Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AD1-017

Smith Mountain-Bearskin 138 kV

April 2018

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 previous PJM Project #AC1-083 request, a 100.0 MW (38.0 MW Capacity) solar generating facility in Pittsylvania County, Virginia by 20.0 MW (7.6 MW Capacity) (see Figure 2). The point of interconnection is to AEP's Smith Mountain – Bearskin 138 kV section of the East Danville – Smith Mountain 138 kV circuit (see Figure 1).

The requested Backfeed date is September 1, 2019.

The requested in service date is October 1, 2019.

Attachment Facilities

Point of Interconnection (Smith Mountain – Bearskin 138 kV Line)

To be constructed by PJM Project #AC1-083.

Note: It is assumed that the 138 kV revenue metering and generator lead installed for #AC1-083 will be adequate for the additional generation.

Interconnection Customer Requirements

The Generation Interconnection Agreement does not in or by itself establish a requirement for American Electric Power to provide power for consumption at the developer's facilities. A separate agreement may be reached with the local utility that provides service in the area to ensure that infrastructure is in place to meet this demand and proper metering equipment is installed. It is the responsibility of the developer to contact the local service provider to determine if a local service agreement is required.

Requirement from the PJM Open Access Transmission Tariff:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

Revenue Metering and SCADA Requirements

PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Sections 24.1 and 24.2.

AEP Requirements

The Interconnection Customer will be required to comply with all AEP Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "Requirements for Connection of New Facilities or Changes to Existing Facilities Connected to the AEP Transmission System" document located at the following link:

http://www.pjm.com/~/media/planning/plan-standards/private-aep/aep-interconnection-requirements.ashx

Network Impacts

The Queue Project AD1-017 was evaluated as a 20.0 MW (Capacity 7.6 MW) injection tapping the Bearskin to Smith Mountain 138kV line in the AEP area. Project AD1-017 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-017 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Base Case Used

Summer Peak Analysis – 2020 Case

Contingency Descriptions

The following contingencies resulted in overloads:

Contingency Name	Description
AEP_P1-2_#6215	CONTINGENCY 'AEP_P1-2_#6215' OPEN BRANCH FROM BUS 242748 TO BUS 242802 CKT 1 / 242748 05PENHOK 138 242802 05SMITHMTN1 138 1 END
AEP_P1-2_#6213	CONTINGENCY 'AEP_P1-2_#6213' OPEN BRANCH FROM BUS 242748 TO BUS 242802 CKT 1 / 242748 05PENHOK 138 242802 05SMITHMTN1 138 1 OPEN BRANCH FROM BUS 242748 TO BUS 242843 CKT 1 / 242748 05PENHOK 138 242843 05WLAKE 138 1 END
247499 05SMITHMTN2 242802 05SMITHMTN1 Z1 138/138	CONTINGENCY '247499 05SMITHMTN2 242802 05SMITHMTN1 Z1 138/138' OPEN BRANCH FROM BUS 247499 TO BUS 242802 CKT Z1 END

Table 1

Generator Deliverability

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

AD1-017 Generator Deliverability													
	Contingency		Affected		Bus			Loading		Rating		MW	FG
#	Type	Name	Area	Facility Description	From	To	PF	Initial	Final	Type	MVA	Con.	App.
1	N-1	AEP_P1-2_#6215	AEP - AEP	05SMITHMTN2-05ROCKCA 138 kV line	247499	242775	DC	99.91	100.49	ER	277	1.69	
2	N-1	AEP_P1-2_#6213	AEP - AEP	05SMITHMTN2-05ROCKCA 138 kV line	247499	242775	DC	99.84	100.42	ER	277	1.69	

Table 2

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

None

Short Circuit

(Summary of impacted circuit breakers)

New circuit breakers found to be over-duty:

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.

Note: Only the most severely overloaded conditions are listed below. 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 shall study all overload conditions associated with the overloaded element(s) identified.

AC1-083 Delivery of Energy Portion of Interconnection Request													
	Contingency		Affected		Bus			Loading		Rating		MW	FG
#	Type	Name	Area	Facility Description	From	To	PF	Initial	Final	Type	MVA	Con.	App.
1	N-1	247499 05SMITHMTN2 242802 05SMITHMTN1 Z1 138/138	AEP - AEP	05BANSTR-05EDAN 2 138 kV line	242549	242632	DC	108.15	112.175	ER	296	14.24	
2	Non	Non	DVP - AEP	05LEESVI-4ALTVSTA 138 kV line	242701	314667	DC	106.0	107.43	NR	205	2.92	
3	N-1	AEP_P1-2_#6215	AEP - AEP	05SMITHMTN2-05ROCKCA 138 kV line	247499	242775	DC	111.03	112.62	ER	277	4.46	
4	N-1	247499 05SMITHMTN2 242802 05SMITHMTN1 Z1 138/138	AEP - AEP	AC1-083 TAP-05BEARSK 138 kV line	926050	242550	DC	110.58	115.18	ER	296	14.24	

Table 3

New System Reinforcements

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

Violation #	Overloaded Facility	Upgrade Description	Schedule	Estimated Cost
#1	05SMITHMTN2-05ROCKCA 138 kV line	The MLSE rating for this section of line is 409 MVA not 277 MVA therefore no mitigation is required.		

Table 4

Schedule

It is anticipated that the time between receipt of executed agreements and Commercial Operation may range from 12 to 18 months if no line work is required. If line work is required, construction time would be between 24 to 36 months after signing an interconnection agreement.

Note: The time provided between anticipated normal completion of System Impact, Facilities Studies, subsequent execution of ISA and ICSA documents, and the proposed Backfeed Date is shorter than usual and may be difficult to achieve.

Conclusion

Based upon the results of this Feasibility Study, the increase of 20.0 MW (7.6 MW Capacity) (PJM Project #AD1-017) generation to the previous request of 100.0 MW (38.0 MW Capacity) for the IC's solar generating facility (PJM Project #AC1-083) will not require additional interconnection charges. Please note that this uprate was requested within 24 months of the base AC1-083 request. The final Interconnection Service Agreement (ISA) will be issued for the combined output of both Queue AC1-083 and AD1-017 respectively.

Figure 1: Point of Interconnection (Smith Mountain - Bearskin 138 kV)

Single-Line Diagram

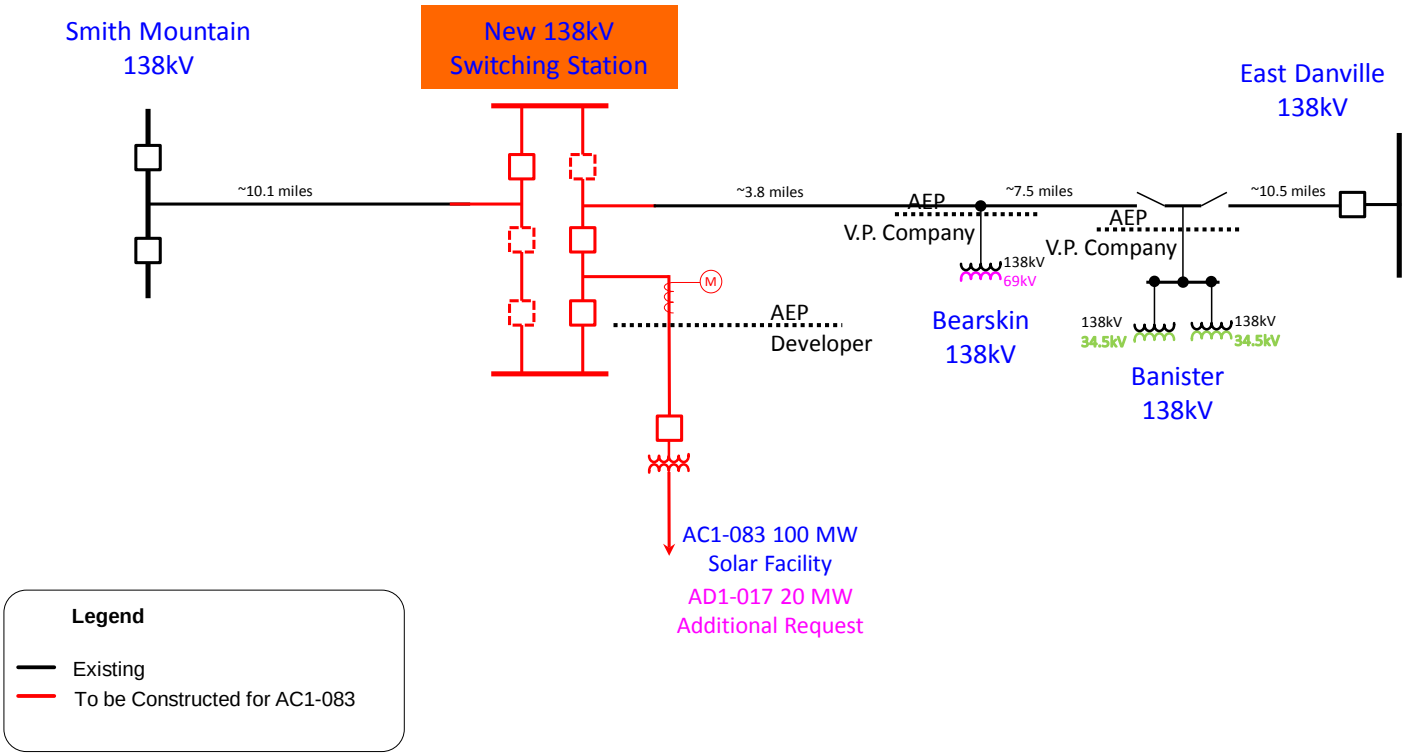

Figure 2: Point of Interconnection (Smith Mountain – Bearskin 138 kV)