



Transmission Expansion Advisory Committee (TEAC) Recommendations to the PJM Board

PJM Staff Whitepaper
Feb. 2019

For Public Use



Executive Summary

On December 5, 2018, the PJM Board of Managers approved changes to the Regional Transmission Expansion Plan (RTEP), totaling \$166.1 million, primarily to resolve baseline reliability criteria violations.

Since then, PJM has identified additional baseline reliability criteria violations and the transmission system enhancements needed to solve them, at an estimated cost of \$466.8 million. In addition, 21 previously approved baseline projects have been canceled resulting in a net cost decrease of \$309.33 million. Scope changes to existing projects will result in a net increase of \$114.45. This yields an overall RTEP net increase of \$271.92 million for which PJM is recommending Board approval. With these changes, RTEP projects will total \$38,505.16 million since the first Board approvals in 2000.

PJM seeks Board Reliability Committee consideration and full Board approval of the additional RTEP baseline projects summarized in this white paper.



February 2019 Baseline Reliability Recommendations

A key dimension of PJM's RTEP process is baseline reliability evaluation, necessary before subsequent interconnection requests can be analyzed. Baseline analysis identifies system violations to reliability criteria and standards. PJM then develops transmission system enhancements to solve identified violations and reviews them with stakeholders through the Transmission Expansion Advisory Committee (TEAC) and Subregional RTEP committees prior to recommendation to the Board. Baseline reliability transmission enhancement costs are allocated to PJM load.

Baseline Reliability Projects Summary

A summary of baseline projects with estimated costs equal to or greater than \$5 million is provided below. A complete listing of all recommended projects and their associated cost allocations is included in Attachment A (for allocation to a single zone) and Attachment B (for allocation to multiple zones). Projects with estimated costs less than \$5 million typically include transformer replacements, line reconductoring, breaker replacements, and upgrades to terminal equipment, including relay and wave trap replacements.

Deactivation Driven Enhancements

DUQ Transmission Zone:

- Reconductor the West Mifflin-Dravosburg and Dravosburg-Elrama 138 kV lines: \$5.7M
- Expand Elrama 138 kV substation to loop in the existing USS Steel Clariton-Piney Fork 138 kV line- \$8.75M

ATSI Transmission Zone:

- Reconductor the Jackson-Maple 138 kV line (4.7 miles), replace line switches at Jackson 138 kV substation and replace line traps and relays at Maple 138 kV substation: \$7.86M

Penelec Transmission Zone:

- Replace the Blairsville East 138/115 kV transformer and associated equipment, including breaker disconnects and bus conductor: \$5M
- Reconductor the Franklin Pike B-Wayne 115 kV line (6.78 miles): \$15M
- Construct 4-breaker ring bus at Geneva 115 kV: \$7M

APS Transmission Zone:

- Reconductor the Westraver-Route 51 138 kV line (5.63 miles) and replace line switches at Westraver 138 kV substation: \$7.5M
- Reconductor the Yukon-Route 51 #1 138 kV line (8 miles), replace the line drops, relays and line disconnect switch at Yukon 138 kV substation: \$10M
- Reconductor the Yukon-Route 51 #2 138 kV line (8 miles) and replace relays at Yukon 138 kV substation: \$10M
- Reconductor the Yukon-Route 51 #3 138 kV line (8 miles) and replace relays at Yukon 138 kV substation: \$10M
- Replace the Wylie Ridge #7 500/345 kV transformer: \$6.37M



FERC Form No. 715 Transmission Owner Criteria driven enhancements

Dominion Transmission Zone:

- Install a second 500-230 kV Transformer at Possum Point substation; replace 19 - 230kV breakers at Possum Point: \$40 million
- Rebuild Loudoun-Elklick 230 kV line: \$13.5 million
- Rebuild Elklick–Bull Run and Clifton–Walney 230 kV lines: \$15.5 million
- Rebuild 4.75 mile section of Lexington-Rockbridge 115 kV line: \$8 million
- Rebuild Lanexa-Northern Neck 230 kV line utilizing double circuit structures at current 230kV standards. Only one circuit is to be installed on the structures with this project with a minimum summer emergency rating of 1047 MVA: \$86 million
- Convert the overhead portion (approx. 1,500 Feet) of North Potomac Yards-Glebe 230 kV Lines to underground and convert Glebe 230 kV substation to gas insulated design: \$120 million

AEP Transmission Zone:

- Rebuild New Liberty–Findlay 34kV line structures 1 through 37 (1.5 miles); rebuild New Liberty–North Baltimore 34kV line structures 1 through 11 (0.5 miles); rebuild West Melrose–Whirlpool 34kV line structures 55 through 80 (1 mile); North Findlay substation: install one 138kV breaker and circuit switcher; Ebersole substation: Install second 138/69/34kV Transformer. Install two low side circuit breakers for transformers No. 1 and No. 2. 69kV 2000A 40kA: \$13 million
- Construct a new greenfield substation named Kewanee, to the west (~1.5 mi.) of the existing Fords Branch substation. This substation will consist of six 40kA 138 kV breakers in a ring arrangement, two 30 MVA 138/34.5 kV transformers, and two 30 MVA 138/12 kV transformers. The existing Fords Branch substation will be retired. Construct approximately 5 miles of new double circuit 138 kV line in order to loop the new Kewanee substation into the existing Beaver Creek–Cedar Creek 138 kV line. Remote end work will be required at Cedar Creek substation: \$23.3 million
- Rebuild Lakin – Racine Tap 69 kV line section (9.2 miles) to 69 kV standards: \$ 23.9 million

PJM is also recommending sixteen projects totaling \$29.9 million that include breaker replacements, line reconductoring and terminal equipment work whose individual cost estimates are less than \$5 million each.

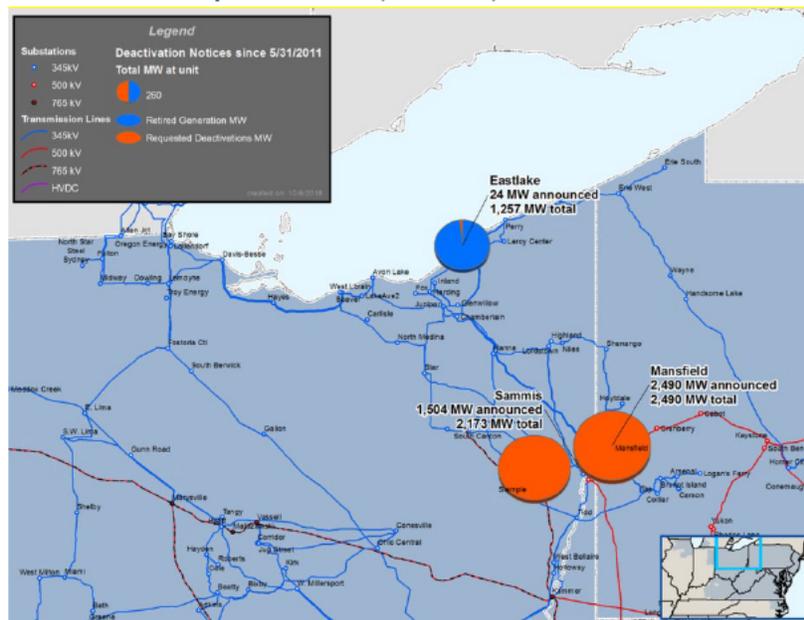
A more detailed description of the larger-scope projects that PJM is recommending to the Board is provided below: Descriptions include criteria driving project need and required in-service date.

Deactivation Analysis: Mansfield 1, 2 and 3; Eastlake 6; Sammis Diesel, Sammis 5, 6, and 7

Baseline Projects: b3061, b3062, b3063, b3064, b3065, b3066, b3067, b3068, b3069, b3070, b3071, b3072, b3073, b3074, b3075, b3076, b3077, b3078, b3079, b3080, b3081, b3082, b3083, b3084, b3085 – On August 28, 2018, PJM received the following generator deactivation notices from First Energy Nuclear, as shown on **Map 1**:

- Bruce Mansfield Units 1, 2 and 3 (ATSI) – 2490 MW – Deactivation Date = June 1, 2021
- Eastlake Unit 6 (ATSI) – 24 MW – Deactivation Date = June 1, 2021
- Sammis Diesel (ATSI) – 13 MW – Deactivation Date = June 1, 2021
- Sammis 5,6 and 7 (ATSI) – 1491 MW – Deactivation Date = June 1, 2019

Map 1: Mansfield, Eastlake, and Sammis





PJM conducted reliability analyses to identify the impacts of the announced Mansfield, Eastlake, and Sammis retirements. Based on those analyses, PJM determined the transmission system enhancements needed for the units to retire as requested without causing reliability criteria violations. Removing Mansfield, Eastlake and Sammis generation from service caused reliability criteria violations in the AEP, APS, ATSI, Duquesne and Penelec transmission zones. In particular, generator deliverability violations were identified on 500 kV, 345 kV, and 138 kV facilities in the Yukon, Elrama, Dravosburg and Route 51 areas of those zones. PJM has determined that the following baseline transmission projects solve identified impacts such that these units can retire as scheduled. PJM can implement operational measures to bridge any delays between actual retirements and transmission actual in-service dates.

Existing Baseline Project Scope Changes Driven by Deactivations

A modification to the scope of one existing RTEP baseline project – shown in **Table 1** – is required to address identified reliability violations driven by the deactivations.

Table 1: Existing Baseline Project Scope Changes Driven by Deactivations

UpgradeId	Description	TransmissionOwner	RequiredInServiceDate
b3012	Modify the scope of existing baseline project b3012 - Construct new ties from Elrama - Route 51 - to construct two separate lines on two separate sets of structures	ATSI/DLCO	6/1/2021

New Baseline Projects Driven by Deactivations

PJM recommends the new baseline projects in **Table 2** and shown on **Map 2** for inclusion in the RTEP to address identified reliability violations driven by the deactivations. The 25 new projects total \$122.24 million. The local transmission owners AEP, APS ATSI, Duquesne and Penelec, as shown above, will be designated to complete this work.



Table 2: New Baseline Projects Driven by Deactivations

Baseline Upgrade ID	Description	TransmissionOwner	RequiredInServiceDate
b3085	Reconductor Kammer - George Washington 138 kV line (~0.08 miles). Replace the wave trap at Kammer 138 kV.	AEP	6/1/2022
b3075	Replace the 500/138 kV transformer breaker and bus conductor at Cabot substation	APS	6/1/2022
b3084	Reconductor the Oakland - Panther Hollow 138 kV line	DL	6/1/2022
b3083	Replace bus conductor at Butler 138 kV and replace bus conductor and line trap at Karns City 138 kV	APS	6/1/2022
b3082	Construct 4-breaker ring bus at Geneva 115 kV	PENELEC	6/1/2022
b3081	Replace breaker and bus conductor at Krendale 138 kV	ATSI	6/1/2022
b3080	Replace bus conductor	ATSI	6/1/2022
b3079	Replace the Wylie Ridge #7 500/345 kV transformer	APS	6/1/2022
b3078	Replace the line trap, relays, bus conductor at Morgan Street 138 kV bus. Replace bus conductor at Venango Junction 138 kV.	PENELEC	6/1/2022
b3077	Reconductor the Franklin Pike B - Wayne 115 kV line (6.78 miles)	PENELEC	6/1/2022
b3076	Reconductor the Edgewater - Loyalhanna (0.67 miles) and upgrade terminals	APS	6/1/2022
b3074	Replace bus conductor at Armstrong substation	APS	6/1/2022
b3073	Replace the Blairsville East 138/115 kV transformer and associated equipment such as breaker disconnects and bus conductor	PENELEC	6/1/2022
b3072	Reconductor the Yukon - Route 51 #3 138 kV line (8 miles) and replace relays at Yukon 138 kV	APS	6/1/2022
b3071	Reconductor the Yukon - Route 51 #2 138 kV line (8 miles) and replace relays at Yukon 138 kV	APS	6/1/2022
b3070	Reconductor the Yukon - Route 51 #1 138 kV line (8 miles), replace the line drops, relays and line disconnect switch at Yukon 138 kV	APS	6/1/2022
b3069	Reconductor the Westraver - Route 51 138 kV line (5.63 miles) and replace line switches at Westraver 138 kV	APS	6/1/2022
b3068	Reconductor the Yukon - Westraver 138 kV line (2.8 miles), replace the line drops and relays at Yukon 138 kV and replace switches at Westraver 138 kV	APS	6/1/2022
b3067	Reconductor the Jackson - Maple 138 kV line (4.7 miles), replace line switches at Jackson 138 kV and replace the line traps and relays at Maple 138 kV	ATSI	6/1/2022
b3066	Reconductor the Cranberry - Jackson 138 kV line (2.1 miles), replace bus conductor at Cranberry 138 kV and replace line switches at Jackson 138 kV	ATSI	6/1/2022
b3065	Add Wilson tie breaker	DL	6/1/2022
b3064	Expand Elrama 138 kV substation to loop in the existing USS Steel Clariton - Piney Fork 138 kV line	DL	6/1/2022
b3063	Reconductor the Wilson - Dravosburg (Z-72) 138 kV line	DL	6/1/2022
b3062	Add West Mifflin 138 kV tie breaker	DL	6/1/2022
b3061	Reconductor the West Mifflin - Dravosburg (Z-73) and Dravosburg - Elrama (Z-75) 138 kV lines	DL	6/1/2022

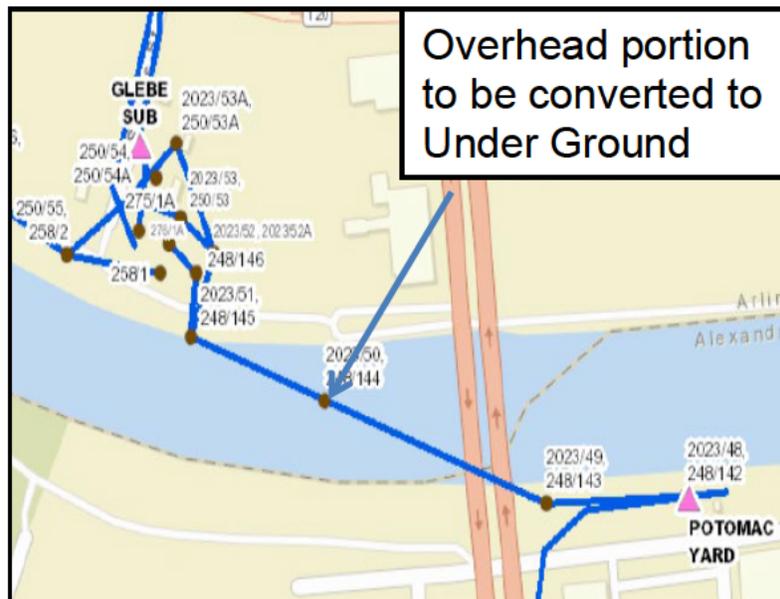
Baseline Project b3090: Potomac Yards North Special Use Permit Expiration

Dominion Transmission Zone – TO Operational Performance

The special use permit (SUP) issued by the City of Alexandria for Potomac Yards North substation will expire on January 1, 2021. The City has indicated they will not extend, nor renew, the permit, which will require the removal of the Potomac Yards North-Glebe 230 kV lines. Reliability studies indicate that doing so will cause numerous NERC criteria violations and significant load loss in the Arlington/Alexandria area.

Absent renewal of the SUP, PJM’s recommended solution – Baseline Project b3090 – is to convert the overhead portion of the Potomac Yards North-Glebe 230 kV Lines to underground and convert the Glebe substation to a gas insulated equipment. Doing so will create the additional space requirements of the two underground cable termination points and convert the existing substation to configuration into a breaker-and-a-half scheme. The estimated cost for this immediate need project is \$120 million. The local transmission owner, Dominion, will be designated to complete this work.

Map 3: Potomac Yards and Glebe Substations





Dominion Transmission Zone End-of-life 230 kV Line Rebuilds

Baseline Projects b3059, b3060, b3089

Three 230 kV lines in the Dominion Transmission zone are at a point that they violate Dominion's FERC Form No. 715 filed "End of Life Criteria", Section C.2.9 regarding age and facility condition, including towers:

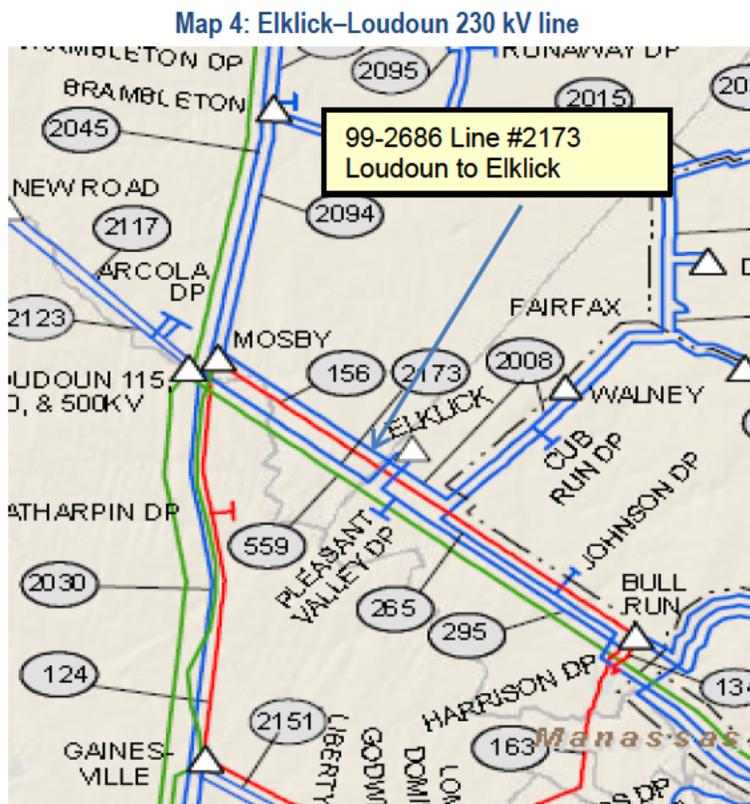
1. Loudoun-Elklick 230 kV Line
2. Elklick-Bull Run 230 kV Line
3. Lanexa-Northern Neck 230 kV line

The lines were built in the 1960s using Cor-Ten lattice and wood H-frame towers and now exhibit a number of aging issues that violate Dominion criteria.

Loudoun- to Ellick 230 kV Line

The towers on along this 4.18 miles line – shown on **Map 4** - show inherent corrosion problems, subjecting steel members to continuous deterioration. This line is part of the network feeding 100 MW of load at Ellick substation. Removing the line from service creates numerous N-1-1 thermal violations on the transmission system.

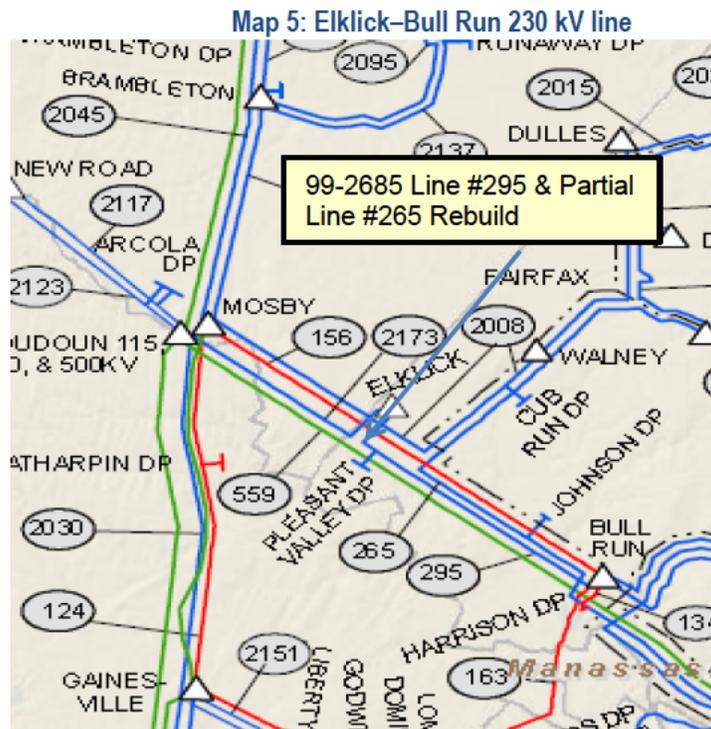
Recommended solution – Baseline Project b3059: Rebuild Loudoun–Ellick 230 kV with double circuit steel structures with a single circuit conductor at current 230kV standards with a minimum rating of 1200 MVA. This project is estimated to cost \$13.5 million. The local transmission owner, Dominion, will be designated to complete this work.



Elklick-Bull Run 230 kV Line

A 3.85 mile long section of the Clifton-Walney 230 kV line is on the same structures as the 4.64 mile long Elklick-Bull Run line, as shown on **Map 5**. show inherent corrosion problems subjecting steel members to continuous deterioration. The line must be rebuilt to solve Dominion end-of-life criteria violations. Removing these lines from service creates numerous N-1-1 thermal and voltage violations on the transmission system.

Recommended solution – Baseline Project b3060:Rebuild Elklick–Bull Run and Clifton–Walney 230 kV lines using double circuit steel structures and double circuit conductor, at current 230 kV standards, with a minimum rating of 1200 MVA. This project is estimated to cost \$15.5 million. The local transmission owner, Dominion, will be designated to complete this work.

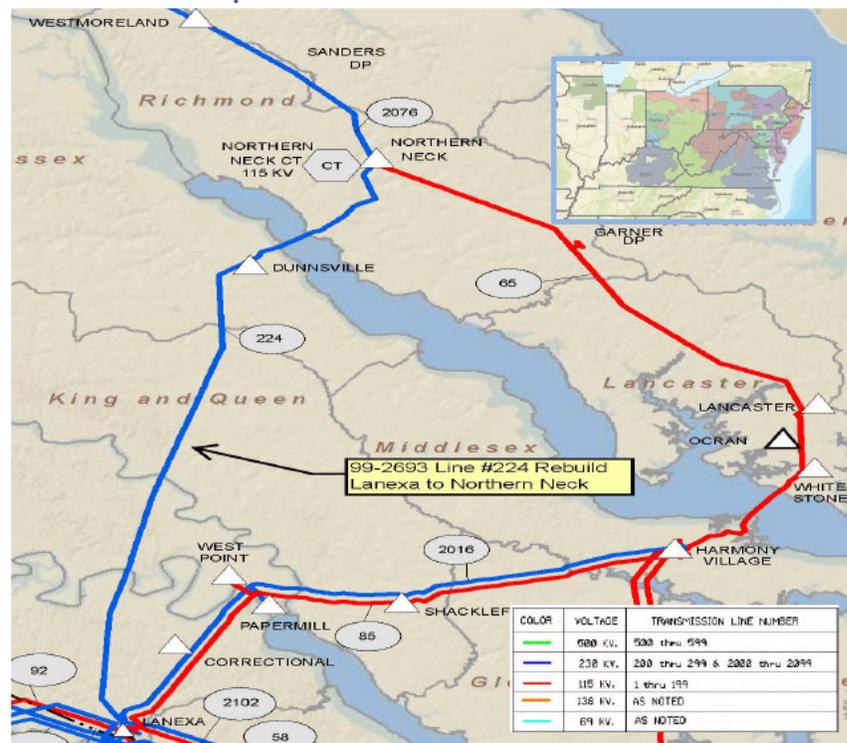


Lanexa-Northern Neck 230 kV Line

The current state of this 41 mile long line - shown on **Map 6** - violates industry guidelines: equipment life for wood structures is 35-55 years, for steel structures is 40 to 60 years, for conductor and connectors is 40-60 years, and for porcelain insulators is 50 years. The line provides network transmission service to over 7,500 customers at Dunnsville substation, including over 4,650 Co-op customers at Howerton. Removing the line causes over 300 MW load loss under N-1-1 conditions.

Recommended solution – Baseline Project b3089: Rebuild Lanexa-Northern Neck line utilizing double circuit structures to current 230kV standards, stringing only one side of the towers. This project is estimated to cost \$86 million. The local transmission owner, Dominion, will be designated to complete this work.

Map 6: Lanexa-Northern Neck 230 kV line





Changes to Previously Approved Projects

PJM recommends that the Board cancel the following projects:

- Baseline projects b2443 (Construct new underground 230kV line from Glebe to Station C.), b2443.3 (New 230kV Potomac River Substation Project (include PARs)), b2443.4 (Rebuild Glebe substation) and b2443.5 (Blue Plains substation breaker replacement) are recommended for cancellation based on the updated b2443.6 and b2443.7 projects.
- The following baseline projects are recommended for cancellation based on updated TO load projections: b2337, b2711, b2730, b2781, b2782, b2784, 2786, b2903, b2904, b2905, b2909, b2911, b2916, b2917, b2918, b2919, b2920
- Baseline project b2930 (Upgrade capacity on E. Frankford-University park 345 kV) is recommended for cancellation as the work has already been completed under network project n5950
- Baseline project b2966.1 (Reconductor the Yukon - Smithton - Shepler Hill Junction 138 kV line) is recommended for cancellation as the work was subsumed as part of baseline project b2966
- Baseline project b3015.6 (Reconductor Elrama to Mitchell 138 kV line - AP portion.) is recommended for cancellation as the work on this line is designated to DUQ and therefore combined with b3015.5

These changes yield a net RTEP decrease of \$309.33 million.

PJM is modifying the scope of the following projects:

- Baseline project b2505 (Remove Line #65 Harmony Village-Northern Neck 115 kV from the Whitestone Bridge) cost has increased from \$30M to \$103.3M based on the VA SCC ruling to underground this line
- Baseline project b2889 (Expand Cliffview substation) cost has increased from \$30M to \$37M based on updated substation design driven by space constraints at Cliffview
- Baseline project b3012 (Construct two new 138 kV tie lines with 2x 954 ACSR between Route 51 and Elrama) scope has been expanded based on Mansfield, Eastlake and Sammis deactivation.
- Baseline project b3019 (Rebuild 500kV Bristers-Chancellor 500 kV line – 21.6 miles long) scope has been expanded to include breaker nameplate updates

These changes yield a net RTEP increase of \$114.45 million.



Review by the Transmission Expansion Advisory Committee (TEAC)

Project needs and recommended solutions as discussed in this report were reviewed with stakeholders during 2018, most recently at the January 2019 TEAC and Subregional RTEP Committee meetings. Written comments were requested to be submitted to PJM to communicate any concerns with project recommendations. No comments have been received as of this white paper publication date.

Cost Allocation

Cost allocations for recommended projects are shown Attachment A (for allocation to a single zone) and Attachment B (for allocation to multiple zones).

Cost allocations were calculated in accordance with Schedule 12 of the Open Access Transmission Tariff (OATT). Baseline reliability project allocations are calculated using a distribution factor methodology that allocates cost to the load zones that contribute to the loading on the new facility. Baseline projects required exclusively to address local transmission owner FERC Form No. 715 planning criteria are allocated to the local transmission owner zone. The allocations will be filed at the FERC 30 days following approval by the Board.

Board Approval

The PJM Board Reliability Committee was requested to endorse the new baseline reliability projects and associated cost allocations and recommend to the full Board approval of the projects in this white paper to be included in PJM's RTEP. The baseline projects will be incorporated into the published RTEP after approval by the PJM Board. The RTEP will be published on PJM's website.

Attachment A - Reliability Project Single Zone Allocations

Upgrade ID	Description	Cost Estimate (\$M)	Trans Owner	Cost Responsibility	Required IS Date
b3019.1	Update the nameplate for Morrisville 500 kV breaker "H1T594" to be 50 kA	\$0.002	Dominion	Dominion	6/1/2018
b3019.2	Update the nameplate for Morrisville 500 kV breaker "H1T545" to be 50 kA	\$0.002	Dominion	Dominion	6/1/2018
b3049	Replace 345kV breaker at Joliet Substation	\$4.00	ComEd	ComEd	6/1/2020
b3055	Install spare 230/69 kV transformer at Davis Substation	\$0.54	Dominion	Dominion	6/1/2023
b3059	Rebuild Line #2173 Loudoun to Elklick	\$13.50	Dominion	Dominion	12/31/2022
b3060	Rebuild 4.6 mile Elk Lick-Bull Run 230 kV Line (#295) and the portion (3.85 miles) of the Clifton-Walney 230kV Line (#265) which shares structures with line #295	\$15.50	Dominion	Dominion	10/30/2018
b3061	Reconductor the West Mifflin - Dravosburg (Z-73) and Dravosburg - Elrama (Z-75) 138 kV lines	\$5.70	DL	DL	6/1/2021
b3062	Install 138 kV tie breaker at West Mifflin	\$4.00	DL	DL	6/1/2021
b3063	Reconductor the Wilson - Dravosburg (Z-72) 138 kV line (~5 miles)	\$4.80	DL	DL	6/1/2021
b3064	Expand Elrama 138 kV substation to loop in the existing USS Steel Clariton - Piney Fork 138 kV line	\$8.75	DL	DL	6/1/2021
b3065	Install 138 kV tie breaker at Wilson	\$4.00	DL	DL	6/1/2021
b3066	Reconductor the Cranberry - Jackson 138 kV line (2.1 miles), reconductor 138 kV bus at Cranberry and replace 138 kv line switches at Jackson	\$3.44	ATSI	ATSI	6/1/2022
b3067	Reconductor the Jackson - Maple 138 kV line (4.7 miles), replace line switches at Jackson 138 kV and replace the line traps and relays at Maple 138 kV	\$7.86	ATSI	ATSI	6/1/2022
b3068	Reconductor the Yukon - Westraver 138 kV line (2.8 miles), replace the line drops and relays at Yukon 138 kV and replace switches at Westraver 138 kV	\$2.50	APS	APS	6/1/2022
b3069	Reconductor the Westraver - Route 51 138 kV line (5.63 miles) and replace line switches at Westraver 138 kV	\$7.50	APS	APS	6/1/2022
b3070	Reconductor the Yukon - Route 51 #1 138 kV line (8 miles), replace the line drops, relays and line disconnect switch at Yukon 138 kV	\$10.00	APS	APS	6/1/2022

b3071	Reconductor the Yukon - Route 51 #2 138 kV line (8 miles) and replace relays at Yukon 138 kV	\$10.00	APS	APS	6/1/2022
b3072	Reconductor the Yukon - Route 51 #3 138 kV line (8 miles) and replace relays at Yukon 138 kV	\$10.00	APS	APS	6/1/2022
b3073	Replace the Blairsville East 138/115 kV transformer and associated equipment such as breaker disconnects and bus conductor	\$5.00	PENELEC	PENELEC	6/1/2022
b3074	Reconductor 138 kV bus at Armstrong substation	\$0.50	APS	APS	6/1/2022
b3075	Replace the 500/138 kV transformer breaker and reconductor 138 kV bus at Cabot substation	\$0.50	APS	APS	6/1/2022
b3076	Reconductor the Edgewater - Loyalhanna 138 kV line (0.67 miles)	\$2.00	APS	APS	6/1/2022
b3077	Reconductor the Franklin Pike B - Wayne 115 kV line (6.78 miles)	\$15.00	PENELEC	PENELEC	6/1/2022
b3078	Reconductor 138 kV bus and replace the line trap, relays Morgan Street. Reconductor 138 kV bus at Venango Junction	\$1.00	PENELEC	PENELEC	6/1/2022
b3080	Reconductor 138 kV bus at Seneca	\$0.07	ATSI	ATSI	6/1/2022
b3081	Replace 138 kV breaker and reconductor 138 kV bus at Krendale	\$1.00	ATSI	ATSI	6/1/2022
b3082	Construct 4-breaker 115 kV ring bus at Geneva	\$7.00	PENELEC	PENELEC	6/1/2022
b3083	Reconductor 138 kV bus at Butler and reconductor 138 kV bus and replace line trap at Karns City	\$2.00	APS	APS	6/1/2022
b3084	Reconductor the Oakland - Panther Hollow 138 kV line (~1 mile)	\$2.75	DL	DL	6/1/2021
b3085	Reconductor Kammer - George Washington 138 kV line (~0.08 miles). Replace the wave trap at Kammer 138 kV.	\$0.50	AEP	AEP	6/1/2022
b3086.1	Rebuild New Liberty – Findlay 34 kV Line structures 1 – 37 (1.5 miles), utilizing 795 26/7 ACSR conductor	\$3.40	AEP	AEP	6/1/2022
b3086.2	Rebuild New Liberty – North Baltimore 34 kV Line structures 1-11 (0.5 miles), utilizing 795 26/7 ACSR conductor	\$1.80	AEP	AEP	6/1/2022
b3086.3	Rebuild West Melrose – Whirlpool 34 kV Line structures 55- 80 (1 mile), utilizing 795 26/7 ACSR conductor	\$2.37	AEP	AEP	6/1/2022
b3086.4	North Findlay Station: Install a 138 kV 3000 A 63 kA line breaker and low side 34.5 kV 2000 A 40 kA breaker, high side 138 kV circuit switcher on T1	\$1.70	AEP	AEP	6/1/2022
b3086.5	Ebersole Station: Install second 90 MVA 138/69/34 kV transformer. Install two low side (69 kV) 2000A 40kA breakers for T1 and T2.	\$3.75	AEP	AEP	6/1/2022

b3087.1	Construct a new greenfield station to the west (~1.5 mi.) of the existing Fords Branch Station in the new Kentucky Enterprise Industrial Park. This station will consist of six 3000A 40kA 138 kV breakers laid out in a ring arrangement, two 30 MVA 138/34.5 kV transformers, and two 30 MVA 138/12 kV transformers. The existing Fords Branch Station will be retired.	\$3.40	AEP	AEP	12/1/2018
b3087.2	Construct approximately 5 miles of new double circuit 138 kV line in order to loop the new Kewanee station into the existing Beaver Creek – Cedar Creek 138 kV circuit.	\$19.90	AEP	AEP	12/1/2018
b3087.3	Remote end work will be required at Cedar Creek Station.	\$0.50	AEP	AEP	12/1/2018
b3088	Rebuild 4.75 mile section of Line #26 between Lexington and Rockbridge with a minimum summer emergency rating of 261 MVA.	\$8.00	Dominion	Dominion	6/1/2018
b3089	Rebuild 230kV Line #224 between Lanexa and Northern Neck utilizing double circuit structures to current 230kV standards. Only one circuit is to be installed on the structures with this project with a minimum summer emergency rating of 1047 MVA.	\$86.00	Dominion	Dominion	6/1/2018
b3090	Convert the overhead portion (approx. 1500 Feet) of 230 kV Lines #248 & #2023 to UG and convert Glebe substation to GIS.	\$120.00	Dominion	Dominion	1/1/2021
b2443.6	Install a second 500/230 kV transformer at Possum Point substation and replace bus work and associated equipment as needed.	\$21.00	Dominion	Dominion	6/1/2023
b2443.7	Replace 19 - 63 kA 230 kV breakers with 19 - 80 kA 230 kV breakers	\$19.00	Dominion	Dominion	6/1/2023
b3094	Move 69 kV 12.0 MVAR capacitor bank from Greenbriar to Bullitt Co 69kV substation	\$0.30	EKPC	EKPC	6/1/2018
b3095	Rebuild Lakin – Racine Tap 69 kV line section (9.2 miles) to 69 kV standards, utilizing 795 26/7 ACSR conductor	\$23.90	AEP	AEP	12/1/2022

Attachment B - Reliability Project Multi-Zone Allocations

Upgrade ID	Description	Cost Estimate (\$M)	Trans Owner	Cost Responsibility	Required IS Date
b3079	Replace the Wylie Ridge 500/345 kV transformer #7	\$6.370	APS	ATSI (72.30%) / DL (27.70%)	6/1/2022