



**Interconnection Facilities Study
For
Generator Interconnection
Request
GEN-2014-020
(IFS-2014-002-03)**

***SPP Generator
Interconnection Studies***

***(#GEN-2014-020)
(#IFS-2014-002-03)***

August 2015

Revision History

Date	Author	Change Description
7/9/2015	SPP	Draft Interconnection Facilities Study Revision 0 Report Issued
8/26/2015	SPP	Final Interconnection Facilities Study Revision 0 Report Issued

Summary

American Electric Power – Public Service Company of Oklahoma (AEPW-PSO) and Oklahoma Gas and Electric Company (OKGE) have performed detailed Interconnection Facilities Studies at the request of Southwest Power Pool (SPP) for Generator Interconnection request GEN-2014-020/IFS-2014-002-03 (100.00 MW/Wind) located in Grady County, Oklahoma. The Interconnection Customer proposed in-service date for GEN-2014-020/IFS-2014-002-03 is December 31, 2017. SPP has proposed the full interconnection service in-service date will be after the assigned Interconnection Facilities and Non-Shared Network upgrades are completed. Full Interconnection Service will require the Network Upgrades listed in the “Other Network Upgrades” section. The request for interconnection was placed with SPP in accordance with SPP’s Open Access Transmission Tariff, which covers new generation interconnections on SPP’s transmission system.

Phases of Interconnection Service

It is not expected that interconnection service will require phases however, interconnection service will not be available until all interconnection facilities and network upgrades can be placed in service.

Interconnection Customer Interconnection Facilities

The Interconnection Customer’s generation facility consists of fifty (50) Vestas V110 2.0MW wind turbines for a total generation capacity of 100.00 MW. The 34.5kV collector system for this wind farm is planned to be connected to one (1) 138/34.5kV Interconnection Customer owned and maintained transformer at the Interconnection Customer owned substation. A short (< 1 mile) 138kV transmission circuit will connect GEN-2014-020/IFS-2014-002-03 Interconnection Customer owned substation to a new AEPW-PSO owned 138kV bus at a new Station tapping the Tuttle – Cornville 138kV transmission circuit. The Interconnection Customer will be responsible for all of the transmission facilities connecting the Interconnection Customer owned substation to the Point of Interconnection (POI).

The Interconnection Customer will be responsible for any equipment located at the Customer substation necessary to maintain a power factor of 0.95 lagging to 0.95 leading at the POI, including approximately 3.7 Mvar¹ of reactors to compensate for injection of reactive power into the transmission system under light wind conditions. Also, the Interconnection Customer will need to coordinate with the Transmission Owner for relay, protection, control, and communication system configurations.

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades

To allow interconnection the interconnecting Transmission Owner, American Electric Power – Public Service Company of Oklahoma (AEPW-PSO) will need to construct a new three (3) breaker ring bus station along with any associated terminal equipment for the acceptance of the Interconnection Customer’s Interconnection Facilities. AEPW estimates an Engineering and Construction (E&C) lead time of approximately twenty-four (24) months after a fully

¹ This approximate amount of reactors is an approximate minimum amount needed for the configuration of the wind farm studied in DISIS-2014-002 Group 01 Analysis. This approximate amount of reactors is subject to change based on results of modification study discussed above.

executed Generator Interconnection Agreement (GIA) for the completion of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. OKGE will need to review relay settings and conduct field testing at the OKGE Cimarron Substation. At this time, GEN-2014-020/IFS-2014-002-03 is responsible for \$7,684,803 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. **Table 1** displays the estimated costs for Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades.

Table 1: GEN-2014-020/IFS-2014-002-03 TOIF and Non-Shared Network Upgrades

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades Description	Allocated Cost (\$)	Allocated Percent (%)	Total Cost (\$)
Interconnection Substation - Transmission Owner Interconnection Facilities 138kV Substation work for line terminal, 3000A line switch, dead end structure, line relaying, and revenue metering	\$750,000	100%	\$750,000
Interconnection Substation - Network Upgrades 138kV Substation work for 3-138kV 3000A Breaker, line relaying, 3000A disconnect switches, and associated equipment	\$6,914,803	100%	\$6,914,803
OKGE Cimarron Substation – Network Upgrade for relay setting verification and field testing work	\$20,000	100%	\$20,000
Total	\$7,684,803	100%	\$7,684,803

Shared Network Upgrades

The Interconnection Customer was studied within the DISIS-2014-002 Impact Study and DISIS-2014-002-1 Impact Restudy with Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). At this time, the Interconnection Customer is allocated \$0 for Shared Network Upgrades. If higher queued interconnection customers withdraw from the queue, suspend or terminate their GIA, restudies will have to be conducted to determine the Interconnection Customers' allocation of Shared Network Upgrades. All studies have been conducted on the basis of higher queued interconnection requests and the upgrades associated with those higher queued interconnection requests being placed in service. At this time, the Interconnection Customer is allocated the costs for Shared Network Upgrade shown in **Table 2**.

Table 2: GEN-2014-020/IFS-2014-002-03 Shared Network Upgrades

Shared Network Upgrades Description	Allocated Cost (\$)	Allocated Percent (%)	Total Cost (\$)
Currently GEN-2014-020/IFS-2014-002-03 is not allocated Shared Network Upgrades	\$0	n/a	\$0
Total	\$0	n/a	\$0

Other Network Upgrades

Certain Other Network Upgrades are currently not the cost responsibility of the Customer but will be required for full Interconnection Service. Currently, no Other Network Upgrades are assigned to GEN-2014-020/IFS-2014-002-03.

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

Conclusion

Interconnection Service for GEN-2014-020/IFS-2014-002-03 will be delayed until the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades are constructed. The Interconnection Customer is responsible for \$7,684,803 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. At this time, the Interconnection Customer is allocated \$0 for Shared Network Upgrades. After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 100.00 MW, as requested by GEN-2014-020/IFS-2014-002-03, can be allowed.

At this time the total allocation of costs assigned to GEN-2014-020/IFS-2014-002-03 for interconnection Service are estimated at \$7,684,803.

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 100 MW wind generation facility in Grady County, Oklahoma to the transmission system of American Electric Power – Public Service Company of Oklahoma (AEPW-PSO). The generator facility, GEN-2014-020, is comprised of fifty (50) Vestas V110 2.0MW wind turbines for a total nameplate of 100.00 MW.

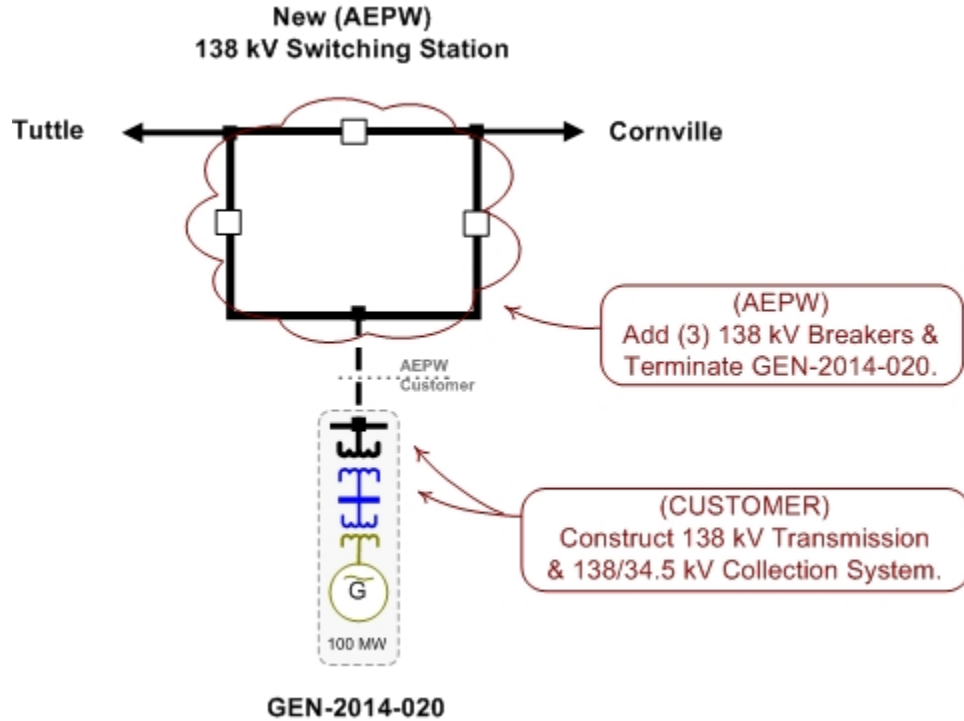
2. Interconnection Facilities and Network Upgrades

The cost for the Interconnection Facilities and Network Upgrades is listed below in Table 1. GEN-2014-020/IFS-2014-002-03 will interconnect a new AEPW owned 138kV bus at a Station tapping Tuttle – Cornville 138kV transmission circuit. The estimated lead time for Transmission Owner Interconnection Facilities and Network Upgrades is twenty-four (24) months after a fully executed Generation Interconnection Agreement (GIA). The one-line diagram is shown in Figure 1.

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

Description	Estimated Cost
AEPW Interconnection Substation - Transmission Owner Interconnection Facilities 138kV Substation work for line terminal, 3000A line switch, dead end structure, line relaying, and revenue metering	\$750,000
AEPW Interconnection Substation - Network Upgrades 138kV Substation work for 3-138kV 3000A Breaker, line relaying, 3000A disconnect switches, and associated equipment	\$6,914,803
Total:	\$7,664,803

Figure 1: Interconnection Configuration for GEN-2014-020



2.1. Interconnection Customer Facilities – The Interconnection Customer will be responsible for its Generating Facility and its one (1) 138/34.5 kV transformer that connect to the wind generators to the Point of Interconnection. In addition, the 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 point of interconnection, which may be provided in part by the reactive power capability of the synchronous 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 Generation Interconnection Agreement.

3. Conclusion

The Interconnection Customer's Interconnection Facilities and Non-Shared Network Upgrades are estimated at \$7,664,803.



FACILITY STUDY

for

Generation Interconnection Request 2014-020

100 MW Wind Generating Facility
In Grady County Oklahoma

August 19, 2015

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Summary

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Oklahoma Gas and Electric (OG&E) performed the following Facility Study to satisfy the Facility Study Agreement executed by the requesting customer for SPP Generation Interconnection request Gen-2014-020. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system. The request is for adding 100MW at a new interconnection substation to be owned by AEP on the Cimarron to Cornville 138kV line. The requirement for the addition of 100 MW of generation is for OG&E to update and test relay settings at Cimarron substation. The cost for this work is \$20,000. No new or additional facilities are necessary to accommodate the generation.

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Introduction

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting an additional 100 MW of wind generation at a new Point of Interconnection within the service territory of American Electric Power West (AEPW) in Grady County Oklahoma. The proposed 138kV point of interconnection is at a new substation on the Cimarron (OKGE) to Cornville (AEPW) 138kV line.

Network Constraints in the American Electric Power West (AEPW), Oklahoma Gas & Electric (OKGE) and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.

Interconnection Facilities

The primary objective of this study is to identify attachment facilities. There are no requirements for additional Transmission Owner Interconnection Facilities at the existing Cimarron Substation. This Facility Study does not guarantee the availability of transmission service necessary to deliver the additional generation to any specific point inside or outside the Southwest Power Pool (SPP) transmission system. The transmission network facilities may not be adequate to deliver the additional generation output to the transmission system. If the customer requests firm transmission service under the SPP Open Access Transmission Tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPP OATT.

The costs of interconnecting the facility to the OKGE transmission system are listed in Table 1.

Short Circuit Fault Duty Evaluation

It is standard practice for OG&E 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.

For this generator interconnection, no breakers were found to exceed their interrupting capability after the addition of the Customer's 100 MW generation and related facilities. OG&E found no breakers that exceeded their interrupting capabilities on their system. Therefore, there is no short circuit upgrade costs associated with the Gen-2014-020 interconnection.

Table 1: Required Interconnection Network Upgrade Facilities

Facility	ESTIMATED COST (2015 DOLLARS)
OKGE – Interconnection Facilities – No new interconnection facilities necessary	\$0
OKGE – Network Upgrades No new network upgrades necessary	\$0
OKGE – Relay settings verification and field testing	\$20,000
Total	\$20,000

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New AEPW 138kV Switching Station

