



INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-167
(IFS-2016-002-02)

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
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2/24/2020	SPP	Final report issued.

CONTENTS

Revision History	i
Summary	1
Introduction.....	1
Phase(s) of Interconnection Service.....	1
Credits/Compensation for Amounts Advanced for Network Upgrade(s).....	1
Interconnection Customer Interconnection Facilities	2
Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s).....	3
Shared Network Upgrade(s)	4
Previous Network Upgrade(s).....	4
Affected System Upgrade(s).....	5
Conclusion	5
Appendices.....	6
A: Transmission Owner’s Interconnection Facilities Study Report and Network Upgrades Report(s)	7

SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-167/IFS-2016-002-02 is for a 73.5 MW generating facility located in Caddo Parish, Louisiana. The Interconnection Request was studied in the DISIS-2016-002 Impact Study for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). The Interconnection Customer's requested in-service date is October 1, 2020.

The interconnecting Transmission Owner, American Electric Power (AEP), performed a detailed IFS at the request of SPP. The full report is included in Appendix A. SPP has determined that full Interconnection Service will be available after the assigned Transmission Owner Interconnection Facilities (TOIF), Non-Shared Network Upgrades, Shared Network Upgrades, Previous Network Upgrades, and Affected System Upgrades that are required for full interconnection service are completed.

The primary objective of the IFS is to identify necessary Transmission Owner Interconnection Facilities, Network Upgrades, other direct assigned upgrades, cost estimates, and associated upgrade lead times needed to grant the requested Interconnection Service.

PHASE(S) OF INTERCONNECTION SERVICE

It is not expected that Interconnection Service will occur in phases. However, full Interconnection Service will not be available until all Interconnection Facilities and Network Upgrade(s) can be placed in service.

CREDITS/COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)

Interconnection Customer shall be entitled to compensation in accordance with Attachment Z2 of the SPP OATT for the cost of SPP creditable-type Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, that are not otherwise refunded to the Interconnection Customer. Compensation shall be in the form of either revenue credits or incremental Long Term Congestion Rights (iLTCR).

INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES

The Generating Facility is proposed to consist of twenty-one (21) 3.5 MW Power Electronics HEC-US-V1500 Inverters for a total generating nameplate capacity of 73.5 MW.

The Interconnection Customer's Interconnection Facilities to be designed, procured, constructed, installed, maintained, and owned by the Interconnection Customer at its sole expense include:

- 34.5 kV underground cable collection circuits;
- 34.5 kV to 138 kV transformation substation with associated 34.5 kV and 138 kV switchgear;
- One (1) 138/34.5 kV 60/80/100 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- Approximately 0.1 mile overhead 138 kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 138 kV bus at new Transmission Owner substation ("Lieberman-North Benton 138 kV Line") that is owned and maintained by Transmission Owner;
- All transmission facilities required to connect the Interconnection Customer's substation to the POI;
- Equipment at the Interconnection Customer's substation necessary to maintain a composite power delivery at continuous rated power output at the high-side of the generator substation at a power factor within the range of 95% lagging and 95% leading in accordance with Federal Energy Regulatory Commission (FERC) Order 827. The Interconnection Customer may use inverter manufacturing options for providing reactive power under no/reduced generation conditions. The Interconnection Customer will be required to provide documentation and design specifications demonstrating how the requirements are met; and,
- All necessary relay, protection, control and communication systems required to protect Interconnection Customer's Interconnection Facilities and Generating Facilities and coordinate with Transmission Owner's relay, protection, control and communication systems.

NOTE:

For certain contingencies at and near the POI, the GEN-2016-167 generator was tripped offline under both under and over frequency relays. Certain limitations within the generator stability model and/or low-inertia within the network can result in drastic changes to the bus reference angles which may then cause spikes in quantities such as the calculated frequencies. According to Siemens PTI, this is a well-known issue with the modeling of PV type devices in simulation software like PSS/E. Some of the frequency relay settings associated with GEN-2016-167 generator were adjusted to prevent the tripping of the generator caused by this modeling issue. It was observed that certain prior outage contingencies require curtailment of study generation as a system adjustment.

Interconnection Customer had provided SPP with information that mitigates the simulation tripping identified in the stability analysis.

TRANSMISSION OWNER INTERCONNECTION FACILITIES AND NON-SHARED NETWORK UPGRADE(S)

To facilitate interconnection, the interconnecting Transmission Owner will perform work as shown below necessary for the acceptance of the Interconnection Customer's Interconnection Facilities.

Table 1 and **Table 2** lists the Interconnection Customer's estimated cost responsibility for Transmission Owner Interconnection Facilities (TOIF) and Non-Shared Network Upgrade(s) and provides an estimated lead time for completion of construction. The estimated lead time begins when the Generator Interconnection Agreement has been fully executed.

Table 1: Transmission Owner Interconnection Facilities (TOIF)

Transmission Owner Interconnection Facilities (TOIF)	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
Transmission Owner New 138 kV Interconnection Substation: Construct one (1) 138 kV line terminal, line switches, dead end structure, line relaying, communications, revenue metering, line arrester, and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer's Generating Facility.	\$1,175,646	100%	\$1,175,646	30 Months
Total	\$1,175,646		\$1,175,646	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	Z2 Type ¹	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
Transmission Owner New 138 kV Interconnection Substation: Build a 3-breaker ring bus station on the Lieberman-North Benton 138 kV section of the Lieberman-Red Point 138 kV line to facilitate the new generation interconnection.	non-creditable	\$9,959,549	100%	\$9,959,549	30 Months
Total		\$9,959,549		\$9,959,549	

¹ Indicates the method used for calculating credit impacts under Attachment Z2 of the Tariff.

SHARED NETWORK UPGRADE(S)

The Interconnection Customer's share of costs for Shared Network Upgrades is estimated in **Table 3** below.

Table 3: Interconnection Customer Shared Network Upgrade(s)

Shared Network Upgrades Description	Z2 Type	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
None	N/A	\$0	N/A	\$0	N/A
Total		\$0		\$0	

All studies have been conducted assuming that higher-queued Interconnection Request(s) and the associated Network Upgrade(s) will be placed into service. If higher-queued Interconnection Request(s) withdraw from the queue, suspend or terminate service, the Interconnection Customer's share of costs may be revised. Restudies, conducted at the customer's expense, will determine the Interconnection Customer's revised allocation of Shared Network Upgrades.

PREVIOUS NETWORK UPGRADE(S)

Certain Previous Network Upgrades are **currently not the cost responsibility** of the Interconnection Customer but will be required for full Interconnection Service.

Table 4: Interconnection Customer Previous Network Upgrade(s)

Previous Network Upgrade(s) Description	Current Cost Assignment	Estimated In-Service Date
None	\$0	N/A

Depending upon the status of higher- or equally-queued customers, the Interconnection Request's in-service date is at risk of being delayed or Interconnection Service is at risk of being reduced until the in-service date of these Previous Network Upgrades.

AFFECTED SYSTEM UPGRADE(S)

To facilitate interconnection, the Affected System Transmission Owner will be required to perform the facilities study work as shown below necessary for the acceptance of the Interconnection Customer's Interconnection Facilities. **Table 5** displays the current impact study costs as part of the Affected System Impact review. The Affected System facilities study could provide revised costs and will provide each Interconnection Customer's allocation responsibilities for the upgrades.

Table 5: Interconnection Customer Affected System Upgrade(s)

Affected System Upgrades Description	Total Cost Estimate (\$)	Allocated Share (%)	Allocated Cost Estimate (\$)
None	\$0	N/A	\$0
Total	\$0		\$0

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 73.5 MW can be granted. Full Interconnection Service will be delayed until the TOIF, Non-Shared NU, Shared NU, Previous NU, Affected System Upgrades that are required for full interconnection service are completed. The Interconnection Customer's estimated cost responsibility for TOIF and Non-Shared NU that is required for full interconnection service is summarized in the table below.

Table 6: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities	\$1,175,646
Network Upgrades	\$9,959,549
Total	\$11,135,195

A draft Generator Interconnection Agreement will be provided to the Interconnection Customer consistent with the final results of this IFS report. The Transmission Owner and Interconnection Customer will have 60 days to negotiate the terms of the GIA consistent with the SPP Open Access Transmission Tariff (OATT).

APPENDICES

A: TRANSMISSION OWNER'S INTERCONNECTION FACILITIES STUDY REPORT AND NETWORK UPGRADES REPORT(S)

See next page for the Transmission Owner's Interconnection Facilities Study Report and Network Upgrades Report(s).



***Interconnection Facilities Study for
DISIS-2016-002
New 138kV Station for Generation
Interconnection***

December 2019

Table of Contents

Table of Contents	2
Summary	3
Interconnection Facilities	4
Interconnection Costs	5
One-line Diagram of Transmission Facilities	6
Area Transmission Map	7

Summary

American Electric Power Southwest Transmission Planning (AEP) performed the following study at the request of the Southwest Power Pool (SPP) for SPP Generation Interconnection request DISIS-2016-002. Per the SPP Generator Interconnection Procedures (GIP), SPP requested that AEPW perform an Interconnection Facilities Studies (IFS) for Network Upgrade(s) in accordance with the Scope of Interconnection Facilities Study in GIP 8.10 and the Interconnection Facilities Study Procedures in accordance with GIP 8.13 for the following Network Upgrades:

- New 138 kV Station
 - Build a new 138 kV, 3-breaker ring bus station on the Lieberman – North Benton 138 kV section of the Lieberman – Red Point 138 kV line.

Interconnection Facilities (See Figures 1 and 2)

New 138 kV Substation

AEP will build a 138 kV, 3-breaker ring bus station on the Lieberman – North Benton 138 kV section of the Lieberman – Red Point 138 kV line to facilitate the new generation interconnection GEN-2016-167.

The design and construction of the new station will meet all AEP specifications for stations. Bus work and disconnect switches will be designed to accommodate the loading requirements, and circuit breakers will be rated to ensure adequate load and fault interrupting capability. AEP will own, operate and maintain the station.

Short Circuit Fault Duty Evaluation

It is standard practice for AEP to recommend replacing a circuit breaker when the current through the breaker for a fault exceeds 100% of its interrupting rating with recloser de-rating applied, as determined by the ANSI/IEEE C37.5-1979, C37.010-1979 & C37.04-1979 breaker rating methods.

In the AEP system, no breakers were found to exceed their interrupting capability after the addition of the generation and related facilities. Therefore, there are no short circuit upgrade costs associated with the DISIS-2016-002 interconnections.

Interconnection Costs

Listed below are the associated costs.

SYSTEM IMPROVEMENT	COST (2019 DOLLARS)
Build new 138 kV three breaker ring bus. (Network Upgrades)	\$9,959,549
Gen-2016-167 Transmission Owner Interconnection Facilities (TOIF)	\$1,175,646
TRANSMISSION INTERCONNECTION FACILITY TOTAL COSTS	\$11,135,195

TABLE 1

Project Lead Time

Project in-service date is projected to be 30 months after the issuance of a NTC from the Southwest Power Pool.

New 138 kV Station



