INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-051

(IFS-2016-001-13)

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
3/01/2018	SPP	Initial draft revision 0 report issued.
4/2/2018	SPP	Final draft revision 0 report issued.
5/3/2019	SPP	Final report updated per DISIS-2016-001-4, updated Table 4.

CONTENTS

SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-051/IFS-2016-001-13 is for a 9.8 MW generating facility located in Custer County, Oklahoma. GEN-2016-051 is an uprate of GEN-2003-022 (120 MW) and GEN-2004-020 (27 MW). The Interconnection Request was studied in the DISIS-2016-001 Impact Study and Restudies for Energy Resource Interconnection Service (ERIS) only. The Interconnection Customer's requested in-service date is December 31, 2017.

The interconnecting Transmission Owner, American Electric Power - Public Service Company of Oklahoma (AEP-PSCO), 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 Non-Shared Network Upgrade(s) and 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 uprating GEN-2003-022 and GEN-2004-020's ninety-eight (98) 1.5 MW General Electric (G.E.) to ninety-eight (98) 1.6 G.E. wind generators for a total generating nameplate capacity of 9.8 MW for GEN-2016-051.

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) 138/34.5kV 96/128/160 MVA (ONAN/ONAF/ONAF) step-up transformer that is owned and maintained by the GEN-2003-022 and GEN-2004-020 Interconnection Customer at the GEN-2003-022 and GEN-2004-020 Interconnection Customer's substation.
- A less than one (<1) mile overhead 138 kV line as part of GEN-2003-022 and GEN-2004-020 facilities will connect the Interconnection Customer's substation to the Point of Interconnection (POI) at the 138 kV bus at existing AEP-PSCO substation ("Weatherford") that is owned and maintained by AEP-PSCO;
- All transmission facilities required to connect the Interconnection Customer's facilities to GEN-2003-022 and GEN-2004-020's 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. Additionally approximately 0.5 Mvars[1] of reactors will be required to compensate for GEN-2003-022, GEN-2004-020, and GEN-2016-051 combined injection of reactive power into the transmission system under no/reduced generating conditions. 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.

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-2016-051 as studied in the DISIS-2016-001 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 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 ($)	Allocated %	Allocated Cost Estimate ($)	Estimated Lead Time
AEP-PSCO Weatherford Interconnection Substation: Transmission Owner Interconnection Facilities	$0	n/a	$0	n/a
Total	**$0**	**n/a**	**$0**	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	Z2 Type[2]	Total Cost Estimate ($)	Allocated %	Allocated Cost Estimate ($)	Estimated Lead Time
AEP-PSCO Weatherford Interconnection Substation - Non-Shared Network Upgrades replace jumpers and review relay settings necessary for Interconnection Customer's Generating Facility.	Non-Creditable	$18,500	100%	$18,500	3 Months
Total		**$18,500**	**100%**	**$18,500**	

[2] 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 Upgrades

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

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.

Table 4: Interconnection Customer Other Network Upgrade(s)

Other Network Upgrade(s) Description	Current Cost Assignment	Estimated In-Service Date*
None	N/A	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 Other Network Upgrades.

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 9.8 MW can be granted. Interconnection Service will be delayed until the Non-Shared Network Upgrade(s) and 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 5: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities	$0
Network Upgrades	$18,500
Total	**$18,500**

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

Interconnection Customer has requested an Interconnection Facilities Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnecting a 9.8 MW wind facility in Custer County, Oklahoma to the transmission system of American Electric Power - Public Service Company of Oklahoma (AEP-PSCO). The generator facility, GEN-2016-051, is consist of uprating GEN-2003-022 and GEN-2004-020's ninety-eight (98) 1.5 MW General Electric (G.E.) to ninety-eight (98) 1.6 G.E. wind generators for a total generating nameplate capacity of 9.8 MW for GEN-2016-051.

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 **and** Table 2. GEN-2016-051/IFS-2016-001-13 is planned to interconnect at the AEP-PSCO owned 138 kV bus located at existing Weatherford Substation. The estimated lead time for Transmission Owner Interconnection Facilities and Network Upgrades is 3 (3) months after a fully executed Generator Interconnection Agreement (GIA). The one-line diagram is shown in **Figure 1**.

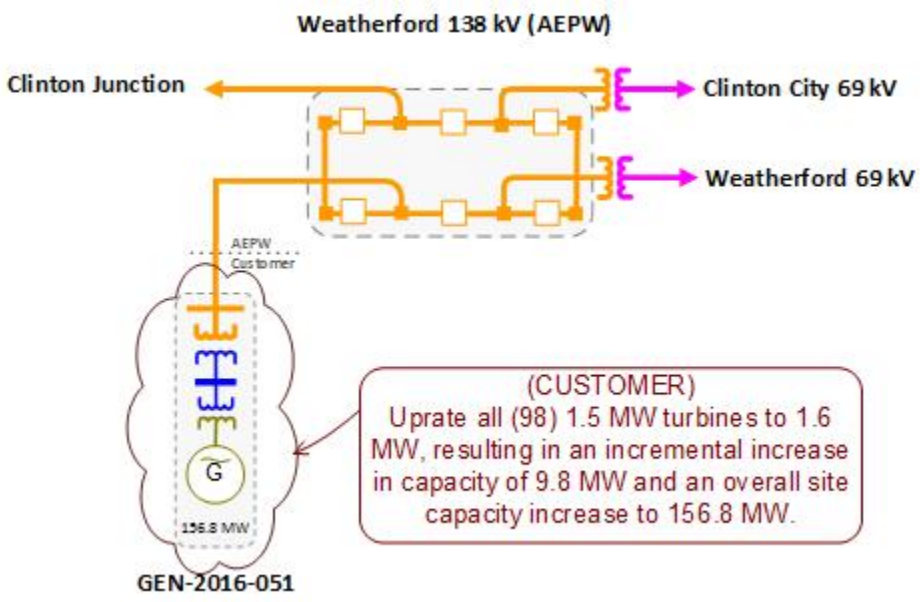
Table 1: Required Transmission Owner Interconnection Facilities

Description	Total Project Cost	Allocated Cost
AEP-PSCO Weatherford Interconnection Substation: Transmission Owner Interconnection Facilities	$0	$0
Total:	$0	$0

Table 2: Non Shared Network Upgrades

Description	Total Project Cost	Allocated Cost
AEP-PSCO Weatherford Interconnection Substation - Non-Shared Network Upgrades replace jumpers and review relay settings necessary for Interconnection Customer's Generating Facility.	$18,500	$18,500
Total:	$18,500	$18,500

Figure 1: Interconnection Configuration for GEN-2016-051



2.1. **Interconnection Customer Facilities** – The Interconnection Customer will be responsible for its Generating Facility and its one (1) 138/34.5 kV transformers that connect to the wind generators 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 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, 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 $18,500.