PJM Generator Interconnection Request
Queue AB2-101
George Washington 138 kV
Feasibility Study Report

December 2016

Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

The Interconnection Customer (IC) proposes to increase the generation of its previously proposed PJM queue positions by 31 MW connecting to the George Washington 138 kV substation in Moundsville, WV.

The requested Backfeed date is March 1, 2018.

The requested in-service date is April 1, 2019.

The objective of this Feasibility study is to determine budgetary cost estimates and approximate construction timelines for identified transmission facilities required to connect the proposed generating facilities to the AEP transmission system. These reinforcements include the Attachment Facilities, Local Upgrades, and Network Upgrades required to maintain the reliability of the AEP transmission system. Stability analysis is not included as part of this study.

Attachment Facilities

PJM project Y3-068 will pay for the necessary direct connection worked required at the George Washington 138 kV substation. No additional attachment facilities are required to accommodate the additional output associated with the AB2-101 request.

Local and Network Impacts

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet performance parameters prescribed in the AEP FERC Form 715[1] and Connection Requirements for AEP Transmission System[2]. Therefore, these criteria were used to assess the impact of the proposed facility on the AEP System. The Queue Project AB2-101 was evaluated as a 31.0 MW (Capacity 31.0 MW) as an uprate to the Y3-068 project at the George Washington 138kV substation in the AEP area. Project AB2-101 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB2-101 was studied with a commercial probability of 53%.

1 https://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/GuideLines/AEP_East_FERC_715_2016_Final_Part_4.pdf

2 https://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/Requirements/AEP_Interconnection_Requirements_rev1.pdf

Network Impacts

The Queue Project AB2-101 was evaluated as a 31.0 MW (Capacity 31.0 MW) as an uprate to the Y3-068 project at the George Washington 138kV substation in the AEP area. Project AB2-101 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB2-101 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Analysis - 2020

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

AB2-101 Generator Deliverability

#	Type	Contingency Name	Affected Area	Bus Facility Description	Bus From	Bus To	Cir.	PF	Loading Initial	Loading Final	Rating Type	Rating MVA	MW Con.	FG App.
1	N-1	GWASHINGTON-DILLES_138KV_CKT2	AEP - AEP	05DILESBTMZ1-05HOLLOW 138 kV line	247840	247131	1	DC	92.17	94.35	ER	456	9.96	1
2	N-1	DILLESZ2_HOLLOWAY_138KV	AEP - AEP	05DILESBTMZ1-05HOLLOW 138 kV line	247840	247131	1	DC	92.12	94.31	ER	456	9.96	

Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

None

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

None

Steady-State Voltage Requirements

(Results of the steady-state voltage studies should be inserted here)

To be determined

Short Circuit
(Summary of impacted circuit breakers)

None

Affected System Analysis & Mitigation

LGEE Impacts:

LGEE Impacts to be determined during later study phases (as applicable).

MISO Impacts:

MISO Impacts to be determined during later study phases (as applicable).

Duke, Progress & TVA Impacts:

Duke Carolina, Progress, & TVA Impacts to be determined during later study phases (as applicable).

OVEC Impacts:

OVEC Impacts to be determined during later study phases (as applicable).

Delivery of Energy Portion of Interconnection Request
PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.
Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

Not Applicable

Light Load Analysis - 2020

Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

System Reinforcements

Short Circuit
(Summary form of Cost allocation for breakers will be inserted here if any)

To be determined

Stability and Reactive Power Requirement
(Results of the dynamic studies should be inserted here)

To be determined

Summer Peak Load Flow Analysis Reinforcements

New System Reinforcements
(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

1. (AEP - AEP) The 05DILESBTMZ1-05HOLLOW 138 kV line (from bus 247840 to bus 247131 ckt 1) loads from 92.17% to 94.35% (**DC power flow**) of its emergency rating (456 MVA) for the single line contingency outage of 'GWASHINGTON-DILLES_138KV_CKT2'. This project contributes approximately 9.96 MW to the thermal violation.

AEP

2.5 miles of the First Energy portion of 138 kV line is limiting this line. No upgrades required.

First Energy

Description	Total with Tax	Tax	Total Cost
Convert the Burger-Harmon No2 and Burger-Cloverdale No. 1 138kV circuits to a single circuit by 6-wiring the two circuits for 2.4 miles and extend the new circuit into Holloway Sub (0.25 miles).	$2,061,100.00	$233,800.00	$1,827,300.00
Convert the former Burger Loop 138kV circuits to a single circuit by 6-wiring the two circuits for 2.4 miles and extend the new circuit into Holloway Sub (0.25 miles).	$2,000,700.00	$226,600.00	$1,774,100.00
Totals	**$4,061,800**	**$460,400**	**$3,601,400**

2. (AEP - AEP) The 05DILESBTMZ1-05HOLLOW 138 kV line (from bus 247840 to bus 247131 ckt 1) loads from 92.12% to 94.31% (**DC power flow**) of its emergency rating (456 MVA) for the single line contingency outage of 'DILLESZ2_HOLLOWAY_138KV'. This project contributes approximately 9.96 MW to the thermal violation.

Same as New System Reinforcement #1

Conclusion

Based upon the results of this Feasibility Study, the increase of 31 MW at the IC's (PJM Project #AB2-101) natural gas generation facility has a contribution towards a Generator Deliverability network upgrade in First Energy Service Territory. The estimated cost of the mitigation is $4,000,000.

PJM project Y3-068 will pay for the necessary direct connection work required at the George Washington 138 kV substation. PJM will determine in the System Impact Study the AB2-101 queue position share of any allocated network upgrade costs.

Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.

It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Appendix 1

(AEP - AEP) The 05DILESBTMZ1-05HOLLOW 138 kV line (from bus 247840 to bus 247131 ckt 1) loads from 92.17% to 94.35% (**DC power flow**) of its emergency rating (456 MVA) for the single line contingency outage of 'GWASHINGTON-DILLES_138KV_CKT2'. This project contributes approximately 9.96 MW to the thermal violation.

CONTINGENCY 'GWASHINGTON-DILLES_138KV_CKT2'
OPEN BRANCH FROM BUS 243012 TO BUS 247852 CKT 1 / 243012 05G WASH 138 247839 05DILLES BTM 138 2
END

Bus Number	*Bus Name*	*Full Contribution*
235344	*01HANNIB*	*0.51*
243189	*05MLG2*	*11.33*
247632	*Y3-068 OP1*	*175.15*
921992	*AA2-098*	*6.43*
923312	*AB1-140*	*3.21*
923342	*AB1-143*	*3.21*
923422	*AB1-157*	*3.21*
924441	*AB2-093*	*64.22*
924521	*AB2-101*	*9.96*
924871	*AB2-141 C*	*124.89*