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

PJM Staff White Paper

PJM Interconnection
February 2021

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Contents

I. Executive Summary

On December 9, 2020, the PJM Board of Managers approved changes to the Regional Transmission Expansion Plan (RTEP), totaling an overall net increase of $37.78 million, to resolve baseline reliability criteria violations and address scope changes to existing projects. The PJM Board of Managers also approved a net decrease of $573 million for network upgrades, to address new projects with signed ISAs, project scope changes and project cancellations.

Since then, PJM has identified additional baseline reliability criteria violations and the transmission system enhancements needed to solve them, at an estimated cost of $299.23 million. Scope changes to existing projects will result in a net increase of $50.61 million. This yields an overall RTEP net increase of $349.84 million, for which PJM recommended Board approval. With these changes, RTEP projects will total approximately $38,169.2 million since the first Board approvals in 2000.

PJM sought Reliability and Security Committee consideration and full Board approval of the RTEP baseline projects summarized in this white paper. On February 10, 2021, the Board approved the addition of RTEP baseline projects as well as other changes to the RTEP as summarized in this paper.

II. 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, determines the potential to improve the market efficiency and operational performance of the system, as well as incorporates any public policy requirements. 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 Committee prior to recommendation to the Board. Baseline reliability transmission enhancement costs are allocated to PJM load.

III. 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.

A. ATSI Transmission Zone

- Substation work at the Sammis 345 kV station associated with Sammis 1–4 deactivations: $15.3 million

B. APS Transmission Zone

- Reconfigure Stonewall 138 kV substation to a six-breaker breaker-and-a-half layout and add two 36 MVAR capacitors with capacitor switchers: $13.3 million

C. AEP Transmission Zone

- Rebuild and convert the existing East Leipsic-New Liberty 34.5 kV circuit to 138 kV, along with associated substation work at the McComb, East Leipsic and New Liberty stations: $34.418 million
- Rebuild approximately 8.9 miles of Newcomerstown-Salt Fork Switch 69 kV line: $15.89 million
- Rebuild Lancaster-South Lancaster, Lancaster Junction-Ralston and East Lancaster Tap-Lancaster 69 kV lines: $11.147 million
- Rebuild approximately 9 miles of the Rob Park-Harlan 69 kV line: $20.9 million
- Rebuild approximately 4 miles of existing 69 kV line between West Mount Vernon and Mount Vernon stations; Replace the West Mount Vernon 138/69 kV transformer along with existing 69 kV breaker C: $12.926 million

D. AEC Transmission Zone

- Rebuild the Corson-Court 69 kV line: $13.2 million

E. JCPL Transmission Zone

- Replace 14 Freneau overdutied 34.5 kV breakers with 63 kA-rated breakers and associated equipment: $5.7 million
- Replace seven Whippany overdutied 34.5 kV breakers with 50 kA-rated breakers and associated equipment: $8.67 million

F. PENELEC Transmission Zone

- Install a second 125 MVAR 345 kV shunt reactor and associated equipment at Pierce Brook substation: $8.08 million
- Construct a new breaker-and-a-half Warriner Pond 115 kV substation near Tiffany 115 kV substation: $23.2 million

G. Dominion Transmission Zone

- Manassas area work, including the conversion of the Liberty-Lomar and Cannon Branch-Lomar 115 kV lines to 230 kV, substation work and line extensions: $45.5 million
- Extend a new 230 kV single-circuit line with approximately 0.4 miles of new ROW between Farmwell substation and Nimbus substations: $5.7 million
- Midlothian area 300 MW load drop relief area improvements: $6.22 million

PJM also recommended projects totaling $59.081 million that include 69 kV and minor 230 kV rebuilds, capacitor bank installations/replacements, circuit breaker installations/replacements, a MOAB replacement, slow circulation implementation on an existing underground cable, reactor installations, a transformer replacement and terminal equipment replacement, whose individual cost estimates are less than $5 million.

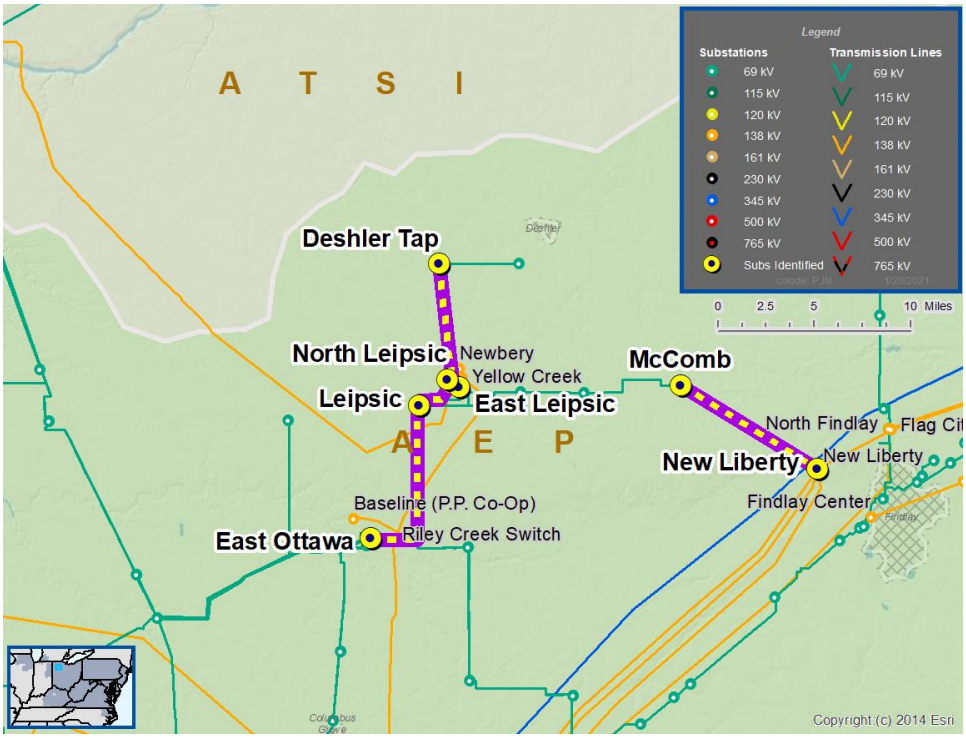
A more detailed description of the larger-scope projects that PJM recommended to the Board is provided below:

Baseline Project b3273: Leipsic Area Improvements

AEP Transmission Zone

For 2020 Window 1, the East Ottawa-Leipsic-Deshler Tap 69 kV line, East Leipsic-North Leipsic 69 kV line, East Leipsic 138/69 kV transformer, Cairo-East Lima 69 kV line and McComb OP-New Liberty 34.5 kV line are overloaded for a tower contingency and multiple N-1-1 contingency pairs. These issues were identified through AEP's FERC 715 Planning Criteria.

Map 1. Leipsic Area



The recommended solution, solicited through the competitive proposal window, is to rebuild and convert the existing 17.6-mile East Leipsic-New Liberty 34.5 kV circuit to 138 kV using 795 ACSR. The project will also convert the existing 34.5 kV equipment to 138 kV and expand the existing McComb station to the north and east to allow for new equipment to be installed, including two new 138 kV box bays to allow for line positions and two new 138/12 kV transformers. The solution will expand the existing East Leipsic station to the north to allow for another 138 kV line exit to be installed, which involves installing a new 138 kV circuit breaker, disconnect switches and new dead-end structure, along with extending the existing 138kV bus. At New Liberty station, the project will retire 34.5 kV breaker F and install one 138 kV circuit breaker, disconnect switches and line relaying potential devices to add an additional line position. In addition to resolving the identified violations from the proposal window, the project also addresses the needs reviewed with stakeholders at the March 2020 SRRTEP-West meeting for the M-3 process need number AEP-2020-OH020. The estimated cost for this project is $34.418

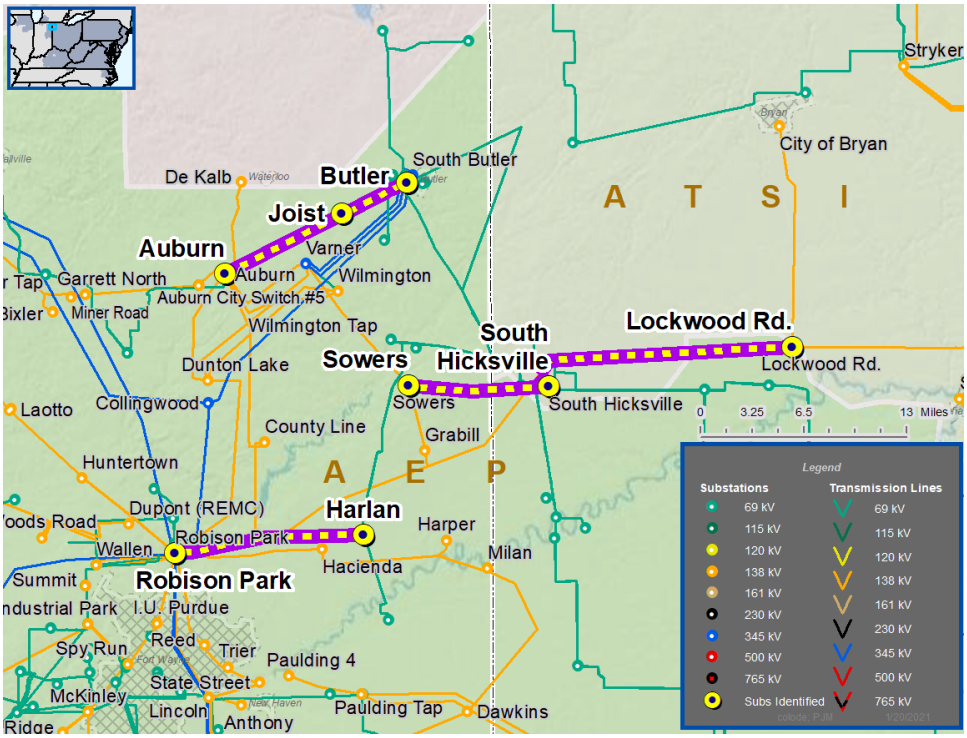
million, with a required in-service date of June 2025. The projected in-service date is January 2024, and the local transmission owner, AEP, will be designated to complete this work.

Baseline Project b3244: Rob Park-Harlan 69 kV Rebuild

AEP Transmission Zone

The Harlan-Robinson Park 69 kV line is overloaded for the N-1-1 contingency pair of the loss of Sowers-South Hicksville-Lockwood 138 kV line with South Hicksville 138/69 kV transformer and the loss of the Auburn-Joist-Butler 69 kV line. These issues were identified through AEP's FERC 715 Planning Criteria, and were excluded from the competitive proposal window through the below 200 kV exemption.

Map 2. Rob Park-Harlan 69 kV



The recommended solution is to rebuild approximately 9 miles of the Rob Park-Harlan 69 kV line. The estimated cost for this project is $20.9 million, with a required in-service date of June 2025. The projected in-service date is June 2023, and the local transmission owner, AEP, will be designated to complete this work.

Baseline Project b3246: Manassas Area Improvements

Dominion Transmission Zone

The Manassas area of northern Virginia in the Dominion territory is experiencing significant load growth due to the introduction of multiple new load locations and increases to existing load. The original introduction of new load was identified with smaller magnitudes of new load. However, subsequent increases in that new load have resulted in a magnitude of load significantly greater than was originally reviewed.

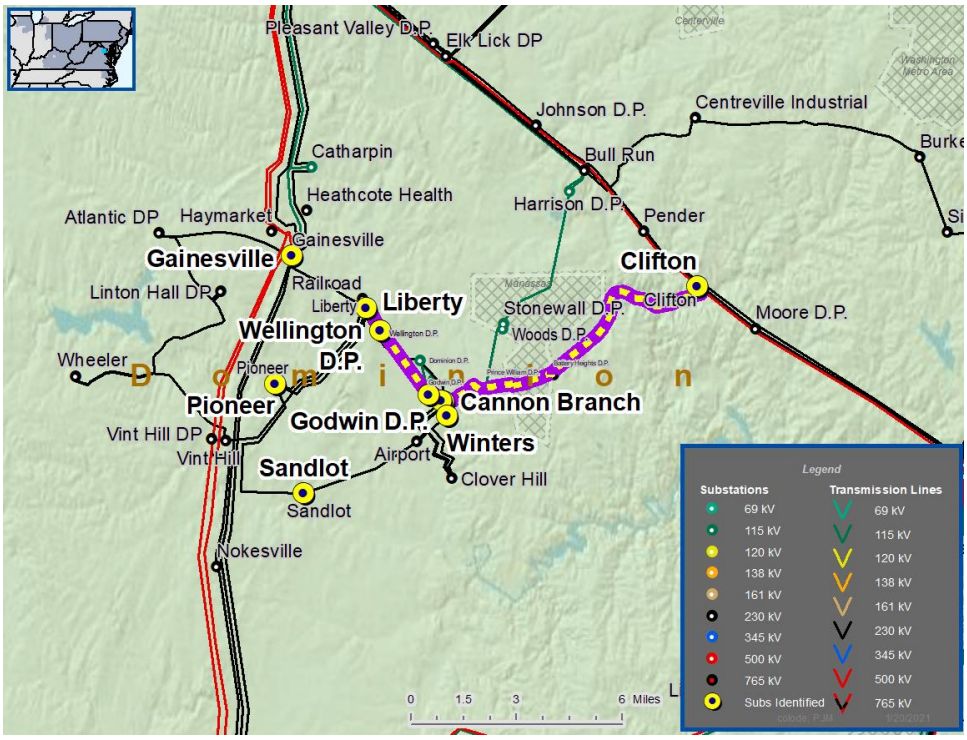
The original introduction of load in this area had commitments by customers to connect load as was studied by PJM in the do-no-harm tests. PJM and Dominion discussed with the stakeholders that there was a potential to have a significant increase in load at a later date. However, this additional load was not confirmed, during initial discussion with the customers, through the process Dominion employs to determine if new load is to be served, and how that service would be provided. Based on evolving information from the customers since the summer of 2019, the load increases in the load pocket identified in the violations discussed below and which were posted in the list of reliability violations for 2020 Window 1, are now expected to exceed 500 MW.

The results of both the winter and summer 2025 RTEP N-1-1 analysis showed that load drop violations will occur for the following contingency pairs and as a result of reverse-power relay schemes to prevent feeding the 230 kV system in the area from the 115 kV system:

- The loss of Cannon Branch-Winters Branch and Pioneer-Sandlot 230 kV lines
- The loss of Cannon Branch-Winters Branch and Cloverhill-Sandlot 230 kV lines
- The loss of Cannon Branch-Winters Branch and Liberty-Pioneer 230 kV lines
- The loss of Cannon Branch-Liberty and Liberty-Pioneer 230 kV lines

Due to the significant increase in load over the near term, and the interaction of the reverse-power relay scheme, the load drop violations are now anticipated to occur in the 2022/2023 time frame. Additionally, due to the expected arrival of future load growth in this area, integrated plans need to be considered to address the growth potential that has been evident in this area of the system. As a result, the recommended solution to address these issues was designated immediate need to address the near-term violation of dropping more than 300 MW in the 2022/2023 time frame, as well as those violations seen in 2025.

Map 3. Manassas Area



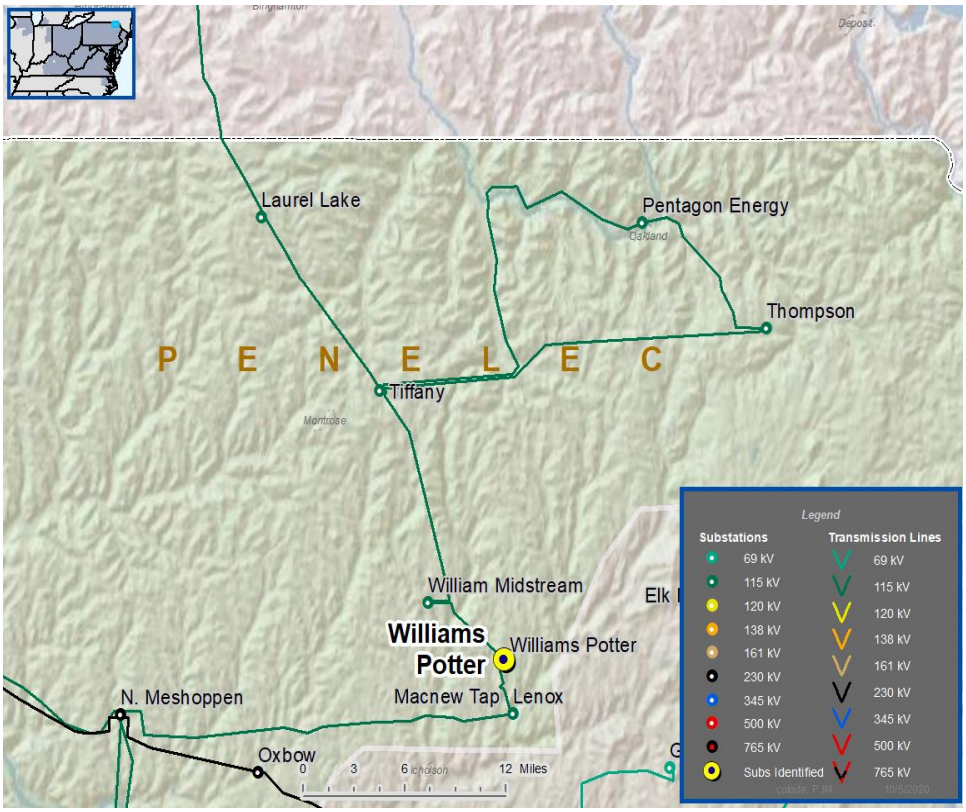
The recommended solution is to convert the Liberty-Lomar and Cannon Branch-Lomar 115 kV lines to 230 kV to provide a new 230 kV source between Cannon Branch and Liberty. A wreck and rebuild will be required on a 0.36-mile segment of the line between Lomar and Cannon Branch junction. Substation work will be required at Liberty, Wellington, Godwin, Pioneer, Sandlot, Cannon Branch, Brickyard and Winters Branch. The project will extend Cannon Branch-Clifton to Winters Branch by removing the existing line termination at Cannon Branch and extending the line to Brickyard, creating a Brickyard-Clifton line and extending a new line between Brickyard and Winters Branch. Substation work will be required at Cannon Branch, Brickyard and Winters Branch. Additionally, the overdutied Gainesville 230 kV 40 kA breaker 216192 will be replaced with a 50 kA breaker. The estimated cost for this project is $45.5 million, with a required and projected in-service date of June 2023. The local transmission owner, Dominion, will be designated to complete this work.

Baseline Project b3245: Warriner Pond 115 kV

PENELEC Transmission Zone

In the 2025 RTEP winter case, the Williams 115 kV bus has a voltage drop issue for a line fault stuck breaker contingency loss of the Williams-Tiffany-Laurel lake-Westover 115 kV circuit. These issues were excluded from the competitive proposal window through the below 200 kV exemption.

Map 4. Williams and Tiffany 115 kV Area



The recommended solution is to construct a new breaker-and-a-half Warriner Pond 115 kV substation near Tiffany substation. All transmission assets and lines will be relocated from Tiffany to the new substation. The two distribution transformers will be fed via two dedicated 115 kV feeds to the existing Tiffany substation. The estimated cost for this project is $23.2 million, with a required and projected in-service date of June 2025. The local transmission owner, PENELEC, will be designated to complete this work.

IV. Transmission Owner Criteria Projects

Of the $299.23 million of the new recommended baseline transmission system enhancements, approximately $145.83 million is driven by transmission owner planning criteria, which makes up 48.7 percent of the new project cost estimates.

V. Changes to Previously Approved Projects

The following scope/cost modifications were recommended:

- Sowers Station baseline b2779 (construction of a new 138 kV station, Sowers, tapping into the Grabill-South Hicksville 138 kV line) has undergone a scope change. The original project construction plan would have required a prolonged outage of the Collingwood 345 kV line, which is the only line that currently serves 300+ MW demand at the Steel Dynamics, Inc. (SDI) Varner station. As SDI could not afford to take a prolonged outage, the resolution would have involved building the 138 kV infrastructure before the 345 kV outages can be taken, resulting in prolonged flicker exposure to local customers. Additionally, the future expansion at SDI would risk increased flicker levels to other customers. To arrest cost increases and avoid flicker exposure, AEP is recommended modifications to the project scope in consultation with SDI. The new project configuration splits the load at SDI to serve the furnaces via the 345 kV lines from Dunton Lake and the segregated load via the 138 kV lines from Auburn and Sowers. This configuration eliminates the prolonged outage of the Collingwood 345 kV line and also improves power quality by keeping the arc furnaces on the 345 kV. Additionally, the updated configuration allows for future maintenance on any feed to SDI. The scope change has increased the total cost of the project from $107.7 million to $135 million, yielding an RTEP increase of $27.3 million. However, it is important to note that the total estimated cost for the revised scope is $29.2 million less than if the original solution was kept, which would have experienced a cost increase after undergoing a more detailed engineering cost estimate.

- Tiltonsville-Windsor 138 kV baseline b2555 (reconductor 0.5 miles of Tiltonsville-Windsor 138 kV and string the vacant side of the 4.5-mile section using 556 ACSR in a six-wire configuration) has undergone a scope change. The revised scope is to reconductor 0.3 miles of Tiltonsville-Windsor 138 kV into Tiltonsville station with 795 ACSS, and string the vacant side of the 3.8-mile middle section using 556 ACSR and operate in a six-wire configuration. The revised scope also includes rebuilding the 0.9-mile section crossing from Ohio into the Windsor station in West Virginia, using 795 ACSS. The final 0.9-mile section crossing Ohio River and into Windsor station, which are 1916-vintage structures, could not be reconductored due to the age and condition of the towers crossing the Ohio River. Additionally, there are higher expected construction access roads as the project area's terrain is very challenging, with rolling hills in the Ohio River valley. For this reason, helicopter construction methods are being explored to hopefully reduce the actual project's costs. The scope change has increased the total cost of the project from $2 million to $10.8 million, yielding an RTEP increase of $8.8 million.

- Dunn Hollow-London 46 kV baseline b2881 (rebuild approximately 1.7 miles of the Dunn Hollow-London 46 kV line section utilizing 795 26/7 ACSR conductor) has undergone a cost increase. The cost increase is due to issues identified and remediated during construction, including but not limited to: unaccounted for rock at drilling and grillage sites, access road cut and fill, matting requirements, additional tree and brush clearing and storm water pollution prevention (required due to recent change to state regulations). The additional work during construction has resulted the total cost of the project to increase from $4.5 million to $11.3 million, yielding an RTEP increase of $6.8 million.

- Chickahominy 500/230 kV baseline b3213 (install 2nd Chickahominy 500/230 kV transformer) requires additional scope. The additional scope is to replace eight Chickahominy 230kV overdutied breakers with 63 kA breakers: SC122, 205022, 209122, 210222-2, 28722, H222, 21922 and 287T2129. The scope addition has increased the total cost of the project from $22 million to $25.76 million, yielding a net RTEP increase of $3.76 million.

- Kyger Creek-Sporn 345 kV baseline b2832 (six wire the Kyger Creek-Sporn 345 kV circuits #1 and #2 and convert them to one circuit) requires additional scope. The additional scope is to replace structures outside of the station to complete the six-wire scope. While the original scope of work proposed the six-wire solution to all be done within the station, after engineering work was completed, it was determined that work would be required outside of the Kyger Creek station to replace structures to complete the six-wire scope. The scope addition has increased the total cost of the project from $0.3 million to $3 million, yielding a net RTEP increase of $2.7 million.
- Elk Garden and Lebanon 138 kV baseline b2670 (replace switches at Elk Garden and Lebanon 138 kV substations on the Elk Garden-Lebanon 138 kV circuit) has undergone a cost increase. The cost increase is due to a mobile transformer install and temporary transmission line work required to keep customers in-service from Lebanon and Elk Garden stations. Additionally, there is limited accessibility and rough terrain around the switch locations which increased construction costs. The total cost of the project has increased from $1.25 million to $4.8 million, yielding an RTEP increase of $3.55 million.
- Chesterfield-Plaza 115 kV baseline b3161 (split Chesterfield-Plaza 115 kV by rebuilding the Brown Boveri tap line as double-circuit loop in-and-out of the station) has undergone a scope change. The revised scope is to install two 2000 Amp 115 kV line switches, and extend the Reymet fence and bus to allow installation of risers to Chesterfield-Kevlar 115 kV. The scope change has decreased the total cost of the project from $5.3 million to $3 million, yielding an RTEP decrease of $2.3 million.

These changes yield a net RTEP increase of $50.61 million.

VI. Review by the Transmission Expansion Advisory Committee (TEAC)

Project needs and recommended solutions as discussed in this report were reviewed with stakeholders during 2020 and 2021, most recently at the January 2020 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.

VII. Cost Allocation

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

Cost allocations are 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. The allocations will be filed at FERC 30 days following approval by the Board.

VIII. Board Approval

The PJM Reliability and Security Committee is requested to endorse the changes to the RTEP proposed in this white paper, and recommend to the full Board for approval of the changes to existing RTEP projects as detailed in this white paper to be included in PJM's RTEP. On February 10, 2021, the Board approved the addition of RTEP baseline projects as well as other changes to the RTEP as summarized in this paper.

Attachment A – Reliability Project Single-Zone Allocations

Upgrade ID	Description	Cost Estimate ($M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b2779.6	Construct a 345 kV ring bus at Dunton Lake to serve SDI load at 345 kV via two circuits	$23.40	AEP	AEP	12/31/2021
b2779.7	Retire Collingwood 345 kV station	$1.40	AEP	AEP	12/31/2021
b3123	At Sammis 345 kV station: Install a new control building in the switchyard, construct a new station access road, install new switchyard power supply to separate from existing generating station power service, separate all communications circuits, and separate all protection and controls schemes	$15.30	ATSI	ATSI	6/1/2022
b3213.1	Replace the eight (8) Chickahominy 230kV breakers with 63kA breakers: "SC122", "205022", 209122", 210222-2", "28722", "H222", "21922", "287T2129"	$3.76	Dominion	Dominion	6/1/2023
b3222	Install one (1) 7.2 MVAR fixed cap bank on the Lock Haven-Reno 69 kV line and one (1) 7.2 MVAR fixed cap bank on the Lock Haven-Flemington 69 kV line near the Flemington 69/12kV substation.	$1.90	PPL	PPL	6/1/2025
b3224	Replace a disconnect switch and reconductor a short span of Mt. Pleasant - Middletown Tap line	$0.43	DPL	DPL	6/1/2025
b3226	Add 10 MVAR 69 kV capacitor bank at Swainton substation	$2.90	AEC	AEC	6/1/2025
b3227	Rebuild the Corson-Court 69 kV line to achieve ratings equivalent to 795 ACSR conductor or better	$13.20	AEC	AEC	6/1/2025
b3228	Replace two relays at Center Substation to increase ratings on the 110552 circuit	$0.03	BGE	BGE	6/1/2025
b3230	At Enon Substation install a second 138 kV, 28.8 MVAR nameplate, capacitor and the associated 138 kV capacitor switcher.	$1.80	APS	APS	6/1/2025

Upgrade ID	Description	Cost Estimate ($M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3231	Replace the existing No. 2 cap bank breaker at Huntingdon substation with a new breaker with higher interrupting capability.	$0.80	PENELEC	PENELEC	6/1/2025
b3232	Replace the existing Williamsburg, ALH (Hollidaysburg) and bus section breaker at the Altoona substation with a new breaker with higher interrupting capability.	$1.70	PENELEC	PENELEC	6/1/2025
b3233	Install one 34 MVAR 115 kV shunt reactor and breaker. Install one 115 kV circuit breaker to expand the substation to a 4 breaker ring bus.	$4.90	PENELEC	PENELEC	6/1/2025
b3234	Extend both the east and west 138 kV buses at Pine substation, and install one 138 kV breaker, associated disconnect switches, and one 100 MVAR reactor.	$3.80	ATSI	ATSI	6/1/2025
b3235	Extend 138 kV bus work to the west of Tangy substation for the addition of the 100 MVAR reactor bay and one 138 kV 40 kA circuit breaker.	$3.70	ATSI	ATSI	6/1/2025
b3236	Extend the 138 kV Bus by adding two new breakers and associated equipment and install a 75 MVAR Reactor	$4.50	ATSI	ATSI	6/1/2025
b3237	Install two 46 kV 6.12 MVAR capacitors effective at Mt Union.	$4.00	PENELEC	PENELEC	6/1/2025
b3238	Replace (7) overdutied 34.5 kV breakers with 50 kA rated equipment.	$8.67	JCPL	JCPL	6/1/2025
b3239	Replace (14) overdutied 34.5 kV breakers with 63 kA rated equipment.	$5.70	JCPL	JCPL	6/1/2025
b3240	Upgrade Cherry Run and Morgan terminals to make the Transmission Line the limiting component.	$0.23	APS	APS	12/1/2025

Upgrade ID	Description	Cost Estimate ($M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3241	Install 138 kV, 36 MVAR capacitor and a 5 uF reactor protected by a 138 kV capacitor switcher. Install a breaker on the 138 kV Junction terminal. Install a 138 kV 3.5 uF reactor on the existing Hardy 138 kV capacitor.	$2.85	APS	APS	6/1/2025
b3242	Reconfigure Stonewall 138 kV substation from its current configuration to a six-breaker breaker-and-a-half layout and add two 36 MVAR capacitors with capacitor switchers.	$13.30	APS	APS	6/1/2025
b3243	Replace risers at Bass 34.5kV station	$0.10	AEP	AEP	6/1/2025
b3244	Rebuild approximately 9 miles of the Rob Park - Harlan 69 kV line	$20.90	AEP	AEP	6/1/2025
b3245	Construct a new breaker-and-a-half substation near Tiffany substation. All transmission assets and lines will be relocated to the new substation. The two distribution transformers will be fed via two dedication 115 kV feeds to the existing Tiffany substation.	$23.20	PENELEC	PENELEC	6/1/2025
b3246.1	Convert 115kV Line #172 Liberty-Lomar and 115kV Line #197 Cannon Branch-Lomar to 230kV to provide a new 230kV source between Cannon Branch and Liberty. The majority of 115kV Line #172 Liberty-Lomar and Line #197 Cannon Branch-Lomar is adequate for 230kV operation. Rebuild 0.36 mile segment between Lomar and Cannon Branch junction. Lines to have a summer rating of 1047MVA/1047MVA (SN/SE)	$10.00	Dominion	Dominion	6/1/2023
b3246.2	Perform substation work for the 115kV to 230kV Line conversion at Liberty, Wellington, Godwin, Pioneer, Sandlot and Cannon Branch.	$21.00	Dominion	Dominion	6/1/2023

Upgrade ID	Description	Cost Estimate ($M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3246.3	Extend 230kV Line #2011 Cannon Branch – Clifton to Winters Branch by removing the existing Line #2011 termination at Cannon Branch and extending the line to Brickyard creating 230kV Line #2011 Brickyard-Clifton. Extend a new 230kV line between Brickyard and Winters Branch with a summer rating of 1572MVA/1572MVA (SN/SE)	$10.00	Dominion	Dominion	6/1/2023
b3246.4	Perform substation work at Cannon Branch, Brickyard and Winters Branch for the 230kV Line #2011 extension.	$4.00	Dominion	Dominion	6/1/2023
b3246.5	Replace the Gainesville 230kV 40kA breaker "216192" with a 50kA breaker.	$0.50	Dominion	Dominion	6/1/2023
b3248	Install a low side 69 kV circuit breaker at Albion 138/69 kV transformer 1	$0.40	AEP	AEP	6/1/2025
b3253	Install a 3000A 40 kA 138 kV breaker on high side of 138/69 kV transformer #5 at Millbrook Park station. The transformer and associated bus protection will be upgraded accordingly.	$0.63	AEP	AEP	6/1/2025
b3255	Upgrade 795 AAC risers at Sand Hill 138 kV station towards Cricket Switch with 1272 AAC	$0.04	AEP	AEP	6/1/2025
b3256	Upgrade 500 MCM Cu risers at Tidd 138 kV station towards Wheeling Steel; replace with 1272 AAC conductor	$0.07	AEP	AEP	6/1/2025
b3257	Replace two spans of 336.4 26/7 ACSR on Twin Branch-AM General #2 34.5 kV circuit	$0.14	AEP	AEP	6/1/2025
b3258	Install a 3000A 63 kA 138 kV breaker on high side of 138/69 kV transformer #2 at Wagenhals station. The transformer and associated bus protection will be upgraded accordingly.	$1.10	AEP	AEP	6/1/2025

Upgrade ID	Description	Cost Estimate ($M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3259	At West Millersburg station, replace the 138 kV MOAB on the West Millersburg - Wooster 138 kV line with a 3000A 40 kA breaker.	$0.68	AEP	AEP	6/1/2025
b3265	Implement slow circulation on existing underground 138 kV high pressure fluid filled (HPFF) cable between Arsenal and Riazzi substations.	$2.40	DL	DL	6/1/2025
b3266	Upgrade the metering CT associated with the Clay Village-Clay Village T 69 kV line section to increase the line ratings.	$0.03	EKPC	EKPC	12/1/2021
b3267	Rebuild the 4/0 ACSR Norwood-Shopville 69 kV line section using 556 ACSR/TW.	$3.79	EKPC	EKPC	12/1/2021
b3273.1	Rebuild and convert the existing 17.6 miles East Leipsic-New Liberty 34.5 kV circuit to 138 kV using 795 ACSR	$31.35	AEP	AEP	6/1/2025
b3273.2	Convert the existing 34.5 kV equipment to 138 kV and expanded the existing McComb station to the north and east to allow for new equipment to be installed. Install two new 138 kV box bays to allow for line positions and two new 138/12 kV transformers.	$0.87	AEP	AEP	6/1/2025
b3273.3	Expand the existing East Leipsic 138 kV station to the north to allow for another 138 kV line exit to be installed. The new line exit will involve installing a new 138 kV circuit breaker, disconnect switches and new dead end structure along with extending existing 138 kV bus work.	$1.30	AEP	AEP	6/1/2025
b3273.4	Add one 138 kV circuit breaker and disconnect switches in order to add an additional line position at New Liberty 138 kV station. Install line relaying potential devices and retire the 34.5 kV breaker F.	$0.90	AEP	AEP	6/1/2025

Upgrade ID	Description	Cost Estimate ($M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3274	Rebuild approximately 8.9 miles of 69 kV line between Newcomerstown and Salt Fork Switch with 556 ACSR conductor.	$15.89	AEP	AEP	6/1/2025
b3275.1	Rebuild Kammer Station-Cresaps Switch 69 kV, approximately 0.5 miles.	$0.93	AEP	AEP	6/1/2025
b3275.2	Rebuild Cresaps Switch-McElroy Station 69 kV, approximately 0.67 miles.	$1.25	AEP	AEP	6/1/2025
b3275.3	Replace a single span of 4/0 ACSR from Moundsville-Natrium str 93L to Carbon Tap switch 69kV located between Colombia Carbon and Conner Run stations. Remainder of line is 336 ACSR.	$0.01	AEP	AEP	6/1/2025
b3275.4	Rebuild from Colombia Carbon to Columbia Carbon Tap str 93N 69 kV, approximately 0.72 miles. The remainder of the line between Colombia Carbon Tap structure 93N and Natrium station is 336 ACSR and will remain.	$1.08	AEP	AEP	6/1/2025
b3275.5	Replace the Cresaps 69 kV 3-Way Phase-Over-Phase Switch and structure with a new 1200 A 3-Way Switch and Steel Pole.	$0.71	AEP	AEP	6/1/2025
b3275.6	Replace 477 MCM Alum bus and risers at McElroy 69 kV station.	$0.33	AEP	AEP	6/1/2025
b3275.7	Replace Natrium 138 kV bus existing between CB-BT1 and along the 138 kV Main Bus # 1 dropping to CBH1 from the 500MCM conductors to a 1272 KCM AAC conductor. Replace the dead end clamp and strain insulators.	$0.29	AEP	AEP	6/1/2025
b3276.1	Rebuild the 2/0 Copper section of the Lancaster-South Lancaster 69 kV line, approximately 2.9 miles of the 3.2 mile total length with 556 ACSR conductor. The remaining section has 336 ACSR conductor.	$5.37	AEP	AEP	6/1/2025

Upgrade ID	Description	Cost Estimate ($M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3276.2	Rebuild the 1/0 Copper section of the line between Lancaster Junction and Ralston station 69 kV, approximately 2.3 miles of the 3.1 mile total length.	$4.58	AEP	AEP	6/1/2025
b3276.3	Rebuild the 2/0 Copper portion of the line between East Lancaster Tap and Lancaster 69 kV, approximately 0.81 miles.	$1.20	AEP	AEP	6/1/2025
b3277	Replace the existing East Akron 138 kV breaker B-22 with 3000A continuous, 40 KA momentary current interrupting rating circuit breaker.	$0.55	ATSI	ATSI	6/1/2021
b3300	Reconductor 230kV Line #2172 from Brambleton to Evergreen Mills along with upgrading the line leads at Brambleton to achieve a summer emergency rating of 1574 MVA.	$2.32	Dominion	Dominion	6/1/2025
b3301	Reconductor 230kV Line #2210 from Brambleton to Evergreen Mills along with upgrading the line leads at Brambleton to achieve a summer emergency rating of 1574 MVA.	$2.26	Dominion	Dominion	6/1/2025
b3302	Reconductor 230kV Line #2213 from Cabin Run to Yardley Ridge along with upgrading the line leads at Yardley to achieve a summer emergency rating of 1574 MVA.	$1.75	Dominion	Dominion	6/1/2025
b3303.1	Extend a new single circuit 230KV line (#9250) from Farmwell Substation to Nimbus Substation.	$5.65	Dominion	Dominion	6/1/2025
b3303.2	Remove Beaumeade 230kV Line #2152 line switch.	$0.05	Dominion	Dominion	6/1/2025
b3304	Midlothian Area 300 MW Load Drop Relief Area Improvements	$6.22	Dominion	Dominion	6/1/2025
b3304.1	Cut 230kV Line #2066 at Trabue junction	$0.00	Dominion	Dominion	6/1/2025

Upgrade ID	Description	Cost Estimate ($M)	Transmission Owner	Cost Responsibility	Required In-Service Date
b3304.2	Reconductor idle 230kV Line #242 (radial from Midlothian to Trabue junction) to allow a minimum summer rating of 1047 MVA and connect to the section of 230kV Line #2066 between Trabue junction and Winterpock; re-number 230kV Line #242 structures to #2066;	$0.00	Dominion	Dominion	6/1/2025
b3304.3	Use the section of idle 115kV Line #153, between Midlothian and Trabue junction to connect to the section of (former) 230kV Line #2066 between Trabue junction and Trabue to create new Midlothian-Trabue lines with new line numbers #2218 and #2219	$0.00	Dominion	Dominion	6/1/2025
b3304.4	Create new line terminations at Midlothian for the new Midlothian-Trabue lines.	$0.00	Dominion	Dominion	6/1/2025
b3305	Replace Pumphrey 230/115kV transformer	$4.69	BGE	BGE	6/1/2025
b3306	Install a second 125 MVAR 345 kV shunt reactor and associated equipment at Pierce Brook Substation. Install a 345 kV breaker on the high side of the #1 345/230 kV transformer	$8.08	PENELEC	PENELEC	6/1/2025
b3312	Rebuild approximately 4.0 miles of existing 69 kV line between West Mount Vernon and Mount Vernon stations. Replace the existing 138/69 kV transformer at West Mount Vernon with a larger 90 MVA unit along with existing 69 kV breaker 'C'.	$12.93	AEP	AEP	6/1/2025

Attachment B – Reliability Project Multi-Zone Allocations

None