Transmission Expansion Advisory Committee

June 5, 2014

Interregional Planning Update

EIPC non-grant 2014 Analysis

- 2014 Scenario Analysis - update
  - Scenario A - Update rollup case
  - Scenario B - Severe Heat and Drought
  - May – July - target assumptions and model builds
  - July Stakeholder WebEx
  - June – August - target analysis
  - Sept – Oct - target draft report
  - November - target Stakeholder WebEx

EIPC non-grant – Future Work

- Beyond 2014 discussions
  - Winter Scenario
  - Production Cost Analysis
  - DOE Congestion Report Support
  - Synergies between Planning Coordinator MOD standard activities and EIPC model building

Interregional Planning Studies (not including JCM)

- NCTPC - update
  - Study requested by NCUC
  - Reliability and Economic impact of BRA resources
  - Reliability and Economic Scopes Approved
  - 2014 target completion
- PJM/MISO Joint Planning Study
  - Futures 1, 2, 3 analysis is complete
  - Stakeholder comments have been incorporated
  - 3 Proposals under further joint review - JOA metric B/C > 1.25
  - Further discussion of lessons learned
- Northeast Protocol Activities

2014 RTEP Proposal Windows Update

2014 RTEP Proposal Windows Anticipated Schedule

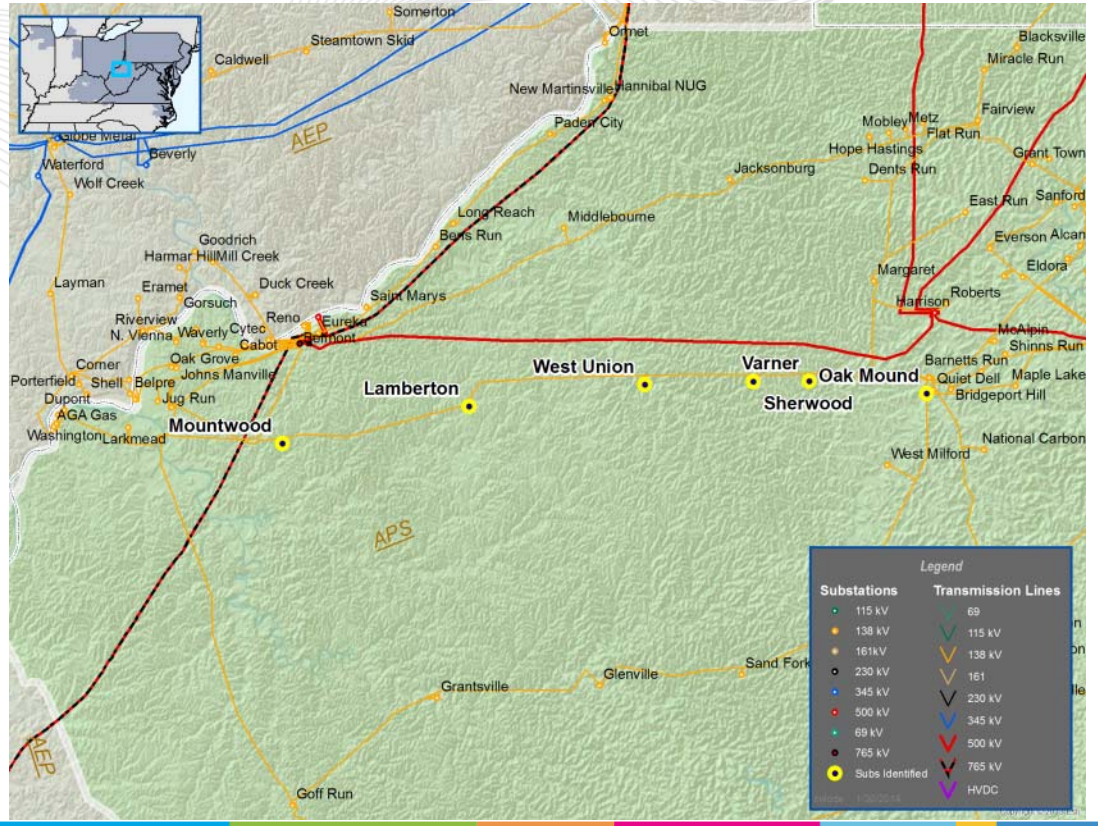
- Early May 2014
  - 2019 Power Flow and contingency files posted to window participants
  - 2019 Thermal Baseline N-0 & N-1 results posted to window participants
- Mid May 2014
  - 2019 Generator Deliverability results posted
- Late May 2014
  - 2019 Load Deliverability results distributed
- Early June 2014
  - 2019 Thermal N-1-1 results to be distributed
- Early July 2014
  - Anticipate opening 2014 RTEP proposal window
  - Included in scope: Baseline N-0 & N-1, Generator Deliverability, Load Deliverability, N-1-1

- 2019 Summer Thermal Analysis
  - Basecase Analysis Result
    - 12 potential thermal violations
  - Generation Deliverability Analysis Result
    - 42 potential thermal violations
  - Load Deliverability Analysis Result
    - One potential voltage violation
  - N-1-1 Analysis Result
    - Several potential thermal violations

Reliability Analysis Update

APS Transmission Zone

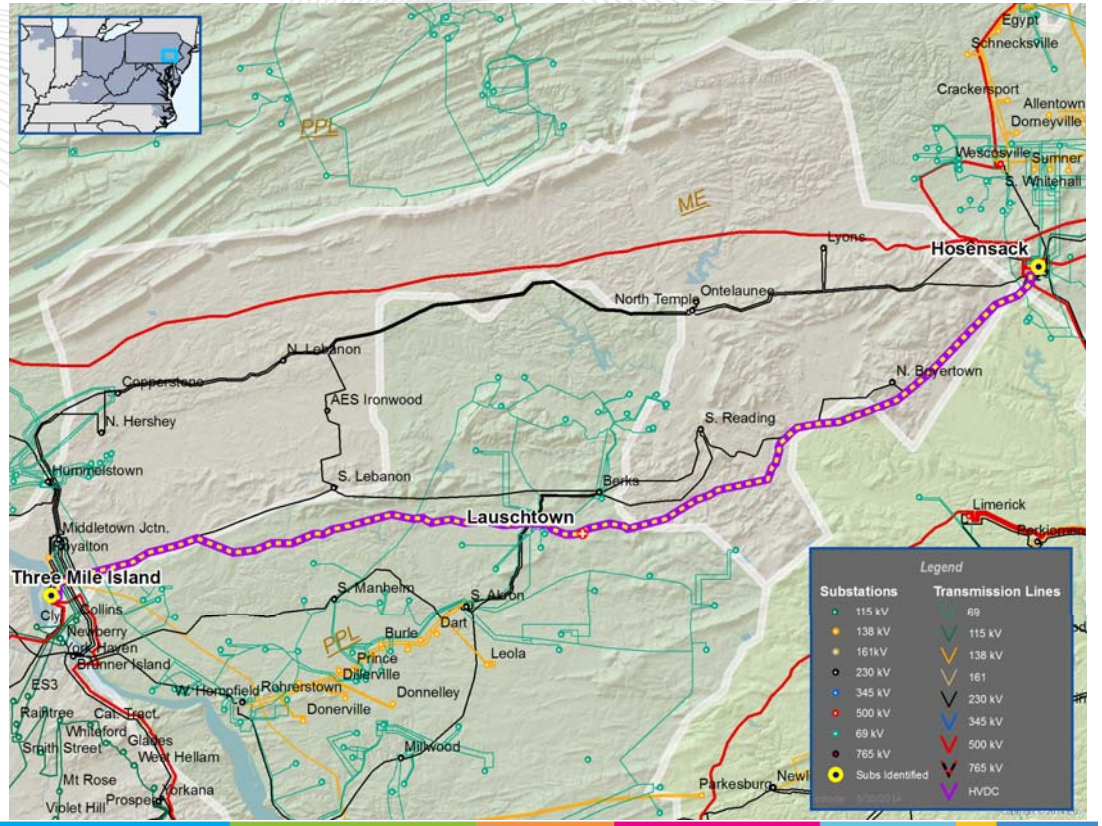
- Driver: Block load addition in the APS zone
- Lead time: less than 24 months
- Low voltage and voltage drop violations at West Union, Varner, Mountwood, Lamberton, and Sherwood 138kV buses for various contingencies
- Construct a new line between Oak Mound 138kV Substation and Waldo Run 138kV Substation. (B2475)
- Estimated Project Cost: $38M
- Projected IS Date: 12/31/2015



MetEd Transmission Zone

- Add Additional upgrades to existing project scope to address required work in neighboring transmission zones
- The existing B2006 upgrade establishes Lauschtown 500/230/69 kV stations and loops TMI – Hosensack 500 kV into the new 500 kV stations. (Estimated Project Cost: $95 M)
- Add additional upgrades (B2006.1.1 and B2006.2.1) to address the required MetEd/FirstEnergy work that is required as part of the existing B2006 upgrade.

- **B2006.1.1**: Build new sections to loop the 5026 (TMI – Hosensack 500 kV) line in to the Lauschtown substation and upgrade relay at TMI 500 kV.
- **Estimated Project Cost**: $5.25 M
- **Required IS Date**: 6/1/2017
- **B2006.2.1:** Upgrade relay at South Reading, on the 1072 230 kV line.
- **Estimated Project Cost**: $0.25 M
- **Required IS Date**: 5/1/2016



Winter Peak Study Update

2014 RTEP Winter Study Update – Load Flow Model

- PJM Winter Study case update
  - PJM topology - 2019 Summer Peak RTEP model
  - External world model is updated to the MMWG 2019 winter model
  - Winter rating and Winter load profile applied
  - PJM Winter load forecast applied

2014 RTEP Winter Study Update – Base Dispatch

- Base case dispatch
  - Pumped storage will be in generating mode
  - Similar to the PJM Light Load Reliability criteria, the generator fuel type will be considered in the initial base case dispatch
  - Average Capacity Factors (CF) by fuel type during the winter peak hours are used for the base case generating levels as shown in the following table (initial generator output = AVG CF* ICAP)
  - Target area interchange reflects all yearly long term firm (LTF) transmission service
  - Coal Units will be scaled to maintain the interchange
  - ProMOD study underway to predict the future CF for different fuel type of generator
    - The results of the ProMOD run will determine if additional sensitivity studies are needed

FUEL TYPE	Solar	Coal (<500MW)	Black Liquor	Distillate Fuel Oil	Kerosene	Landfll Gas	Municipal Solid Waste	Natural Gas	Nuclear	Other Biomass Gas	Other Solid	Petroleum Coke	Residual Fuel Oil	Water	Waste Coal	Wood Waste	Wind	Coal (>500MW)
AVG CF (2008-2013)	0.05	0.51	0.74	0.01	0.00	0.46	0.79	0.25	0.98	1.11	0.19	0.75	0.02	0.38	0.75	0.66	0.33	0.73

2014 RTEP Winter Study Update – Generator Ramping Study

- Similar to the Generator Deliverability, Common Mode Outage and Light Load reliability criteria, generation will be ramped from their base values

- Deliverability test
  - Wind will be ramped up to 80% for single contingencies
  - The ramping limit for the remaining generators of all fuel types will be 100%

- Contingencies
  - NERC Category A, B, C (except N-1-1)

2014 RTEP Winter Study Update – Load Deliverability Study

- Critical Conditions:
  - Forced outage rates
  - Natural gas contingency
- Capacity Emergency Condition Simulation
- PJM Resource Adequacy is currently calculating Winter CETO values
- PJM Developing a list of target LDAs for load deliverability simulation
- PJM Developing gas contingency definitions

2019 Winter Study Update – Next Steps

- Next Steps

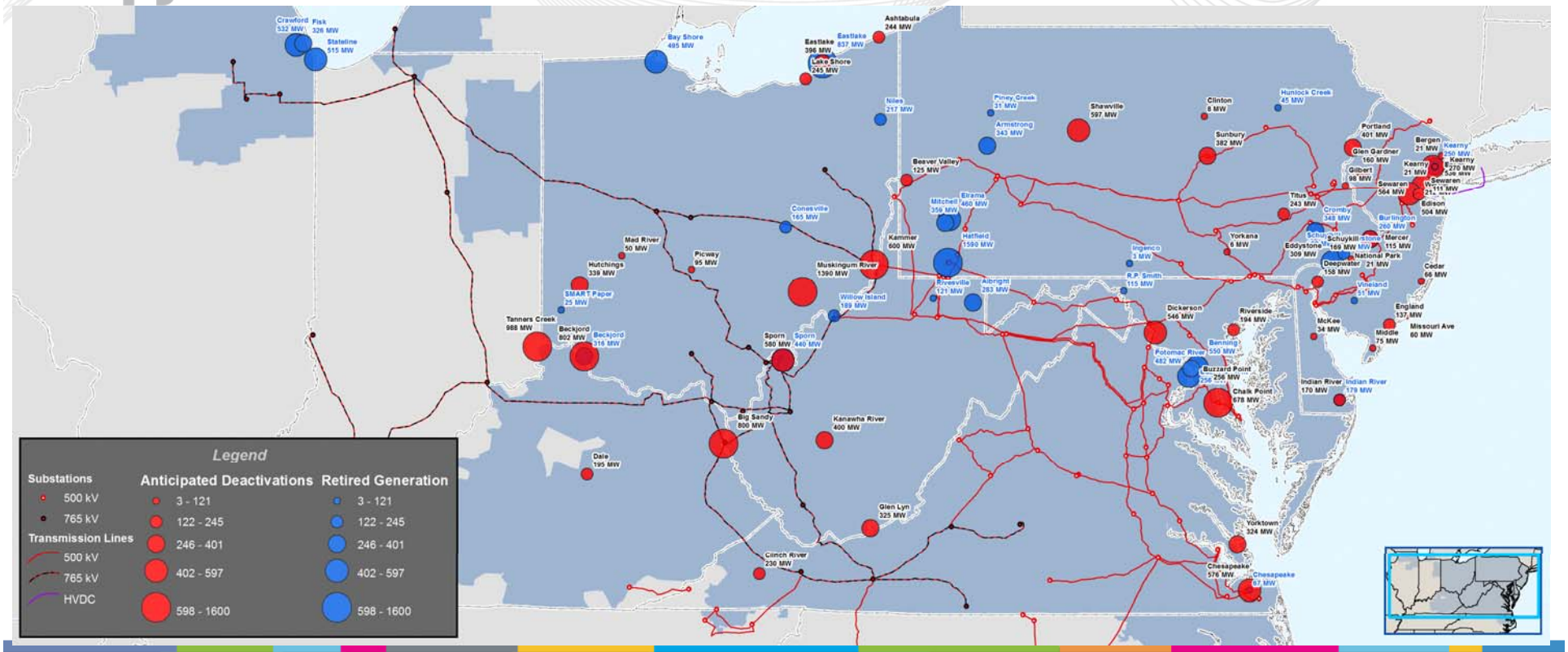
- Finalize base case
- Perform generator ramping study
- Define gas related contingencies
- Determine Locational Deliverability Areas (LDAs) to study
  - Calculate CETO values for LDAs
- Begin Load Deliverability Analysis

Generation Deactivation Notification Update

Deactivation Status

Unit(s)	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
- UPDATED Sunbury 1-4 (382MWs total)	PPL	7/18/2014 (Previous 6/1/2015)	Impacts identified and will be presented at July TEAC
- UPDATED Riverside 4 (76MWs)	BGE	6/1/2015 (Previous 6/1/2016)	Reliability analysis complete. No violations identified
-UPDATED Chalk 1, 2 & Dickerson 1-3 (1224MWs)	PEPCO	5/31/2018 (Previous 5/31/2017)	Impacts identified and will be presented at July TEAC

Generation Retirements



Yorktown 1 & 2

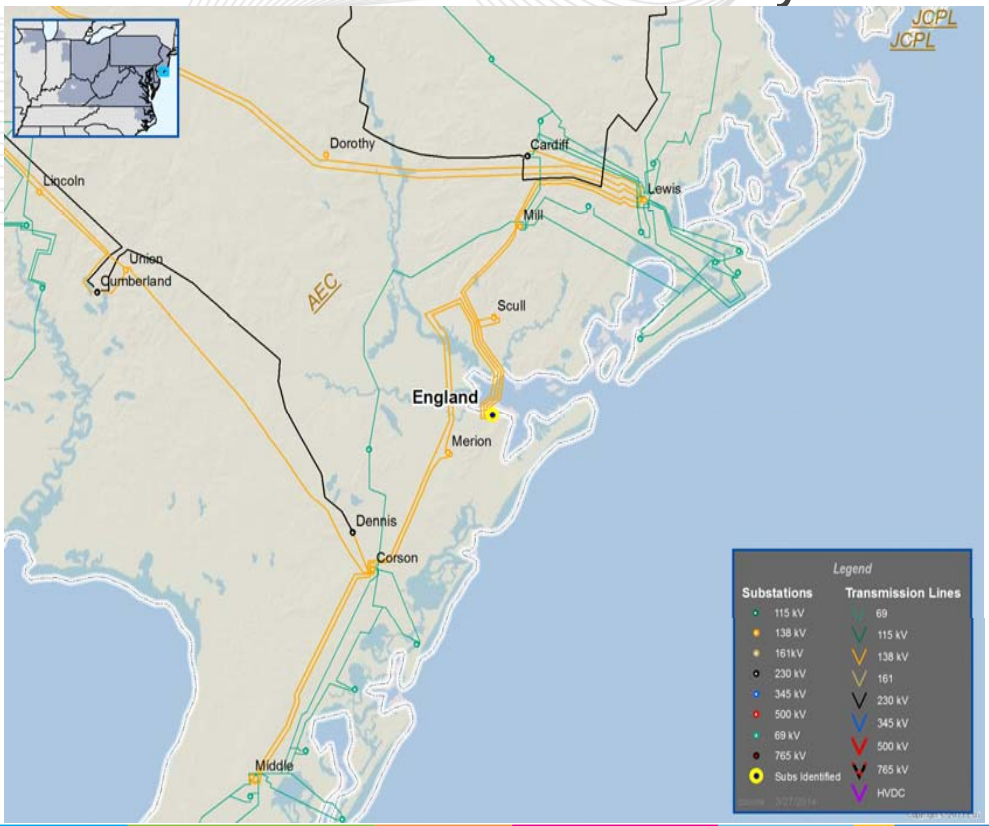
- Yorktown 1 & 2 scheduled to deactivate 12/31/2014
- Skiffe's Creek reinforcement identified as upgrade for deactivation of Yorktown 1 & 2 (b1905)
  - Construction schedule delayed and an updated schedule is being finalized
- Yorktown 1 & 2 have been requested to remain available beyond requested deactivation date and have indicated they will discuss continued operation
- PJM & Dominion currently working to resolve construction schedule in order to inform discussion with Yorktown 1 & 2

Generation Deactivation At Risk Analysis

Deactivation At Risk Analysis

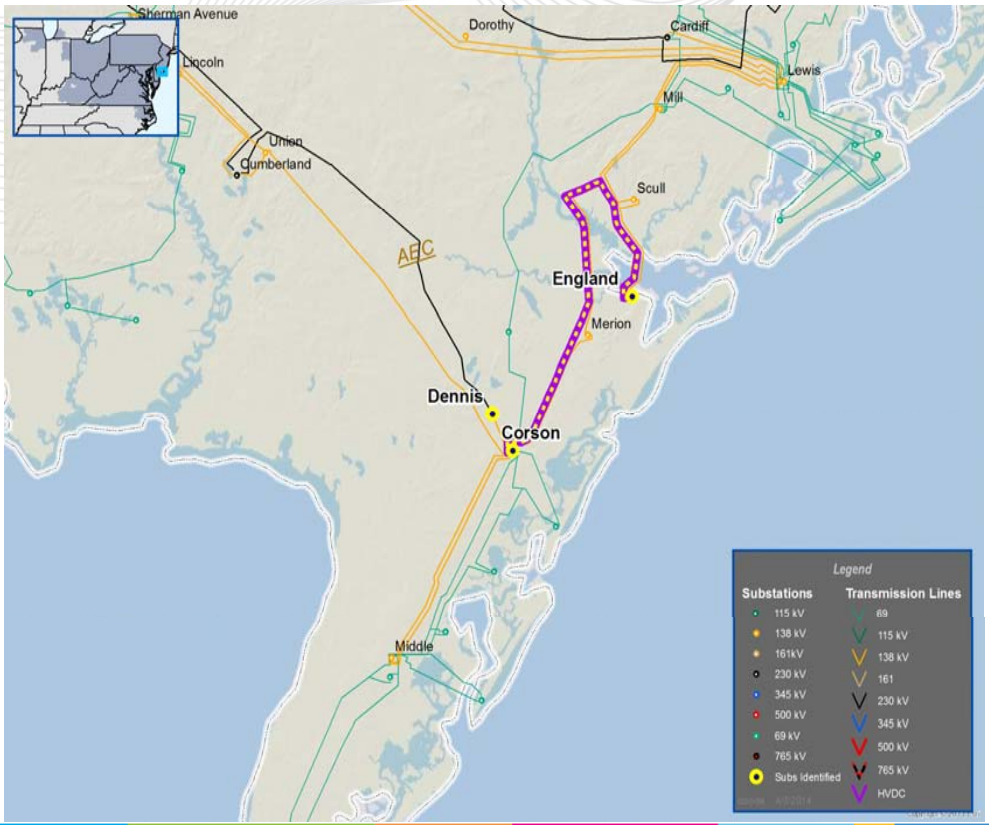
- BL England diesel: 8 MW
- BL England unit 2: 155MW
- BL England unit 3: 148.9MW
  - ACE Transmission Zone
  - 288 MW Total
  - Deactivation date: 06/01/2015

- BL England unit1 was modeled offline in this study as it was already studied for deactivation



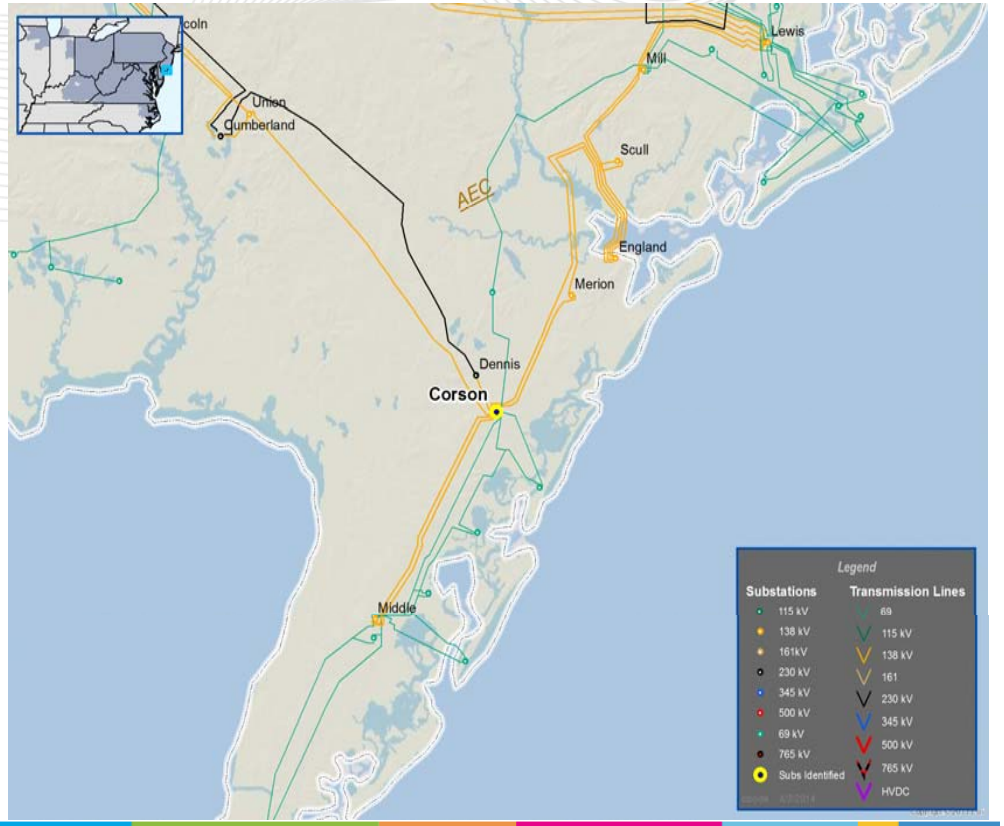
ACE Transmission Zone

- N-1-1 Violation
- The DENNIS 230/138kV transformer is overloaded to 119.35% and DENNIS – CORSON 2 138kV line is overloaded to 114.37% for the loss of the New Freedom to Cardiff 230 kV line (*CONTINGENCY 'NEWFDM-CARD'*) followed by the loss of Corson 3 – Union 138kV line (*CONTINGENCY 'CORSON-UNION'*)
- *The MDLE TP – BLE 138kV line is overloaded to 102.81% for the loss of New Freedom – Cardiff 230 kV line followed by the loss of Oyster Creek – Cedar 230 kV line*
- Install new Dennis 230/69kV transformer (b2476)
- Cost Estimate: $15.2M
- Required IS Date: 6/1/2015
- Expected IS Date: 6/01/2016



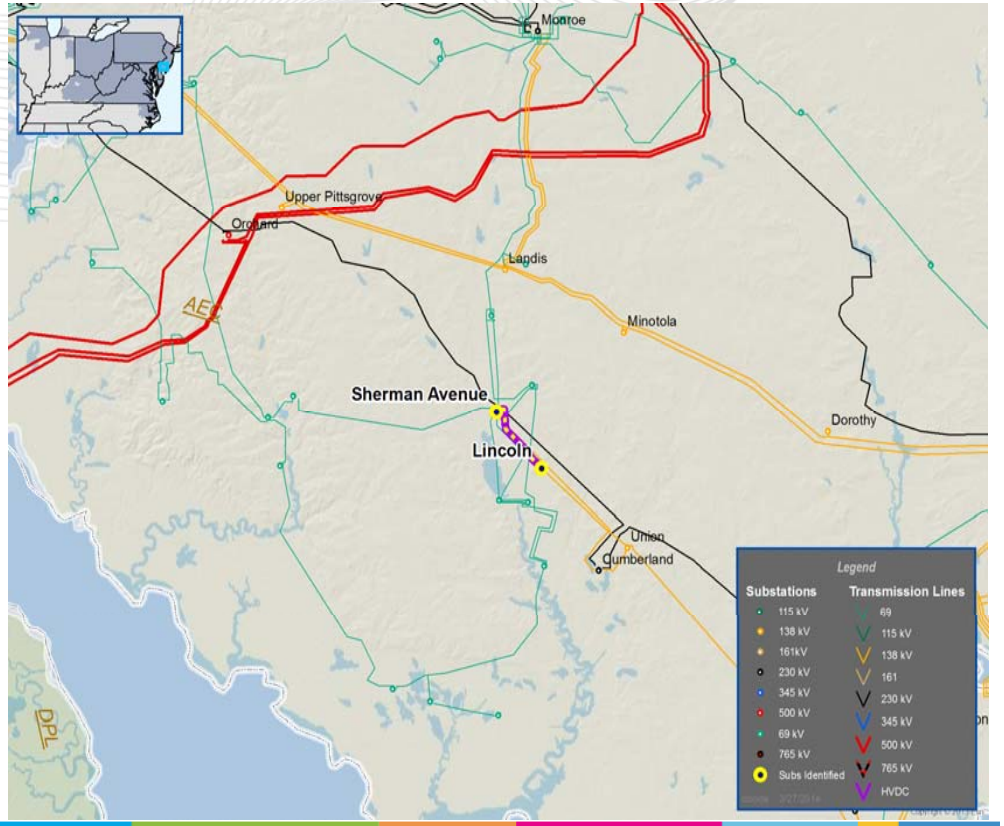
ACE Transmission Zone

- N-1-1 Violation
- The CORSON 2 - CORSON 1 138kV line is overloaded to 115.97% for the loss of the New Freedom to Cardiff 230 kV line (*CONTINGENCY 'NEWFDM-CARD'*) followed by the loss of Corson 2 – MDLE TP kV 138kV line (*'228107(CORSON 2)-228111(MDLE TP)_1'*)
- The CORSON 2 - MDLE TP 138kV line is overloaded to 114.31% *for the loss of New Freedom – Cardiff 230 kV line followed by the loss of Corson 1 – Corson 2 138kV line* (*CONTINGENCY '228106(CORSON 1)-228107(CORSON 2)_1'*)
- Upgrade 138kV and 69kV breakers at Corson substation (b2477)
- Cost Estimate: $0.8M
- Required IS Date: 6/1/2015
- Expected IS Date: 6/01/2016



ACE Transmission Zone

- N-1-1 Violation
- The SHRMAN#3 - LINCOLN 138kV line is overloaded to 103.22% for the loss of the Dennis – Corson 2 138kV (*CONTINGENCY 'DENN-COR')* followed by the loss of Union – Cumberland 138kV line (*CONTINGENCY '228210(UNION)-228262(CUMB)_1')*
- Reconductor 2.74 miles Sherman-Lincoln 138 kV line (b2478)
- Sherman substation work (b2490)
  - Cost Estimate: $0.11M
- Lincoln substation work (b2491)
  - Cost Estimate: $0.11M
- Cost Estimate: $4.0M
- Required IS Date: 6/1/2015
- Expected IS Date: 6/01/2016



ACE Transmission Zone

Multiple N-1-1 Thermal and N-1-1 Voltage magnitude and drop violations in ACE area are addressed by this set of upgrades

- IS Date 6/1/2015
- Expected IS Date: 6/01/2017-06/01/2018
- New Orchard – Cardiff 230kV line (Remove, rebuild and reconfigure existing 138 kV) (b2479)
  - Cost Estimate: $57.0M
- New Upper Pittsgrove – Lewis 138kV line (b2480)
  - Cost Estimate: $28.0M
- New Cardiff – Lewis #2 138kV line (b2481)
  - Cost Estimate: $3.5M
- Orchard substation work to accommodate new Orchard – Cardiff 230kV line (b2482)
  - Cost Estimate: $3.6M
- Upper Pittsgrove substation work (b2483)
  - Cost Estimate: $0.05M

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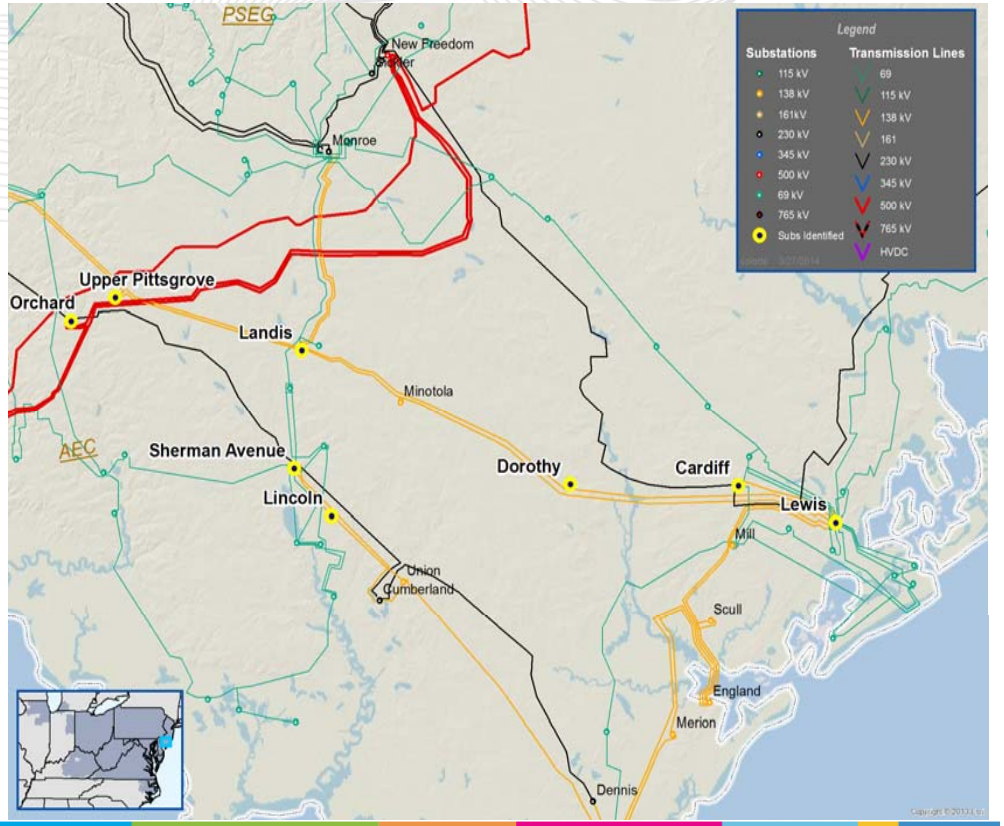
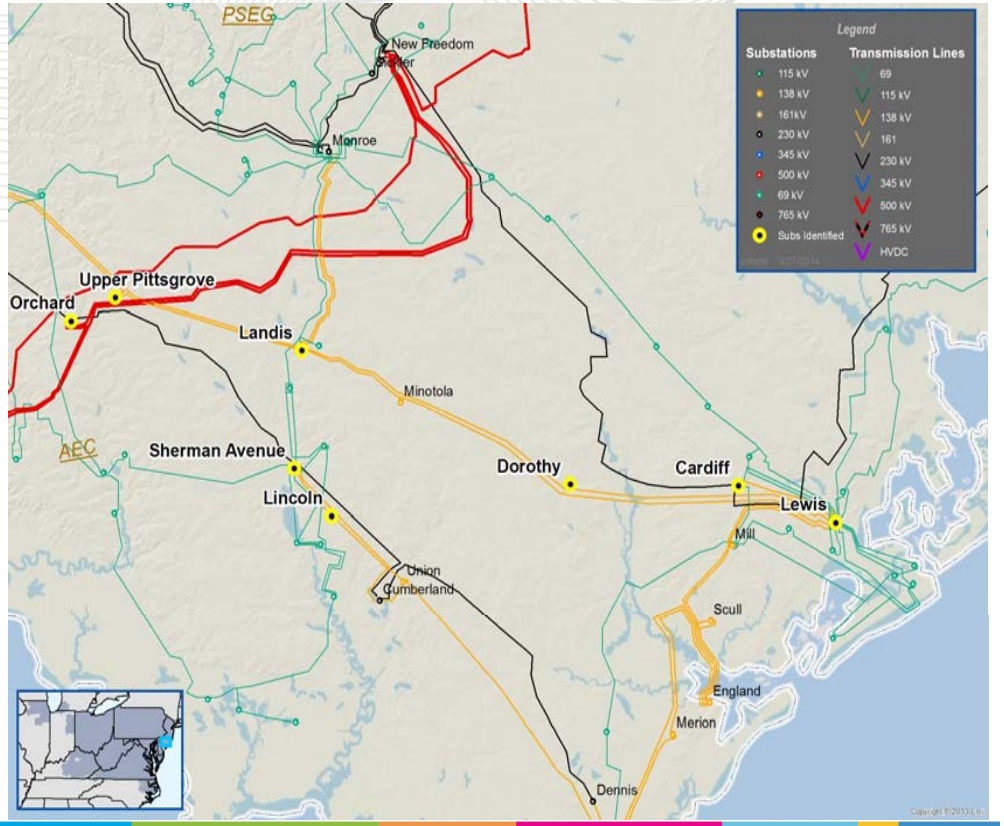


ACE Transmission Zone

Continued from the previous slide:

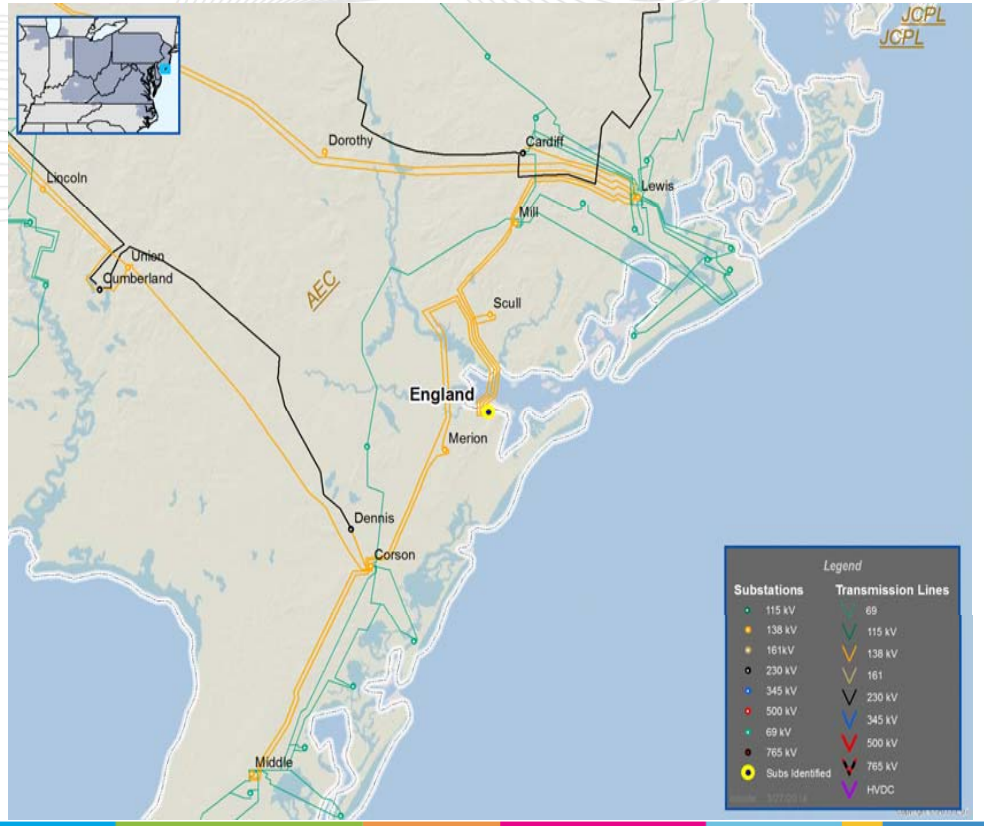
- Landis substation work to convert Landis to a ring bus and connect 3 lines to it (b2484)
  - Cost Estimate: $13.4M
- Dorothy substation work – replace two switches with breakers (b2485)
  - Cost Estimate: $4.0M
- Cardiff substation work to accommodate new Orchard – Cardiff 230kV line and new Cardiff – Lewis 138kV line (b2486)
  - Cost Estimate: $16.4M
- Lewis substation work (b2487)
  - Cost Estimate: $0.1M
- Environmental (b2488)
  - Cost Estimate: $2M

Note: These upgrades will use existing ROW and will also address significant existing age and condition issue of 40 mile 138 kV double circuit tower line.



ACE Transmission Zone

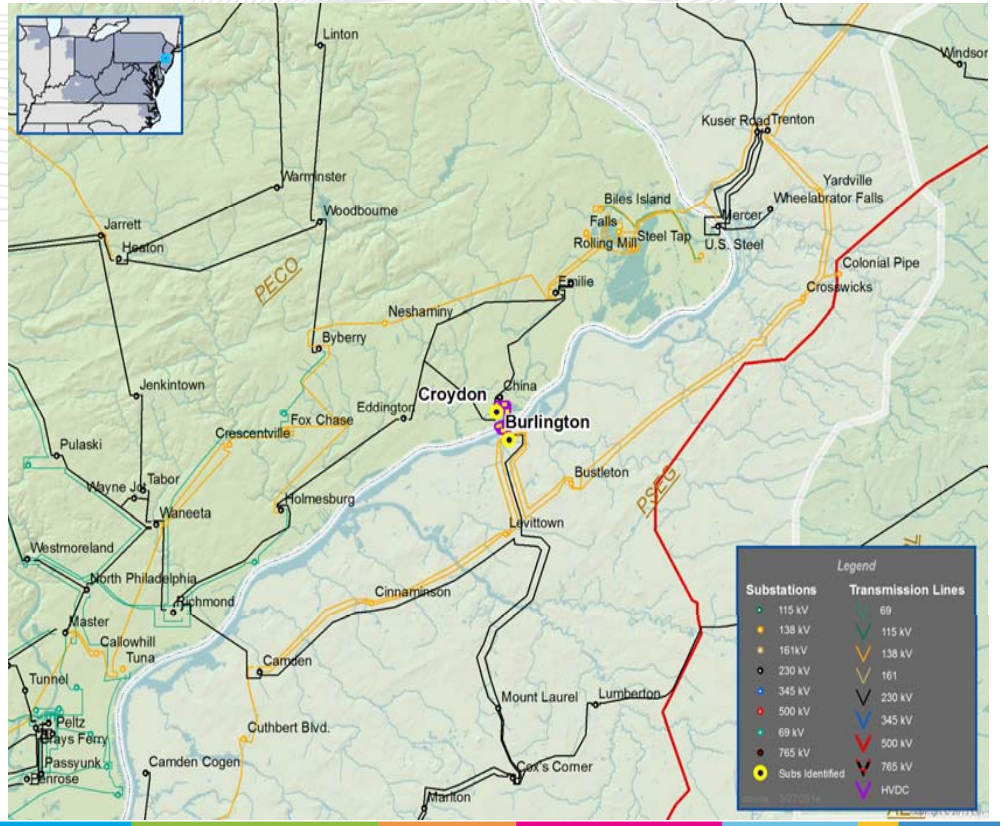
- Short term solution to multiple N-1-1 Voltage Violation in ACE area is to install a 100 MVAr capacitor at BLE (b2489)
- Cost Estimate: $4.0M
- Required IS Date: 6/1/2015
- Expected IS Date: 6/1/2016



PECO Transmission Zone

- **Generator Deliverability Violation**
- Croydon – Burlington 230kV line is overloaded to 107.61%% for the loss of Neshameny 138kV bus (*CONTINGENCY '130-25/* $ BUCKS $ 130-25 $ L'*)
- *Existing baseline upgrades b1197 and b1197.1 – reconductor Croydon – Burlington 230kV line*

- Cost Estimate: $8.6M
- Required IS Date: 6/1/2015
- Expected IS Date: 6/1/2015



BL England

- Current unit status
  - Unit 1 – Deactivated
  - Unit 2 – Under consent order to shut down in 2015 due to environmental concerns
  - Unit 3 – available for operations
- New Service Request exists for repowering facility
  - Natural gas facility requiring pipeline
  - New Jersey Pinelands Commission has denied the proposal to build pipeline
- Concerns exist as to the violations which will exist if BL England deactivates
  - Sufficient lead time is not available to construct the necessary upgrades
- PJM staff will recommend the upgrades to the PJM Board for inclusion in the RTEP
- The need for the upgrades will be re-evaluated if assumptions regarding the status of the BL England generation change

Artificial Island Update

Artificial Island Timeline

- **Monday, May 19th Artificial Island TEAC**
  - **3 hour stakeholder technical meeting**
  - **In-person at PJM CTC**
- Monday, June 2nd – Due date for stakeholder comment/feedback (14 day comment period)
- Today - June 5th TEAC
- **Monday, June 16th – PJM review of stakeholder comment/feedback and final recommendation meeting**
  - **TEAC WebEx / Teleconference**
- Comment Period to the PJM Board (36 days for comment period)
- July 10th TEAC
- **Tuesday, July 22nd – PJM Board meeting**
  - **Artificial Island solution recommendation to the PJM Board**

2014 RTEP Next Steps

2014 RTEP Next Steps

- Open a single proposal window for Baseline N-1, Generator Deliverability, Load Deliverability and N-1-1
- Complete 2019 Summer Voltage Analysis
- Review 15 Year Analysis Results with the TEAC
- Develop Year 8 (2022) Base Case
- Consider additional at-risk generation to evaluate

Questions?

Email: RTEP@pjm.com

Revision History

- V1 – 6/3/2014 – Original version distributed to the PJM TEAC