



**Facility Study
For
Generation Interconnection
Request
GEN-2014-001
(IFS-2014-001-8)**

***SPP Generator
Interconnection Studies***

***(#GEN-2014-001)
(#IFS-2014-001-8)***

January 2015

Revision History

Date	Author	Change Description
1/09/2015	SPP	Facility Study Report Issued

Summary

Westar Energy (WERE) performed a detailed Facility Study at the request of Southwest Power Pool (SPP) for Generation Interconnection request GEN-2014-001/IFS-2014-001-8 (200.6 MW/Wind) located in Marion County, Kansas. The Interconnection Customer proposed in-service date for IFS-2014-001-8 is December 15, 2014. SPP has proposed the in-service date will be after the assigned Interconnection Facilities and Non-Shared Network upgrades are completed. Full Interconnection Service will require the Network Upgrades listed in the "Other Network Upgrades" 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 one hundred and eighteen (118) 1.7 G.E. wind turbines for a total generation capacity of 200.6MW. The 34.5kV collector system for this wind farm is planned to be connect to two (2) 345/34.5kV Interconnection Customer owned and maintained transformers at the Interconnection Customer owned substation. An approximate twelve (12) mile 345kV transmission circuit will connect the Interconnection Customer owned substation to the new WERE owned 345kV substation¹. The Interconnection Customer will be responsible for all of the transmission facilities connecting the Interconnection Customer owned substation to the Point of Interconnection (POI), at new 345kV bus at a new Westar Energy (WERE) owned 345kV substation, which will tap the WERE Wichita – Emporia Energy Center 345kV transmission line approximately forty-two (42) miles from Wichita.

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 21.0 Mvar² 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 Upgrades

To allow interconnection the Transmission Owner will need construct a new 345kV substation with a new three breaker ring bus and associated terminal equipment for acceptance of the Interconnection Customer's Interconnection Facilities. WERE has estimated a lead time for in-service date for the Interconnection Facilities and Non-shared Network Upgrades of ninety (90) weeks after an fully executed Generation Interconnection

¹ The Interconnection Customer has recently requested a modification study to change the wind generators to either Vestes generators or Gamesa generators. The evaluation of this modification will require a restudy by SPP which will begin no later than January 15, 2015.

² Subject to change based on results of restudy discussed above.

Agreement (GIA). At this time, GEN-2014-001/IFS-2014-001-8 is responsible for \$19,343,307 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. Table 1 displays the estimated costs for Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades.

Table 1: IFS-2014-001-8 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	\$600,000	100%	\$600,000
Interconnection Substation - Network Upgrades 345kV Substation work	\$18,743,307	100%	\$18,743,307
Total	\$19,343,307	100%	\$19,343,307

Shared Network Upgrades

The Interconnection Customer was studied within the DISIS-2014-001 Impact Study with Energy Resource Interconnection Service (ERIS) only. 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 2: GEN-2014-001/IFS-2014-001-8 Shared Network Upgrades

Shared Network Upgrades Description	Allocated Cost (\$)	Allocated Percent (%)	Total Cost (\$)
Currently GEN-2014-001 is not allocated Shared Network Upgrades	\$0	n/a	\$0
Total	\$0	n/a	\$0

Other Network Upgrades

Certain Other Network Upgrades are currently not the cost responsibility of the Customer but will be required for full Interconnection Service. At this time, no Other Network Upgrades are assigned to GEN-2014-001/IFS-2014-001-8.

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-2014-001/IFS-2014-001-8 will be delayed until the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades are constructed. The Interconnection Customer is responsible for \$19,343,307 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 Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 200.6 MW, as requested by GEN-2014-001/IFS-2014-001-8, can be allowed.

At this time the total allocation of costs assigned to GEN-2014-001/IFS-2014-001-8 for Interconnection Service are estimated at \$19,343,307.



**Generation Interconnection Facility
Study**

For

**Generation Interconnection Request
SPP-GEN-2014-001
SPP-IFS-2014-001-8**

December 18, 2014

Introduction

This report summarizes the results of a Generation Interconnection Facility Study performed for the Southwest Power Pool (SPP) by Westar Energy to evaluate a generation interconnection request by Sunwind Energy Group, LLLP for 200 MW of wind-powered generation to the Westar Energy transmission system. The proposed interconnection is on the Wichita – Emporia Energy Center 345 kV line near Doyle, Kansas. A System Impact Study has been completed and the requested in-service date of the generating facility is December 15, 2015.

Project Location and Existing Facilities

The project is located in Marion County in central Kansas. The interconnection will be at a new 345 kV ring-bus substation on the Wichita – Emporia Energy Center 345 kV line near Doyle, Kansas. The substation will connect to customer facilities at 345 kV. Figure 1 shows the Regional Transmission Facilities.

Interconnection Facilities

Interconnection to the Westar Energy transmission system will be by way of a new 345 kV three position ring-bus switching station on the existing Wichita – Emporia Energy Center 345 kV transmission line. The new substation terminal will look towards Customer's facilities. Construction of this new substation terminal requires additional land adjacent to the existing transmission line right-of-way.

345 kV Substation Work

- **Ring Bus Substation (no metering or customer equipment included)**
The estimated cost includes three (3) 345 kV breakers, seven (7) 345 kV switches, two (2) 345 kV motor operated switches, six (6) 345 kV CCVTs, four (4) 345 kV wave traps, new redundant primary relaying, relaying setting changes and trap tuning at Wichita and Emporia Energy Center, two (2) 345 kV full tension deadend structures, and all associated site, yard, cable, grounding and conduit work.
- **345 kV Substation (Equipment on customer side of meter)**
The estimated cost includes three (3) 345 kV arresters, one (1) 3000A motor operated switch, three (3) 345 kV arrester stands, one (1) 345 kV full tension dead-end structure, and one (1) 3-phase bus support. The estimate also includes all other associated yard, cable, grounding, communication, and conduit work.
- **345 kV Interconnection Revenue Metering**
The estimated cost includes three (3) 345 kV VTs, three (3) 345 kV CTs, and revenue interconnection metering plus all associated yard and conduit work.

\$12,703,990

345 kV Transmission Line Work

The estimated cost is for two three-pole steel dead end and turning structures to connect the existing Wichita – Emporia Energy Center 345 kV transmission line into the interconnection substation plus associated foundations and labor.

\$ 1,799,897

The total cost estimate for Transmission Owner Interconnection Facilities (Interconnection Metering) and Stand Alone Network Upgrades (345 kV Ring-bus Substation and Transmission Line Work) is:

\$12,703,990 345 kV Substation Work
\$ 1,799,897 345 kV Transmission Line Work
\$ 1,379,072 AFUDC
\$ 3,460,348 Contingency
\$19,343,307

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.

20 weeks Engineering Time
40 weeks Procurement Time
30 weeks Construction Time
90 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 – Westar Regional Transmission System

The proposed interconnection is 42 miles from Wichita 345 kV substation

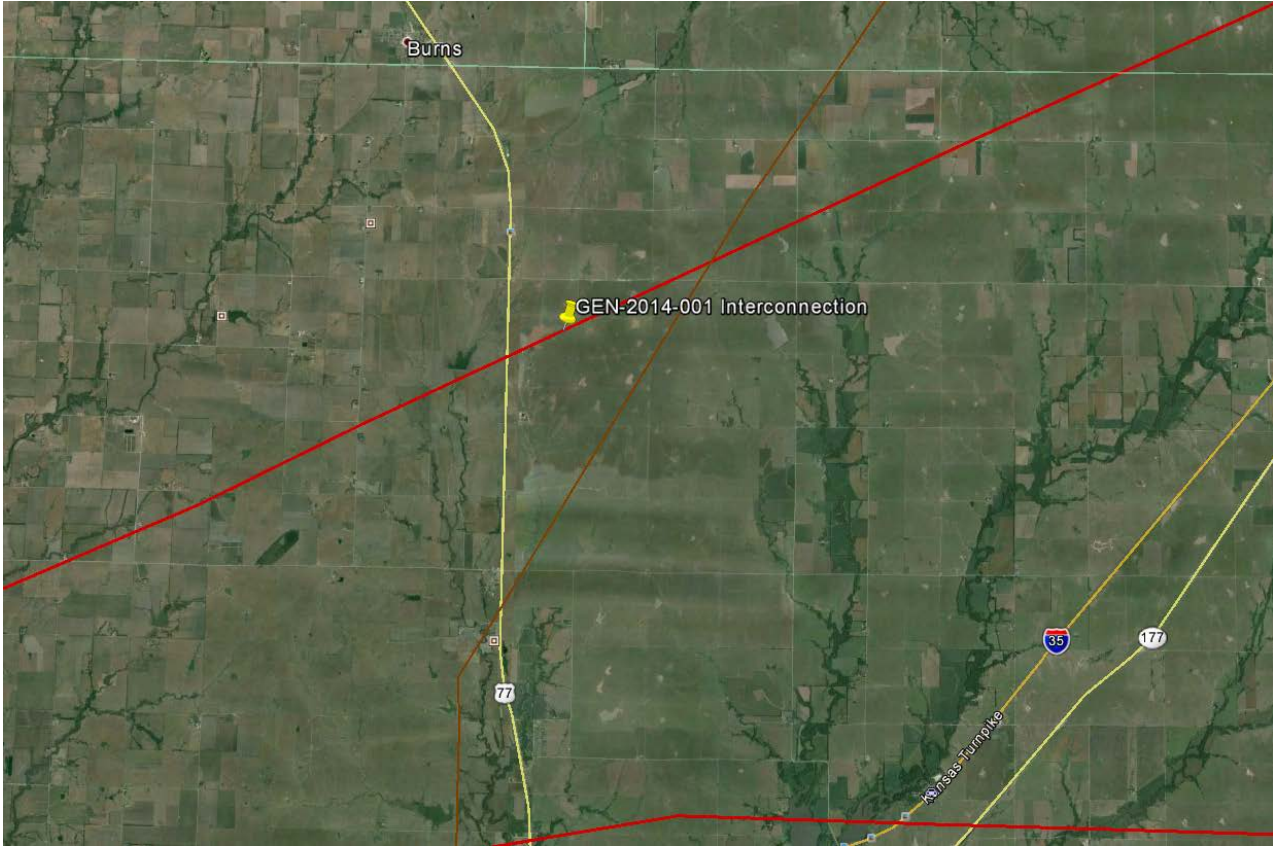
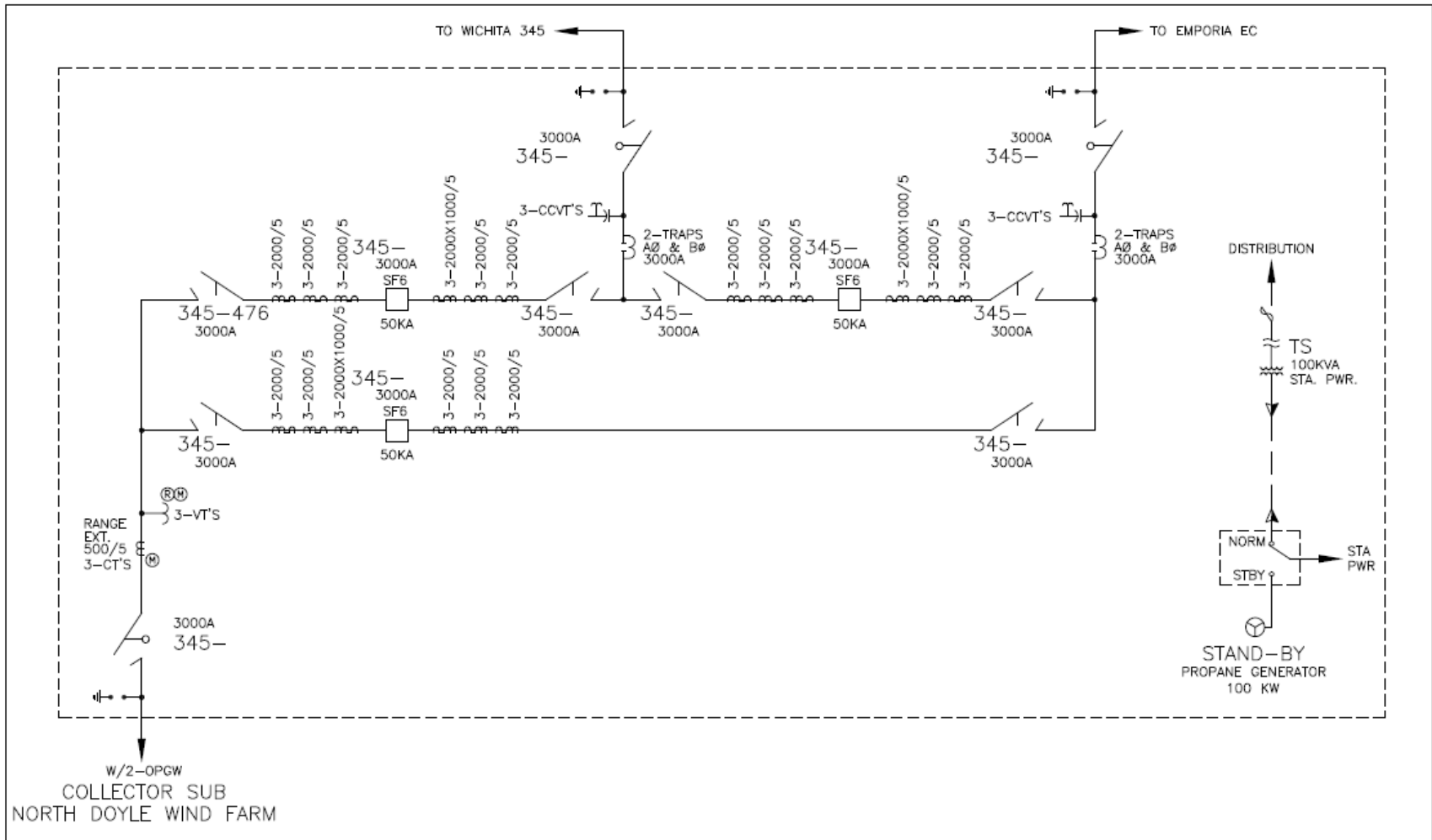


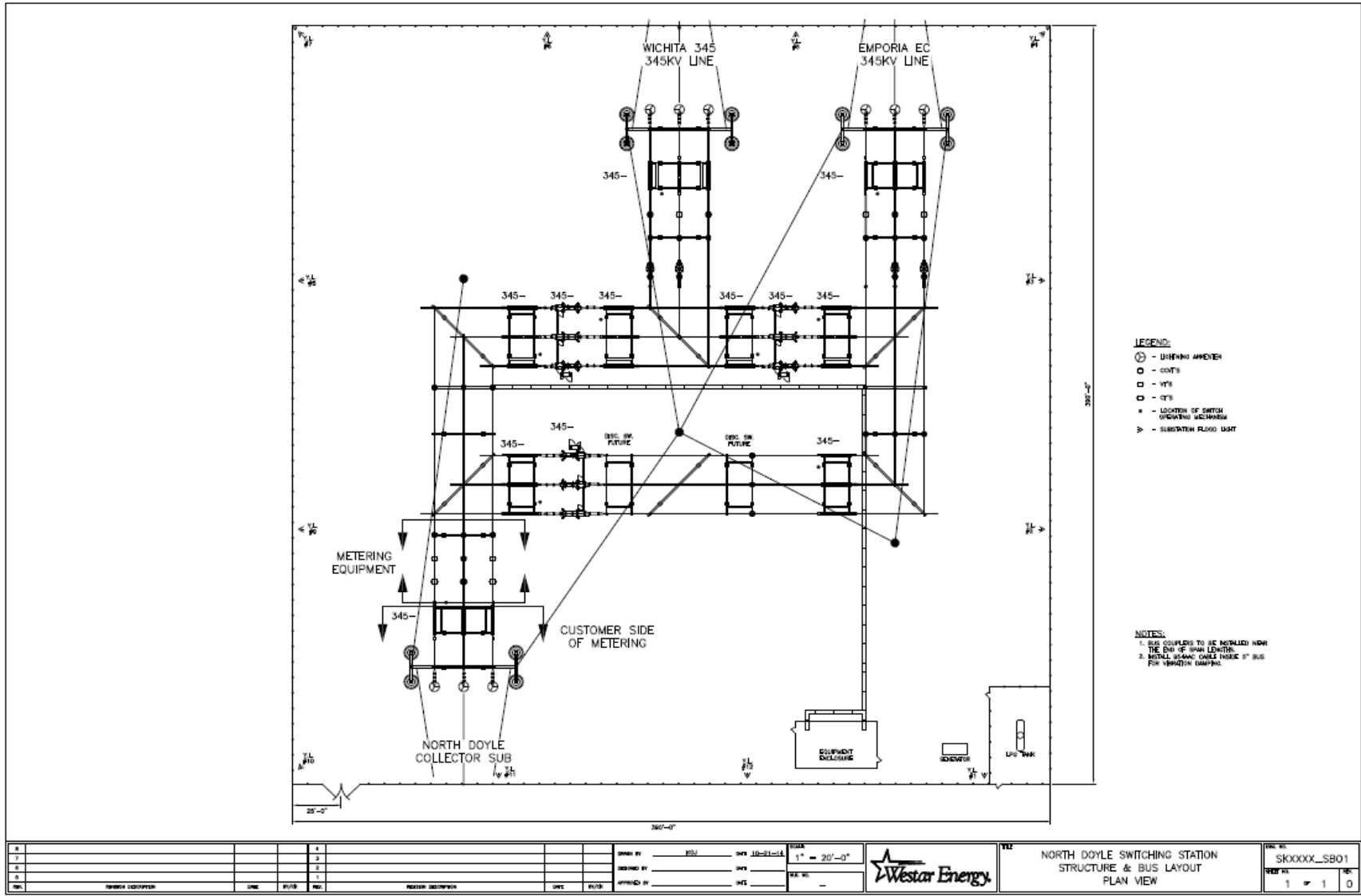
Figure 2 – Interconnection Substation Preliminary One-Line



4				DRAWN BY: KDJ	DATE: 10-21-14		TITLE	DWG. NO.
3				CHECKED BY:	DATE:		NORTH DOYLE SWITCHING STATION	SK XXXX
2				APPROVED BY:	DATE:		PRELIMINARY ONE-LINE DIAGRAM	SHEET NO.
1				SCALE: NONE	WORK ORDER NO.			1 OF 1
REV.	DESCRIPTION	DATE	BY/CK					REV.
								0

GROUP: ESUB USER: PRELIM CAD FILE NO: SK XXXX

Figure 3 – Interconnection Substation Preliminary Layout



Results of Short Circuit Analysis

As a part of this Facility Study, a short circuit study was performed to determine the available fault current at the interconnection bus using PSS/E's activity SCMU. The interconnection bus was modeled as a tap on the Wichita-Emporia Energy Center 345 kV line approximately 42 miles out of Wichita 345 kV substation. The 2015 and 2025 Summer Peak 2014 Series MDWG Final Reduced cases were used in the study. No GEN-2014-001 Wind Farm generation was in service for this analysis. As a result, the numbers generated represent the available utility interconnection fault current:

2015 Summer:

- For a 3-Phase fault at the GEN-2014-001 interconnection, the fault current is estimated to be 9819 Amps.
- For a Phase-to-Ground fault at the GEN-2014-001 interconnection, the fault current is estimated to be 6141 Amps.

2025 Summer:

- For a 3-Phase fault at the GEN-2014-001 interconnection, the fault current is estimated to be 9929 Amps.
- For a Phase-to-Ground fault at the GEN-2014-001 interconnection, the fault current is estimated to be 6180 Amps.