



INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-166
(IFS-2016-002-03)

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By SPP Generator Interconnections Dept.

REVISION HISTORY

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-166/IFS-2016-002-03 is for a 35 MW generating facility located in Washington, Arkansas. 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 ten (10) Power Electronics HEC-US-V1500 Inverters for a total generating nameplate capacity of 35 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 69 kV transformation substation with associated 34.5 kV and 69 kV switchgear;
- One (1) 69/34.5 kV 24/32/40 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- Approximately one (1) mile overhead 69 kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 69 kV bus at existing Transmission Owner substation ("Prairie Grove 69 kV") 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 GEN-2016-166 tripped offline due to frequency relay initiated tripping. The Interconnection Customer (IC) should review with the generator vendor the frequency relay settings, including the frequency measurement location, as well as dynamic response of the inverter model to avoid such type of tripping. Refer to Stability Report for details.

Prior to completion of Facility Study, the GEN-2016-166 customer must provide SPP with an updated model or fault simulation instructions from the inverter vendor that mitigates the simulation tripping identified.

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 Prairie 69 kV Interconnection Substation: Construct one (1) 69 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.	\$1,049,625	100%	\$1,049,625	36 Months
Total	\$1,049,625		\$1,049,625	

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 Prairie 69 kV Interconnection Substation: Rebuild the high side of the substation into a 4-breaker ring bus to facilitate the new generation interconnection. 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.	non-creditable	\$9,588,977	100%	\$9,588,977	36 Months
Total		\$9,588,977		\$9,588,977	

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 35 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	\$1,049,625
Network Upgrades	\$9,588,977
Total	\$10,638,602

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
GI Cluster Impact Study
DISIS-2016-002
Upgrade Prairie Grove Station
for Generation Interconnection***

December 2019

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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:

- Prairie Grove 69 kV Station
 - Rebuild the high side of the Prairie Grove station to a four breaker ring bus configuration to facilitate the interconnection of GEN-2016-166.

Interconnection Facilities (See Figures 1 and 2)

Prairie Grove 69 kV Substation

AEP will rebuild the high side of Prairie Grove into a 4-breaker ring bus to facilitate the new generation interconnection GEN-2016-166.

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)
Rebuild Prairie Grove 69 kV to a four breaker ring bus. (Network Upgrades)	\$9,588,977
Gen-2016-166 Transmission Owner Interconnection Facilities (TOIF)	\$1,049,625
TRANSMISSION INTERCONNECTION FACILITY TOTAL COSTS	\$10,638,602

TABLE 1

Project Lead Time

Project in-service date is projected to be 36 months after the issuance of a NTC from the Southwest Power Pool.

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