Generation Interconnection System Impact Study Report

For

PJM Generation Interconnection Request Queue Position AC1-172

Tanners Creek 345 kV

February 2018

Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. 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. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

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 or merchant transmission upgrade, 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 System Impact Study is performed.

The System Impact 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

Lawrenceburg Power, LLC proposes to increase generation at the existing Lawrenceburg Generation Plant connected to the Tanners Creek 345 kV Substation by 50.0 MW (50.0 MW Capacity) in Dearborn County, Indiana (see Figure 2). The AC1-172 request is for the Lawrenceburg Power Block II 2x1 combined cycle unit (see Figure 1). The increased generation is due to the Lawrenceburg GT2A and GT2B being upgraded with Advanced Gas Path Technology that will improve efficiency and increase MW output for the block.

The requested in service date for the generation increase is May 31, 2019.

Attachment Facilities

Point of Interconnection (Tanners Creek 345 kV Substation)

Not required for an existing facility.

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 AC1-172 was evaluated as a 50.0 MW (Capacity 50.0 MW) injection into the Tanners Creek 345 kV substation in the AEP area. Project AC1-172 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC1-172 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Base Case Used

Summer Peak Analysis – 2020 Case

Contingency Descriptions

The following contingencies resulted in overloads:

Option 1	
Contingency Name	**Description**
P1-#..B2 TERMINAL-EAST BEND 4516	CONTINGENCY 'P1-#..B2 TERMINAL-EAST BEND 4516' OPEN BRANCH FROM BUS 249575 TO BUS 249565 CKT 1 END

Table 1

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)

AC1-172 Contribution to Previously Identified Overloads															
	Contingency				Bus				Loading		Rating				
#	Type	Name	Affected Area	Facility Description	From	To	Cir.	PF	Initial	Final	Type	MVA	MW Con.	FG App.
1	N-1	P1-#..B2 TERMINAL-EAST BEND 4516	AEP - DEO&K	05TANNER-08M.FORT 345 kV line	243233	249567	1	AC	105.85	107.28	NR	1409	20.46	

Table 2

Steady-State Voltage Requirements

None

Short Circuit

(Summary of impacted circuit breakers)

New circuit breakers found to be over-duty:

None

Stability Analysis

No mitigation or system upgrades were identified to interconnect the AC1-172 generation.

Affected System Analysis & Mitigation

LGEE Impacts:
LGEE Impacts to be determined during later study phases (as applicable).
None

MISO Impacts:
MISO Impacts to be determined during later study phases (as applicable).
None

Duke, Progress & TVA Impacts:
None

OVEC Impacts:
OVEC Impacts to be determined during later study phases (as applicable).
None

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.

Not Applicable

Additional Limitations of Concern

None

Previous System Reinforcements

Violation #	Overloaded Facility	Upgrade Description
#1	05TANNER-08M.FORT 345 kV line	To relieve the Tanners Creek – Miami Fort 345 kV line overload: • The DEOK-end SE rating is 919 MVA. 2018 baseline upgrade B2831.2 (upgrade DEOK portion of circuit) will raise the DEOK-end SE rating to 2151 MVA. The projected IS date is 12-1-2021. The earliest possible ISD is 6-1-2021 per DEOK. The AC1-172 customer has no cost responsibility for this baseline upgrade; however, AC1-172 may need the baseline upgrade in-service in order to be deliverable to the PJM transmission system. An interim study may be required if AC1-172 comes into service prior to B2831.2. • The AEP-end SN rating is 1409 MVA. 2018 baseline upgrade B2831.1 (upgrade AEP portion of circuit) will raise the AEP-end SN rating to 1740 MVA. The projected IS date is 12-1-2021. The AC1-172 customer has no cost responsibility for this baseline upgrade; however, AC1-172 may need the baseline upgrade in-service in order to be deliverable to the PJM transmission system. An interim study may be required if AC1-172 comes into service prior to B2831.1.

Table 3 - AEP

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.

Conclusion

Based upon the results of this System Impact Study, the increase of 50.0 MW (50.0 MW Capacity) natural gas generation to the existing Lawrenceburg Generation Plant will not require additional network upgrade charges.

Note: The customer should review the capability of the lead from the point of ownership transition into the generating plant to ensure that it is sufficient to accommodate the increase generation output.

Figure 1: Point of Interconnection (Tanners Creek 345 kV Substation)

Single-Line Diagram

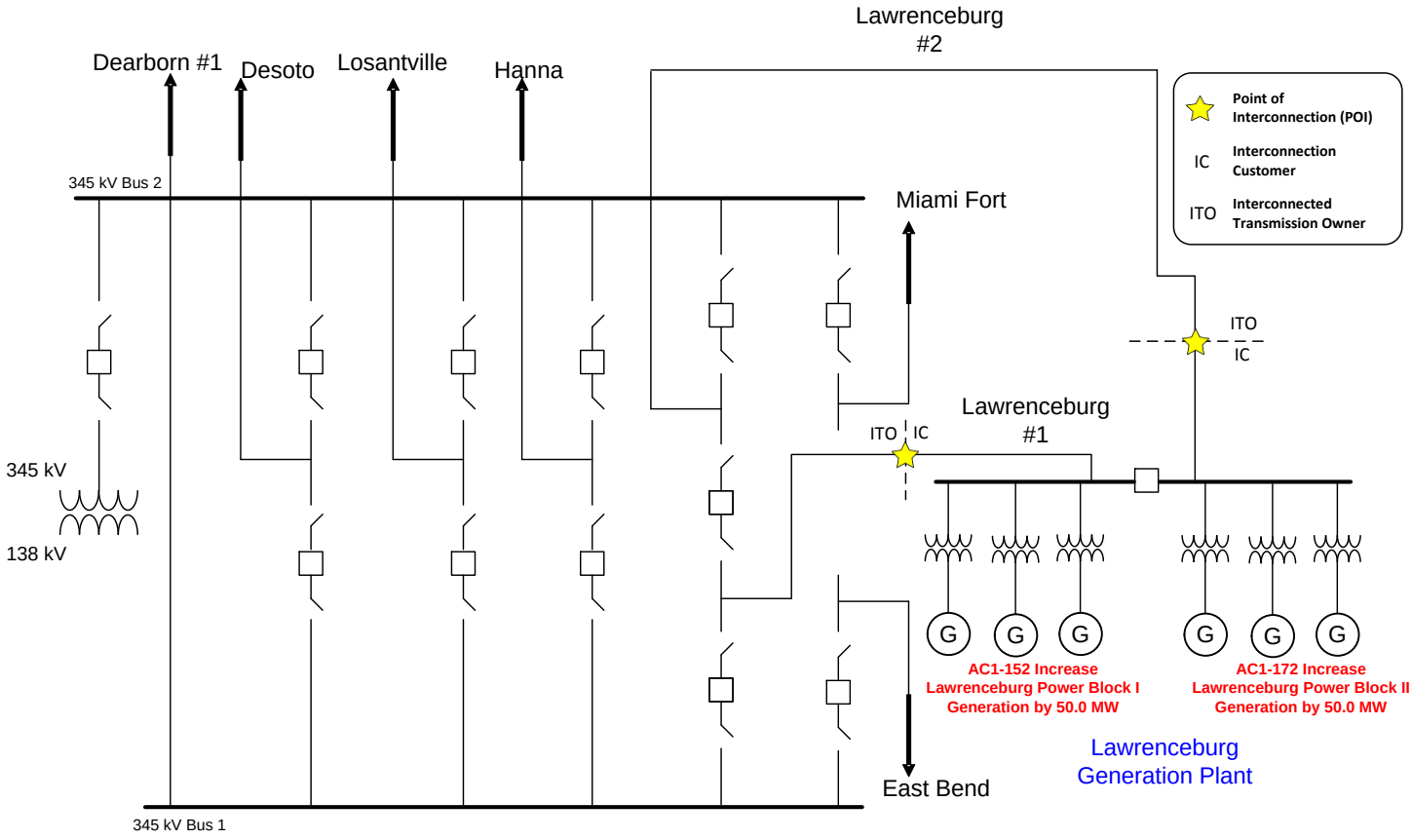
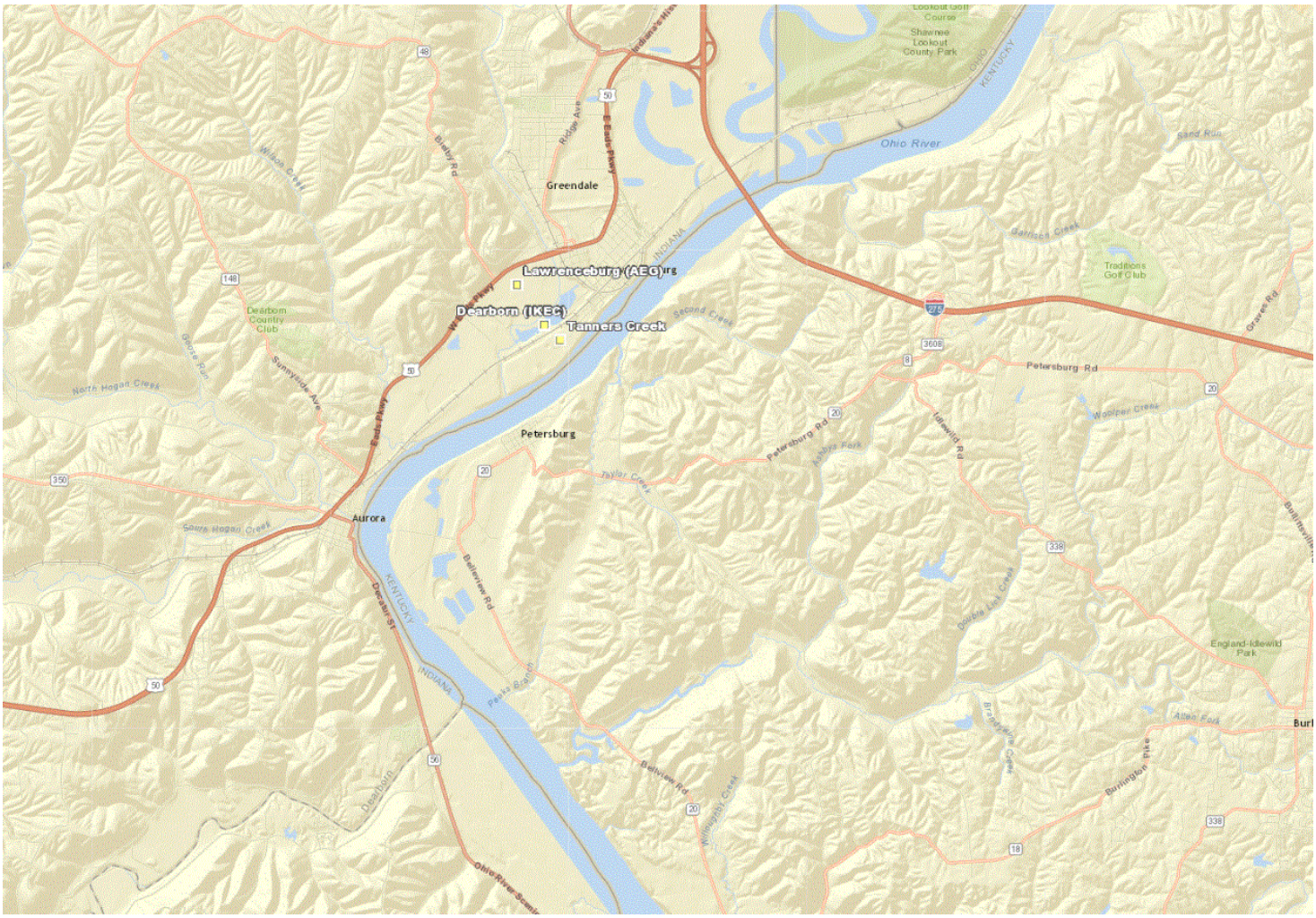


Figure 2: Point of Interconnection (Tanners Creek 345 kV Substation)



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 - DEO&K) The 05TANNER-08M.FORT 345 kV line (from bus 243233 to bus 249567 ckt 1) loads from 105.85% to 107.28% (AC power flow) of its normal rating (1409 MVA) for the single line contingency outage of 'P1-#..B2 TERMINAL-EAST BEND 4516'. This project contributes approximately 20.45 MW to the thermal violation.

CONTINGENCY 'P1-#..B2 TERMINAL-EAST BEND 4516'
OPEN BRANCH FROM BUS 249575 TO BUS 249565 CKT 1
END

Bus Number	*Bus Name*	*Full Contribution*
247285	*05AND G1*	*0.81*
247286	*05AND G2*	*0.81*
247287	*05AND G3*	*1.69*
243795	*05HDWTR1G C*	*1.03*
247292	*05KEY G1*	*1.35*
247293	*05KEY G2*	*1.35*
247294	*05KEY G3*	*1.35*
247295	*05KEY G4*	*1.35*
247264	*05LAWG1A*	*12.83*
247265	*05LAWG1B*	*12.83*
247266	*05LAWG1S*	*20.48*
247267	*05LAWG2A*	*12.83*
247268	*05LAWG2B*	*12.83*
247269	*05LAWG2S*	*20.48*
247288	*05RICHG1*	*0.54*
247289	*05RICHG2*	*0.54*
247270	*05RPMNG1*	*1.9*
246991	*05WLD G1 C*	*0.3*
247255	*05WLD G2 C*	*0.32*
243415	*05WWVSTA*	*1.51*
251947	*08EBND2*	*29.83*
247536	*S-071 C*	*0.47*
247543	*V3-007 C*	*5.19*
247568	*V3-015 C*	*4.49*
247588	*W4-004 C*	*2.29*
247589	*W4-008 C*	*2.29*
900404	*X3-028 C*	*100.53*
247621	*Y3-024*	*0.06*
701701	*Y4-071*	*1.65*
LTF	*Z1-043*	*14.18*
917721	*Z2-115 C*	*0.02*
922372	*AA2-148 C*	*4.46*
922982	*AB1-087 C OP*	*36.86*
922992	*AB1-088 C OP*	*36.86*

LTF	*AB2-013*	*8.15*
923881	*AB2-028 C*	*3.74*
924211	*AB2-065 C*	*3.14*
926581	*AC1-059 C*	*11.87*
926872	*AC1-088 C*	*2.4*
927611	*AC1-152*	*20.45*
927821	*AC1-172*	*20.45*
927851	*AC1-175 C*	*15.17*
928231	*AC1-212 C*	*1.66*