



# RTEP Upgrades and Market Efficiency Impacts

Paul McGlynn

EMUSTF

[Paul.McGlynn@pjm.com](mailto:Paul.McGlynn@pjm.com)

(610) 666 - 4227



## RTEP Upgrades

- Schedule 6 of the Operating Agreement – Regional Transmission Expansion Planning Protocol
- Reliability – Evaluates the system to ensure that it conforms to the NERC Reliability Standards and other applicable reliability standards including PJM standards, transmission owner standards and RFC and SERC standards
- Operational Performance

- **Market Efficiency Criteria**
  - Codified in Section 1.5.7 of Schedule 6 of the Operating Agreement
  - Perform market simulations to determine the benefit of a proposed upgrade
    - Perform the simulations with and without the proposed market efficiency upgrade to determine the benefit
    - Simulations are run over a series of years throughout the 15-year planning horizon

- **Market Efficiency Criteria**

- B/C = (present value of the total annual benefit of the first 15 years of the enhancement) / (present value of the total enhancement cost for the first 15 years of the enhancement)
- Benefit based on production cost and net load payments
- Costs based on NPV of annual revenue requirement for the upgrade
- B/C must be greater than 1.25

- **Market Efficiency**

- Identify transmission upgrades, that if accelerated, would improve the market efficiency of the system
- Identify enhancements to reliability upgrades that would improve the market efficiency of the system
- Identify transmission upgrades to improve the market efficiency of the transmission system
  
- Historical congestion is the key benchmark for the analyses





## 2014 Load, Generation and Economic Assumptions Top 25 Market Efficiency Constraints

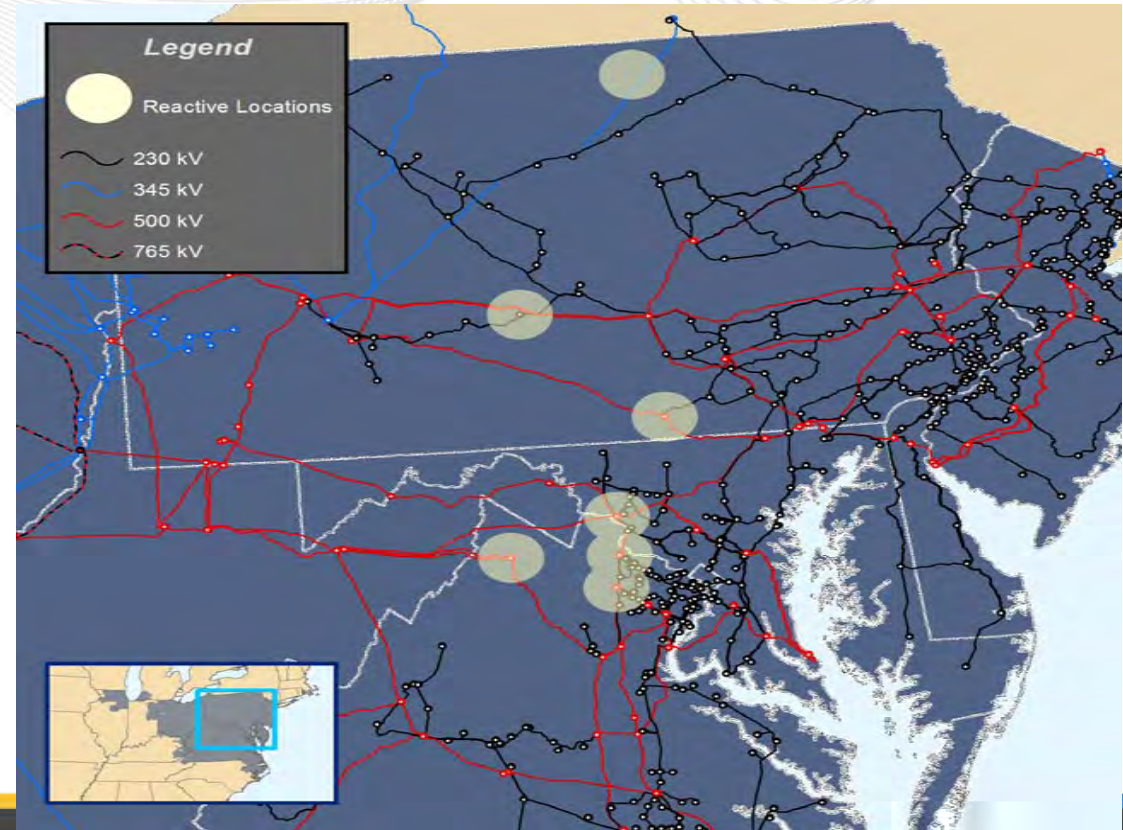
Top 25 Congestion Events			2014 Topology		2017 Topology	
Constraint Name	Area	Type	Frequency (Hours)	Market Congestion (\$ millions)	Frequency (Hours)	Market Congestion (\$ millions)
AP SOUTH L/O BED-BLA	PJM	INTERFACE	927	\$74.1	812	\$62.7
Breed 345kV to Wheatland Power Facility 345kV	M2M	LINE	4069	\$57.2	3911	\$54.0
Rantoul 138kV to Rantoul 138kV	M2M	LINE	1826	\$28.5	0	\$0.0
Crete Energy Park 345kV to St John 345kV	M2M	LINE	1518	\$26.8	1480	\$24.8
Cloverdale 765 KV 765kV to Cloverdale 345kV	AEP	Transformer	177	\$19.2	0	\$0.0
Dean H Mitchell 138kV to US Steel 138kV	M2M	LINE	2984	\$19.1	3034	\$20.4
Pawnee 345kV to Pawnee 138kV	M2M	Transformer	4020	\$18.8	3975	\$18.8
Tiltonsville 138kV to Windsor 138kV	AEP to AP	LINE	89	\$15.3	69	\$10.9
Oak Grove 161kV to Galesburg 161kV	M2M	LINE	1226	\$13.1	723	\$5.4
Danville 138kV to East Danville 138kV	AEP	LINE	868	\$12.6	2	\$0.0
Whitpain 230kV to Plymouth Meeting 230kV	PECO	LINE	21	\$12.5	27	\$10.1
Graceton 230kV to BAGLEY 230kV	BG&E	LINE	681	\$12.3	0	\$0.0
Galesburg 161kV to Galesburg 138kV	M2M	Transformer	955	\$11.7	492	\$4.4
Mickleton 230kV to Thorofare 230kV	AE to PSEG	LINE	216	\$11.0	0	\$0.0
CTYSTLTP 69kV to Darley 69kV	DP&L	LINE	730	\$9.9	672	\$9.1
Bunsonville 345kV to Eugene 345kV	M2M	LINE	1046	\$8.9	749	\$6.3
Tazewell 345kV to Tazewell 138kV	M2M	Transformer	51	\$8.2	3	\$0.1
Glenarm 115kV to Windy Edge 115kV	BG&E	LINE	758	\$7.7	0	\$0.0
Muskingum River 138kV to Wolf Creek 138kV	AEP	LINE	353	\$7.5	617	\$20.3
Pruntytown 500kV to Mt Storm 500kV	AP to DVP	500 kV	131	\$7.1	153	\$6.6
Leesville 138kV to Altavista 138kV	AEP to DVP	LINE	37	\$6.2	0	\$0.0
Palmyra 345kV to Palmyra 161kV	M2M	Transformer	316	\$5.9	317	\$4.4
Wolf Creek 138kV to Wolf Creek 138kV	AEP	Transformer	365	\$5.4	537	\$10.8
Rising 345kV to Rising 138kV	M2M	Transformer	333	\$5.4	2080	\$38.3
Osage 138kV to Collins Ferry 138kV	AP	LINE	85	\$5.4	0	\$0.0
<b>Top 25 Congestion Sub-Total:</b>				<b>\$409.8</b>		
<b>Total Congestion:</b>				<b>\$476.6</b>		
<b>Top 25% of Total Congestion</b>				<b>86.0%</b>	<b>97.7%</b>	

- **Reactive Uplift Areas**
  - BGE/PEP for AP South and Bedington – BlackOak
  - Delmarva High Voltages
  - Seneca area of PN
  - Cleveland Interface of ATSI
  
- **Related RTEP upgrades**



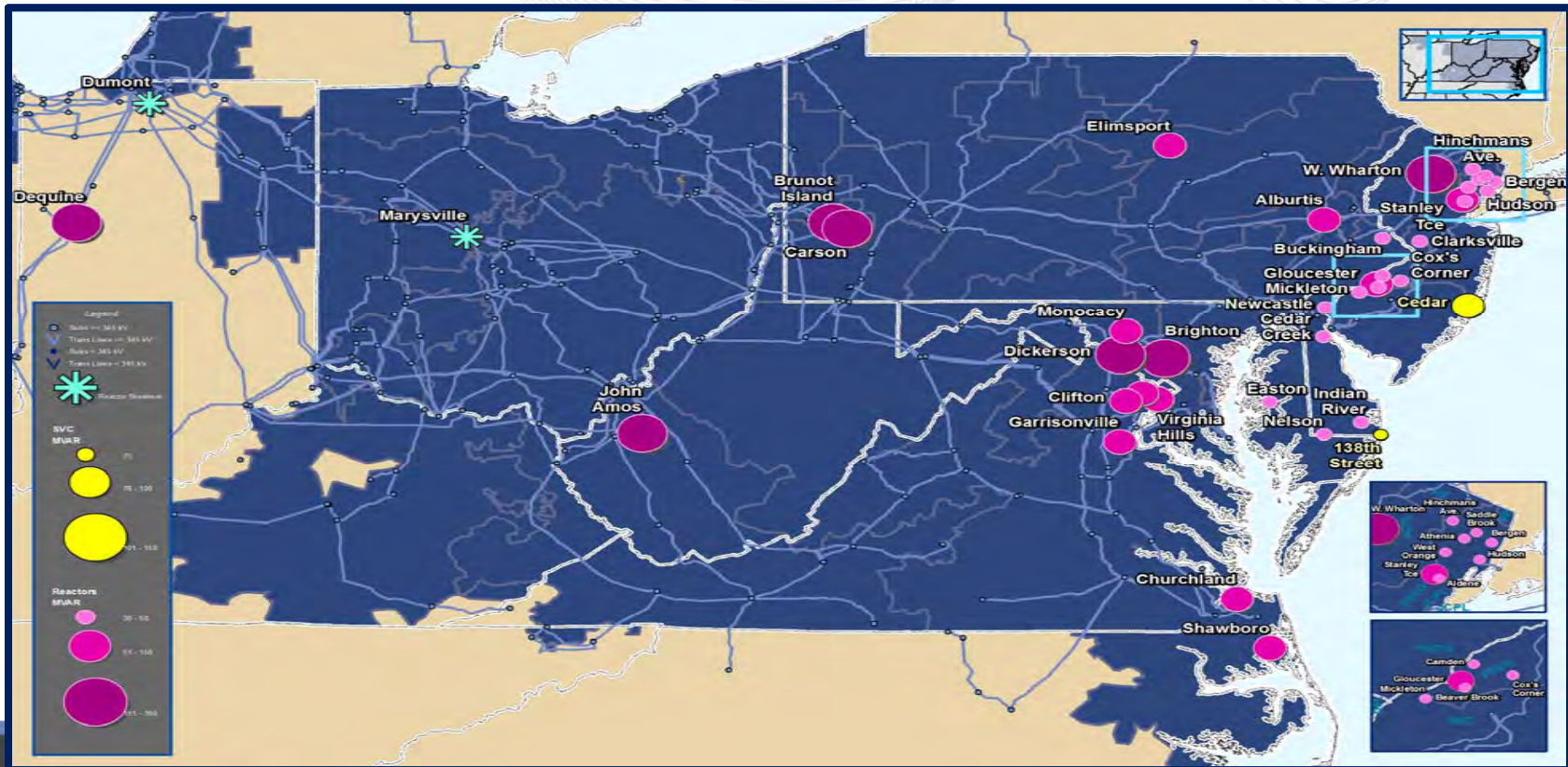
## 2011 RTEP – Significant Reactive Upgrades

- Hunterstown 500 kV
- Altoona 230 kV
- Mansfield 345 kV
- Loudoun 500 kV
- Pleasant View 500 kV
- Doubs 500 kV
- Meadow Brook 500 kV



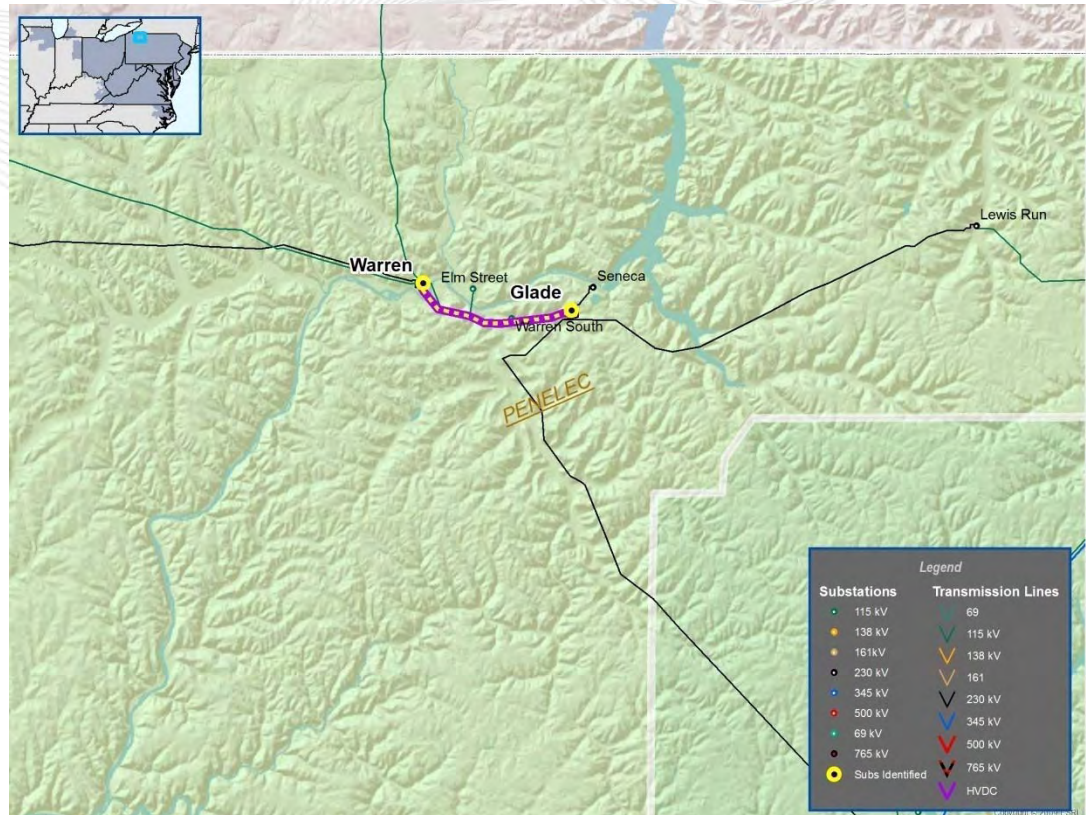


# High Voltage Solutions and Locations



# PN Transmission Zone

- Seneca pumping low voltages
- There are various low voltage magnitude and voltage drop violations in the Seneca area for various contingencies.
- Proposed Solution: Build a 2nd Glade - Warren 230 kV line (b2180).
- Cost Estimate:  
\$29.6 M
- Required IS Date: 6/1/2015.







# ATSI Transmission Zone Reinforcement

- New Cleveland LDA
- Convert Eastlake units 1, 2, 3, 4 and 5, and Lakeshore unit 18 to a synchronous condenser
- There are also a number of upgrades to address voltage issues including new 345 kV lines, new 345/138 kV substations and transformers, SVCs and capacitors

