



INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-071

IFS-2016-001-19

Published February 2022

By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
05/24/2019	SPP	Initial draft report issued.
06/25/2019	SPP	Revised draft report issued.
06/28/2019	SPP	Final report issued. Revised upgrades/costs in Table 2 and Table 6. OKGE Facility Study Report updated to version 2.
01/07/2020	SPP	Revised final report per DISIS-2016-001-5. Removed Wolf Creek-Emporia Shared NU in Table 3. Added Contingent Network Upgrade table in report.
02/24/2022	SPP	Revised final report issued. Removed “Wolf Creek – Blackberry” from Table 4 based on latest reposting.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-071/IFS-2016-001-19 is for a 200.10 MW generating facility located in Kay County, Oklahoma. The Interconnection Request was studied in the DISIS-2016-001 Impact Study and DISIS-2016-001-1, DISIS-2016-001-2 Impact Restudies for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's requested in-service date is 12/2018.

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 interconnect facilities (TOIF), non-shared network upgrades, shared network upgrades, contingent network upgrades, previously allocated, 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.

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 creditable-type 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 Eighty seven (87) General Electric 2.3 MW wind turbines for a total generating nameplate capacity of 200.10 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 collector circuits;
- 34.5 kV to 138 kV transformation substation with associated 34.5 kV and 138 kV switchgear;
- One (1) 138/34.5 kV 135/180/225 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- A four (4) mile overhead 138 kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 138 kV bus at new Transmission Owner substation ("Proposed new 138kV substation in Kay County, OK") Middleton Tap 138 kV Substation 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. Additionally approximately 8.4 Mvars¹ of reactors will be required to compensate for 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.

¹This approximate minimum reactor amount is needed for the current configuration of GEN-2016-071 as studied in the DISIS-2016-001 Impact Study and Restudies.

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 Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>OKGE Proposed new 138kV substation near Middleton Tap Interconnection Substation:</u> Add a single 138kV line terminal to new substation, 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.	\$410,000	100%	\$410,000	18 months
Total	\$410,000	100%	\$410,000	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	Z2 Type ²	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>OKGE Proposed new 138kV substation near Middleton Tap Interconnection Substation:</u> Construct a new four (4) breaker ring bus configuration 138 kV substation, four (4) 138 kV 2000 continuous ampacity breakers, terminate 3 existing transmission lines at new terminals (2 OKGE, 1 WFEC), control panels, line relaying, cut in transmission lines and re-terminate, acquire land, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials.	Non-Creditable	\$4,052,190	100%	\$4,052,190	18 Months
Total		\$4,052,190	100%	\$4,052,190	

² Indicates the method used for calculating credits 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 Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
None	N/A	\$0	N/A	\$0	N/A
Total		\$0		\$0	

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)

Contingent Network Upgrade(s) Description	Current Cost Assignment	Estimated In-Service Date
None	N/A	N/A

PREVIOUS NETWORK UPGRADE(S)

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

Table 5: Interconnection Customer Previous Network Upgrade(s)

Previous Network Upgrade(s) Description	Current Cost Assignment	Estimated In-Service Date
None	\$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 Previous 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 6** displays the current impact study costs 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 6: Interconnection Customer Affected System Upgrade(s)

Affected System Upgrades Description	Total Cost Estimate (\$)	Allocated Share (%)	Allocated Cost Estimate (\$)
None	\$0	N/A	\$0
Total	\$0		\$0

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 200.10 MW can be granted. Full Interconnection Service will be delayed until the transmission owner interconnect facilities (TOIF), non-shared network upgrades, shared network upgrades, contingent network upgrades, previously allocated, and affected system upgrades that are required for full interconnection service are completed. The Interconnection Customer’s estimated cost responsibility is summarized in the table below.

Table 7: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities	\$410,000
Network Upgrades	\$4,052,190
Total	\$4,462,190

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).



**Revised
FACILITY STUDY**

for

Generation Interconnection Request 2016-071R2

New 200 MW Wind Generating Facility
In Kay County
Oklahoma

June 27, 2019

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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-2016-071. 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 four new 138kV breakers and terminals for the existing, Creswell line, the Kildare line and the Middleton Tap Line to WFEC Chilocco as well as the new wind farm line. The total cost for OKGE to build the new substation with four new 138kV breakers and a terminal for the wind farm line and the existing lines in a new Substation, the interconnection facility, is estimated at \$4,212,190.

The WFEC Chilocco line will need to be routed into the new substation at an additional cost of \$250,000.

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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 Kay County Oklahoma. The proposed 138kV point of interconnection is at a new substation in Kay County. This substation will be owned by OKGE. The new substation will be constructed at the current Middleton Tap location. The cost for adding a new 138kV terminal to a new substation, the required interconnection facility, is estimated at \$410,000. The cost for routing WFEC Chilocco line into this substation is estimated at \$250,000.

Network Constraints in the Southwest Public Service (SPS), OKGE, Western Farmers Electric Cooperative (WFEC), AEPW(AEP West) and Western Resources 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, Western Farmers Electric Cooperative (WFEC), and Western Resources 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 a new 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 a new substation, the interconnection facility, is estimated at \$410,000. This cost does not include building the 138kV line from the Customer substation into the new 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.

Additionally,

The interconnection of WFEC facilities into the new OKGE 138kV substation will require WFEC lines located next to the new OKGE substation to be routed into the new substation at a cost of \$250,000.

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 200 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-2016-071 interconnection.

Table 1: Required Interconnection Network Upgrade Facilities

Facility	ESTIMATED COST (2017 DOLLARS)
OKGE – Interconnection Facilities - Add a single 138kV line terminal to a new substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs	\$410,000
OKGE – Network Upgrades install 4-138kV 2000A breakers, terminate 3 existing transmission lines at new terminals and the generator lead line, line relaying, disconnect switches, and associated equipment.	\$3,682,190
OKGE – Property for new 138kV substation site	\$120,000
WFEC – Interconnection Facilities – Re-routing of 138kV line into new OKGE Substation. line switch, line relaying, revenue metering including CTs and PTs(Cost by WFEC)	\$250,000
Total	\$4,462,190

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June 27, 2019

New 138kV Substation in Kay County

Convert Middleton Tap to Four Breaker Ring

