

Generator Interconnection Affected System Study Report

PJM Interconnection Cluster AD1

Revision 2



June 8, 2022
Duke Energy Progress
Transmission Department

PURPOSE

The purpose of this study was to determine under what conditions the DEP transmission system can accommodate PJM's interconnection cluster AD1. Cluster AD1 includes generation throughout the PJM interconnection, but only those with an impact on the DEP system were included in this study. The size and in-service dates of the projects vary. The following PJM queue requests are included in this analysis:

Queue #	MW	Interconnection Substation or Transmission Line
AD1-022	120	Cashie-Trowbridge 230 kV
AD1-056/057	94	Hornertown-Hathaway 230 kV
AD1-074/075/076	484	Trowbridge 230 kV

This Revision 2 follows the PJM retooling revisions of 12/2021 – 5/2022. The PJM retooling and this DEP report assume that reconductoring of the Rocky Mount – Battleboro 115kV line is the next upgrade to address overloading of this line. The schedule and funding of this reconductor project are not yet finalized.

The PJM 115kV reconfiguration project at Hathaway and Battleboro is confirmed as the next upgrade after the reconductor to address loading on the Rocky Mount – Battleboro 115kV line. The phase shifter option for the Rocky Mount – Battleboro 115kV line is removed from this report.

This report also considers the withdrawal of PJM queue # AD1-023.

ASSUMPTIONS

The following affected system study results are from a PJM power-flow model that reflects specific conditions of the system at points in time consistent with the generator interconnection requests being evaluated. The cases include the most recent information for load, generation additions, transmission additions, interchange, and other pertinent data necessary for analysis. Future years may include transmission, generation, and interchange modifications that are not budgeted for and for which no firm commitments have been made. Further, DEP retains the right to make modifications to power-flow cases as needed if additional information is available or if specific scenarios necessitate changes. For the systems surrounding the study area, data is based on the ERAG MMWG model. The suitability of the model for use by others is the sole responsibility of the user. Prior queued generator interconnection requests were considered in this analysis.

The results of this analysis are based on the Interconnection Customer's queue requests including generation equipment data provided. If the facilities' technical data or interconnection points to the transmission system change, the results of this analysis may need to be reevaluated.

RESULTS

Power Flow Analysis Results

Facilities that may require upgrade within the first three to five years following the in-service date are identified. Based on projected load growth on the DEP transmission system, facilities of concern are those with post-contingency loadings of 95% or greater of their thermal rating and low voltage of 0.92 pu and below, for the requested in-service year. The identification of these facilities is crucial due to the construction lead times necessary for certain system upgrades. This process will ensure that appropriate focus is given to these problem areas to investigate whether construction of upgrade projects is achievable to accommodate the requested interconnection service.

Contingency analysis study results show that interconnection of these generation facilities result in the following thermal issues on the DEP system. Based on study results for 2021 summer, Table 1 shows thermal facility loadings:

Table 1: Power Flow Results

Overloaded Transmission Facility	Loading %	Contingency
Rocky Mount – Battleboro (DVP) 115kV line, 164 MVA	239.31	DVP_P7-1: LN 2058-2181: Rocky Mount-Hathaway (DVP) 230kV East and West lines Common Tower Outage
Greenville – Everetts (DVP) 230kV line, 478 MVA (DEP: 485 MVA)	118.77 (117.06)*	DVP_P7-1: LN 2058-2181: Rocky Mount-Hathaway (DVP) 230kV East and West lines Common Tower Outage

* DEP requires upgrades for loadings above 95%

Interconnection requests contributing to the overloaded facilities are shown in Table 2.

Table 2: Upgrades and Contributing Requests

Overloaded Transmission Facility	Contributing Requests	Upgrade Description	Upgrade Cost	Time to Complete (months)
Rocky Mount – Battleboro (DVP) 115kV line	AD1-022 AD1-056/057	Reconductor 8.54 miles	\$31 M	30
Rocky Mount – Battleboro (DVP) 115kV line	AD1-022 AD1-056/057	PJM project to reconfigure 115kV lines	-	-
Greenville – Everetts (DVP) 230kV line	AD1-022 AD1-056/057 AD1-074/075/076	Rebuild 1.87 miles of aging double circuit 230kV towers, ISD 6/1/2027	\$19 M*	36*
Greenville – Everetts (DVP) 230kV line	AD1-022 AD1-056/057 AD1-074/075/076	Reconductor 1.87 miles of one side of double circuit 230kV line plus terminal equipment	\$0.35 M*	36*

* Transmission Planning or Class 5 estimates

The DEP portion of the Greenville-Everetts 230kV line (1.87 miles) is tentatively scheduled to be rebuilt by 6/1/2027 due to age and condition, but that in-service date is subject to change depending upon DEP's construction sequencing priorities for its transmission plan. Reconductoring the line to higher capacity can only be performed during or after the condition-based rebuild. If a generator developer would like an earlier or firm in-service date, the Interconnection Customer would be responsible for paying expediting costs of the rebuild, plus the larger conductor cost.

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SUMMARY

This Generator Interconnection Affected System Study assessed the impact on the Duke Energy Progress system of new generation facilities interconnecting to the Dominion transmission system as part of the PJM AD1 cluster. Power flow analysis found overloading issues that must be mitigated. Required upgrades and assigned costs are listed below.

AD1-022 Assigned and Contingent Upgrades		Assigned Cost
Reconductor Rocky Mount-Battleboro 115kV line		\$0
PJM project to reconfigure 115kV lines at Hathaway and Battleboro		-
Rebuild aging towers including Greenville-Everetts 230kV line		\$0
Reconductor Greenville-Everetts 230kV line (DEP portion)		\$350,000
Total for AD1-022		\$350,000

AD1-056/057 Assigned and Contingent Upgrades		Assigned Cost
Reconductor Rocky Mount-Battleboro 115kV line		\$0
PJM project to reconfigure 115kV lines at Hathaway and Battleboro		-
Rebuild aging towers including Greenville-Everetts 230kV line		\$0
Reconductor Greenville-Everetts 230kV line (DEP portion)		\$0
Total for AD1-056/057		\$0

AD1-074/075/076 Assigned and Contingent Upgrades		Assigned Cost
Rebuild aging towers including Greenville-Everetts 230kV line		\$0
Reconductor Greenville-Everetts 230kV line		\$0
Total for AD1-074/075/076		\$0

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