



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

PJM Staff White Paper

PJM Interconnection  
July 2022

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## I. Executive Summary

On February 16, 2022, the PJM Board of Managers approved changes to the Regional Transmission Expansion Plan (RTEP), totaling a net increase of \$515.41 million for baseline projects, to resolve baseline reliability criteria violations and address changes to existing projects.

Since then, PJM has identified additional baseline reliability criteria violations, and the transmission system enhancements needed to solve them, at an estimated cost of \$82.79 million. Scope/cost changes to an existing project will result in a net increase of \$7.7 million, and cancellation to existing projects will result in a net decrease of \$8.4 million. This yields an overall RTEP net increase of \$82.09 million, for which PJM recommended Board approval. With these changes, RTEP projects will total approximately \$39,531 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 July 13, 2022, the Board approved the addition of RTEP baseline projects as well as other changes to the RTEP as summarized in this paper.

## II. Baseline Project Recommendations

A key dimension of PJM's RTEP process is baseline reliability evaluation, which is 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, and 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 committees prior to submitting its recommendation to the Board. Baseline reliability transmission enhancement costs are allocated to PJM responsible customers.

## III. Baseline Reliability Projects Summary

A summary of baseline projects with estimated costs equal to or greater than \$10 million is provided below. A complete listing of all recommended projects and their associated cost allocations is included in Attachment A (allocations to a single zone) and Attachment B (allocations to multiple zones). Projects with estimated costs less than \$10 million typically include, by way of example, transformer replacements, line reconductoring, breaker replacements and upgrades to terminal equipment, including relay and wave trap replacements.

### A. ME Transmission Zone

- Baseline project b3715 – Allen 115 kV Area Improvements: \$17.82 million

### B. PSEG Transmission Zone

- Baseline project b3705 – Athenia 230/138 kV Transformer Replacement: \$13.04 million
- Baseline project b3704 – Lawrence 230/69 kV Transformer Replacement: \$13.36 million

PJM also recommended projects totaling \$38.57 million, which include a 230/115 kV transformer installation, a 230/138 transformer replacement, a 69 kV supply line construction, circuit breaker replacements/installations, substation work resulting from generation retirement, terminal equipment replacements/upgrades, protection-setting modifications, a capacitor bank installation, a 69 kV line section rebuild and a 69 kV supply line construction, whose individual cost estimates are less than \$10 million.

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

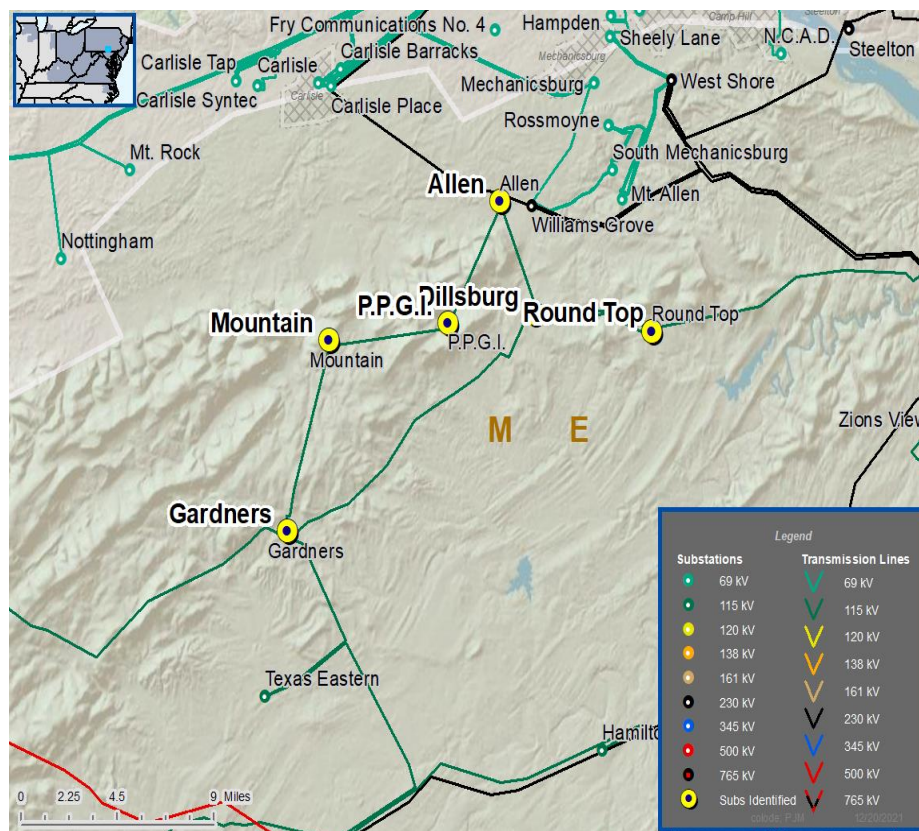
### C. Baseline Reliability Project Details

#### Baseline Project b3715: Allen 115 kV Area Improvements

##### ME Transmission Zone

In the 2026 RTEP summer case, there are voltage magnitude and voltage drop violations at several 115 kV stations in the Allen vicinity for multiple N-1 outage combinations.

Map 1. b3715: Allen 115 kV Area



The recommended solution, which was solicited through the 2021 Window 1, is to install a new 300 MVA 230/115 kV transformer at the existing PPL Williams Grove substation and construct a new 3.4 mile 115 kV single-circuit transmission line from Williams Grove to Allen substation. A new four breaker ring bus switchyard will be installed at Allen, near the existing ME Allen substation on adjacent property presently owned by FirstEnergy. The Round Top-

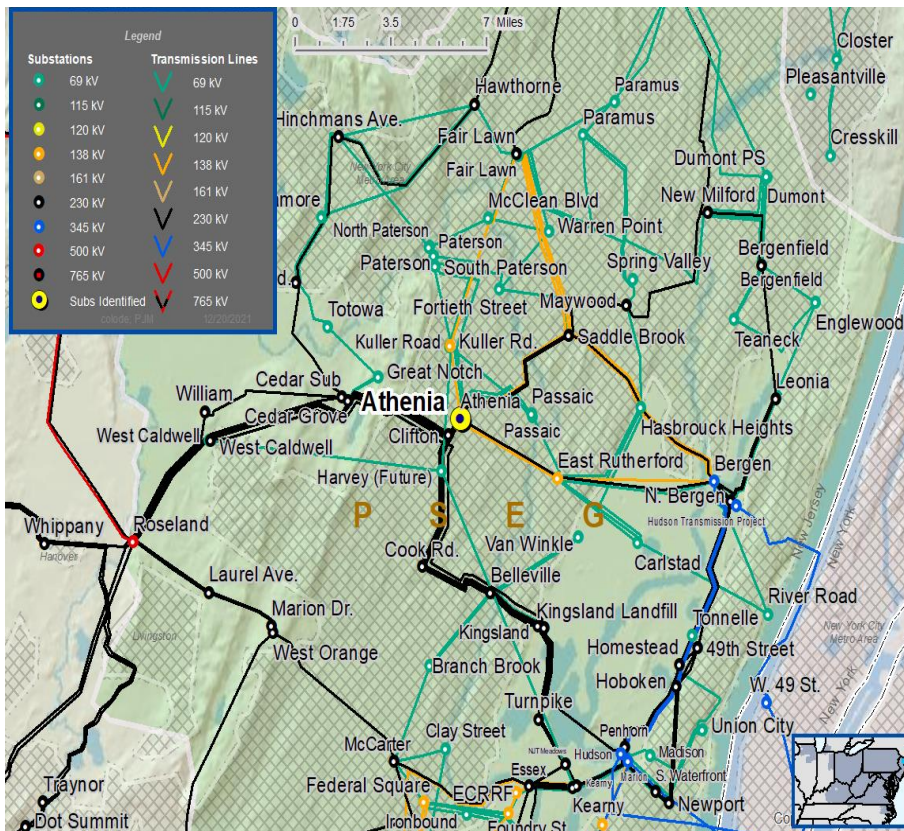
Allen and Allen-PPGI (P.P.G. Industries) 115 kV lines will terminate into the new switchyard. The estimated cost for this project is \$17.82 million, with a required and projected in-service date of June 2026. The local transmission owners, ME and PPL, will be designated to complete this work.

### Baseline Project b3705: Athena 230/138 kV Transformer Replacement

#### PSEG Transmission Zone

Per PSEG’s FERC 715 planning criteria evaluation, the Athena 230/138 kV transformer No. 220-1 was identified for replacement based on equipment performance, condition assessment and system needs. The No. 220-1 transformer at Athena has been heavily gassing for many years and has been de-gassed multiple times due to high levels of combustible gas in the main tank.

**Map 2. b3705: Athena 230/138 kV**



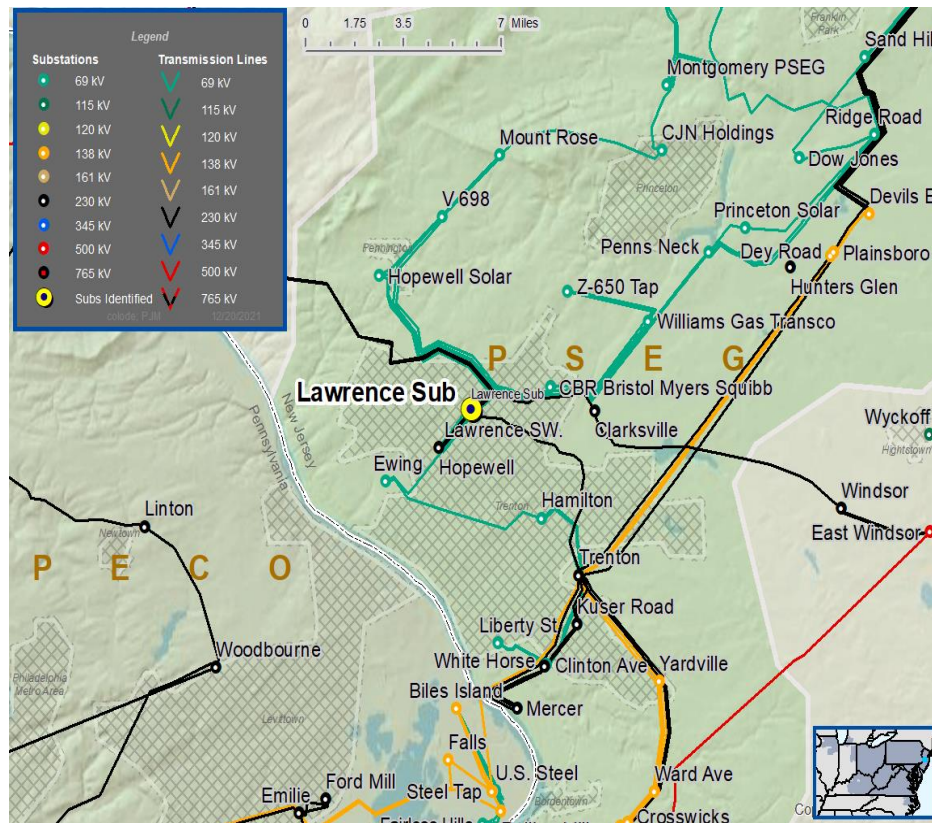
The recommended solution, which was solicited through the 2021 Window 3, is to replace the existing Athena 230/138 kV transformer No. 220-1. The estimated cost for this project is \$13.04 million, with a required and projected in-service date of June 2026. The local transmission owner, PSEG, will be designated to complete this work.

## Baseline Project b3704: Lawrence 230/69 kV Transformer Replacement

### PSEG Transmission Zone

Per PSEG’s FERC 715 planning criteria evaluation, the Lawrence 230/69 kV transformer No. 220-4 was identified for replacement based on equipment performance, condition assessment and system needs.

**Map 3. b3704: Lawrence 230/69 kV**



The recommended solution, which was solicited through the 2021 Window 3, is to replace the Lawrence switching station 230/69 kV transformer No. 220-4 and its associated circuit switchers with a new larger-capacity transformer with Load Tap Changer (LTC) and new dead tank circuit breaker. A new 230 kV gas insulated breaker, associated disconnects, overhead bus and other necessary equipment will be installed to complete the bay within the Lawrence 230 kV switchyard. The estimated cost for this project is \$13.36 million, with a required and projected in-service date of June 2026. The local transmission owner, PSEG, will be designated to complete this work.

## IV. Transmission Owner Criteria Projects

Of the \$82.79 million of new recommended baseline transmission system enhancements, approximately \$46.58 million is driven by transmission owner planning criteria, which makes up approximately 56.3% of the new project cost estimates.

## V. Changes to Previously Approved Projects

### D. Cancellations

The following cancellations were recommended:

#### JCPL Transmission Zone Atlantic 34.5 kV breakers

The following baseline projects were identified as part of the 2021 RTEP Window 1 to resolve FirstEnergy's FERC 715 Planning Criteria. Based on FirstEnergy's latest analysis, the Freneau 34.5 kV breaker BK6 associated with b3676 and the Atlantic 34.5 kV breaker J36 associated with b3674 are no longer overdutied. The latest analysis also determined that the remainder of the breakers, four Atlantic 34.5 kV breakers (BK1A, BK1B, BK3A and BK3B) and six Werner 34.5 kV breakers (E31A\_Prelim, E31B\_Prelim, V48 future, W101, M39 and U99), are driven overdutied by the b3130 project (MCRP replacement projects). As a result, the below baseline projects will be cancelled, and the remainder of the overdutied breakers will be assigned to the b3130 project scope.

- Baseline project b3674: Replace Five Atlantic 34.5 kV breakers (J36, BK1A, BK1B, BK3A and BK3B) with 63kA-rated breakers and associated equipment. The project had an estimated cost of \$3.5 million.
- Baseline project b3675: Replace Six Werner 34.5 kV breakers (E31A\_Prelim, E31B\_Prelim, V48 future, W101, M39 and U99) with 40 kA-rated breakers and associated equipment. The project had an estimated cost of \$4.2 million.
- Baseline project b3676: Replace One Freneau 34.5 kV breaker (BK6) with 63 kA-rated breakers and associated equipment. The project had an estimated cost of \$0.7 million.

This change yields a net RTEP decrease of \$8.4 million.

### E. Scope/Cost Changes

The following scope/cost modification was recommended:

#### JCPL Transmission Zone

- Baseline project b3130 (MCRP replacement projects) has undergone a scope and cost increase. FirstEnergy's latest FERC 715 Planning Criteria assessment determined that four Atlantic 34.5 kV breakers (BK1A, BK1B, BK3A and BK3B) and six Werner 34.5 kV breakers (E31A\_Prelim, E31B\_Prelim, V48 future, W101, M39 and U99) are driven overdutied due to the b3130 project. As such, the four Atlantic 34.5 kV breakers will be replaced with 63 kA breakers, and the six Werner 34.5 kV breakers will be replaced with 40 kA breakers as part of the b3130 project scope. The total cost of the project has increased from \$223 million to \$230.7 million, yielding an RTEP increase of \$7.7 million.

This change yields a net RTEP increase of \$7.7 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 2022, most recently at the June 2022 TEAC meeting. 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 recommended to the full Board for approval the changes to existing RTEP projects as detailed in this white paper to be included in PJM's RTEP. On July 13, 2022, the Board approved the addition of RTEP baseline projects as well as other changes to the RTEP as summarized in this paper. The RTEP is published annually on PJM's website.

## Attachment A – Reliability Project Single-Zone Allocations

| Upgrade ID | Description   | Cost Estimate (\$M) | Transmission Owner | Cost Responsibility | Required In-Service Date |
|------------|---|---------------------|--------------------|---------------------|--------------------------|
| b3130.11   | Replace four Atlantic 34.5 kV breakers (BK1A, BK1B, BK3A and BK3B) with 63 kA rated breakers and associated equipment.  | \$3.50              | JCPL               | JCPL                | 9/30/2023                |
| b3130.12   | Replace six Werner 34.5 kV breakers (E31A_Prelim, E31B_Prelim, V48 future, W101, M39 and U99) with 40 kA rated breakers and associated equipment.   | \$4.20              | JCPL               | JCPL                | 6/1/2024                 |
| b3350.1    | Replace overdutied 69 kV breakers C, G, I, Z, AB and JJ in place. The new 69 kV breakers to be rated at 3000 A 40 kA breakers.  | \$2.00              | AEP                | AEP                 | 6/1/2023                 |
| b3350.2    | Upgrade remote end relaying at Point Pleasant, Coalton and South Point 69 kV substations.   | \$0.00              | AEP                | AEP                 | 6/1/2023                 |
| b3354      | Replace circuit breakers '42' and '43' at Bexley station with 3000 A, 40 kA 69 kV breakers (operated at 40 kV), slab, control cables and jumpers.   | \$1.00              | AEP                | AEP                 | 6/1/2023                 |
| b3355      | Replace circuit breakers 'A' and 'B' at South Side Lima station with 1200 A, 25 kA 34.5 kV breakers, slab, control cables and jumpers.  | \$0.75              | AEP                | AEP                 | 6/1/2023                 |
| b3356      | Replace circuit breaker 'H' at West End Fostoria station with 3000 A, 40 kA 69 kV breaker, slab, control cables and jumpers.  | \$0.50              | AEP                | AEP                 | 6/1/2023                 |
| b3357      | Replace circuit breakers 'C', 'E,' and 'L' at Natrium station with 3000 A, 40 kA 69 kV breakers, slab, control cables and jumpers.  | \$1.50              | AEP                | AEP                 | 6/1/2023                 |
| b3688      | Replace the 4/0 SDCU stranded bus with 954 ACSR and a 600 A disconnect switch with a 1200 A disconnect switch on the 6716 line terminal inside Todd substation (on the Preston-Todd 69 kV circuit). | \$0.75              | DPL                | DPL                 | 6/1/2026                 |
| b3703      | Construct a third 69 kV supply line from Penns Neck substation to the West Windsor substation.  | \$1.05              | PSEG               | PSEG                | 1/1/2023                 |

| Upgrade ID | Description   | Cost Estimate (\$M) | Transmission Owner | Cost Responsibility | Required In-Service Date |
|------------|---|---------------------|--------------------|---------------------|--------------------------|
| b3704      | Replace the Lawrence switching station 230/69 kV transformer No. 220-4 and its associated circuit switchers with a new larger capacity transformer with load tap changer (LTC) and new dead tank circuit breaker. Install a new 230 kV gas insulated breaker, associated disconnects, overhead bus and other necessary equipment to complete the bay within the Lawrence 230 kV switchyard  | \$13.36             | PSEG               | PSEG                | 6/1/2026                 |
| b3705      | Replace existing 230/138 kV Athenia No. 220-1 transformer.  | \$13.04             | PSEG               | PSEG                | 6/1/2026                 |
| b3706      | Replace Fair Lawn 230/138kV transformer No. 220-1 with an existing O&M system spare at Burlington.  | \$4.45              | PSEG               | PSEG                | 6/1/2026                 |
| b3708      | Replace the Shawville 230/115/17.2 kV transformer with a new Shawville 230/115 kV transformer and associated facilities. Replace the plant's No. 2B 115/17.2 kV transformer with a larger 230/17.2 kV transformer.  | \$8.78              | PENELEC            | PENELEC             | 6/1/2026                 |
| b3709      | Rebuild the Summer Shade-West Columbia 69 kV 0.19 miles of 266 conductor double circuit to 556 conductor.   | \$0.19              | EKPC               | EKPC                | 12/1/2025                |
| b3711      | Install 345 kV bus tie 5-20 circuit breaker in the ring at Dresden station in series with existing bus tie 5-6.   | \$4.26              | ComEd              | ComEd               | 12/1/2026                |
| b3712      | Install a 28 MVAR cap bank at Liberty Junction 69 kV.   | \$0.54              | EKPC               | EKPC                | 12/1/2022                |
| b3713      | <ul style="list-style-type: none"> <li>• Disconnect and remove five 138 kV bus tie lines and associated equipment from the Avon Lake Substation to the plant (800-B Bank, 8-AV-T Generator, 5-AV-T, 6-AV-T, and 7-AV-T).</li> <li>• Disconnect and remove one 345 kV bus tie line and associated equipment from the Avon substation to the plant (Unit 9).</li> <li>• Adjust relay settings at Avon Lake, Avon and Avondale substations.</li> <li>• Removal/rerouting of fiber to the plant and install new fiber between the 345 kV and 138 kV yards for the Q4-AV-BUS relaying.</li> <li>• Remove SCADA RTU, communications and associated equipment from plant.</li> </ul> | \$2.50              | ATSI               | ATSI                | 4/28/2023                |

| Upgrade ID | Description   | Cost Estimate (\$M) | Transmission Owner | Cost Responsibility | Required In-Service Date |
|------------|---|---------------------|--------------------|---------------------|--------------------------|
| b3714      | <ul style="list-style-type: none"> <li>Replace (4) 345 kV disconnect switches (D74, D92, D93, &amp; D116) with 3000 A disconnect switches at Beaver.</li> <li>Replace dual 954 45/7 ACSR SCCIR conductors between 5" pipe and WT with new, which meets or exceeds ratings of SN: 1542 MVA, SSTE: 1878 MVA at Beaver.</li> <li>Replace 3000 SAC TL drop and 3000 SAC SCCIR between 954 ACSR and 5" bus with new, which meets or exceeds ratings of SN: 1542 MVA, SSTE: 1878 MVA at Beaver.</li> <li>Upgrade BDD relays at breaker B-88 and B-115 at Beaver.</li> <li>Relay settings changes at Hayes.</li> </ul> | \$2.10              | ATSI               | ATSI                | 6/1/2023                 |
| b3715.1    | At the existing PPL Williams Grove substation, install a new 300 MVA 230/115 kV transformer.  | \$6.30              | PPL                | ME                  | 6/1/2026                 |
| b3715.2    | Construct a new ~3.4 mile 115 kV single circuit transmission line from Williams Grove to Allen substation.  | \$5.11              | PPL                | ME                  | 6/1/2026                 |
| b3715.3    | Install a new Allen four breaker ring bus switchyard near the existing MetEd Allen substation on adjacent property presently owned by FirstEnergy. Terminate the Round Top-Allen and the Allen-PPGI (PPG Industries) 115 kV lines into the new switchyard.  | \$6.41              | ME                 | ME                  | 6/1/2026                 |
| b3716      | Construct a third 69 kV supply line from Totowa substation to the customer's substation.  | \$8.20              | PSEG               | PSEG                | 1/1/2025                 |

## **Attachment B – Reliability Project Multi-Zone Allocations**

None