INTERCONNECTION FACILITIES STUDY REPORT

GEN-2015-045

(IFS-2015-002-10)

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
5/2/2017	SPP	Initial draft report issued.	
11/8/2017	SPP	Initial final report issued.	

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2015-045/IFS-2015-002-10 is for a 20.00 MW generating facility located in Grady County, Oklahoma. The Interconnection Request was studied in the DISIS-2015-002 Impact Study for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). Prior to an executed IFS agreement, the Interconnection Customer requested to withdraw NRIS per Section 4.4.1 of the Southwest Power Pool (SPP) Generator Interconnection Procedures (GIP), therefore ERIS-only was analyzed for this request in the DISIS-2015-002-1 Impact Restudy and DISIS-2015-002-2 Impact Restudy. The Interconnection Customer's requested in-service date is December 1, 2017.

The interconnecting Transmission Owner, American Electric Power Oklahoma Transmission Company (AEPOK), 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 Other Network Upgrade(s) 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, 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 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) 2.0 MW Parker 890GT-B battery storage inverters for a total generating nameplate capacity of 20.00 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 345 kV transformation substation with associated 34.5 kV and 345 kV switchgear;
- One (1) 345/34.5kV 168/224/280 MVA (ONAN/ONAF/ONAF) step-up transformer per GEN-2015-092/IFS-2015-002-36 facilities to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation.
- A less than one (<1) mile underground 34.5 kV line to connect the Interconnection Customer's substation to the Point of Change of Ownership (PCO) with GEN-2015-092/IFS-2015-002-36 34.5kV. The Interconnection Request will utilize the GEN-2015-092/IFS-2015-002-36 345/34.5kV step-up transformer and 345kV generator lead line. GEN-2015-092/IFS-2015-002-36's two (2) miles overhead 345kV line will connect to the PCO with GEN-2014-057/IFS-2014-002-22 facilities. The Interconnection Request, GEN-2014-057/IFS-2014-002-22, and GEN-2015-092/IFS-2015-002-36 will require a "shared usage" agreement for shared facilities to the POI at the 345 kV bus at existing AEPOK substation ("Terry Road") that is owned and maintained by AEPOK;
- All transmission facilities required to connect the Interconnection Customer's substation to the POI;
- To accommodate the "shared usage," Interconnection Customer will be required to attain a Shared Facilities Agreement and provide a copy of the Shared Facilities Agreement with the Transmission Provider and Transmission Owner before Interconnection Customer energizes its facilities;
- Equipment at the Interconnection Customer's substation necessary to maintain a power factor at the POI between 95% lagging and 95% leading, including approximately 3.8Mvars[1] of reactors to compensate for injection of reactive power into the transmission system under no/reduced generating conditions. The Interconnection Customer may use wind turbine 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.

The Interconnection Customer shall coordinate relay, protection, control, and communication system configurations and schemes with the Transmission Owner.

[1] This approximate minimum reactor amount is needed for the current configuration of GEN-2015-045 and GEN-2015-092 as studied in the DISIS-2015-002 Impact Study.

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 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: Interconnection Customer TOIF and Non-Shared Network Upgrade(s)

TOIF and Non-Shared Network Upgrades Description	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
Currently None	$0	N/A	$0	N/A
Total	**$0**	**N/A**	**$0**	

A Shared Facilities Usage Agreement for the shared facilities with GEN-2014-057/IFS-2014-002-22 and GEN-2015-092/IFS-2015-002-36 shall be required for Generator Interconnection Service. Shared Facilities Usage Agreement details will be determined during the negotiation phase of the GIA.

SHARED NETWORK UPGRADE(S)

The Interconnection Customer's share of costs for Shared Network Upgrades is estimated in **Table 2** below.

Table 2: Interconnection Customer Shared Network Upgrades

Shared Network Upgrades Description	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
Currently none	$0	N/A	$0
Total	**$0**	**N/A**	**$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.

OTHER NETWORK UPGRADE(S)

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

1) GEN-2015-092/IFS-2015-002-36

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 Other Network Upgrades.

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 20.00 MW can be granted. Interconnection Service will be delayed until Other Network Upgrade(s) are completed. The Interconnection Customer's estimated cost responsibility for Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades is summarized in the table below.

Table 3: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities	$0
Network Upgrades	$0
Total	**$0**

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

See next page for the Transmission Owner's Interconnection Facilities Study Report.

1. Introduction

<OMITTED TEXT> (Interconnection Customer) has requested an Interconnection Facilities Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnecting a 20.00 MW battery storage facility in Grady County, Oklahoma to the transmission system of American Electric Power Oklahoma Transmission Company (AEPOK). The generator facility, GEN-2015-045, is comprised of ten (10) 2.0 MW Parker 890GT-B battery storage inverters for a total generating nameplate capacity of 20.00 MW.

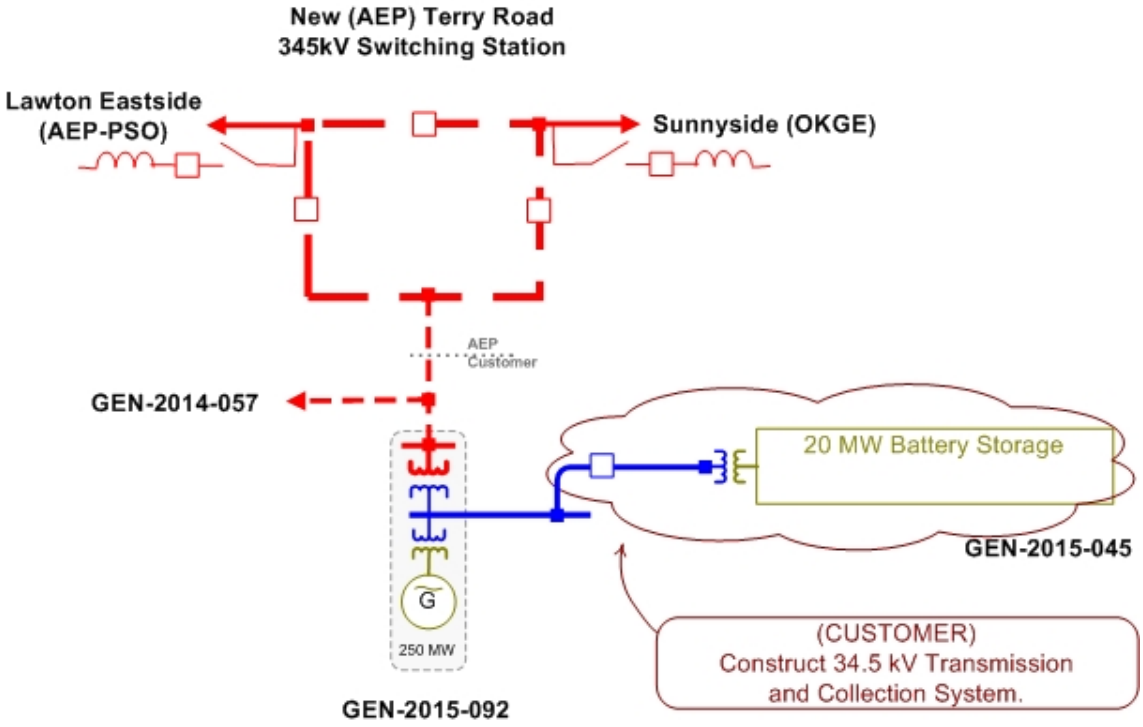
2. Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades

The cost for the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades is listed below in **Table 1**. GEN-2015-045/IFS-2015-002-10 is planned to interconnect at the AEPOK owned 345 kV bus located at Terry Road Substation. The one-line diagram is shown in **Figure 1**.

Table 1: Required Transmission Owner Interconnection Facilities and Non Shared Network Upgrades

Description	Total Project Cost	Allocated Cost
AEPOK Terry Road Interconnection Substation: Transmission Owner Interconnection Facilities	$0	$0
AEPOK Terry Road Interconnection Substation - Shared Network Upgrades	$0	$0
Total:	$0	$0

Figure 1: Interconnection Configuration for GEN-2015-045



2.1. **Interconnection Customer Facilities** – The Interconnection Customer will be responsible for its Generating Facility and its one (1) 345/34.5 kV transformer per GEN-2015-092/IFS-2015-002-36 facilities that connect to the wind generators under GEN-2015-092 and battery storage facility under GEN-2015-045 to the Point of Interconnection. In addition, the Interconnection Customer will be required to install the following equipment in its facilities.

2.1.1. **Reactive Power Equipment** – The Customer will be responsible for reactive power compensation equipment to maintain 95% lagging (providing vars) and 95% leading (absorbing vars) power factor at the POI, which may be provided in part by the reactive power capability of the generators. Any capacitor banks installed by the Interconnection Customer shall not cause voltage distortion in accordance with Article 9.7.4 of the standard SPP Generator Interconnection Agreement.

3. Conclusion

The Interconnection Customer's Interconnection Facilities and Shared Network Upgrades are estimated at $0.