



INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-088
(IFS-2016-002-40)

Published December 2019

By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
11/07/2019	SPP	Initial draft report issued.
12/09/2019	SPP	Final report issued.

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).....	3
Shared Network Upgrade(s)	4
Previous Network Upgrade(s).....	4
Affected System Upgrade(s)	5
Conclusion.....	5
Appendices.....	6
A: Transmission Owner’s Interconnection Facilities Study Report and Network Upgrades Report(s).....	7

SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-088/IFS-2016-002-40 is for a 151.2 MW generating facility located in Dekalb County, Missouri. The Interconnection Request was studied in the DISIS-2016-002 Impact Study for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). The Interconnection Customer's requested in-service date is December 31, 2018.

The interconnecting Transmission Owner, Transource Missouri (TMO), 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 Interconnection Facilities (TOIF), Non-Shared Network Upgrades, Shared Network Upgrades, Previous Network Upgrades, 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 seventy –two (72) GE 2.1 MW wind generators for a total generating nameplate capacity of 151.2 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 collection circuits;
- 34.5 kV to 345 kV transformation substation with associated 34.5 kV and 345 kV switchgear;
- One (1) 345/34.5 kV 96/128/160 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- Approximately six (6) mile overhead 345 kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 345 kV bus at existing Transmission Owner substation ("Ketchum") 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. The Interconnection Customer may use 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 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
Transmission Owner Ketchum 345 kV Interconnection Substation: Construct one (1) new 345 kV dead-end, one (1) new 345 kV disconnect switch, three (3) new potential transformers, three (3) new bushing transformers, and one (1) new line panel.	\$665,342	100%	\$665,342	18 Months
Total	\$665,342		\$665,342	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	Z2 Type ¹	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
Transmission Owner Ketchum 345 kV Interconnection Substation: Construct one (1) new 345 kV circuit breaker and two (2) 345 kV disconnect switches.	non-creditable	\$589,932	100%	\$589,932	18 Months
Total		\$589,932		\$589,932	

¹ Indicates the method used for calculating credit 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 Upgrade(s)

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.

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 4: 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 5** 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 5: 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 151.2 MW can be granted. Full Interconnection Service will be delayed until the TOIF, and Network Upgrades required are completed. The Interconnection Customer's estimated cost responsibility for TOIF and Network Upgrades is summarized in the table below.

Table 6: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities	\$655,342
Network Upgrades	\$589,932
Total	\$1,245,274

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 Open Access Transmission Tariff (OATT).

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).



Transource Missouri
Facility Study for Southwest Power Pool
Generation Interconnection Request
GEN-2016-088

Studies prepared by Evergy Transmission Planning on behalf of Transource
Missouri
October 21, 2019

Executive Summary

Pursuant to the Southwest Power Pool (SPP) Open Access Transmission Tariff (Tariff) and at the request of SPP, Evergy Transmission Planning performed the following Facility Study on behalf of Transource Missouri (TMO) to satisfy the Facility Study Agreement executed by the requesting Interconnection Customer (Customer) for SPP Generation Interconnection Request GEN-2016-088. The request for interconnection was placed with SPP in accordance with the Tariff, which covers new generation interconnections on SPP member's transmission system. The Customer requests interconnection service for a 151.2-MW wind farm to interconnect at the existing Ketchum 345kV substation owned by TMO. The Customer has proposed a commercial operation date for the wind farm of December 31, 2019. The requirements for interconnection consist of construction of a new 345kV line terminal at the Ketchum substation in Dekalb County, Missouri.

The total cost for TMO to construct the new 345kV line terminal at Ketchum is \$1,245,274. 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 significant and the accuracy of this estimate at the time of actual procurement and construction cannot be assured.

The estimated construction schedule for completing the 345kV line terminal is approximately 18 months after execution of the Generation Interconnection Agreement (GIA).

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 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 Tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPP Tariff.

Interconnection Facilities

The primary objective of this study is to identify the transmission owner network upgrades and interconnection facilities. The Customer desires to interconnect a 151.2-MW wind farm using 72 GE 2.1-MW wind turbines at the existing Ketchum 345kV substation. The proposed commercial operation date for the wind farm is December 31, 2019. The proposed point of interconnection is TMO's Ketchum 345kV substation. A one-line diagram of the GEN-2016-088 (Osborn II) Interconnection and Ketchum 345kV Substation is shown in Appendix A. The Customer will be responsible for constructing, owning and maintaining all facilities on the Customer's side of the point of change of ownership. The major components of the transmission owner facilities and their estimated costs (including AFUDC and contingency) are shown below.

Estimated Costs for TOIF and Network Upgrades

Transmission Owner Interconnection Facilities (TOIF)

TOIF at the Ketchum substation include one (1) new 345kV dead-end, one (1) new 345kV disconnect switch, three (3) new potential transformers, three (3) new bushing current transformers, and one (1) new line panel.

TOIF Costs	\$655,342
------------	-----------

Network Upgrades

Network Upgrades at the Ketchum substation include one (1) new 345kV circuit breaker and two (2) new 345kV disconnect switches.

Network Upgrades	\$589,932
------------------	-----------

The total cost estimate for the required Transmission Owner Interconnection Facilities (TOIF) and Network Upgrades is shown below.

\$	655,342	TOIF
\$	<u>589,932</u>	<u>Network Upgrades</u>
\$	1,245,274	Total

Engineering, Procurement, and Construction Schedule: The schedule for TMO to design, procure equipment and construct a 345kV line terminal of this type is approximately 18 months. According to good business practice, the TMO engineering and procurement process cannot begin until the parties have executed a mutually agreeable Generation Interconnection Agreement, or as an alternative an E&P (engineering and procurement) agreement.

Short Circuit Fault Duty Evaluation

Evergy engineering staff reviewed short circuit analysis for the Ketchum 345 kV substation to determine if the added generation would cause the available fault currents to exceed the

interrupting capability of any existing circuit breakers. The fault currents are within circuit breaker interrupting capability with the addition of the GEN-2016-088 wind farm.

Other Required Interconnection Facilities

No other equipment additions have been identified for this proposed generator interconnection.

Appendix A: One-Line Diagram of GEN-2016-088 (Osborn II) Interconnection and Ketchum 345kV Substation