



INTERCONNECTION FACILITIES STUDY REPORT

GEN-2015-066
(IFS-2015-002-38)

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
3/15/2017	SPP	Initial draft report issued.
5/9/2017	SPP	Initial final report issued.
6/11/2020	SPP	Update final report issued. Updated Tables 1 and 4 cost information.

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
Affected System Upgrade(s)	4
Shared Network Upgrade(s)	5
Other Network Upgrade(s)	5
Conclusion.....	6
Appendices.....	7
A: Transmission Owner’s Interconnection Facilities Study Report.....	8
B: Affected System Transmission Owner’s Affected System Interconnection Facilities Study Report	9

SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2015-066/IFS-2015-002-38 is for a 248.40 MW generating facility located in Pawnee County, Oklahoma. The Interconnection Request was studied in the DISIS-2015-002 Impact Study for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's requested in-service date is October 15th, 2022.

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. Additionally, the Affected System Transmission Owner, Associated Electric Cooperative Inc. (AECI) has performing a detailed Affected System Interconnection Facilities Study (AS-IFS) for impacts on the AECI transmission system. The full report is included in Appendix B. SPP has determined that full Interconnection Service will be available after the assigned Transmission Owner Interconnection Facilities and 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 one hundred-eight (108) 2.3 MW General Electric (G.E.) wind generators for a total generating nameplate capacity of 248.40 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 170/220/280 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- A less than one (<1) mile overhead 345kV line to connect the Interconnection Customer's substation to the POI at the 345kV bus at the new OKGE substation ("GEN-2015-066 Tap") to be owned and maintained by OKGE. GEN-2015-066 Tap would tap and loop in the Cleveland – Sooner 345kV transmission circuit. GEN-2015-066 Tap is planned to be located approximately ten (10) miles from Sooner 345kV on the Cleveland – Sooner 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 13.1Mvars¹ 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.

¹ 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
<p><u>OKGE GEN-2015-066 Tap Interconnection Substation: Transmission Owner Interconnection Facilities</u> 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.</p>	\$1,199,958	100%	\$1,199,958	13 Months
<p><u>OKGE GEN-2015-066 Tap Interconnection Substation - Non-Shared Network Upgrades*</u> Install three (3) 3000 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.</p>	\$10,482,642	100%	\$10,482,642	
Total	\$11,682,600	100%	\$11,682,600	

AFFECTED SYSTEM UPGRADE(S)

To facilitate interconnection, the Affected System Transmission Owner, has performed study work necessary for the acceptance of the Interconnection Customer’s Interconnection Facilities.

Cleveland – Silver City 138kV upgrade is required by the Interconnection Request and also GEN-2015-047/IFS-2015-002-02. This shared upgrade cost assignment will be determined by AECI if both requests proceed into a construction agreement with AECI. If GEN-2015-047/IFS-2015-002-02 withdraws, then the total cost for the Cleveland – Silver City 138kV upgrade could be assigned to this Interconnection Request.

The Interconnection Customer’s costs for Affected System Upgrade(s) are estimated in **Table 2** below.

Table 2: Interconnection Customer Affected System Upgrades

Shared Network Upgrades Description	Allocated Cost Estimate (\$)	Allocated Percent (%)	Total Cost Estimate (\$)
<u>AECI Cleveland – Silver City 138kV circuit #1</u> uprate Cleveland – Silver City 138kV line to operate at 100C temperature, remove silver city wave trap, reconfigure CT ration at Silver City and Cleveland	TBD by AECI *	TBD by AECI *	\$790,900
Total	TBD by AECI*	TBD by AECI*	\$790,900

*To be determined by AECI if this upgrade is a shared upgrade with GEN-2015-047.

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	Allocated Cost Estimate (\$)	Allocated Percent (%)	Total Cost Estimate (\$)
<u>Currently none</u>	\$0	N/A	\$0
Total	\$0	N/A	\$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.

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) Currently 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, Network Upgrades, and Affected System Upgrade(s) have been placed into service, Interconnection Service for 248.40 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 4: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities	\$1,199,958
Network Upgrades	\$10,482,642
Affected System Upgrades	TBD by AECI
Total	\$11,682,600

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 OATT.

APPENDICES

A: TRANSMISSION OWNER'S INTERCONNECTION FACILITIES STUDY REPORT

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

B: AFFECTED SYSTEM TRANSMISSION OWNER'S AFFECTED SYSTEM INTERCONNECTION FACILITIES STUDY REPORT

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



FACILITY STUDY

for

Generation Interconnection Request 2015-066

248.4 MW Wind Generating Facility
In Pawnee County
Oklahoma

June 10, 2020

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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-2015-066. 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 EHV substation, with three new 345kV breakers, a terminal for the wind farm line, a terminal for a line to Sooner, and a terminal for a line to Cleveland. The total cost for OKGE to build the new substation with three new 345kV breakers, and three line terminals in a new EHV Substation, the interconnection facility, is estimated at \$11,683,000.

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 Pawnee County Oklahoma. The proposed 345kV point of interconnection is at a new EHV Substation in Pawnee County. This substation will be owned by OKGE and will be located approximately 10 miles from Sooner on the Sooner-Cleveland Transmission line. The cost for adding a new 345kV terminal to a new EHV Substation, the required interconnection facility, is estimated at \$1,199,958.

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 a new EHV Substation. 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 \$1,199,958. This cost does not include building the 345kV line from the Customer substation into the new EHV 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 248.4 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-2015-066 interconnection.

Table 1: Required Interconnection Network Upgrade Facilities

Facility	ESTIMATED COST (2016 DOLLARS)
OKGE – Interconnection Facilities - Add a single 345kV line terminal to a new EHV Substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs	\$1,199,958
OKGE – Network Upgrades at a new EHV sub, Install 3-345kV 3000A breakers, line relaying, disconnect switches, and associated equipment.	\$10,482,642
OKGE – Land for substation provided by GEN-2015-066	\$0
Total	\$11,682,600

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June 10, 2020

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New Substation in Pawnee County

