Final Review and Recommendation
2021 RTEP Proposal Window 1 – Cluster No. 2

May 27, 2022

For Public Use

This page is intentionally left blank.

2021 RTEP Proposal Window No. 1 - Cluster No. 2

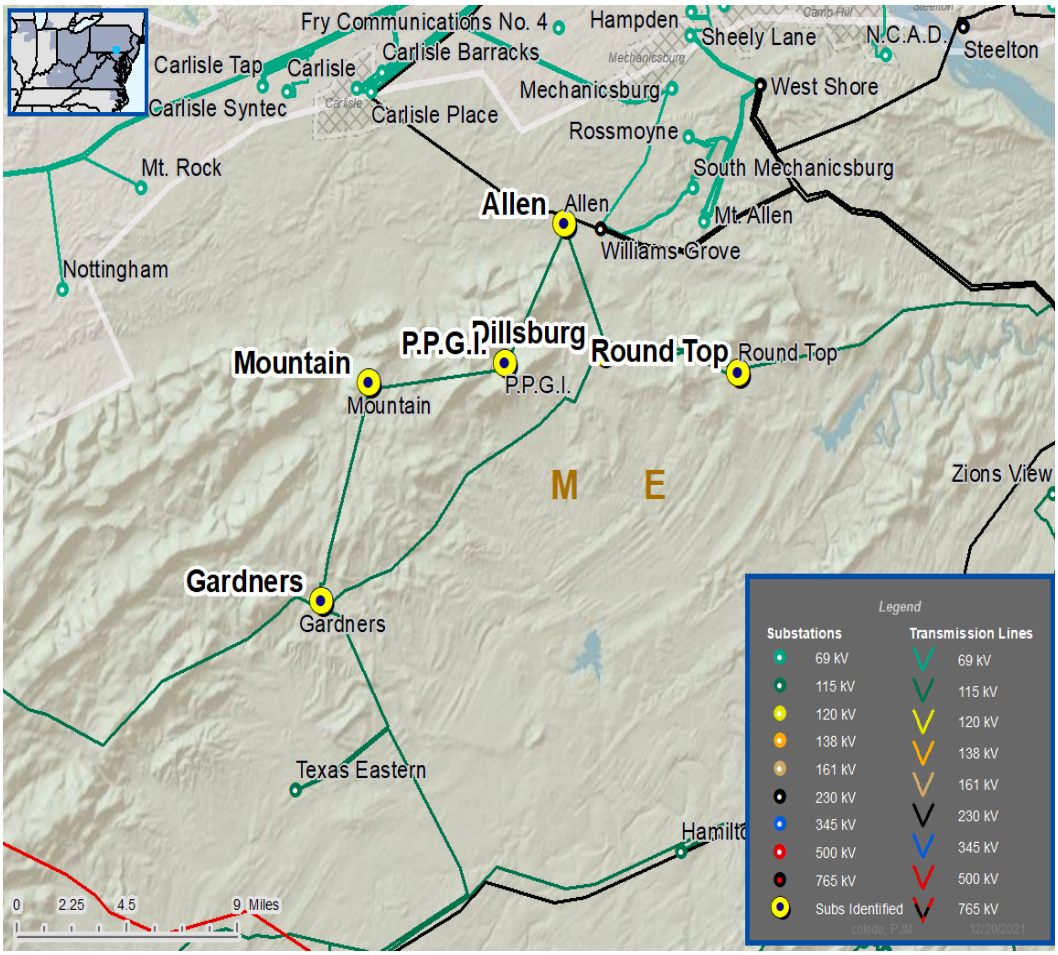
Final Review and Recommendation – Cluster No. 2 Flowgates

As part of its 2021 RTEP process cycle of studies, PJM identified clustered groups of flowgates that were put forward for proposals as part of 2021 RTEP Window No. 1. Specifically, Cluster No. 2 - discussed in this Final Review and Recommendation report - includes those flowgates listed in **Table 1**.

Table 1 - 2021 RTEP Proposal Window No. 1 – Cluster No. 2 List of Flowgates

Flowgate	kV Level	Driver
N2-SVM8, N2-SVM9, N2-SVM10, N2-SVM11, N2-SVM12, N2-SVM13, N2-SVM16, N2-SVM17, N2-SVM18, N2-SVM19, N2-SVM26, N2-SVM27, N2-SVD1, N2-SVD2, N2-SVD3, N2-SVD4, N2-SVD5, N2-SVD6, N2-SVD7, N2-SVD8, N2-SVD9, N2-SVD10, N2-SVD11, N2-SVD12, N2-SVD15, N2-SVD16	115 kV	Summer N-1-1 Voltage

Figure 1 – 2021 RTEP Proposal Window 1 – Cluster No. 2



Proposals Submitted to PJM

PJM conducted 2021 RTEP Proposal Window No. 1 for 60 days beginning July 2, 2021 and Closing August 31, 2021. During the window, four entities submitted ten proposals through PJM's Competitive Planner Tool. The proposals are summarized in **Table 2**. Publicly available redacted versions of the proposals can be found on PJM's web site: https://www.pjm.com/planning/competitive-planning-process/redacted-proposals.aspx.

Table 2 - 2021 RTEP Proposal Window No. 1 – Cluster No. 2 List of Proposals

Proposal ID#	Project Type	Project Description	Total Construction Current Year Cost M$	Cost Capping Provisions (Y/N)
292	Greenfield	The Dogwood Run project includes a new 115/230kV substation. This substation will include a 115kV 3-position ring bus and a 115/230kV transformer. The substation will connect via a short (~0.25 mile) 230kV line to a new line position at the nearby William Grove Substation. The Allen to Roundtop 115kV transmission line will be tied into the substation via an approximately 2 mile double circuit transmission line.	$15.10	Y
582	Greenfield	The Dogwood Sprint 500 kV project includes a new 500/115kV substation interconnecting the Juniata - Three Mile Island 500kV transmission line and the Allen to Roundtop 115kV transmission line. The substation will include a 500kV three-position ring bus that steps down, via a 500/115kV transformer, to a 115kV three-position ring bus.	$21.58	Y
561	Greenfield	At the existing PPL Williams Grove Substation, install a new 75 MVA 115 / 69 kV transformer and construct a new ~3.4 mile 115 kV single circuit transmission line from Williams Grove to Allen Substation. Install a new Allen four breaker ring bus Switchyard near the existing METED Allen Substation on adjacent new property to be purchased and owned by PPL. Terminate the Round Top - Allen and the Allen-PPGI 115 kV lines into the new switchyard.	$15.62	Y
992	Greenfield	At the existing PPL Williams Grove Substation, install a new 300 MVA 230/115 kV transformer. Construct a new ~3.4 mile 115 kV single circuit transmission line from Williams Grove to Allen Substation. Install a new Allen four breaker ring bus Switchyard near the existing METED Allen Substation on adjacent new property to be purchased and owned by PPL. Terminate the Round Top - Allen and the Allen-PPGI 115 kV lines into the new switchyard	$18.57	Y
386	Greenfield	Expand the existing incumbent Williams Grove 230 kV station to add a new 230/115 kV transformer. Construct a 3.7 mile greenfield 115 kV line from Williams Grove 115 kV station to Allen 115 kV station. Install (2) breakers at Williams Grove 230 kV, (1) breaker at Williams Grove 115 kV, and (1) breaker at Allen 115 kV. Also, reconductor 14.2 miles of existing Juniata - Cumberland 230kV line.	$20.25	Y
113	Greenfield	Expand the existing incumbent Williams Grove 230 kV station to add a new 230/115 kV transformer. Construct a 3.7 mile greenfield 115 kV line from Williams Grove 115 kV station to Allen115 kV station. Install (2) breakers at Williams Grove 230 kV, (1) breaker at Williams Grove 115 kV, and (1) breaker at Allen 115 kV. (hereinafter, "the Project")	$12.03	Y
789	Greenfield	Loop the PPL owned Cumberland - Williams Grove 230 kV Line into a new MAIT owned substation constructed adjacent to the line. The substation will be a three-breaker ring bus and will include a 300 MVA 230/115 kV transformer. The MAIT owned Allen 115 kV Substation is to be reconfigured into a four-breaker ring bus. A new 115 kV line (approx. 2.1 miles) is to be constructed and terminated at the new substation and the Allen Substation along the TMI-Juniata 500 kV Line corridor.	$28.54	N
477	Upgrade	Install +/- 90 MVAR STATCOM at Roundtop Substation	$32.16	N

Proposal ID#	Project Type	Project Description	Total Construction Current Year Cost M$	Cost Capping Provisions (Y/N)
457	Greenfield	At the existing PPL Williams Grove Substation, install a new 75 MVA 115 / 69 kV transformer and construct a new ~3.4 mile 115 kV single circuit transmission line from Williams Grove to Allen Substation. Install a new Allen four breaker ring bus Switchyard near the existing METED Allen Substation on adjacent new property presently owned by FE. Terminate the Round Top - Allen and the Allen-PPGI 115 kV lines into the new switchyard	$15.27	Y
99	Greenfield	At the existing PPL Williams Grove Substation, install a new 300 MVA 230/115 kV transformer. Construct a new ~3.4 mile 115 kV single circuit transmission line from Williams Grove to Allen Substation. Install a new Allen four breaker ring bus Switchyard near the existing METED Allen Substation on adjacent property presently owned by FE. Terminate the Round Top - Allen and the Allen-PPGI 115 kV lines into the new switchyard.	$17.82	Y

Final Review and Recommendation – Steps Taken

PJM completed the Final Review, and made a Recommendation from the proposals listed in **Table 2** above based on data and information provided by the project sponsors as part of their submitted proposals. PJM's review included the following assessments:

- *Initial Performance Review* – PJM evaluated whether or not the project proposals solved the required reliability criteria violation drivers posted as part of the open solicitation process.
- *Initial Planning Level Cost Review* – PJM reviewed the estimated project costs submitted by the project sponsors and any relevant cost containment mechanisms submitted as well.
- *Initial Feasibility Review* – PJM reviewed the overall proposed implementation plans to determine if the projects, as proposed, can feasibly be constructed.
- *Additional Benefits Review* – PJM reviewed information provided by the proposing entity to determine if the project, as proposed, provides additional benefits such as the elimination of other needs on the system
- *Detailed Constructability and Independent Cost Review* - PJM engaged an external consultant to perform an independent constructability and cost evaluation of three proposals from Cluster No. 2 (Proposal IDs 99, 292, and 582) that were identified from initial reviews as the most competitive solutions proposed.

Initial Review Conclusions and Next Steps

Based on PJM's evaluation of the information provided for each proposal,

- Proposals ID 561 and 457 require building a new feed to Allen 115kV from the 69 kV system and are not preferable.
- Proposal ID 113 and 386 do not provide same level of operational flexibility as the other projects
- Proposal ID 789 causes a new violation.
- Proposal ID 477 does not provide the operational flexibility a new 115 kV feed provides to the Allen area, and is the most expensive proposal.

- Proposal ID 582 proposes a connection to the 500 kV system and will require additional greenfield construction.
- Proposal ID 292 requires additional greenfield to build a new 230/115 kV substation.
- Proposal ID 99 addresses the need and provides the most operational flexibility due to the proposed Allen 115 kV expansion.
- Proposal ID 992 is similar to Proposal ID 99, but requires additional greenfield work to build a 115 V substation to expand the Allen station.

In order to ensure that PJM develops more efficient or cost effective transmission solutions to the identified regional needs, RTEP Process consideration must be given to the additional benefits a proposal window-submitted project may provide beyond those required to solve identified reliability criteria violations. As discussed in Section 1.1 and Section 1.4.2 of PJM manual 14B, Transmission Owner Attachment M-3 needs and projects must be reviewed to determine any overlap with solutions proposed to solve the violations identified as part of opening an RTEP proposal window.

A review of these proposals as part of PJM's 2021 Window No. 1 screening has identified potential benefits beyond solving identified reliability criteria violations. With the exception of proposal ID 477, all nine proposals add a third source to the Allen 115 kV substation and provide some additional operational flexibility. Proposal ID 386 provides market efficiency benefit, however the market efficiency need is already addressed separately.

Initial reviews yielded the following conclusions:

1. All ten proposals solve the identified reliability criteria violations
2. One of the proposals (proposal ID 789) creates a new reliability issue
3. Three proposals from Cluster No. 2 (Proposal IDs 99, 292, and 582) were identified as the most competitive solutions proposed. These three proposals were recommended for more detailed constructability and independent cost reviews.

Detailed Constructability and Cost Review

PJM engaged an external consultant to perform detailed constructability and cost evaluations of the three proposals from Cluster No. 2 (Proposal IDs 99, 292, and 582) that were identified from initial reviews as the most competitive solutions proposed.

Environmental, Siting, and Permitting Risks

A review of environmental, siting, and permitting risks that could impact the schedule of the projects was performed, and needs for any water encroachments, earth disturbance, FAA, utility rights-of-way and other crossings, were taken into consideration. All three projects were proposed for construction in similar areas, and were found to have

minimal impacts on wetland/endangered species and cultural resources. Proposal IDs 292 and 582 require more greenfield construction, and are ranked higher risk for siting and permitting. Notably, Proposal ID 582 appears to use First Energy right-of-way for siting the proposed Dogwood Sprint 500 kV substation, and is ranked higher risk from a siting perspective.

Project Development

The degree of detail in each proposal contributed to the determination of risks as presented. Proposal IDs 292 and 582 are ranked higher risk due to potential cost and schedule volatility, as both projects provided limited details on the substation components required, with Proposal ID 582 having the most risk due to the least amount of detail for the scope proposed. Proposal ID 99's largest risk is the relatively short time frame allotted for right-of-way acquisition for the greenfield line proposed, however this project provided the most detail for the proposed for the Allen 115 kV substation expansion.

Substation Design

Proposal IDs 292 and 582 did not account for remote end relaying and interconnection metering, and were ranked higher risk from a substation design perspective. Notably, Proposal ID 292 project omitted a high side transformer circuit breaker and associated protection, which would be required (according to PPL's interconnection standards) for connecting the proposed Dogwood Run 230/115 kV transformer to PPL's Williams Grove 230 kV substation.

Independent Cost Estimates and Cost Containment Evaluation

An independent cost estimate was determined for each of the three proposals based on the scope and descriptions provided, with the greatest variance from proposal cost estimate observed for Proposal ID 582, in part due to the low amount of detail provided relative to the proposed scope.

- Proposal ID 99 independent cost estimate (in-service year dollars) is $21.81M compared to the proposal estimate of $19.76M. Proposal ID 99 provided a capital cost cap for components that the proposing entity is responsible for constructing, and excluded those components that the incumbent transmission owner will be responsible for constructing. No other capping mechanisms were identified (ROE, Equity ratio, etc.), and no revenue requirement build-up details were provided. The total of capped component costs are $12.65M compared to a total capital cost cap of $12.65M.
    - A capital cost overrun scenario was performed assuming up to 30% increase in capital costs for the project, and the revised capital cost with the cost capping applied was $23.30M.
- Proposal ID 292 independent cost estimate (in-service year dollars) is $18.80M compared to the proposal estimate of $17.08M. Proposal ID 292 provided a capital cost cap for components that the proposing entity is responsible for constructing, and excluded those components that the incumbent transmission owner will be responsible for constructing. No other capping mechanisms were identified (ROE, Equity ratio, etc.), and no revenue requirement build-up details were provided. The total of capped component costs are $15.07M compared to a total capital cost cap of $12.65M.

    - A capital cost overrun scenario was performed assuming up to 30% increase in capital costs for the project, and the revised capital cost with the cost capping applied was $21.20M.

- Proposal ID 582 independent cost estimate (in-service year dollars) is $33.52M compared to the proposal estimate of $24.44M. Proposal ID 582 provided a capital cost cap for components that the proposing entity is responsible for constructing, and excluded those components that the incumbent transmission owner will be responsible for constructing. No other capping mechanisms were identified (ROE, Equity ratio, etc.), and no revenue requirement build-up details were provided. The total of capped component costs are $22.60M compared to a total capital cost cap of $27.30M.
    - A capital cost overrun scenario was performed assuming up to 30% increase in capital costs for the project, and the revised capital cost with the cost capping applied was $33.40M.

Based on the detailed cost reviews, it was determined that Proposal ID 292 is the least cost project of the three reviewed. All three projects performed comparably in terms of cost containment, with capital cost caps effectively applied to keep the project costs down.

A detailed summary of the results of the constructability and cost evaluations is provided in the Appendix – Figure 2.

Recommended Solution

Based on the detailed evaluations completed by PJM that reviewed reliability performance, operational flexibility, constructability, and cost for the Cluster 2 proposals, Proposal ID 99 is the recommended solution with an estimated cost of $17.82M, and a projected in-service date of 6/1/2026.

PJM presented this Recommended Solution to stakeholders at the May 10, 2022 TEAC. A final recommendation will be made to the PJM Board at its meeting scheduled for July 2022 for PJM Board review and approval.

Appendix

Figure 2 - Detailed Constructability and Cost Evaluation Summary (Risk Rankings are based on relative comparison of the projects)

PJM Proposal ID	Project Description	Proposer* Total Project Cost ($M)	Proposer* Project Cost Cap ($M)	Cost Cap Exclusions	Independent* Total Project Cost ($M)	Independent* Cost Overrun Scenario ($M)	Quality of Proposal	Proposal Completeness	Environmental & Siting / Permitting Risks	Project Development Risk	Independent Constructability Findings
292	Dogwood Run 115/230kV Transmission Project	$17.08[1]	$19.00	1. Scope of Work change 2. Uncontrollable Force 3. O&M costs 4. Capital upgrades occurring after Project is initially placed in service	$18.80	$21.20	Low	No	Medium	Medium	> Line: Uses Greenfield > Substation: Greenfield > Didn't include remote end relay and interconnection metering consideration. > Proposal Deficiency: >No High side transformer protection (breaker)
582	Dogwood Sprint 115/500kV Transmission Project	$24.44[2]	$27.30	1. Scope of Work change 2. Uncontrollable Force 3. O&M costs 4. Capital upgrades occurring after Project is initially placed in service	$33.52	$33.40	Low	Yes	Medium	High	> Line: Uses Greenfield > Substation: Greenfield > Didn't include remote end relay and interconnection metering consideration. > Project utilizes First Energy ROW for substation siting. > Least detailed proposal
99	Williams Grove - Allen 115 kV line upgrade sourced from Williams Grove 230 kV bus (FE-Allen Switchyard)	$19.76[3]	$12.65	1. Change in law. 2. Change in ISO req'ts 3. Force Majeure 4. Legal Fees & Expenses 5. Charges associated with acceleration of work before commercial ops.	$21.81	$23.30	High	Yes	Low	Low	> Line: Uses Greenfield > Substation: Upgrade Construction > Most detailed proposal and accounts for existing substation design/expansion requirements

Notes:

*All costs in In-Service Year $

1. Project 292 Capped Component Costs are $15.07M
2. Project 582 Capped Component Costs are $22.60M
3. Project 99 Capped Component Costs are $12.65M