



# **INTERCONNECTION FACILITIES STUDY REPORT**

GEN-2015-081  
(IFS-2015-002-04)

Published May 2017

By SPP Generator Interconnections Dept.

## REVISION HISTORY

---

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
3/15/2017	SPP	Initial draft report issued.	
5/10/2017	SPP	Initial final report issued.	

# CONTENTS

---

Revision History.....	i
Summary.....	1
Introduction .....	1
Phase(s) of Interconnection Service .....	1
Credits/Compensation for Amounts Advanced for Network Upgrade(s).....	1
Interconnection Customer Interconnection Facilities .....	2
Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s).....	2
Shared Network Upgrade(s) .....	3
Other Network Upgrade(s) .....	4
Conclusion.....	4
Appendices.....	5
A: Transmission Owner’s Interconnection Facilities Study Report.....	6

## SUMMARY

---

### *INTRODUCTION*

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2015-081/IFS-2015-002-04 is for a 180.00 MW generating facility located in Dewey 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). The Interconnection Customer's requested in-service date is July 1, 2018.

The interconnecting Transmission Owner, Oklahoma Gas and Electric Company (OKGE), 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 Upgrades are completed.

The primary objective of the IFS is to identify necessary Transmission Owner Interconnection Facilities, Network Upgrade(s), other direct assigned upgrade(s), and associated upgrade lead times needed to grant the requested Interconnection Service at the specified Point of Interconnection (POI).

### *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 ninety (90) 2.0 MW Vestas wind generators for a total generating nameplate capacity of 180.00 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:

- A 34.5kV collector system;
- One (1) 345/34.5kV 84/112/140 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- A five (5) mile overhead 345kV line to connect the Interconnection Customer's substation to the POI at the 345 kV bus at a new OKGE substation ("GEN-2015-081 Tap") to be owned and maintained by OKGE. GEN-2015-081 Tap will be located approximately twenty-five (25) miles from Woodward 345kV on the Woodward -Tatonga 345kV transmission circuit;
- 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 power factor at the POI between 95% lagging and 95% leading, including approximately 8.4Mvars<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.

### ***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.

---

<sup>1</sup> This approximate minimum reactor amount is needed for the current configuration of the wind farm as studied in the DISIS-2015-002 Impact Study.

Table 1: Interconnection Customer TOIF and Non-Shared Network Upgrade(s)

TOIF and Non-Shared Network Upgrades Description	Allocated Cost Estimate (\$)	Allocated Percent (%)	Total Cost Estimate (\$)	Estimated Lead Time
<b><u>OKGE Interconnection Substation: Transmission Owner Interconnection Facilities</u></b> Construct one (1) 345 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.	\$1,099,958	100%	\$1,099,958	12 Months*
<b><u>OKGE Interconnection Substation - Non-Shared Network Upgrades*</u></b> Construct five (5) 5000 continuous ampacity breakers, cut in transmission line and re-terminate, control panels, line relaying, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials.	\$14,539,042*	100%	\$14,539,042*	
<b>Total</b>	<b>\$15,639,000</b>	<b>100%</b>	<b>\$15,639,000</b>	

\*Estimated costs, descriptions, and lead time are based on the Interconnection Customer providing the Transmission Owner land for the new substation.

**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	Allocated Cost Estimate (\$)	Allocated Percent (%)	Total Cost Estimate (\$)
<b><u>Currently non</u></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) Woodward – Tatonga – Mathewson 345kV circuit #2, assigned in 2012 Integrated Transmission Planning – 10 Year Assessment (ITP10). Currently on schedule for 7/1/2018 in-service.
- 2) Woodward EHV Phase Shifting Transformer circuit #1 build, assigned to DISIS-2011-001 Interconnection Customer(s). Currently on schedule for 6/1/2017 in-service.

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 180.00 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, 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	\$1,099,958
Network Upgrades	\$14,539,042
<b>Total</b>	<b>\$15,639,000</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

---



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

---

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



## **FACILITY STUDY**

**for**

### **Generation Interconnection Request 2015-081**

180 MW Wind Generating Facility  
In Woodward County  
Near  
Seiling, Oklahoma

January 12, 2016

Andrew R. Aston, P.E.  
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-2015-081. 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 requirements for interconnection consist of building a new substation with five new 345kV breakers and a terminal. The total cost for OKGE to build the new substation with five new 345kV breakers and a terminal in a new substation along the Tatonga to Woodward District EHV 345kV transmission line is estimated at \$15,639,000.

## Table of Contents

Table of Contents	3
Introduction	4
Interconnection Facilities	5
Interconnection Costs	6
One-Line diagram of Interconnection	7

## **Introduction**

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting a wind generating facility within the service territory of OG&E Electric Services (OKGE) in Woodward County Oklahoma. The proposed 345kV point of interconnection is at a new substation in the Tatonga to Woodward District EHV 345kV transmission line in Woodward County. This substation is owned by OKGE. The cost for adding a new 345kV terminal to the new Substation, the required interconnection facility, is estimated at \$1,099,958.

Network Constraints in the Southwest Public Service (SPS), OKGE and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.

Other Network Constraints in the American Electric Power West (AEPW), Southwest Public Service (SPS), 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. The requirements for interconnection consist of adding a new 345kV terminal in the new substation along the Tatonga to Woodward District EHV 345kV transmission line. This 345kV addition shall be constructed and maintained by OKGE. It is assumed that obtaining all necessary right-of-way for the line into the new OKGE 345kV substation facilities will be performed by the interconnection customer.

The total cost for OKGE to add a new 345kV terminal in a new EHV Substation, the interconnection facility, is estimated at \$1,099,958. This cost does not include building the 345kV line from the Customer substation into the new Substation. The Customer is responsible for this 345kV line up to the point of interconnection. This cost does not include the Customer's 345-34.5kV substation and the cost estimate should be determined by the Customer.

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 re-closer 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 180MW 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-2015-081 interconnection.

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

Facility	ESTIMATED COST (2016 DOLLARS)
OKGE – <b>Interconnection Facilities</b> - Add a single 345kV line terminal to a new EHV Substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs	<b>\$1,099,958</b>
OKGE – <b>Network Upgrades</b> at a new EHV sub, Install 5-345kV 5000A breakers, line relaying, disconnect switches, and associated equipment.	<b>\$14,539,042</b>
OKGE - Right-of-Way for 345kV terminal addition	No Additional ROW
<b>Total</b>	<b>\$15,639,000</b>

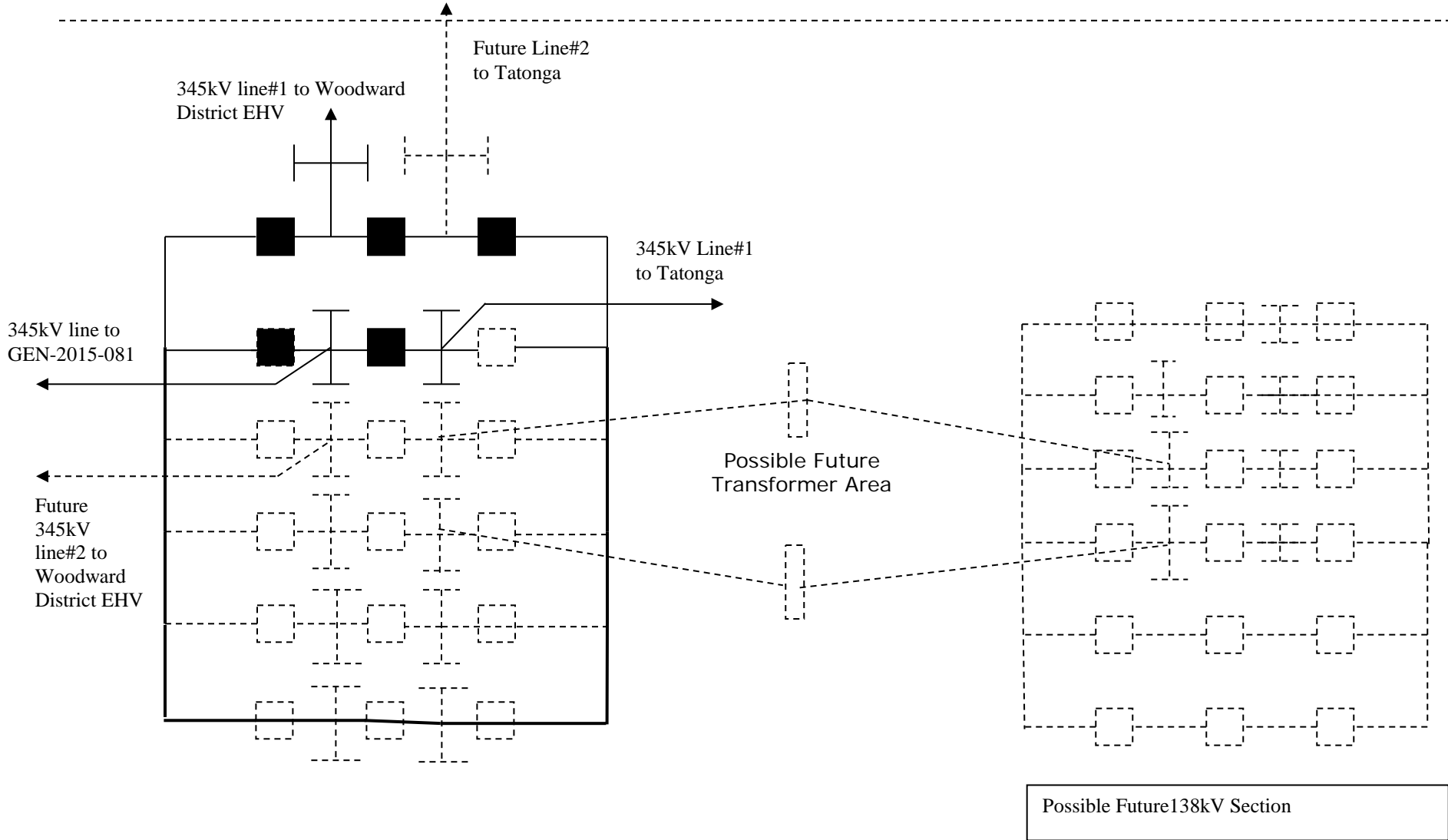
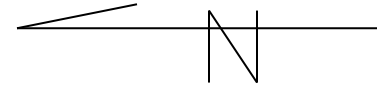
Prepared by Andrew R. Aston, PE

January 12, 2016

Lead Engineer, Transmission Planning  
OG&E Electric Services

Reviewed by:  
*Steve M Hardebeck P. E.*  
Manager, Transmission Planning  
OG&E Utility Technical Support

# GEN-2015-081 Substation



PL