Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AA2-098

George Washington 138 kV

August 2015

Preface

The intent of the Feasibility Study is to determine a plan, with high level estimated cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer (IC). The IC may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the IC 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 IC is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by ITO, the costs may be included in the study.

AEP Analysis

General

Interconnection Customer (IC) proposes to increase the generation of its previously proposed PJM queue positions Z2-048 and Y3-068 by 20 MW. Y3-068 is a 525 MW combined cycle plant, and Z2-048 a 20 MW uprate based on increased efficiency to the duct boiler. The present 20 MW uprate (AA2-098) is due to improved efficiencies of the Gas Turbines. Project AA2-098 is evaluated as an injection of 20 MW (20 MW Capacity) at George Washington 138 kV substation (see Figure 1). The location of this natural gas fueled generating facility is in IC , WV (see Figure 2).

The in-service date requested for this project is June 1, 2018. The AA2-098 request was studied on a 2019 base case year and this study provides it rights for year 2019. However, the IC has formally made a request for an interim deliverability study for the additional 20 MW of energy to be in service in 2018.

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 Station. No additional attachment facilities are required to accommodate the additional output associated with the AA2-098 request.

Local and Network Impacts

The Feasibility impact of the proposed 20 MW increase associated with AA2-098 queue 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 20 MW increase on the AEP System. The IC's Power project AA2-098 was studied as an injection of 20 MW (20 MW Capacity) at George Washington 138

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1 https://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/GuideLines/2015_AEP_PJM_FERC_715_Final_Part_4.pdf

2 http://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/Requirements/AEP_Interconnection_Requirements_Rev1.pdf

kV substation consistent with the interconnection application. Project #AA2-098 was evaluated for compliance with reliability criteria for summer peak conditions in 2019.

Potential network impacts were as follows:

Normal System (2019 Summer Conditions Capacity Output)

- No problems identified

Single Contingency (2019 Summer Conditions Capacity Output)

- No problems identified

Multiple Contingency (2019 Summer Conditions Capacity Output)

- No problems identified

Contribution to Previously Identified Overloads (2019 Summer Conditions Capacity Output)

- No problems identified

Normal System (2019 Summer Conditions Full Output)

- Not applicable

Single Contingency (2019 Summer Conditions Full Output)

- Not applicable

Multiple Contingency (2019 Summer Conditions Full Output)

- Not applicable

Contribution to Previously Identified Overloads (2019 Summer Conditions Energy Output)

Table 1 – PJM Identified Contributions to Previously Identified Overloads (2019 Summer Conditions Energy Output)					
#	**Contingency Name**	**Contingency Description**	**Overload Facility Description**	**Limiting Element**	**Mitigation**
1	'5213_B2_TOR773'	CONTINGENCY '5213_B2_TOR773' OPEN BRANCH FROM BUS 243012 TO BUS 243026 CKT 1 / 243012 05G WASH 138 243026 05KAMMR1 138 1 END	The DILLES-SHADYSID 69 kV line (from bus 245086 to bus 245098 ckt 1) loads from 101.26% to 104.46% (**DC power flow**) of its emergency rating (46 MVA) for the single line contingency outage of '5213_B2_TOR773'.	COPPER ~ 3/0 ~ 7 ~ Conductor Section 1	Problem is mitigated by Project Y3-068 (Network Upgrade Number n4206)

Table 2– AEP Identified Contributions to Previously Identified Overloads (2019 Summer Conditions Energy Output)					
#	**Contingency Name**	**Contingency Description**	**Overload Facility Description**	**Limiting Element**	**Mitigation**
1	'5213_B2_TOR773'	CONTINGENCY '5213_B2_TOR773' OPEN BRANCH FROM BUS 243012 TO BUS 243026 CKT 1 / 243012 05G WASH 138 243026 05KAMMR1 138 1 END	LOCKWOOD (245939) 69.0 TO MOUNDVILE (245942) 69.0 branch loads from 144.6% to 148.8% (**DC power flow**) for contingency 5213_B2_TOR773	ACSR/EHS ~ 176.9 ~ 12/7 ~ Dotter Conductor Section 2	Kammer – IC 69 kV RTEP baseline project (b2605) will address this violation. In-Service Date: 6/1/2019
2	'5213_B2_TOR773'	CONTINGENCY '5213_B2_TOR773' OPEN BRANCH FROM BUS 243012 TO BUS 243026 CKT 1 / 243012 05G WASH 138 243026 05KAMMR1 138 1 END	BRUES (245920) 69.0 TO GLENDALE (245937) 69.0 loads from 107.3% (**DC power flow**)to 111.1% for single line outage of contingency outage 5213_B2_TOR773	COPPER ~ 3/0 ~ 7 ~ Conductor Section 1	Problem is mitigated by Project Y3-068 (Network Upgrade Number n4207)
3	'5213_B2_TOR773'	CONTINGENCY '5213_B2_TOR773' OPEN BRANCH FROM BUS 243012 TO BUS 243026 CKT 1 / 243012 05G WASH 138 243026 05KAMMR1 138 1 END	The DILLES-SHADYSID 69 kV line (from bus 245086 to bus 245098 ckt 1) loads from 100.8% to 104% (**DC power flow**) of its emergency rating (46 MVA) for the single line contingency outage of contingency 5213_B2_TOR773	COPPER ~ 3/0 ~ 7 ~ Conductor Section 1	Problem is mitigated by Project Y3-068 (Network Upgrade Number n4206)
4	'5213_B2_TOR773'	CONTINGENCY '5213_B2_TOR773' OPEN BRANCH FROM BUS 243012 TO BUS 243026 CKT 1 / 243012 05G WASH 138 243026 05KAMMR1 138 1 END	George Washington (243012) 138/69 kV transformer #2 loads from 115.7% to 118.7% for normal operating condition of outage of contingency 5213_B2_TOR773	138/69 kV transformer #2	No work Required. Correct Ratings are S/N = 133 MVA and S/E = 175 MVA

Short Circuit Analysis

- No problems identified

Stability Analysis

- To be determined during System Impact Study.

Voltage Variations

- No problems identified

Additional Limitations of Concern

- None

Local/Network Upgrades

- None

Conclusion

Based upon the results of this Feasibility Study, the increase of 20 MW at the IC's Power (PJM Project #AA2-098) natural gas generation facility will require no additional interconnection charges. PJM project Y3-068 will pay for the necessary direct connection work

PJM Analysis

Network Impacts

The Queue Project AA2-098 was evaluated as a 20.0 MW (Capacity 20.0 MW) injection at George Washington 138 kV substation in the AEP area. Project AA2-098 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AA2-098 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Analysis - 2019

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

None

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)

1. (AEP - AEP) The DILLES-SHADYSID 69 kV line (from bus 245086 to bus 245098 ckt 1) loads from 101.26% to 104.46% (**DC power flow**) of its emergency rating (46 MVA) for the single line contingency outage of '5213_B2_TOR773'. This project contributes approximately 1.47 MW to the thermal violation.

CONTINGENCY '5213_B2_TOR773'
OPEN BRANCH FROM BUS 243012 TO BUS 243026 CKT 1 / 243012 05G WASH 138 243026 05KAMMR1 138 1
END

Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

Steady-State Voltage Requirements
(Results of the steady-state voltage studies should be inserted here)

To be determined

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 - 2019

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)

None

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)

None

Contribution to Previously Identified System Reinforcements
(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

1. (AEP - AEP) The DILLES-SHADYSID 69 kV line:
Rebuild the entire 5.83 mile section of the Dilles – Shadyside 69 kV line. Estimated Cost: $5,797,700; the estimated time required for construction is between 24 to 36 months after signing an interconnection agreement. This overload is mitigated by Y3-068 network upgrade **n4206**. See Table 1 in the AEP section of this report

Light Load Load Flow Analysis Reinforcements

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

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

None

Contribution to Previously Identified System Reinforcements
(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None

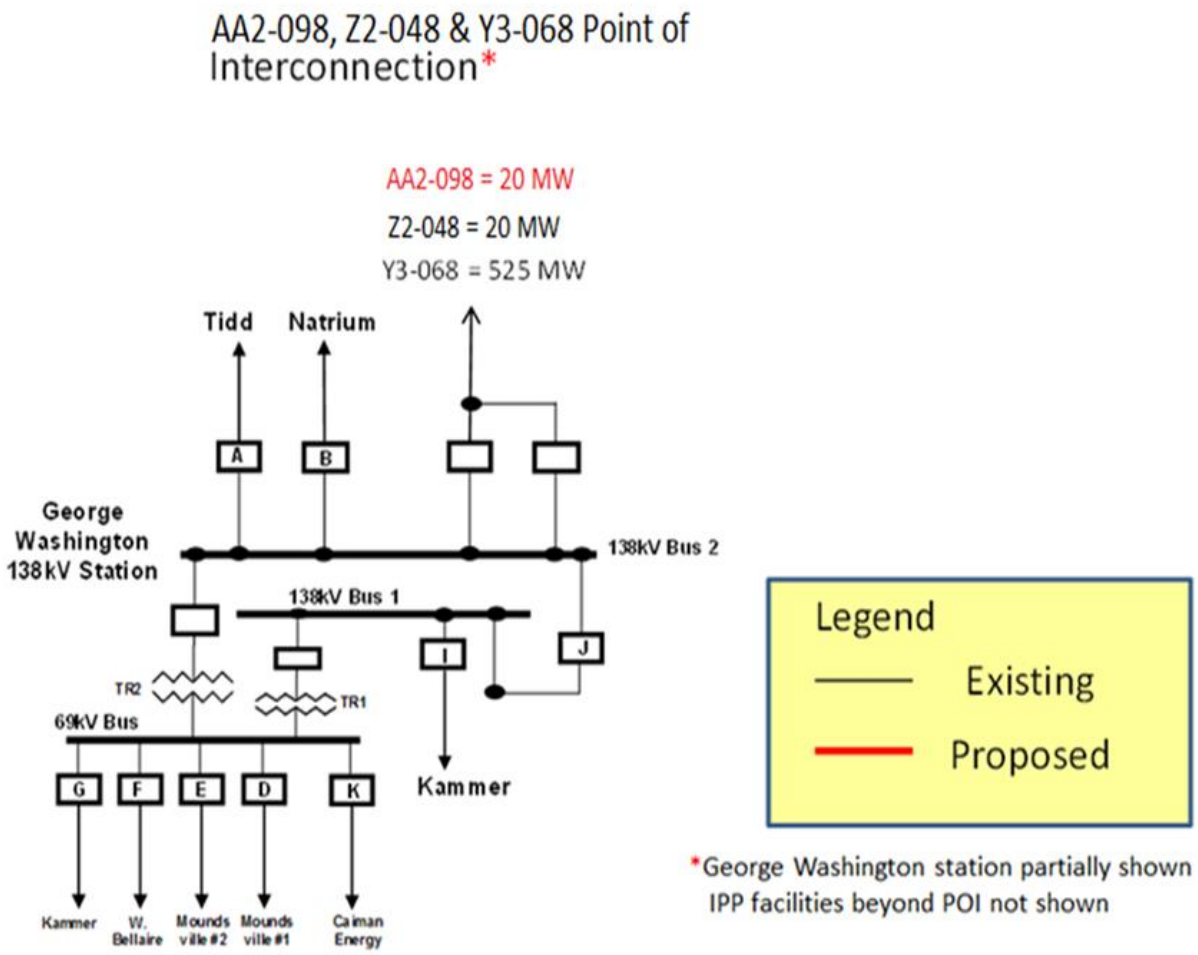

Figure 1

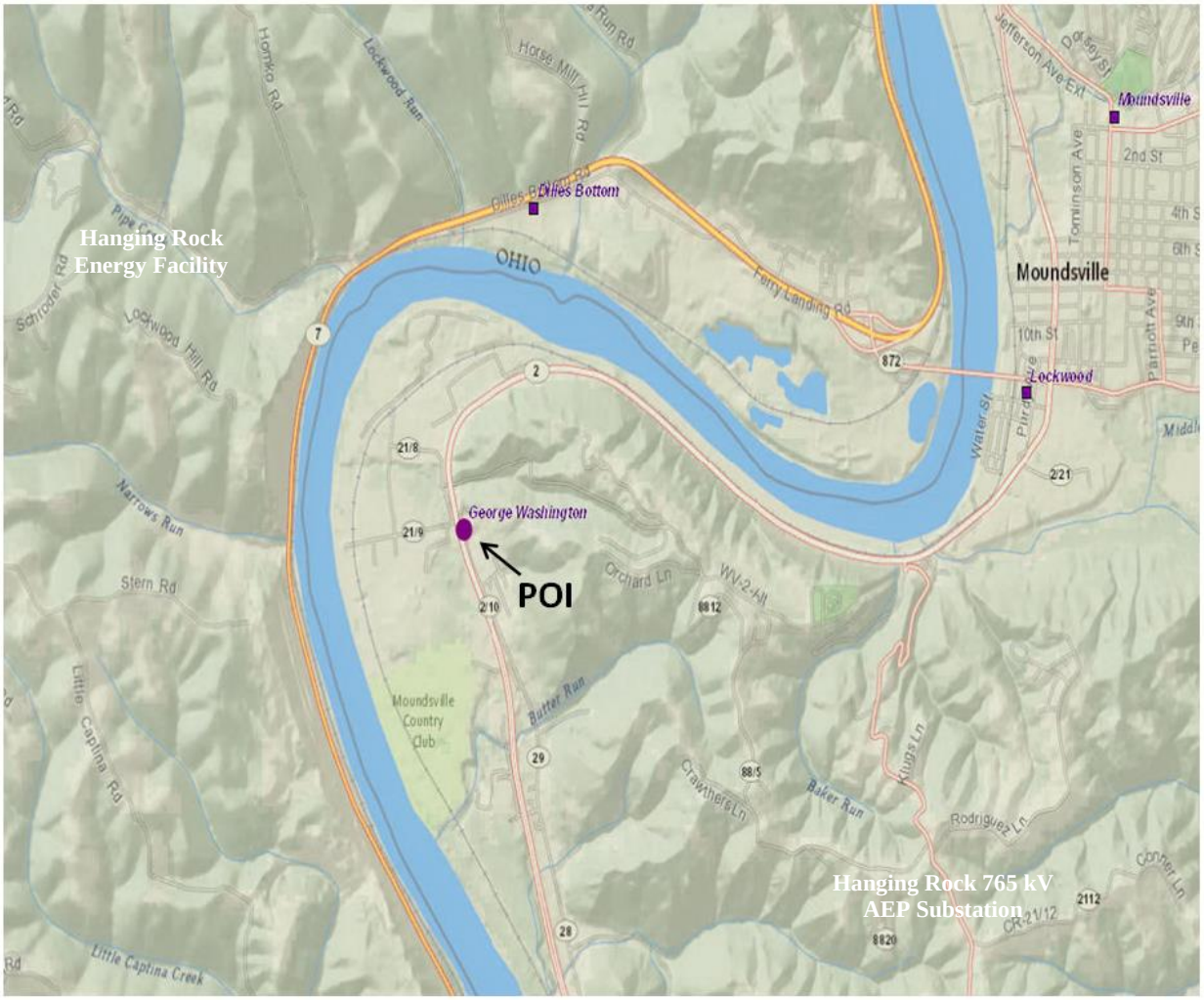

Figure 2

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 DILLES-SHADYSID 69 kV line (from bus 245086 to bus 245098 ckt 1) loads from 101.26% to 104.46% (**DC power flow**) of its emergency rating (46 MVA) for the single line contingency outage of '5213_B2_TOR773'. This project contributes approximately 1.47 MW to the thermal violation.

CONTINGENCY '5213_B2_TOR773'
OPEN BRANCH FROM BUS 243012 TO BUS 243026 CKT 1 / 243012 05G WASH 138 243026 05KAMMR1 138 1
END

Bus Number	Bus Name	Full Contribution
915561	Y3-068 OP1	38.61
917361	Z2-048	1.47
920051	AA2-098	1.47