



# **INTERCONNECTION FACILITIES STUDY REPORT**

GEN-2017-027

Published January 2022

By SPP Generator Interconnections Dept.

## REVISION HISTORY

---

<b>DATE OR VERSION NUMBER</b>	<b>AUTHOR</b>	<b>CHANGE DESCRIPTION</b>
12/14/2021	SPP	Initial draft report issued.
12/20/2021	SPP	Updated draft to include changes to customer facility data
01/07/2022	SPP	Final report issued.

# CONTENTS

---

Revision History.....	i
Summary.....	1
Introduction .....	1
Phase(s) of Interconnection Service.....	1
Compensation for Amounts Advanced for Network Upgrade(s).....	1
Interconnection Customer Interconnection Facilities.....	2
Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s).....	3
Shared Network Upgrade(s).....	4
Contingent Network Upgrade(s) .....	5
Affected System Upgrade(s) .....	6
Conclusion.....	7
Appendices.....	8
A: Transmission Owner’s Interconnection Facilities Study Report and Network Upgrades Report(s) .....	9

## SUMMARY

---

### INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2017-027 is for a 140 MW generating facility located in Carter County, OK. The Interconnection Request was studied in the DISIS-2017-001 Impact Study and the DISIS-2017-001-1 Impact Restudy for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's requested in-service date is November 29, 2021.

The interconnecting Transmission Owner, Oklahoma Gas and Electric (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 (TOIF), Non-Shared Network Upgrades, Shared Network Upgrades, Contingent Network Upgrades, and Affected System Upgrades that are required for full interconnection service 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, full Interconnection Service will not be available until all Interconnection Facilities and Network Upgrade(s) can be placed in service.

### COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)

FERC Order ER20-1687-000 eliminated the use of Attachment Z2 revenue crediting as an option for compensation. The Incremental Long Term Congestion Right (ILTCR) process will be the sole process to compensate upgrade sponsors as of July 1st, 2020.

## **INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES**

The Generating Facility is proposed to consist of eleven (11) Vestas V110 2.2 MW turbines, twenty one (21) Vestas V120 2.2 MW, nine (9) Vestas V150 CP 4.0 MW turbines, and eight (8) Vestas V150 CP 4.2 MW turbines for a total generating nameplate capacity of 140 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 138kV transformation substation with associated 34.5 kV and 138 kV switchgear;
- One 138/34.5 kV 108/133/167 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An approximately 6.3 mile overhead mile overhead kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 138 kV bus at existing Transmission Owner substation ("Pooleville - Ratliff (Carter County) 138kV") that is owned and maintained by Transmission Owner;
- 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 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. 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; and,
- All necessary relay, protection, control and communication systems required to protect Interconnection Customer's Interconnection Facilities and Generating Facilities and coordinate with Transmission Owner's relay, protection, control and communication systems.

**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)*

<b>Transmission Owner Interconnection Facilities (TOIF)</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Allocated Cost Estimate (\$)</b>	<b>Estimated Lead Time</b>
<b><u>Pooleville - Ratliff 138 kV GEN-2017-027 Interconnection (TOIF) (OKGE) (132972):</u></b> Add a single 138kV line terminal to Carter County Substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs.	\$515,000	100%	\$515,000	14 Months
<b>Total</b>	<b>\$515,000</b>		<b>\$515,000</b>	

*Table 2: Non-Shared Network Upgrade(s)*

<b>Non-Shared Network Upgrades Description</b>	<b>ILTCR</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Allocated Cost Estimate (\$)</b>	<b>Estimated Lead Time</b>
<b><u>Pooleville - Ratliff 138 kV GEN-2017-027 Interconnection (Non-Shared NU) (OKGE) (132973):</u></b> Install 1 -138kV 2000A breaker, line relaying, disconnect switches, and associated equipment.	Not Eligible	\$1,396,000	100%	\$1,396,000	14 Months
<b>Total</b>		<b>\$1,396,000</b>		<b>\$1,396,000</b>	

**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 Upgrade(s)*

<b>Shared Network Upgrades Description</b>	<b>ILTCR</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Allocated Cost Estimate (\$)</b>	<b>Estimated Lead Time</b>
<b>None</b>	N/A	\$0	N/A	\$0	N/A
<b>Total</b>		<b>\$0</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.

### CONTINGENT NETWORK UPGRADE(S)

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

*Table 4: Interconnection Customer Contingent Network Upgrade(s)*

<b>Contingent Network Upgrade(s) Description</b>	<b>Current Cost Assignment</b>	<b>Estimated In-Service Date</b>
<b>None</b>	\$0	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 Contingent Network Upgrades.



**AFFECTED SYSTEM UPGRADE(S)**

To facilitate interconnection, the Affected System Transmission Owner will be required to perform the facilities study work as shown below necessary for the acceptance of the Interconnection Customer’s Interconnection Facilities. **Table 5** displays the current impact study costs provided by either MISO or AECI as part of the Affected System Impact review. The Affected System facilities study could provide revised costs and will provide each Interconnection Customer’s allocation responsibilities for the upgrades.

*Table 5: Interconnection Customer Affected System Upgrade(s)*

<b>Affected System Upgrades Description</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Allocated Cost Estimate (\$)</b>
<b>None</b>	\$0	N/A	\$0
<b>Total</b>	\$0		\$0

**CONCLUSION**

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 140 MW can be granted. Full Interconnection Service will be delayed until the TOIF, Non-Shared NU, Shared NU, Contingent NU, Affected System Upgrades that are required for full interconnection service are completed. The Interconnection Customer’s estimated cost responsibility for full interconnection service is summarized in the table below.

*Table 6: Cost Summary*

<b>Description</b>	<b>Allocated Cost Estimate</b>
Transmission Owner Interconnection Facilitie Upgrade(s)	\$515,000
Non-Shared Network Upgrade(s)	\$1,396,000
Shared Network Upgrade(s)	\$0
Affected System Upgrade(s)	\$0
<b>Total</b>	<b>\$1,911,000</b>

Use the following link for Quarterly Updates on upgrades from this report: <https://spp.org/spp-documents-filings/?id=18641>

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 AND NETWORK UPGRADES REPORT(S)**

See next page for the Transmission Owner's Interconnection Facilities Study Report and Network Upgrades Report(s).



## **FACILITY STUDY**

**for**

### **Generation Interconnection Request 2017-027**

140 MW Wind Generating Facility  
In Carter County  
Oklahoma

August 17, 2020

Adam Snapp  
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-2017-027. 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 adding one 138kV breaker, a terminal for the wind farm line, associated metering, protection, and communications in Carter County substation. OG&E will also move the Carter County – Pooleville line to the new terminal location and bring the new gen tie line into the terminal currently occupied by Pooleville. The total cost for OG&E to complete the necessary work is estimated at \$1,911,000.

## 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 Carter County Oklahoma. The proposed 138kV point of interconnection is at Carter County Substation in Carter County. This substation is owned by OKGE. The cost for adding a new 138kV terminal to Carter County Substation, the required interconnection facility, is estimated at \$515,000.

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 138kV terminal in an existing substation. This 138kV 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 138kV substation facilities will be performed by the interconnection customer.

The total cost for OKGE to add a new 138kV terminal in an existing substation, and re-route the Pooleville line into the new terminal, freeing up the existing terminal to be accessed by the gen-tie facility, is estimated at \$1,911,000. This cost does not include building the 138kV line from the Customer substation into the POI Substation. The Customer is responsible for this 138kV line up to the point of interconnection. This cost does not include the Customer's 138-34.5kV 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 SPPOATT.

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 140MW 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-2017-027 interconnection.

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

Facility	ESTIMATED COST (2020 DOLLARS)
Lead Time	14 months
OKGE – <b>Interconnection Facilities</b> - Add a single 138kV line terminal to Carter County Substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs	<b>\$515,000</b>
OKGE – <b>Network Upgrades</b> at Carter County sub, Install 1-138kV 2000A breaker, line relaying, disconnect switches, and associated equipment.	<b>\$1,396,000</b>
OKGE - Right-of-Way for 138kV terminal addition	No Additional ROW
<b>Total</b>	<b>\$1,911,000</b>

Prepared by:  
 Adam Snapp  
 Lead Engineer, Transmission Planning  
 snappad@oge.com

August 17, 2020

Reviewed by:  
 Steve M Hardebeck PE, PMP  
 Manager- Transmission Planning  
 hardebsm@oge.com

September 11, 2020



# Carter County Substation in Carter County



