INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-158

(IFS-2016-002-17)

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
1/27/2020	SPP	Initial draft report issued.
2/27/2020	SPP	Final draft issued.
5/20/2020	SPP	Updated Transmission Owner Facility Study.
8/26/2020	SPP	Updated final report issued. Updated Table 5 and Table 6.
3/28/2023	SPP	Updated Transmission Owner Facility Study. Updated Table 5 and Table 6.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-158/IFS-2016-002-17 is for a 252.0 MW generating facility located in Allen County, Kansas. The Interconnection Request was studied in the DISIS-2016-002 Impact Study for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's requested in-service date is December 31, 2019.

The interconnecting Transmission Owner, Evergy Metro, Inc. (formerly KCPL), 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 one-hundred twenty-six (126) GE 2.0 MW wind generators for a total generating nameplate capacity of 252.0 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 174/232/290 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- Approximately five (5) 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 ("West Gardner 345 kV") 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; and,
- All necessary relay, protection, control and communication systems required to protect Interconnection Customer's Interconnection Facilities and Generating Facilities and coordinate with Transmission Owner's relay, protection, control and communication systems.

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 West Gardner 345 kV Interconnection Substation: None, see Note	$0	N/A	$0	N/A
Total	**$0**		**$0**	

Note: GEN-2016-158 will share a generator lead with GEN-2016-157 from the customer facility to the point of interconnection. If GEN-2016-157 does not proceed with interconnection all costs associated with GEN-2016-157 will need to be re-evaluated and re-allocated to GEN-2016-158 as equipment was sized for interconnection two (2) 252 MW wind farms.

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 West Gardner 345 kV Interconnection Substation: Review and application of new relaying settings	non-creditable	$43,187	100%	$43,187	2 Months
Evergy Kansas Central Substation: Review and applying new relaying settings.	non-creditable	$10,000	100%	$10,000	2 Months
Total		**$53,187**		**$53,187**	

[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 provided by AECI 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 ($)	Allocated Share (%)	Allocated Cost Estimate ($)
AECI Affected System Study Cycle Projects: Rebuild the 18-mile-long Hamburg to Northboro 69 kV line to 336 ASCR. **Need Date:** 2021 **Year in Service:** 2021	$7,434,000	8.1%	$602,319
AECI Affected System Study Cycle Projects: Rebuild the 4.4-mile-long Phelps to Rockpot 69 kV line to 336 ASCR. **Need Date:** 2021 **Year in Service:** 2021	$1,817,000	8.1%	$148,417
AECI Affected System Study Cycle Projects: Rebuild the 11.4-mile-long Linden to Phelps 69 kV line to 336 ASCR. **Need Date:** 2021 **Year in Service:** 2021	$4,708,000	8%	$378,033
AECI Affected System Study Cycle Projects: Rebuild the 4.136-mile-long Bevier to Macon Lake 69 kV line to 477 ASCR. **Need Date:** 2021 **Year in Service:** 2021	$2,938,000	9.3%	$275,415
AECI Affected System Study Cycle Projects: Rebuild the 2.2-mile-long Macon Lake to Axtell to Macon Tap 69 kV line to 477 ASCR. **Need Date:** 2021 **Year in Service:** 2021	$1,562,000	9.1%	$143,402
Total	**$18,459,000**		**$1,547,586**

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 252.0 MW can be granted. Full Interconnection Service will be delayed until the TOIF, Non-Shared NU, Shared NU, Previous NU, Affected System Upgrades that are required for full interconnection service are completed. The Interconnection Customer's estimated cost responsibility for TOIF, Non-Shared NU and Affected System Upgrades that is required for full interconnection service is summarized in the table below.

Table 6: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities	$0
Network Upgrades	$53,187
AECI Affected System Upgrades	$1,547,586
Total	**$1,600,773**

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).

Evergy

Facility Study for Southwest Power Pool

Generation Interconnection Requests

GEN-2016-157

GEN-2016-158

January 2023

Public

Introduction

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 Evergy Metro and Evergy Kansas Central to satisfy the Facility Study Agreement executed by the requesting Interconnection Customer (Customer) for SPP Generation Interconnection Request GEN-2016-157 and GEN-2016-158. 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 two (2) separate 252 MW wind farms. 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 West Gardner substation in Gardner, Kansas.

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.

Southwest Power Pool Generation Interconnection Request

Southwest Power Pool (SPP) Generation Interconnection (GI) requested Evergy Metro and Evergy Kansas Central perform an Interconnection Facility Study (IFS).

GI Request #	Point of Interconnection	Capacity (MW)	Fuel Type
GEN-2016-157	West Gardner 345kV	252	Wind
GEN-2016-158	West Gardner 345kV	252	Wind

Public

Cost Estimates

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

GEN-2016-157

Evergy Metro

Transmission Owner Interconnection Facilities (TOIF)
TOIF at the West Gardner substation include one (1) new 345kV dead-end, one (1) new 345kV disconnect switch, three (3) new voltage transformers, three (3) new current transformers, one (1) phasor measurement unit (PMU) and one (1) new line panel.

TOIF Cost $2,812,285

Network Upgrades
Network Upgrades at the West Gardner substation include conversion from ring to breaker-and-a-half configuration, consisting of adding six (6) breakers, four (4) wave traps, sixteen (16) switches, fourteen (14) PTs, and ten (10) control panels. The estimate also includes other associated site work, foundations, grounding, cable, conduit, and work to support line terminal relocations for Swissvale, Stilwell, LaCygne, and Craig transmission lines.

Network Upgrades $38,610,669

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

$	2,812,285	TOIF
$	38,610,669	Network Upgrades
$	41,422,955	Total

Time Estimate
Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	8 Months
Procurement Time	9 Months
Construction Time	16 Months
Total Project Length	24 Months

Evergy Kansas Central

Network Upgrades
Network Upgrades on Evergy Kansas Central system include replacing one control panel and reviewing and applying new relaying settings at the Swissvale substation.

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Network Upgrades $139,825

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

$	0	TOIF
$	139,825	Network Upgrades
$	139,825	Total

Time Estimate

Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	4 Month
Procurement Time	4 Month
Construction Time	4 Month
Total Project Length	10 Months

GEN-2016-158

GEN-2016-158 will share a generator lead with GEN-2016-157 from the customer facility to the point of interconnection. If GEN-2016-157 does not proceed with interconnection all costs associated with GEN-2016-157 will need to be reevaluated and reallocated to GEN-2016-158 as equipment was sized for the interconnection of two (2) 252 MW wind farms.

Evergy Metro

There is no required substation work associated with interconnection of GEN-2016-158 for Evergy Metro. Relaying setting review and changes will be required.

Network Upgrades

Network Upgrades at the West Gardner substation include review and application of new relaying settings.

Network Upgrades $43,187

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

$	0	TOIF
$	43,187	Network Upgrades
$	43,187	Total

Time Estimate

Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	1 Month
Procurement Time	0 Month
Construction Time	1 Month
Total Project Length	2 Months

Public

Evergy Kansas Central

There is no required substation work associated with interconnection of GEN-2016-157 for Evergy Kansas Central Substations. Relaying setting review and changes will be required.

Network Upgrades

Network Upgrades on Evergy Kansas Central system include review and application of new relaying settings.

Network Upgrades $10,000

The total cost for the required Transmission Owner Interconnection Facilities (TOIF) and Network Upgrades for Evergy Kansas Central is shown below

$	0	TOIF
$	10,000	Network Upgrades
$	10,000	Total

Time Estimate

Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

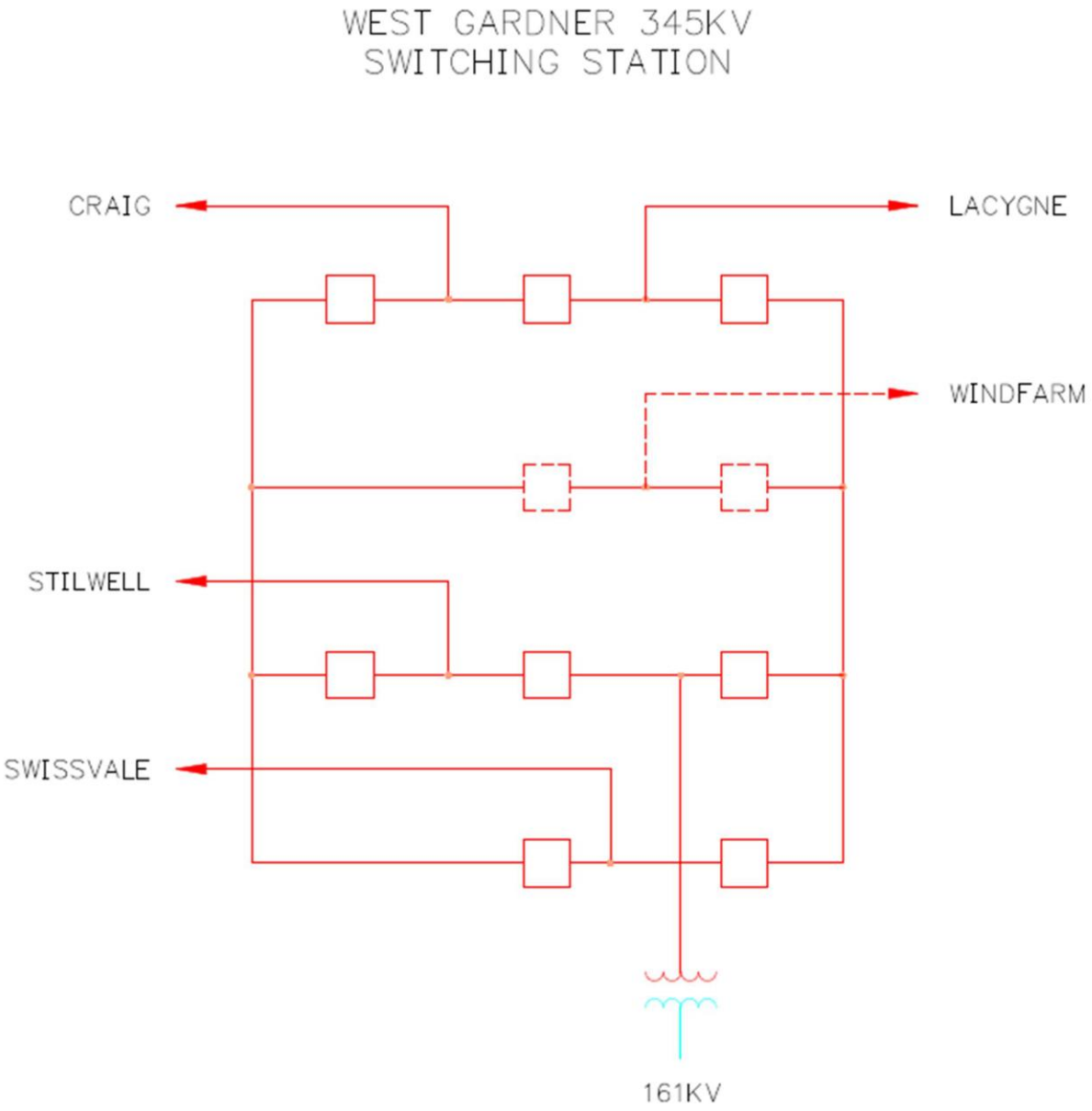
Engineering Time	1 Month
Procurement Time	0 Month
Construction Time	1 Month
Total Project Length	2 Months

Short Circuit Fault Duty Evaluation

Evergy engineering staff reviewed short circuit analysis for the West Gardner 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-2016-157 and GEN-2016-158 wind farms.

Public

Appendix A: West Gardner 345kV Substation One-Line Diagram



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