



# **INTERCONNECTION FACILITIES STUDY REPORT**

GEN-2015-092  
(IFS-2015-002-36)

Published December 2017

By SPP Generator Interconnections Dept.

## REVISION HISTORY

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DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
3/23/2017	SPP	Initial draft report issued.	
12/4/2017	SPP	Initial final report issued.	

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# SUMMARY

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## *INTRODUCTION*

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2015-092/IFS-2015-002-36 is for a 250.00 MW generating facility located in Stephens 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 assigned Transmission Owner Interconnection Facilities and Non-Shared 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 one-hundred-twenty-five (125) 2.0 MW General Electric (G.E.) wind generators for a total generating nameplate capacity of 250.00 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 to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation.
- A two (2) mile overhead 345 kV line to connect the Interconnection Customer's substation to the Point of Change of Ownership (PCO) with GEN-2014-057/IFS-2014-002-22 facilities. Additionally, GEN-2015-045/IFS-2015-002-10 will connect to the 34.5kV facilities of the Interconnection Request. The Interconnection Request, GEN-2014-057/IFS-2014-002-22, and GEN-2015-045/IFS-2015-002-10 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<sup>1</sup> 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.

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<sup>1</sup> This approximate minimum reactor amount is needed for the current configuration of the wind farm and GEN-2015-045 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)*

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

A Shared Facilities Usage Agreement for the shared facilities with GEN-2014-057/IFS-2014-002-22 and GEN-2015-045/IFS-2015-002-10 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*

<b>Shared Network Upgrades Description</b>	<b>Allocated Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Total Cost Estimate (\$)</b>
<b>Currently none</b>	\$0	N/A	\$0
<b>Total</b>	<b>\$0</b>	<b>N/A</b>	<b>\$0</b>

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) None

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 250.00 MW can be granted. Interconnection Service will be delayed until the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades 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*

<b>Description</b>	<b>Allocated Cost Estimate</b>
Transmission Owner Interconnection Facilities	\$0
Network Upgrades	\$0
<b>Total</b>	<b>\$0</b>

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

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# **A: AEP TRANSMISSION OWNER'S INTERCONNECTION FACILITIES STUDY REPORT**

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See next page for the AEP 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 250.00 MW wind farm facility in Grady County, Oklahoma to the transmission system of American Electric Power Oklahoma Transmission Company (AEPOK). The generator facility, GEN-2015-092, is comprised of one-hundred-twenty-five (125) 2.0 MW General Electric (G.E.) wind generators for a total generating nameplate capacity of 250.00 MW.

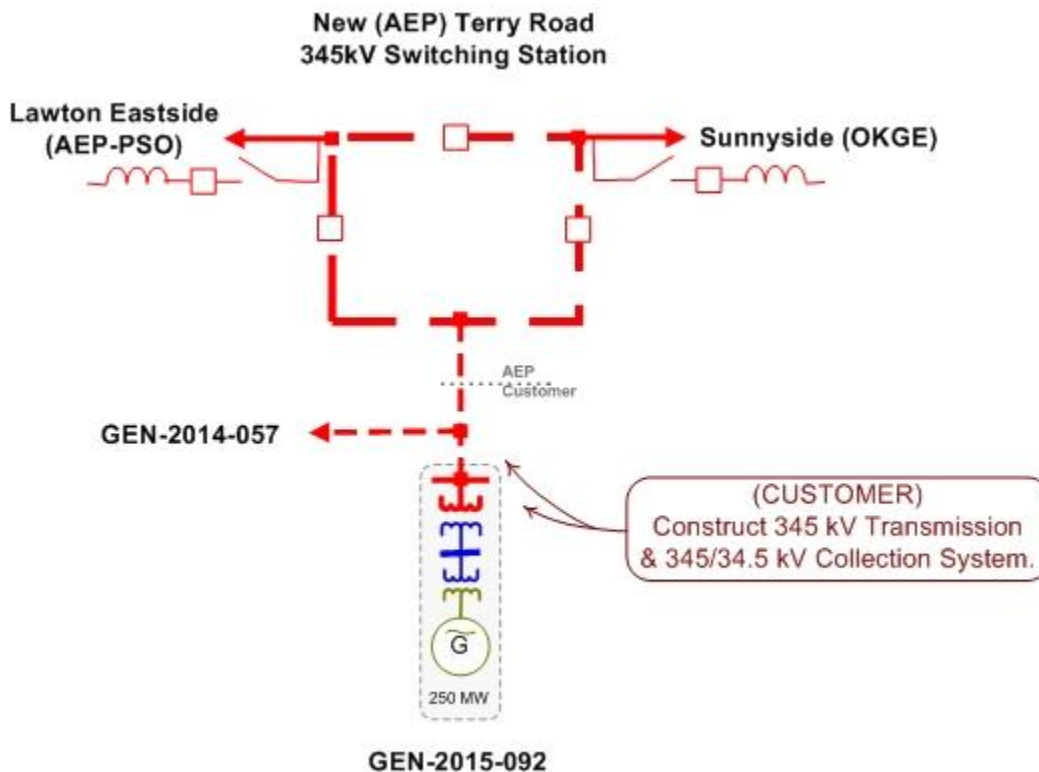
**2. Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades**

The cost for the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades is listed below in Table 1. GEN-2015-092/IFS-2015-002-36 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
<u>AEPOK Terry Road Interconnection Substation: Transmission Owner Interconnection Facilities</u>	\$0	\$0
<u>AEPOK Terry Road Interconnection Substation - Shared Network Upgrades</u>	\$0	\$0
<b>Total:</b>	\$0	\$0

Figure 1: Interconnection Configuration for GEN-2015-092



**2.1. Interconnection Customer Facilities** – The Interconnection Customer will be responsible for its Generating Facility and its one (1) 345/34.5 kV transformer that connects 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.

## **B: OKGE TRANSMISSION OWNER'S INTERCONNECTION FACILITIES STUDY REPORT**

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



## **FACILITY STUDY**

**for**

### **Generation Interconnection Request 2015-092**

250MW Wind Generating Facility  
In Stephens County  
Oklahoma

May 18, 2016

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Lead Engineer  
Transmission Planning  
**OG&E Electric Services**

## **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-2015-092. 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 a new 250 MW wind facility to an existing Point of Interconnection on an adjacent line to OG&E's Sunnyside substation. No new or additional facilities are necessary to accommodate the additional generation.

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## **Introduction**

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting 250 MW of new wind generation to an existing Point of Interconnection adjacent to the service territory of OG&E Electric Services (OKGE) in Stephens County Oklahoma. The proposed 345kV point of interconnection is at the existing Terry Road Substation in Grady County. This substation is owned by AEPW.

Network Constraints in the American Electric Power West (AEPW), 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 interconnection facilities at OG&E's Sunnyside 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 250 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-2015-092 interconnection.

**Table 1: Required Interconnection Network Upgrade Facilities**

Facility	ESTIMATED COST (2016 DOLLARS)
OKGE – <b>Interconnection Facilities</b> - No new interconnection facilities necessary	<b>\$0</b>
OKGE – <b>Network Upgrades</b> No work required.	<b>\$0</b>
OKGE - Right-of-Way for 345kV terminal addition	No Additional ROW
<b>Total</b>	<b>\$0</b>

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May 18, 2016

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# Terry Road Substation (AEPW)

