Interconnection Facilities Study
For
Generator Interconnection Request
GEN-2014-026
(IFS-2014-002-06)

SPP Generator Interconnection Studies

(#GEN-2014-026)
(#IFS-2014-002-06)

October 2015

Revision History

Date	Author	Change Description
9/03/2015	SPP	Draft Interconnection Facilities Study Report Revision 0 Issued
10/5/2015	SPP	Final Interconnection Facilities Study Report Revision 0 Issued

Summary

Oklahoma Gas and Electric Company (OKGE) performed a detailed Interconnection Facilities Study at the request of Southwest Power Pool (SPP) for Generator Interconnection Request (IR) GEN-2014-026/IFS-2014-002-06 (150.0 MW/Wind) located in Beaver County, Oklahoma. The Interconnection Customer proposed in-service date for GEN-2014-026/IFS-2014-002-06 is December 31, 2016. SPP has proposed the full Interconnection Service in-service date will be after the assigned Interconnection Customer Interconnection Facilities, Transmission Owner Interconnection Facilities, and Non-Shared Network Upgrade(s) are completed. Full Interconnection Service will require the Network Upgrade(s) listed in the "Other Network Upgrade(s)" section. The request for interconnection was placed with SPP in accordance with SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system.

Phases of Interconnection Service

It is not expected that interconnection service will require phases however, interconnection service will not be available until all interconnection facilities and network upgrades can be placed in service.

Interconnection Customer Interconnection Facilities

The Interconnection Customer's generation facility consists of fifty (50) Acciona 3.0MW wind turbines for a total generation nameplate rating of 150.0 MW. The 34.5kV collector system for this wind farm is planned to be connected to one (1) 345/34.5kV Interconnection Customer owned and maintained transformer at the Interconnection Customer owned substation. An approximate six (6) mile overhead 345kV transmission circuit will connect GEN-2014-026/IFS-2014-002-06 to the Point of Change of Ownership (PCO) with the GEN-2010-001 Interconnection Customer's 345kV overhead transmission line between the GEN-2010-001 Interconnection Customer's collector substation and the Point of Interconnection (POI), the OKGE Beaver County 345kV substation. GEN-2014-026/IFS-2014-002-06 will utilize or share a portion, approximately five (5) miles, of the GEN-2010-001 overhead 345kV transmission circuit from the GEN-2010-001 345kV bus to the existing OKGE 345kV bus at the OKGE Beaver County 345kV substation. The Interconnection Customer will be responsible for Interconnection Customer Interconnection Facilities that require building a new three (3) terminal ring 345kV bus with associated breakers and terminal equipment at the PCO. The three (3) breaker ring bus configuration will eliminate the need for the three (3) terminal Interconnection Customer 345kV line and allow for acceptable relay coordination. Additionally, GEN-2014-026 will also share the Transmission Owner's Interconnection Facilities placed in service for GEN-2010-001 at the Point of Interconnection. In order to share transmission facilities with an entity that is not a party to the GEN-2014-026 Generator Interconnection Agreement, a copy of an executed Shared Facilities Usage Agreement between GEN-2014-026 and GEN-2010-001 will be a requirement for GEN-2014-026 interconnection. The Interconnection Customer will be responsible for all of the transmission facilities connecting the Interconnection Customer owned substation to the Point of Change of Ownership, at the existing 345kV bus at Oklahoma Gas and Electric Company (OKGE) owned Beaver County 345kV substation.

The Interconnection Customer will be responsible for any equipment located at the Customer substation necessary to maintain a power factor of 0.95 lagging to 0.95 leading at the POI, including approximately 14.0 Mvar[1] of reactors to compensate for injection of reactive power into the transmission system under light wind conditions. Also, the Interconnection Customer will need to coordinate with the Transmission Owner for relay, protection, control, and communication system configurations.

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s)
To allow interconnection the Transmission Owner will need updated and replace protective relays and fiber for communications for acceptance of the Interconnection Customer's Interconnection Facilities. Currently, OKGE estimates an Engineering and Construction (E&C) lead time of approximately twenty-four (24) weeks after a fully executed Generator Interconnection Agreement (GIA) for the completion of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s). At this time, GEN-2014-026/IFS-2014-002-06 is responsible for $120,000 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s) at the Point of Interconnection (POI) Station. **Table 1** displays the estimated costs for Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades.

Table 1: GEN-2014-026/IFS-2014-002-06 TOIF and Non-Shared Network Upgrades

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades Description	Allocated Cost ($)	Allocated Percent (%)	Total Cost ($)
Interconnection Substation - Transmission Owner Interconnection Facilities 345kV Substation work for replacement and upgrade of relays and communication	$120,000	100%	$120,000
Interconnection Substation - Network Upgrades 345kV Substation work	$0	N/A	$0
Total	$120,000	100%	$120,000

A Shared Facilities Usage Agreement for the shared facilities with GEN-2010-001 shall be required for Generator Interconnection Service. Shared Facilities Usage Agreement details will be determined during the negotiation phase of the GIA.

The Interconnection Customer was studied within the DISIS-2014-002 Impact Study and the DISIS-2014-002-1 Impact Restudy as Energy Resource Interconnection Service (ERIS) with updated cost allocations in DISIS-2014-002-2 Impact Restudy. As identified in the latest impact restudy, the Interconnection Customer is currently allocated $21,823,556 for Non-Shared Network Upgrade(s) beyond the Point of Interconnection (POI) Station. Current cost estimate and upgrade descriptions are listed in **Table 2**. Currently, OKGE estimates a lead time of approximately twenty-four (24) months after a fully executed Generator Interconnection Agreement for the completion of the Non-Shared Network Upgrades in **Table 2**.

[1] This approximate amount of reactors is an approximate minimum amount needed for the configuration of the wind farm studied in DISIS-2014-002 Group 02 reduced generation analysis.

Table 2: GEN-2014-026/IFS-2014-002-06 DISIS-2014-002-2 Non-Shared Network Upgrades

Non-Shared Network Upgrades Description	Allocated Cost ($)	Allocated Percent (%)	Total Cost ($)
Beaver County Reactive Power Support: Install 75Mvars of fast switching capacitive reactive power support at Beaver County Substation.	$21,823,556	100%	$21,823,556
Total	$21,823,556	100%	$21,823,556

Due to the nature of the equipment comprising the Non-Shared Network Upgrade(s) listed in **Table 2**, further analysis with additional dynamic and voltage response studies for the design of the equipment would be performed by OKGE at the cost of the Interconnection Customer after the execution of the Generator Interconnection Agreement (GIA). A withdrawal of higher queued or sharing Interconnection Requests (prior to signing a GIA) will result in a restudy to determine new Network Upgrade requirements.

At this time, GEN-2014-026/IFS-2014-002-06 is responsible for $21,943,556 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s).

Shared Network Upgrade(s)

The Interconnection Customer was studied within the DISIS-2014-002 Impact Study and the DISIS-2014-002-1 Impact Restudy as Energy Resource Interconnection Service (ERIS) with updated cost allocations in DISIS-2014-002-2 Impact Restudy. At this time, the Interconnection Customer is allocated $0 for Shared Network Upgrades. If higher queued interconnection customers withdraw from the queue, suspend or terminate their GIA, restudies will have to be conducted to determine the Interconnection Customers' allocation of Shared Network Upgrades. All studies have been conducted on the basis of higher queued interconnection requests and the upgrades associated with those higher queued interconnection requests being placed in service. At this time, the Interconnection Customer is allocated the following cost for Shared Network Upgrade:

Table 3: GEN-2014-026/IFS-2014-002-068 Shared Network Upgrades

Shared Network Upgrades Description	Allocated Cost ($)	Allocated Percent (%)	Total Cost ($)
Currently GEN-2014-026/IFS-2014-002-06 is not allocated Shared Network Upgrades	$0	n/a	$0
Total	$0	n/a	$0

Other Network Upgrade(s)

Certain Other Network Upgrades are currently not the cost responsibility of the Customer but will be required for full Interconnection Service. Currently, Other Network Upgrades are assigned to GEN-2014-026/IFS-2014-002-06.

- Woodward – FPL Switch – Mooreland 138kV rebuild, assigned to DISIS-2011-001 Interconnection Customers required for NRIS only.

Depending upon the status of higher or equally queued customers, the Interconnection Customer's in-service date is at risk of being delayed or their Interconnection Service is at risk of being reduced until the in-service date of these Other Network Upgrades.

Conclusion

Interconnection Service for GEN-2014-026/IFS-2014-002-06 will be delayed until the Interconnection Customer Interconnection Facilities, Transmission Owner Interconnection Facilities, and Non-Shared Network Upgrade(s) are constructed. The Interconnection Customer Interconnection Facilities will be the cost responsibility of the Interconnection Customer. The Interconnection Customer is responsible for $21,943,556 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s). At this time, the Interconnection Customer is allocated $0 for Shared Network Upgrade(s). After all Interconnection Facilities and Non-Shared Network Upgrade(s) have been placed into service, Interconnection Service for 150.0 MW, as requested by GEN-2014-026/IFS-2014-002-06, can be allowed.

At this time the total allocation of costs assigned to GEN-2014-026/IFS-2014-002-06 for interconnection Service are estimated at $21,943,556.

FACILITY STUDY

for

Generation Interconnection Request 2014-026

150 MW Wind Generating Facility
In Beaver County
Oklahoma

August 24, 2015

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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-2014-026. 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 150 MW wind generator using an existing Point of Interconnection. The requirements for interconnection consist of updating relay settings, testing, and updating records. The total cost for OG&E to add the 150MW of wind generation at the existing GEN-2010-001 point of interconnection is $120,000. The generator will have to install a three breaker ring switching station to eliminate a three terminal line between GEN-2010-001, GEN-2014-026, and Beaver County substation.

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Introduction

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting an additional 150 MW of wind generation to an existing Point of Interconnection within the service territory of OG&E Electric Services (OKGE) in Beaver County Oklahoma. The proposed 345kV point of interconnection is at the existing Beaver County Substation in Beaver County. This substation is owned by OKGE. The proposed in-service date for the additional generation is December 31, 2016.

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 Transmission Owner Interconnection Facilities at the existing Beaver County Substation. The Customer Attachment Facilities will be to install 3 breaker ring bus between GEN-2010-001, GEN-2014-026, and Beaver County to eliminate a three terminal line.

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 150 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-2014-026 interconnection.

Table 1: Required Interconnection Network Upgrade Facilities

Facility	ESTIMATED COST (2015 DOLLARS)
Customer – **Interconnection Facilities**- build a 3 breaker ring at the tap point between GEN-2014-026 and GEN-2010-001	**Customer Cost**
OKGE – **Network Upgrades** No new network upgrades necessary	**$0**
OKGE – Relay settings, testing, and records update.	**$120,000**
Total	**$120,000**

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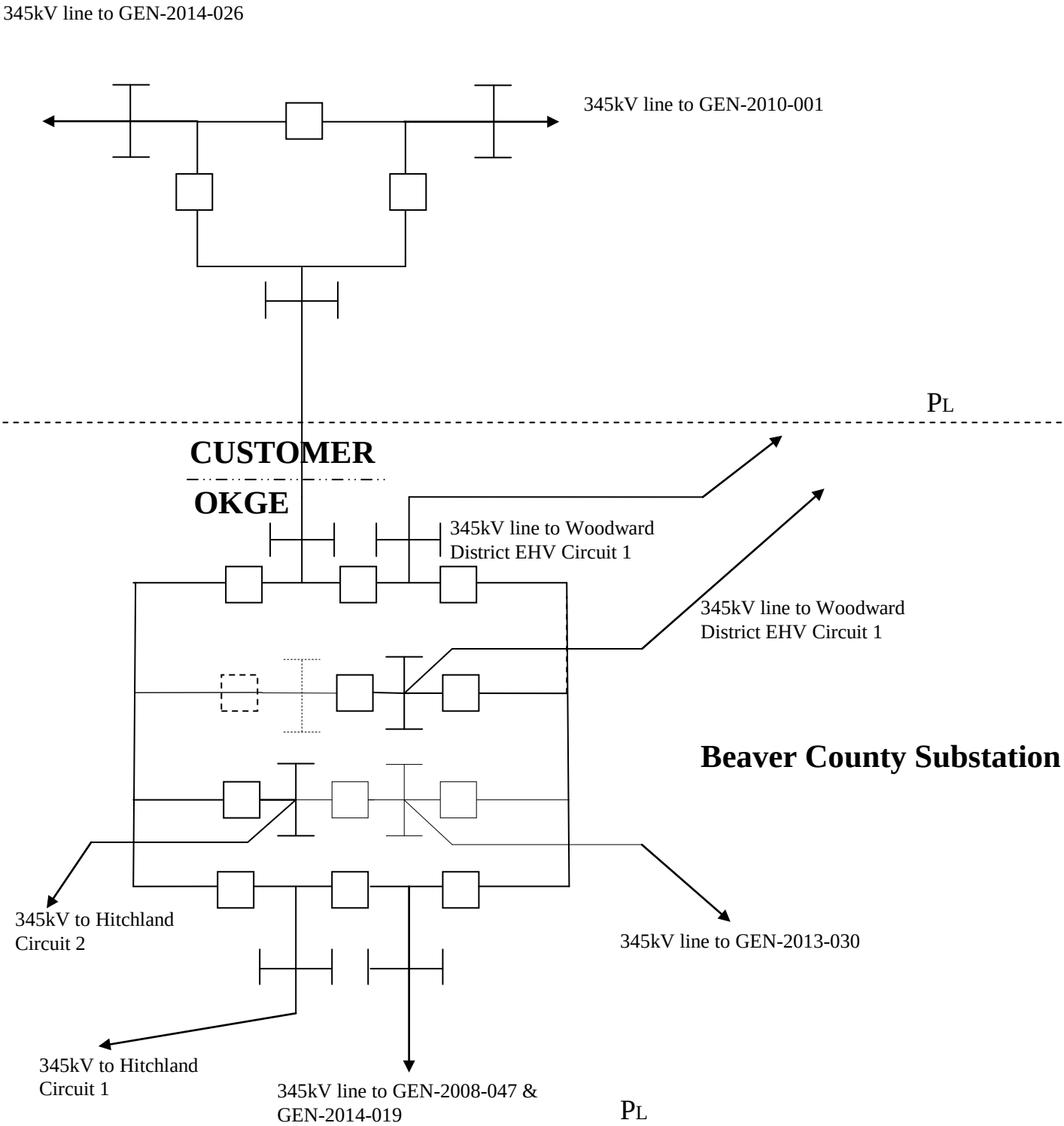
Beaver County Substation



SPP Southwest Power Pool

Interconnection Facilities Study
For
Oklahoma Gas & Electric Company (OKGE)
Non-Shared Network Upgrade(s)
Transmission Facilities

SPP Generator Interconnection Studies

(#IFS-2014-002)

September 2015

Revision History

Date	Author	Change Description
9/03/2015	SPP	Non-Shared Network Facility Study Report Revision 0 Issued

Summary

Oklahoma Gas and Electric Company (OKGE) a performed a detailed Interconnection Facilities Study at the request of Southwest Power Pool (SPP) for Non-Shared Network Upgrade(s) assigned in SPP Generator Interconnection (GI) DISIS-2014-002 Impact Study, DISIS-2014-002-1 Impact Restudy, and DISIS-2014-002-2 Impact Restudy. Interconnection Request (IR) that has cost allocation responsibilities for the assigned Non-Shared Network Upgrade(s) will require the assigned Non-Shared Network Upgrade(s) to be in-service for full Interconnection Service. The request for interconnection was placed with SPP in accordance with SPP's Open Access Transmission Tariff, which covers new generator interconnections on SPP's transmission system. The SPP Non-Shared Network Upgrade(s) Facilities Study request consists of building a fast switching capacitive reactive power device to connect at Beaver County 345kV bus at the OKGE Beaver County Substation. The current total estimate current cost for the Non-Shared Network Upgrade(s) is $21,823,556. Due to the nature of the equipment comprising this upgrade, further analysis with additional dynamic and voltage response studies for the design of the equipment would be performed by OKGE at the cost of the Interconnection Customer(s) after the execution of the Generator Interconnection Agreement (GIA).

Generator Interconnection Customer(s)

The Interconnection Customer(s) assigned the Non-Shared Network Upgrade(s) are listed in **Table 1**.

Table 1: Generation Interconnection Customer(s)

GI Request Number	Point of Interconnection (POI)	Capacity (MW)
GEN-2014-026/IFS-2014-002-06	Beaver County 345kV	150.00

The Interconnection Request mentioned above in **Table 1** was included in the DISIS-2014-002 Impact Study and DISIS-2014-002-1 Impact Restudy with updated cost allocations in the DISIS-2014-002-2 Impact Restudy.

Non-Shared Network Upgrade(s) Facilities Costs

Non-Shared Network Upgrade(s) description and total costs are shown in **Table 2**. The fast switching capacitive reactive power support network upgrade would include building a new terminal position at Beaver County 345kV bus along with associated substation and terminal equipment for connection of the fast switching reactive power device. A step up transformer will be needed to connect the device to the 345kV terminal position.

At this time, the Interconnection Request is allocated an estimate of $21,823,556 for Non-Shared Network Upgrade(s) Facilities Costs. If the Interconnection Request proceeds to execute a GIA, OKGE will perform further analysis with additional dynamic and voltage response studies for the design of the equipment at the of the Interconnection Customer. OKGE currently estimates a lead time of twenty-four (24) months after the execution of the Generator Interconnection Agreement to complete the Network Upgrade in Table 2.

Table 2: Non-Shared Network Upgrade(s) Facilities Costs

Upgrade Description	Total Cost
Beaver County Capacitive Reactive Power – Build and install 75Mvar of fast switching capacitive reactive power support device, step down transformer, new 345kV terminal position, breakers, switches, and associated 345kV terminal equipment at Beaver County	$21,823,556
Total	**$21,823,556**

If higher queued Interconnection Request(s) withdraw from the SPP GI Queue, suspend or terminate their Generator Interconnection Agreement (GIA), restudies will have to be conducted to determine the Interconnection Customers' allocation of Non-Shared Network Upgrades. All studies have been conducted on the basis of higher queued interconnection requests and the upgrades associated with those higher queued interconnection requests and upgrades being placed in service.

Non-Shared Network Upgrade(s) Cost Allocation by Interconnection Request

Non-Shared Network Upgrade(s) Cost Allocation by Interconnection Request responsibility is shown in **Table 3**.

Table 3: Non-Shared Network Upgrade(s) Cost Allocation by Customer(s)

Network Upgrade(s)	Allocated Cost by Request		Total Upgrade Cost
	GEN-2014-026 IFS-2014-002-06		
	Cost ($)	Allocation %	
Beaver County 75Mvar Capacitive Reactive Power Support	$21,823,556	100%	$21,823,556
Customer Total	**$21,823,556**	**100%**	**$21,823,556**

Conclusion

Full Interconnection Service for the Interconnection Customer listed in **Table 1** will be delayed until the Non-Shared Network Upgrade(s) listed in are constructed **Table 2**. Currently, The Interconnection Customer(s) are responsible for $21,823,556 of Non-Shared Network Upgrades for 75Mvar capacitive reactive power support at Beaver County. Due to the nature of the equipment comprising this upgrade, further analysis with additional dynamic and voltage response studies for the design of the equipment would be performed by OKGE at the cost of the Interconnection Customer(s) after the execution of the Generator Interconnection Agreement (GIA).