



Interconnection Facilities Study

**GEN-2015-025
(IFS-2015-001-03)**

February 2016

Generator Interconnection



Revision History

Date	Author	Change Description
1/14/2016	SPP	Draft Interconnection Facilities Study Report Revision Issued
2/24/2016	SPP	Final Interconnection Facilities Study Report Revision Issued

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Interconnection Facilities Study Summary

Interconnection Facilities Study Introduction

This Interconnection Facilities Study for GEN-2015-025/IFS-2015-001-03 (Interconnection Request) is for a 220 MW wind farm facility located in Pratt County, Kansas. The Interconnection Request was studied in the DISIS-2015-001 Impact Study as an Energy Resource Interconnection Service (ERIS). Since the posting of the DISIS-2015-001 Impact Study, the Interconnection Customer has executed the Interconnection Facilities Study Agreement per Appendix 4 or Appendix 4A and provided deposit securities as required by the Section 8.9 of the Generator Interconnection Produce (GIP) to proceed to the Interconnection Facilities Study. The GIP is covered under Attachment V of the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT). The request for interconnection was placed with SPP by the requesting customer (Interconnection Customer) in accordance with the OATT, which covers new generation interconnections on SPP's transmission system.

Westar Energy (WERE), on behalf of Prairie Wind Transmission (PWT) performed a detailed Interconnection Facilities Study at the request of SPP for the Interconnection Request. Interconnection Customer's original in service date for the Interconnection Request is December 1, 2016. SPP has proposed the full Interconnection Service will be available after the assigned Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s) are completed. Full interconnection service will require Network Upgrade(s) listed in the "Other Network Upgrade(s)" section.

The primary objective of the Interconnection Facilities Study (IFS) is to identify necessary Transmission Owner Interconnection Facilities, network upgrade(s), other direct assigned upgrade(s), and associated upgrade lead times needed for the additional of the requested Interconnection Service into the SPP Transmission System at the specific 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 either credits or potentially Long Term Congestion Rights (LTCR), otherwise known as compensation, in accordance with Attachment Z2 of the SPP Tariff for any Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, and not refunded to the Interconnection Customer.

Interconnection Customer Interconnection Facilities

The Interconnection Request's Generation Facility is currently proposed to consist of one-hundred-ten (110) General Electric (G.E.) 2.0 MW wind generators for a total nameplate generating capacity of 220MW. The 34.5kV collector system for this wind farm is planned to be connect to one (1) 345/34.5kV, 151/188/235MVA transformer at the Interconnection Customer owned substation. The high side of the 345/34.5V Interconnection Customer transformer will connect into the GEN-2015-

024/IFS-2015-001-02 345kV generator lead at a new substation (Switching Station) owned by the Interconnection Customer by an approximate one (1) mile 345kV overhead transmission circuit. The Switching Station shall have line terminals protected by circuit breakers to prevent three-terminal line configurations, built at the cost and construction responsibility of the Interconnection Customer and/or GEN-2015-024/IFS-2015-001-02. The Interconnection Request will utilize approximately forty-five (45) miles of the generator lead planned to be built by and for the GEN-2015-024/IFS-2015-001-02 Interconnection Request as well as associated 345kV equipment between the Switching Station and the Point of Interconnection (POI) at a new 345kV substation interconnecting into the Wichita – Thistle 345kV double circuits to be built for GEN-2015-024/IFS-2015-001-02. The Interconnection Customer will be responsible for all of the transmission facilities connecting the Interconnection Customer owned substation(s) to the Point of Interconnection (POI) at the new 345kV substation tapping the Wichita-Thistle 345kV double circuit transmission line.

A Shared Facilities Usage Agreement for the shared facilities with GEN-2015-024/IFS-2015-001-02 shall be required for Interconnection Service. These details will be determined during the negotiations phase of the Generator Interconnection Agreement (GIA).

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. GEN-2015-024/IFS-2015-001-02 is also responsible for any equipment located at the GEN-2015-024/IFS-2015-001-02 substation necessary to maintain a power factor of 0.95 lagging to 0.95 leading at the POI, including approximately 57 Mvar¹ of reactors or install and utilize an equivalent means to compensate for injection of reactive power into the transmission system under no/light wind conditions. If GEN-2015-024/IFS-2015-001-02 withdraws from the queue, suspend or terminate its GIA, the no/light wind condition analysis could potentially be updated for the Interconnection Request. 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 facilitate interconnection, the interconnecting Transmission Owner, PWT, will need to construct a new substation including a 345kV breaker-and-a-half substation, eight (8) 3000A continuous ampacity rated 345kV circuit breakers, disconnect switches, structures, and any associated terminal equipment for the acceptance of the Interconnection Customer's Interconnection Facilities. Additionally, two (2) 25Mvar in-line reactors will be required on each terminal at the new 345kV substation for the Thistle 345kV lines. Currently, WERE estimates an Engineering and Construction (E&C) lead time of approximately ninety (90) weeks after a fully executed Generator Interconnection Agreement (GIA) for the completion of GEN-2015-024/IFS-2015-001-01 assigned Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s). These Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s) are currently assigned to GEN-2015-024/IFS-2015-001-02 and are required for the Interconnection Customer's interconnection. If GEN-2015-024/IFS-2015-001-02 withdraws from the queue, suspend or terminate its GIA, the

¹ This approximate minimum reactor amount is needed for the current configuration of the wind farm as studied in the DISIS-2015-001 Impact Study.

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s) with an estimated cost of \$33,199,661 will become the cost responsibility of the Interconnection Customer.

In addition to the GEN-2015-024/IFS-2015-001-02 assigned Interconnection Facilities and Non-Shared Network(s) upgrades, relay review and work will be required by WERE for the addition of the Interconnection Request. Currently, WERE estimates an Engineering and Construction (E&C) lead time of approximately six (6) weeks after a fully executed Generator Interconnection Agreement (GIA) for the completion of current Interconnection Customer assigned Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s).

At this time, Interconnection Customer is responsible for \$30,000 of PWT Transmission Owner Interconnection Facilities (TOIF) and Non-Shared Network Upgrade(s). **Table 1** displays the estimated costs for TOIF and Non-Shared Network Upgrade(s).

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

TOIF and Non-Shared Network Upgrades Description	Allocated Cost (\$)	Allocated Percent (%)	Total Cost (\$)
<u>PWT Interconnection Substation - Transmission Owner Interconnection Facilities</u>	\$0	N/A	\$0
<u>PWT Interconnection Substation - Non-Shared Network Upgrades</u> 345kV substation relay work.	\$30,000	100.00	\$30,000
Total	\$30,000	100.00	\$30,000

Shared Network Upgrade(s)

The Interconnection Request was studied in the DISIS-2015-001 Impact Study as an Energy Resource Interconnection Service (ERIS) only request. At this time, the Interconnection Customer is allocated \$0 for Shared Network Upgrades. If higher queued Interconnection Request(s) 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 Request(s) and the Network Upgrade(s) associated with those higher queued Interconnection Requests being placed in service. At this time, the Interconnection Customer is allocated the following cost listed in **Table 2** for Shared Network Upgrade.

Table 2: Interconnection Customer Shared Network Upgrades

Shared Network Upgrades Description	Allocated Cost (\$)	Allocated Percent (%)	Total Cost (\$)
Currently 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 Interconnection Customer but will be required for full Interconnection Service.

1) 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 their Interconnection Service is at risk of being reduced until the in-service date of these Other Network Upgrades.

Conclusion

Interconnection Service for the Interconnection Request will be delayed until the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades are constructed. The Interconnection Customer is responsible for \$30,000 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. At this time, the Interconnection Customer is allocated \$0 for Shared Network Upgrades. After all assigned Interconnection Facilities and Network Upgrades and GEN-2015-024/IFS-2015-001-02 assigned Interconnection Facilities and Non-Shared Network Upgrade(s) have been placed into service, Interconnection Service for 220 MW, as requested by the Interconnection Customer can be allowed.

At this time the total allocation of costs assigned to Interconnection Customer for interconnection Service are estimated at \$30,000.

Appendices

A: WERE Transmission Owner Interconnection Facilities Study Report

See next page for WERE Interconnection Facilities Study Report.



**Generation Interconnection Facility
Study**

For

**Generation Interconnection Request
SPP-GEN-2015-025**

December 3, 2015

Introduction

This report summarizes the results of a Generation Interconnection Facilities Study performed for the Southwest Power Pool (SPP) by Westar Energy (WR) on behalf of Prairie Wind Transmission (PWT) to evaluate a generation interconnection request for 220 MW of wind-powered generation in south central, Kansas, to the PWT transmission system. The proposed interconnection is on new 345kV generator lead constructed for GEN-2015-024. A System Impact Study has been completed for this project. The requested in-service date of the generating facility is December 1, 2016.

Project Location and Existing Facilities

The project is located in Pratt County in south central Kansas. The proposed interconnection will be on new 345kV generator lead constructed for GEN-2015-024, which will connect at a new 345kV breaker and a half substation on the Wichita-Thistle 345kV line #1 and line #2 near Cheney, Kansas. The substation will connect to customer facilities at 345kV. Figure 1 shows the approximate location of the project.

DISIS Study Review

WR has reviewed the steady-state, short-circuit, and dynamic study results for GEN-2015-025 included within SPP DISIS-2015-001 assessing the reliability impact of the proposed generation interconnection. WR agrees with the study approach and findings of the DISIS as posted by SPP.

Interconnection Facilities

Interconnection to the PWT transmission system will be by way of new 345kV generator lead constructed for GEN-2015-024, which will connect to a new 345kV breaker and half switching station on the existing Wichita-Thistle 345kV line #1 and line #2.

This request will share a generator lead with GEN-2015-024 from the customer facility to the Point of Interconnection. If for any reason GEN-2015-024 does not occur, all costs associated with the GEN-2015-024 interconnection will be required for GEN-2015-025.

No additional infrastructure will be required at the existing interconnection identified by GEN-2015-024. Relaying setting changes will be required.

Assuming this interconnection occurs at the same time as GEN-2015-024, no dollars will be needed to interconnect GEN-2015-025.

345 kV Substation Work

- The estimated cost includes relaying settings changes at the new 345kV switching station identified for GEN-2015-024, after applicable protection data is received from GEN-2015-025. No substation physical upgrades are needed by Westar.

General Considerations

Additional consideration should be given to the following items:

- Westar Energy recommends that the interconnection customer construct breakered stations at the wind farm connections to the 345kV generator lead to prevent three-terminal line configurations with sources at each terminal.

The total cost estimate for Stand Alone Network Upgrades (345 kV Substation Relay Work) is:

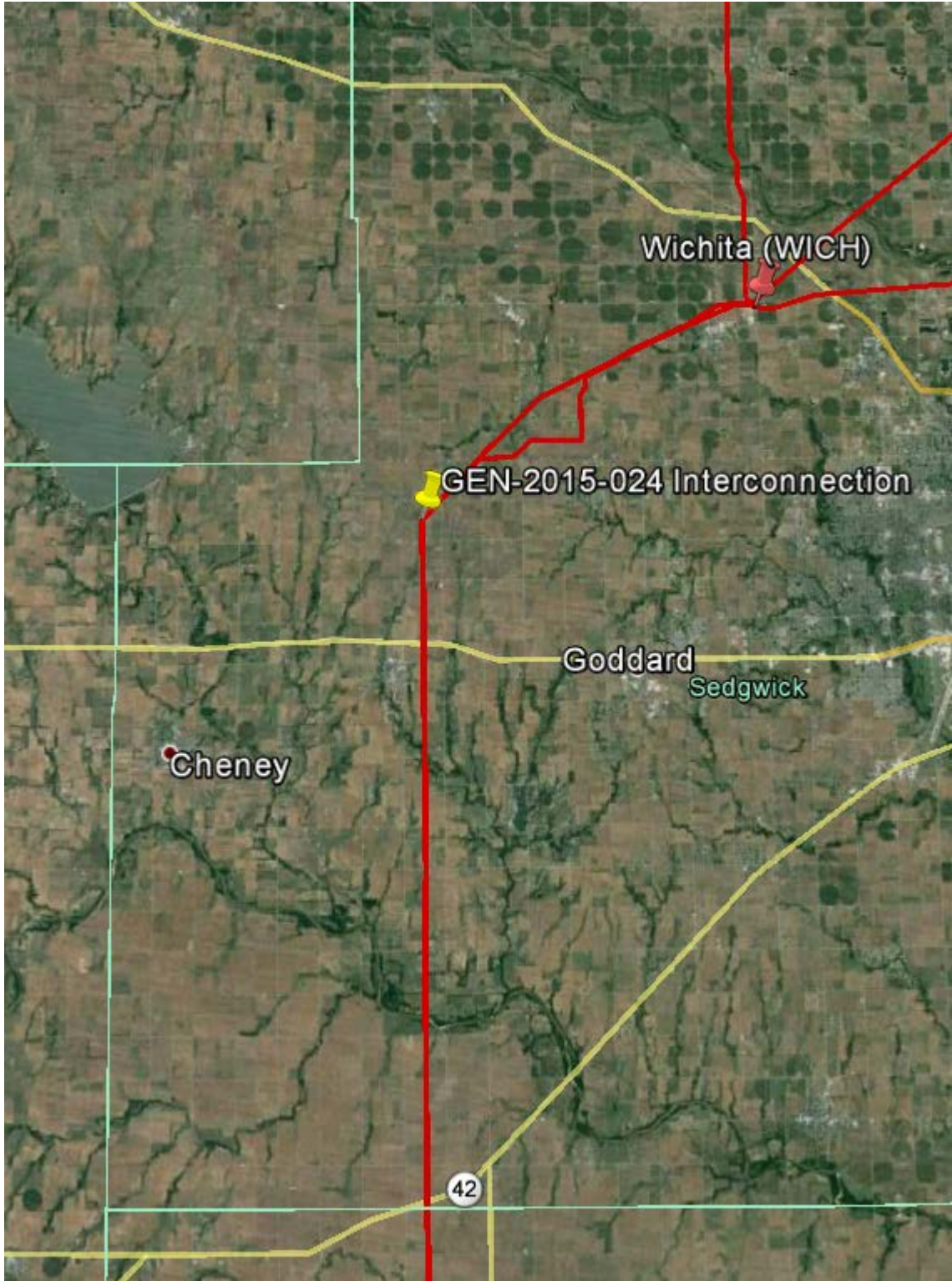
\$	25,000	345 kV Substation Work
\$	0	345 kV Line Work
\$	0	AFUDC
\$	5,000	Contingency
\$	30,000	

This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

3 weeks	Engineering Time
0 weeks	Procurement Time
3 weeks	Construction Time
6 weeks	Total

Westar Energy also maintains its own Facility Connection Requirements, which may be found at (<http://www.oasis.oati.com/WR/index.html>).

Figure 1 – Interconnection Map



The proposed interconnection project is 10 miles from Wichita 345kV substation