



# Market Efficiency Update

Transmission Expansion Advisory Committee  
December 13, 2018

# 2018/19 Long Term Window

- Problem Statement and Eligible Congestion Drivers posted on the Competitive Planning Process web page (See Appendix B)
  - <https://www.pjm.com/planning/competitive-planning-process.aspx>
- Modeling data and supporting documentation posted on the Market Efficiency web page
  - <http://www.pjm.com/planning/rtep-development/market-efficiency.aspx>
- Long Term Proposal window opened on November 2<sup>nd</sup>, 2018
- Long Term Proposal window will close on March 1<sup>st</sup>, 2019
- Window Related Questions
  - Window related questions should be posted to the PJM Planning Community:  
<https://pjm.force.com/planning/s/>

- Market Efficiency Web Page located at
  - <http://www.pjm.com/planning/rtep-development/market-efficiency.aspx>
- Posted Market Efficiency Base Case (database date 11-01-2018)
  - Market Efficiency Base Case files for all study years (PROMOD 11.1.13 XML format)
    - Access requires CEII confirmation (PJM and MISO)
    - Access requires PROMOD vendor (ABB) confirmation
  - Additional PROMOD modeling files: outage library (.lib), PROMOD Event file (.eve)
  - Posted PROMOD Sensitivities (see Appendix A)
  - Congestion results from posted base case (simulated years 2023 and 2026)
- Auxiliary Files
  - Benefit/Cost Evaluation Tool
  - 2018 ARR Data
  - Benchmark test case and results

- PJM finalized the reliability analysis of First Energy retirements

Unit(s)	Transmission Zone	Nameplate Capacity (MW)	Requested Deactivation Date
Eastlake 6	ATSI	24	6/1/2021
Bruce Mansfield 1-2	ATSI	1,660	2/5/2019
Bruce Mansfield 3	ATSI	830	6/1/2021
Sammis Diesel	ATSI	13	6/1/2021
Sammis 5-7	ATSI	1,491	6/1/2021

- A retooled base case will be posted to reflect these retirements and other updates as necessary

Step	Timeline
Long Term Proposal Window	November 2018 – February 2019
2018 Reevaluation Analysis	November – December 2018
Post Retooled Base Case	December 2018
Base Case Mid-Cycle Update	February – May 2019
Analysis of Proposed Solutions	March – November 2019
Final TEAC Review and Board Approval	November – December 2019



# 2018 Reevaluation Approved Market Efficiency Projects

- Applies to market efficiency projects approved during the 2014/15 and 2016/17 RTEP Windows
- Projects already in-service, under construction or with a near in-service date will not be reevaluated
- Projects must meet the B/C criterion of 1.25
- Analysis Status
  - 11 projects already in service or under construction (see slides 9 and 10 for details)
  - 6 projects completed reevaluation and passed (see slides 11 and 12 for details)
  - 1 project under review (see slide 13 for details)





# Projects In Service or Under Construction

PJM Window Project ID	Baseline#	Type	Area	Constraint	Status	Last Updated Date	Description
201415_1-2B	b2691	Upgrade	ME/PPL	Brunner Island to Yorkana 230 kV	IS	11/06/2017	Reconductor three spans limiting Brunner Island - Yorkana 230 kV line, add 1 breaker to Brunner Island switchyard, upgrade associated terminal equipment
201415_1-4J	b2698	Upgrade	AEP	Jacksons Ferry to Cloverdale 765 KV	IS	10/31/2018	Replace relays at Cloverdale and Jackson's Ferry substations
201415_1-10B	b2693	Upgrade	COMED	Wayne to South Elgin 138 kV	IS	11/01/2018	Replace L7915 B phase line trap at Wayne substation
201415_1-10D	b2728	Upgrade	COMED	Loretto to Wilton 345 kV (RPM)	IS	05/21/2018	Mitigate sag limitations on Loretto - Wilton Center 345 kV Line and replace station conductor at Wilton Center
201415_1-12A	b2689.1-3	Upgrade	DUQ	Dravosburg to West Mifflin 138 kV	IS	1: 05/02/2018 2: 10/31/2018 3: 01/22/2018	Reconductor ~7 miles of the Woodville - Peters 138 kV circuit. Reconfigure West Mifflin-USS Clairton 138 kV circuit. Upgrade terminal equipment
201415_1-13E	b2695	Upgrade	DPL	Worcester to Ocean Pines (I) 69 kV	IS	04/04/2018	Rebuild Worcester - Ocean Pine 69 kV ckt. 1
201415_1-18G	b2688.1-3	Upgrade	APS	Taneytown to Carroll 138 kV	1: UC 2,3: IS	1: 09/25/2018 2: 06/07/2018 3: 06/07/2018	Upgrade terminal equipment on the Lincoln - Carroll 115/138kV path.
201415_1-2A	b2690	Upgrade	PPL/BGE	Safe Harbor to Graceton 230 kV	UC	10/17/2018	Reconductor two spans of the Graceton - Safe Harbor 230 kV transmission line
201415_1-18I	b2696	Upgrade	APS/ATSI	Krendale to Shanor Manor 138 kV	UC	10/31/2018	Upgrade 138 kV substation equipment at Butler, Shanor Manor and Krendale substations

IS – In Service  
UC – Under Construction



# Projects In Service or Under Construction (Cont'd)

PJM Window Project ID	Baseline#	Type	Area	Constraint	Status	Last Updated Date	Description
201415_1-10J	b2692.1-2	Upgrade	COMED	Cordova to Nelson 345 kV	UC	06/01/2019	Replace station equipment at Nelson, ESS H-471 and Quad Cities Upgrade conductor ratings of Cordova - Nelson, Quad Cities - ESS H-471 and ESS H-471 - Nelson 345 kV lines and mitigating sag limitations
201617_1-3A	b2930 (RPM) AC1-223	Upgrade	COMED	E. Frankfort to University Park 345 kV	Work Completed	06/10/2021	Upgrade capacity on E. Frankfort-University Park 345kV

UC – Under Construction



# Reevaluations Completed

PJM Window Project ID	Baseline#	Type	Area	Constraint	BC Reevaluation 2018	Capital Cost (\$ million)	Reevaluation TEAC Date	Status	Projected ISD	Description
201415_1-4I	b2697.1-2	Upgrade	AEP	Fieldale to Thornton 138 kV	3.30	\$0.75	11/8/2018	EP	1: 06/01/2019 2: 12/31/2019	Mitigate violations identified by sag study to operate Fieldale-Thornton-Franklin 138 kV overhead line conductor at its max. operating temperature Replace terminal equipment at Danville and East Danville substations
201415_1-9A*	b2743.1-8, b2752.1-7	Greenfield	APS/BGE	AP-South	1.40*	\$372.23	9/13/2018	EP	11/01/2020	New double-circuit Rice – Ringgold 230 kV. New double-circuit Furnace Run - Conastone 230 kV. Reconductor Conastone – NWest 230 kV.
201415_1-11H	b2694	Upgrade	PECO	Peach Bottom 500 kV	1.76	\$9.70	11/8/2018	EP	06/01/2019	Increase ratings of Peach Bottom 500/230 kV transformer
Optimal Caps	b2729	Upgrade	DOM	AP-South	2.51	\$8.98	11/8/2018	EP	12/01/2019	New capacitor banks at Brambleton, Ashburn, Shelhorn and Liberty substations
201617_1-5E	B2992.1-4	Upgrade	BGE	Conastone - Graceton - Bagley 230 kV	9.18	\$39.65	10/11/2018	EP	06/01/2021	Reconductor the Conastone to Graceton 230 kV 2323 & 2324 circuits Add Bundle conductor on the Graceton-Bagley-Raphael Road 2305 & 2313 230kV circuits Reconductor Raphael Road - Northeast 2315 & 2337 circuits

EP – Engineering Procurement

\* 9A Ratio updated based on Transource cost update from October 2018



# Reevaluations Completed (Cont'd)

PJM Window Project ID	Baseline#	Type	Area	Constraint	BC Reevaluation 2018	Capital Cost (\$ million)	Reevaluation TEAC Date	Status	Projected ISD	Description
201617_1A_R PM_DEOK	b2976 (RPM)	Upgrade	DEOK	Tanners Creek to Dearborn 345 kV	470.28	\$0.60	12/13/2018	EP	06/01/2021	Upgrade terminal equipment at Tanners Creek 345kV station. Upgrade 345kV Bus and Risers at Tanners Creek for the Dearborn circuit.

EP – Engineering Procurement



# Reevaluations In Progress

PJM Window Project ID	Baseline#	Type	Area	Constraint	Status	Projected ISD	Description
201617_1-3B*	b2931 (RPM)	Upgrade	COMED	Pontiac to Brokaw 345 kV	EP	06/01/2021	Upgrade substation equipment at Pontiac Midpoint station

\* Results to be presented at January 2019 TEAC.

EP – Engineering Procurement

# 2018 Acceleration Analysis

- Scope
  - Determine which Reliability upgrades, if any, have an economic benefit if accelerated or modified
- Study Years
  - 2019 and 2023 set of economic input assumptions used to study impacts of approved RTEP projects
- Process
  - Compare market congestion for near term vs. future topology
  - Estimate economic impact of accelerating planned reliability upgrades

- Finalized PROMOD modeling work for 2019 and 2023 (AS-IS topology) cases
- Completed PROMOD simulations
  - 2019 and 2023 study years with 2019 Topology (AS-IS Topology)
  - 2019 and 2023 study years with 2023 Topology (RTEP Topology)
- Compared the board approved reliability upgrades with the congestion reductions between the AS-IS and the RTEP Base cases





# Acceleration Analysis: 2019 Load, Generation and Economic Assumptions

Congestion Decreases Associated with Approved Reliability Projects – 2019 Study Year			2019 Study Year			Upgrade Associated with Congestion Reduction	ISD
			2019 Topology	2023 Topology	Congestion Savings (\$ Millions)		
Constraint Name	Area	Type	Year 2019 Congestion (\$ Millions)	Year 2019 Congestion (\$ Millions)	Congestion Savings (\$ Millions)	Upgrade Associated with Congestion Reduction	ISD
CNASTONE500-PCHBTM1S500	PJM500	Line	\$23.0	\$0.6	\$22.4	B2766: Upgrade substation equipment at Conastone & Peachbottom 500 kV	2020
01BUTLER138-01SHANOR138	APS	Line	\$4.1	\$0.0	\$4.1	B2967: Convert the existing 6 wire Butler – Shanor Manor – Krendale 138 kV line into two separate 138 kV lines	2020
05CHAPITOLH138-05CHEM 2138	AEP	Line	\$2.6	\$0.0	\$2.6	B2834: Reconductor and string open position and sixwire 6.2 miles of the Chemical – Capitol Hill 138 kV circuit	2021
05TANNER345-08M.FORT345	AEP/DEOK	Line	\$1.1	\$0.0	\$1.1	B2831: Upgrade/rebuild Tanner Creek to Miami Fort 345 kV line	2021

*Note: For a particular flowgate, the congestion savings for the 2019 study year are calculated as the difference in simulated congestion between the PROMOD case with AS-IS topology and the PROMOD case with the RTEP topology.*



# Acceleration Analysis: 2023 Load, Generation and Economic Assumptions

Congestion Decreases Associated with Approved Reliability Projects – 2023 Study Year			2023 Study Year			Upgrade Associated with Congestion Reduction	ISD
			2019 Topology	2023 Topology	Congestion Savings (\$ Millions)		
Constraint Name	Area	Type	Year 2023 Congestion (\$ Millions)	Year 2023 Congestion (\$ Millions)	Congestion Savings (\$ Millions)		
CNASTONE500-PCHBTM1S500	PJM500	Line	\$1.9	\$0.0	\$1.9	B2766: Upgrade substation equipment at Conastone & Peachbottom 500 kV	2020
01BUTLER138-01SHANOR138	APS	Line	\$2.1	\$0.0	\$2.1	B2967: Convert the existing 6 wire Butler – Shanor Manor – Krendale 138 kV line into two separate 138 kV lines	2020
05CHAPITOLH138-05CHEM 2138	AEP	Line	\$0.0	\$0.0	\$0.0	B2834: Reconductor and string open position and sixwire 6.2 miles of the Chemical – Capitol Hill 138 kV circuit	2021
05TANNER345-08M.FORT345	AEP/DEOK	Line	\$0.2	\$0.0	\$0.2	B2831: Upgrade/rebuild Tanner Creek to Miami Fort 345 kV line	2021

*Note: For a particular flowgate, the congestion savings for the 2023 study year are calculated as the difference in simulated congestion between the PROMOD case with AS-IS topology and the PROMOD case with the RTEP topology.*

- No reliability upgrades were selected for acceleration\*
  - did not provide significant congestion benefits in the acceleration analysis, or
  - ISD is in near future

*\*Update will be provided if any of facilities may be accelerated*

# Appendix A

## PROMOD Sensitivities

<b>Sensitivity</b>	<b>Range</b>
Load Sensitivity	Plus or Minus 2%
Gas Sensitivity	Plus or Minus 20% Henry Hub
No FSA Sensitivity	Remove all units with FSA or suspended ISA status

- PJM reserves right to add sensitivities as necessary

# Appendix B

## 2018/19 Window – Posted Eligible Congestion Drivers



# 2018/19 Window – Posted Eligible Congestion Drivers

2018/19 RTEP Market Efficiency Window Eligible Congestion Drivers			ME Base Case with FSA units (Annual Congestion \$million)		ME Base Case with FSA units (Hours Binding)		Comment	Potential Upgrades
Constraint	FROM AREA	TO AREA	2023 Simulated Year	2026 Simulated Year	2023 Simulated Year	2026 Simulated Year		
Hunterstown to Lincoln 115 kV	METED	METED	\$ 7.45	\$ 10.56	865	1010	Internal Flowgate	
Monroe 1&2 to Wayne 345 kV	MISOE	MISOE	\$ 4.38	\$ 9.51	148	271	M2M	
He Hubbell to Sunman Weisburg 138 kV	MISOC	MISOC	\$ 3.19	\$ 3.20	122	110	M2M	
E Frankfort (R) to Goodings (R) 345 kV	COMED	COMED	\$ 0.56	\$ 1.46	58	145	M2M	
Cumberland TR2 to Juniata Bus 1 230 kV	PLGRP	PLGRP	\$ 8.99	\$ 13.10	357	316	Internal Flowgate	
Marblehead North Bus 1 138/161	MISOC	MISOC	\$ 0.95	\$ 0.60	160	118	M2M	A PJM/MISO TMEP has been proposed for this facility
Bosserman to Trail Creek 138 kV	AEP	MISOE	\$ 7.04	\$ 9.79	265	340	M2M	

- Revision History
  - V1 – 12/10/2018 – Original Version Posted to PJM.com