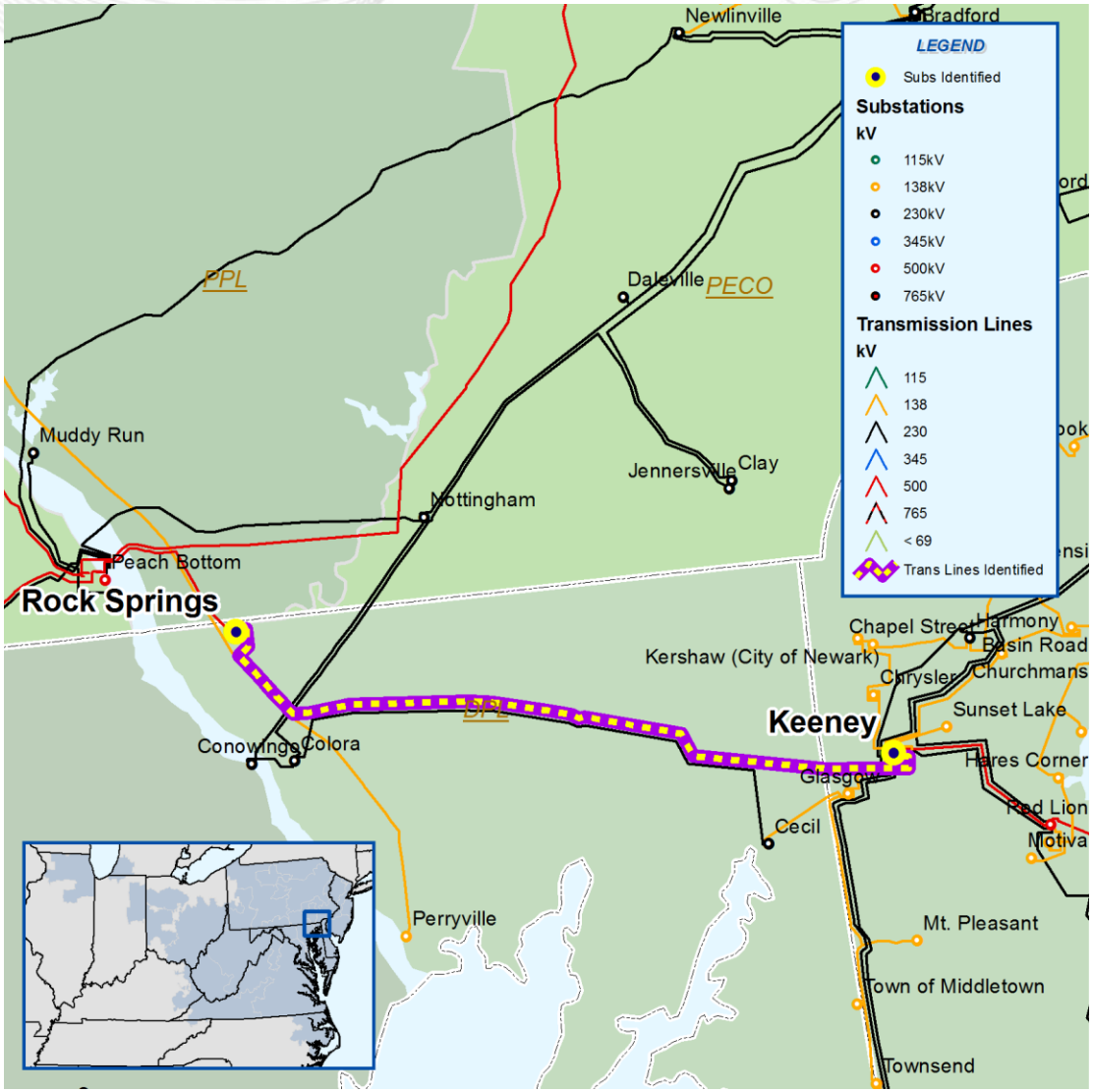
- North Wales 138 kV station voltage drop violation / line fault with stuck breaker contingency ('HEAT0995') loss of Heaton – Woodbourne 230 kV line with stuck breaker 995

- 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



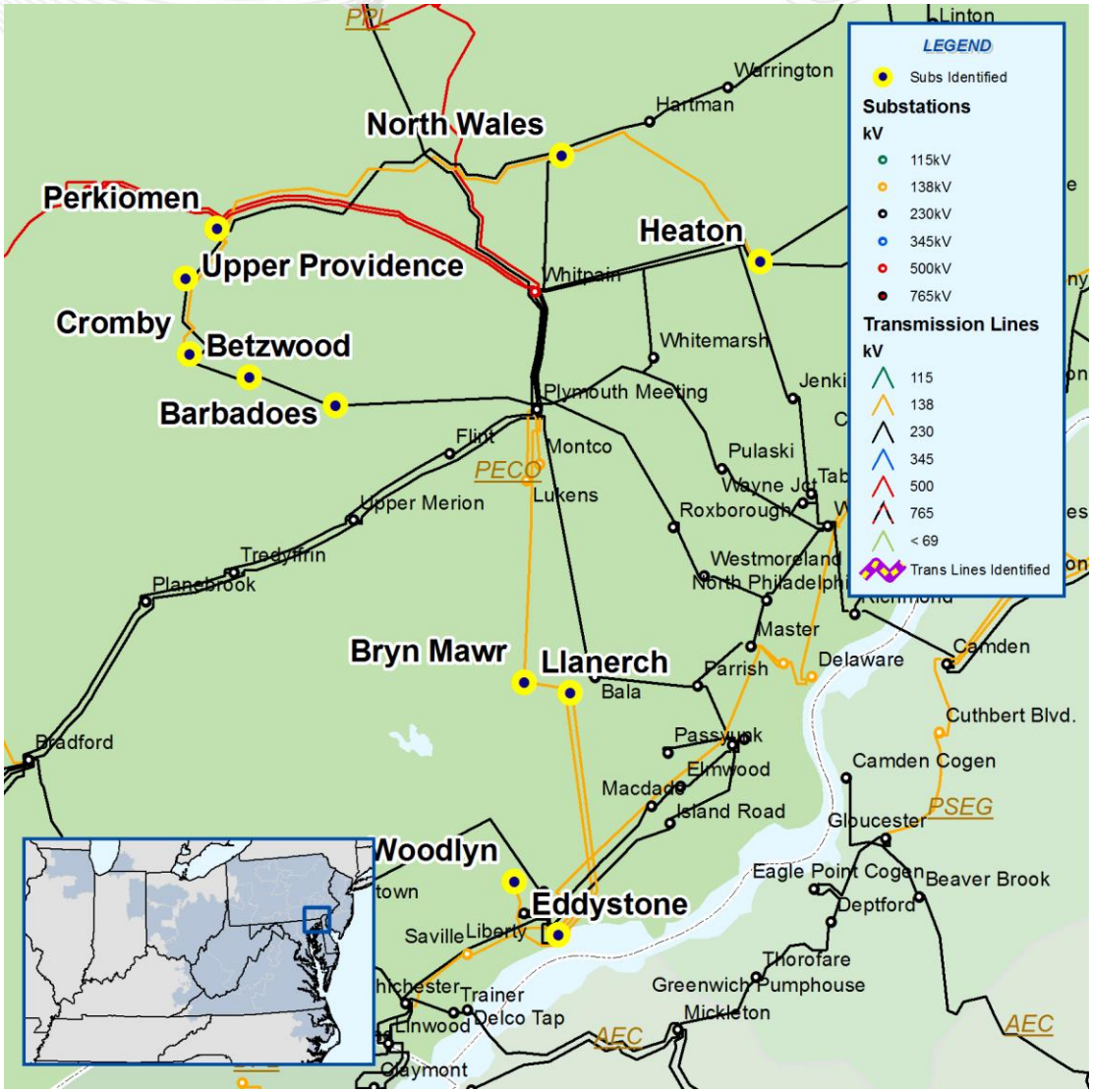
# CETO Voltage Study Violations

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



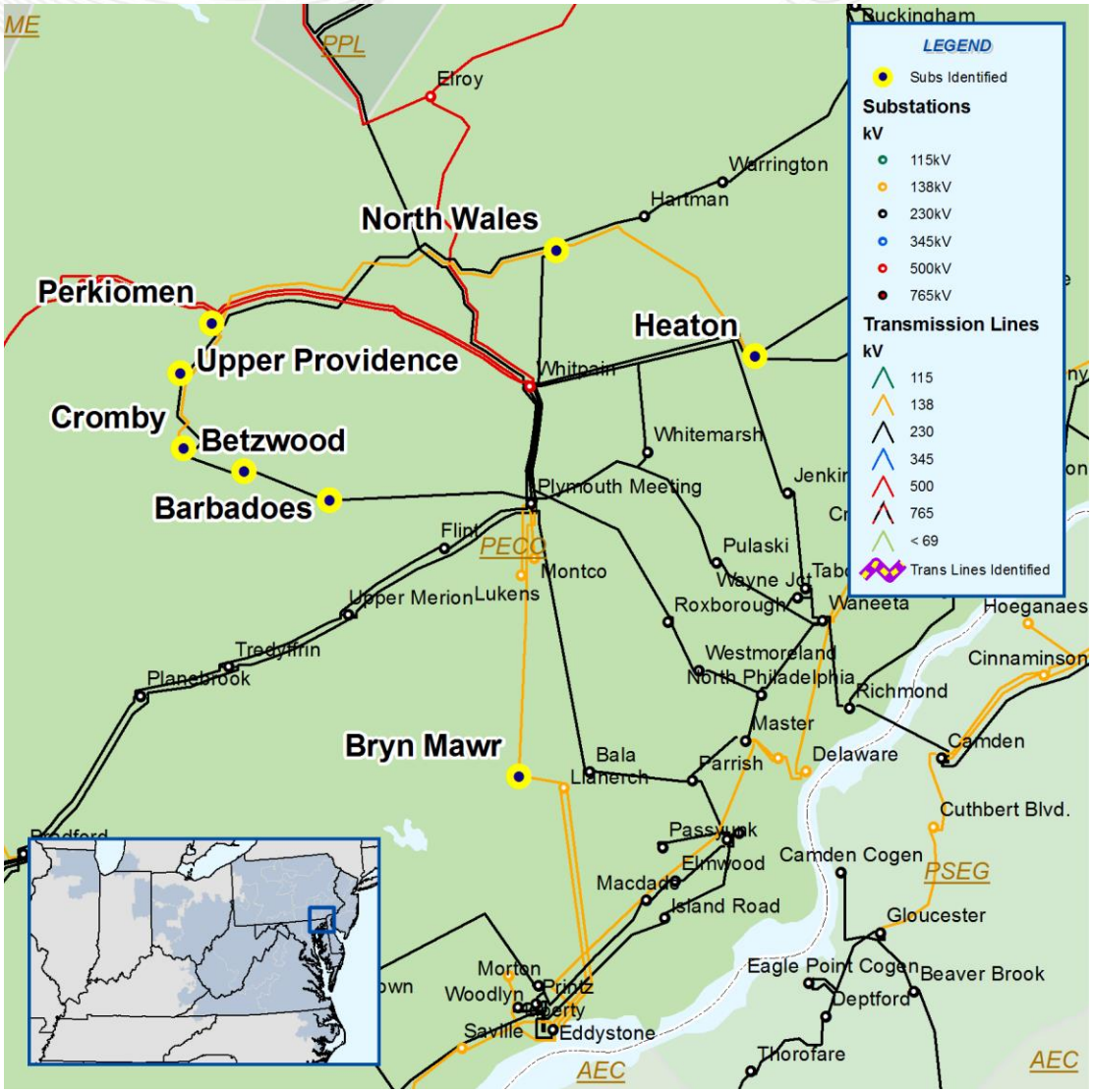
# N-1-1 Voltage Study Violations - Low Voltage Violations

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



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

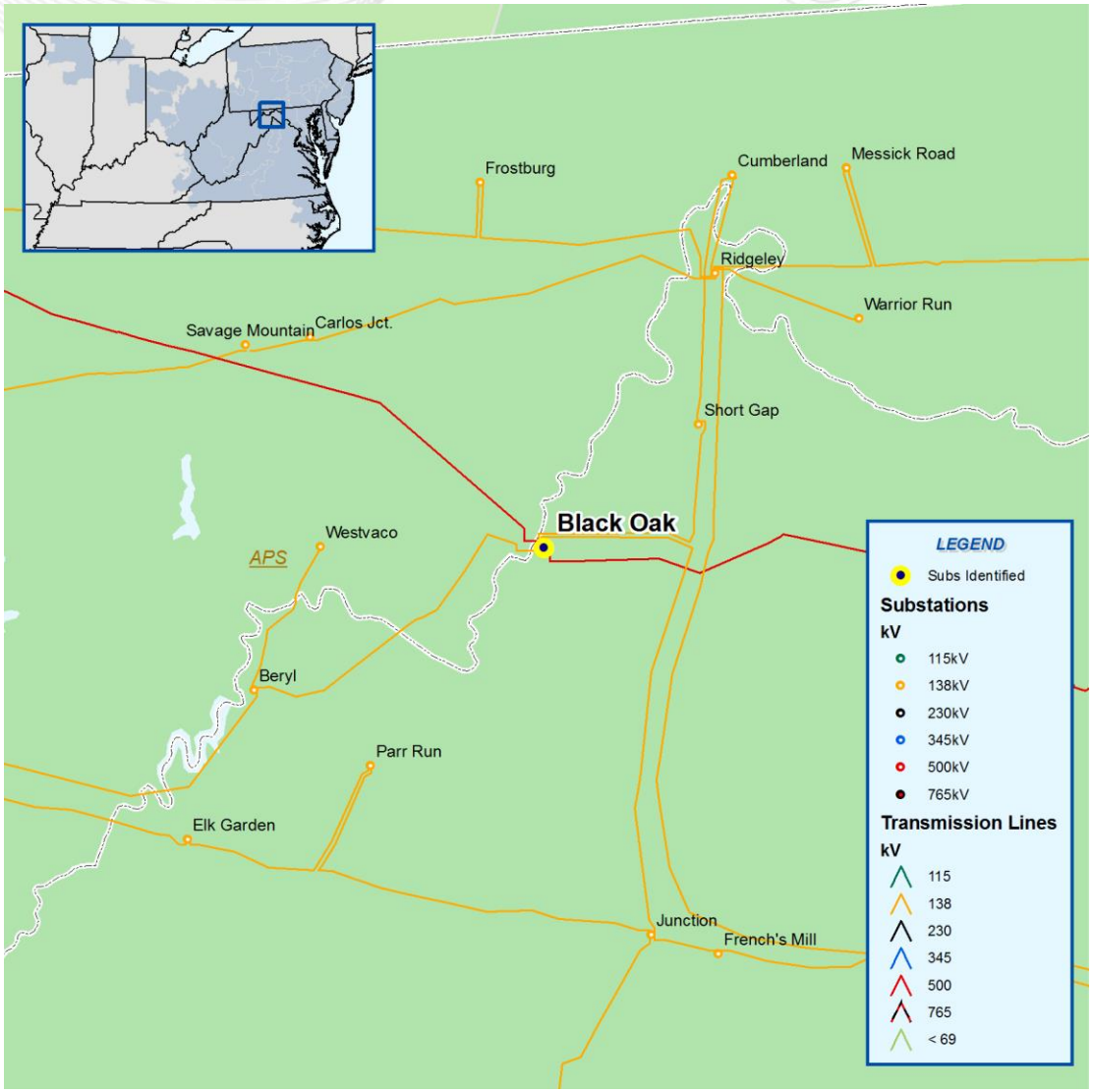
- Numerous voltage drop violations at the stations hi-lighted on the map for various contingencies



# Baseline Reliability Update

# APS Transmission Zone

- 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



# APS Transmission Zone

- 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

# Study Objectives

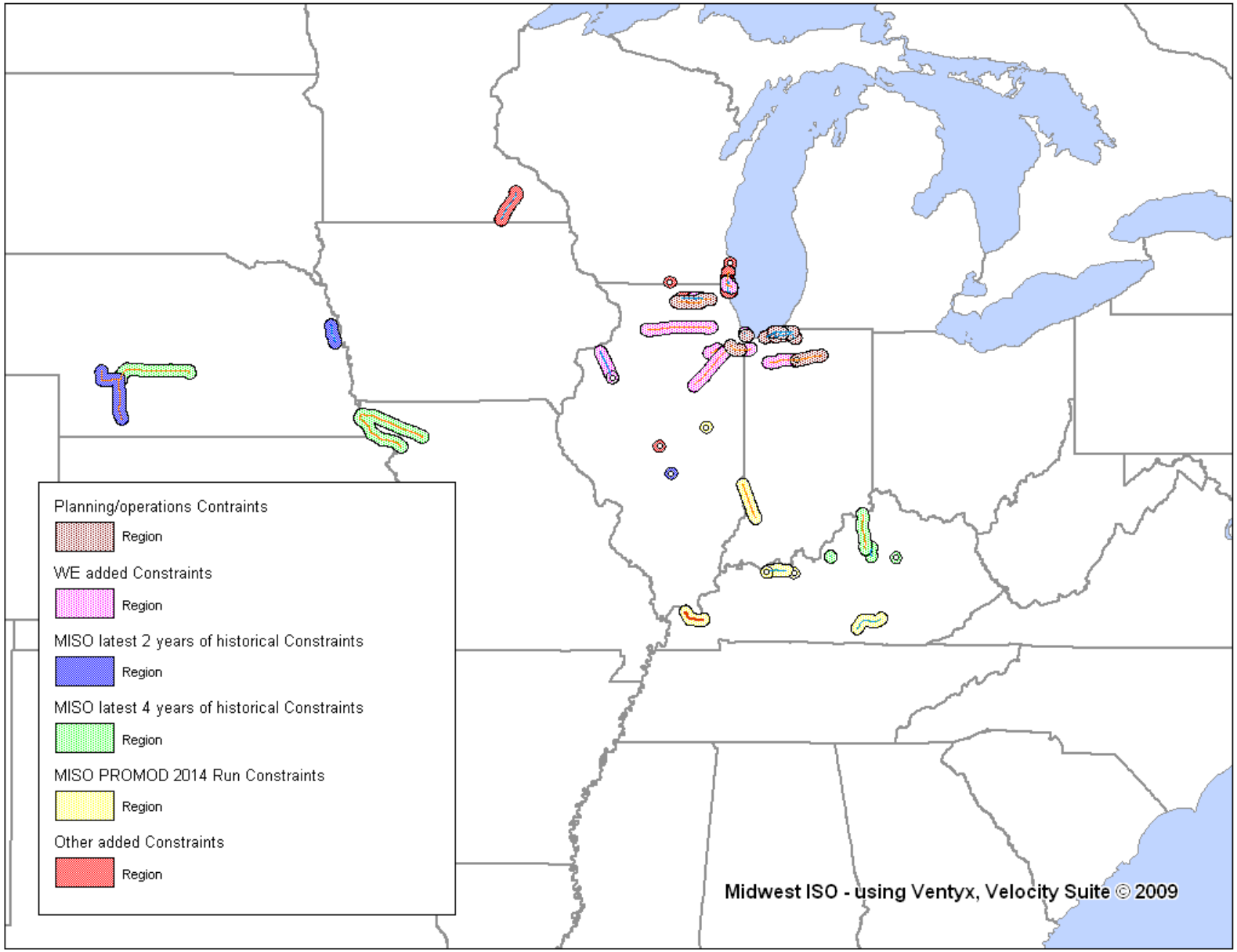
- Address Cross Border non-reliability planning issues per JOAs and Order 890 provisions
- Identify potential projects that are eligible for tariff-based Cross Border Market Efficiency Project (CBMEP) treatment
- Identify potential projects that may be eligible for Midwest ISO or PJM internal tariff 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.

# Process

- 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

# Candidate Flowgates



# Timeline Targets

| Number | Task | Targeted Deadlines | Lead |
|---|---|---|---|
| 1 | Form the study team and identify planning contacts from each RTO | January 22nd | Chuck L. Jay C, David T, Digaunto C, Ming N |
| 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 31st, 2010 | RTOs |

# 2010 RTEP Next Steps

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

# Comments or Questions?