



**INTERCONNECTION  
FACILITIES STUDY  
REPORT**

GEN-2017-005

Published November 2021

By SPP Generator Interconnections Dept.

## REVISION HISTORY

---

| <b>DATE OR VERSION<br/>NUMBER</b> | <b>AUTHOR</b> | <b>CHANGE DESCRIPTION</b>    |
|-----------------------------------|---------------|------------------------------|
| 11/15/2021                        | SPP           | Initial draft report issued. |
| 11/19/2021                        | SPP           | Final report issued.         |
|                                   |               |                              |

# CONTENTS

---

|   |   |
|---|---|
| Revision History.....   | i |
| Summary.....  | 1 |
| Introduction .....  | 1 |
| Phase(s) of Interconnection Service.....  | 1 |
| 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 |
| Contingent Network Upgrade(s).....  | 5 |
| Affected System Upgrade(s) .....  | 6 |
| Conclusion.....   | 7 |
| Appendices.....   | 8 |
| A: Transmission Owner’s Interconnection Facilities Study Report and Network Upgrades Report(s)..... | 9 |

## SUMMARY

---

### INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2017-005 is for a 190 MW generating facility located in Bourbon and Crawford Counties, OK. The Interconnection Request was studied in the DISIS-2017-001 Impact Study and the GEN-2017-005 Interim Availability Interconnection System Impact Study for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's requested in-service date is November 1, 2021.

The interconnecting Transmission Owner, Evergy Electric Services Company (WERE), 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, Contingent 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.

### COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)

FERC Order ER20-1687-000 eliminated the use of Attachment Z2 revenue crediting as an option for compensation. The Incremental Long Term Congestion Right (ILTCR) process will be the sole process to compensate upgrade sponsors as of July 1st, 2020.

## INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES

The Generating Facility is proposed to consist of seventy-eight (78) 2.5 MW Wind Turbine Generators for a total generating nameplate capacity of 190 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 161 kV transformation substation with associated 34.5 kV and 161 kV switchgear;
- One 161/34.5 kV 135/180/224 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An approximately .5 mile overhead mile overhead kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 161 kV bus at existing Transmission Owner substation ("Marmaton - Litchfield 161 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 inverter 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)*

| <b>Transmission Owner Interconnection Facilities (TOIF)</b>   | <b>Total Cost Estimate (\$)</b> | <b>Allocated Percent (%)</b> | <b>Allocated Cost Estimate (\$)</b> | <b>Estimated Lead Time</b> |
|---|---------------------------------|------------------------------|-------------------------------------|----------------------------|
| <b><u>Marmaton – Litchfield 161kV GEN-2017-005 Interconnection (TOIF) (EKC) (132938)</u></b> : Install one (1) breaker, three (3) switches, three (3) standalone CT’s, three (3) 161kV PT’s, one (1) control panel to accept a transmission line from the Interconnection Customer’s Generating Facility. | \$1,216,477                     | 100%                         | \$1,216,477                         | 18 Months                  |
| <b>Total</b>  | <b>\$1,216,477</b>              |                              | <b>\$1,216,477</b>                  |                            |

*Table 2: Non-Shared Network Upgrade(s)*

| <b>Non-Shared Network Upgrades Description</b>  | <b>ILTCR</b> | <b>Total Cost Estimate (\$)</b> | <b>Allocated Percent (%)</b> | <b>Allocated Cost Estimate (\$)</b> | <b>Estimated Lead Time</b> |
|---|--------------|---------------------------------|------------------------------|-------------------------------------|----------------------------|
| <b><u>Marmaton – Litchfield 161kV GEN-2017-005 Interconnection (Non-Shared NU) (EKC) (132939)</u></b> : Tap Transmission Line to construct a new greenfield 161kV breaker and a half substation consisting of three (3) breakers, two (2) wave traps, seven (7) switches, six (6) CCVTs and two (2) control panels. Upgrade one (1) wave trap and review relay settings at Marmaton 161kV substation. | Not Eligible | \$11,434,328                    | 100%                         | \$11,434,328                        | 18 Months                  |
| <b>Total</b>  |              | <b>\$11,434,328</b>             |                              | <b>\$11,434,328</b>                 |                            |

**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)*

| <b>Shared Network Upgrades Description</b> | <b>ILTCR</b> | <b>Total Cost Estimate (\$)</b> | <b>Allocated Percent (%)</b> | <b>Allocated Cost Estimate (\$)</b> | <b>Estimated Lead Time</b> |
|--|--------------|---------------------------------|------------------------------|-------------------------------------|----------------------------|
| None                                       | N/A          | \$0                             | 100%                         | \$0                                 | N/A                        |
| <b>Total</b>                               |              | <b>\$0</b>                      |                              | <b>\$0</b>                          |                            |

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.

### CONTINGENT NETWORK UPGRADE(S)

Certain Contingent Network Upgrades are **currently not the cost responsibility** of the Interconnection Customer but will be required for full Interconnection Service.

*Table 4: Interconnection Customer Contingent Network Upgrade(s)*

| Contingent 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 Contingent 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 MISO 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 Percent (%) | Allocated Cost Estimate (\$) |
|--------------------------------------|--------------------------|-----------------------|------------------------------|
| None                                 | \$0                      | 100%                  | \$0                          |
| <b>Total</b>                         | \$0                      |                       | \$0                          |

**CONCLUSION**

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 190 MW can be granted. Full Interconnection Service will be delayed until the TOIF, Non-Shared NU, Shared NU, Contingent NU, Affected System Upgrades that are required for full interconnection service are completed. The Interconnection Customer’s estimated cost responsibility for GEN-2017-005 that is required for full interconnection service is summarized in the table below.

*Table 6: Cost Summary*

| Description   | Allocated Cost Estimate |
|---|-------------------------|
| Transmission Owner Interconnection Facilitie Upgrade(s) | \$1,216,477             |
| Non-Shared Network Upgrade(s)                           | \$11,434,328            |
| Shared Network Upgrade(s)                               | \$0                     |
| Affected System Upgrade(s)                              | \$0                     |
| <b>Total</b>  | <b>\$12,650,805</b>     |

Use the following link for Quarterly Updates on upgrades from this report: <https://spp.org/spp-documents-filings/?id=18641>

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).



**Interim - Generation Interconnection  
Facility Study**

**For**

**Generation Interconnection Request  
GEN-2017-005**

**November 10, 2020**

## **Introduction**

This report summarizes the scope of the Interim Generation Interconnection Facility Study to evaluate the Generation Interconnection Request for GEN-2017-005. GEN-2017-005 is proposing to build a 195 MW wind-powered generation facility in south east Kansas with an in-service date of June 30, 2021.

## **Southwest Power Pool Generation Interconnection Request:**

Southwest Power Pool (SPP) GI gave Everygy Kansas Central the option to perform an Interim Interconnection Facility Study (IFS).

| <b>GI Request #</b> | <b>Point of Interconnection</b> | <b>Capacity (MW)</b> | <b>Fuel Type</b> |
|---------------------|---------------------------------|----------------------|------------------|
| <b>GEN-2017-005</b> | Marmaton - Franklin 161 kV      | 195                  | Wind             |

## **Estimated Costs for TOIF and Network Upgrades**

### **Transmission Owner Interconnection Facilities (TOIF)**

This estimated cost includes work necessary to install one (1) breaker, three (3) switches, three (3) standalone CT's, three (3) 161kV PT's, one (1) control panel to accept a transmission line from the Interconnection Customer's Generating Facility.

### **161kV Transmission Line Work**

The estimated cost is for the cut in of the new Jayhawk switching station on the existing Marmaton-Franklin 161kV line.

### **161kV Jayhawk Substation Work**

The estimated cost is for constructing a new greenfield 161kV breaker and a half substation consisting of three (3) breakers, two (2) wave traps, seven (7) switches, six (6) CCVTs, and two (2) control panels.

### **161kV Marmaton Substation Work**

The estimated cost is for upgrading one (1) wave trap and to review relay settings and apply adjusted settings if needed.

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

|    |            |                                     |
|----|------------|-------------------------------------|
| \$ | 0          | <b>TOIF (Transmission Line)</b>     |
| \$ | 1,105,888  | <b>TOIF (Substation)</b>            |
| \$ | 0          | <b>TOIF (AFUDC)</b>                 |
| \$ | 110,589    | <b>TOIF (Contingency)</b>           |
| \$ | 414,762    | <b>161kV Transmission Line Work</b> |
| \$ | 9,980,082  | <b>161kV Substation Work</b>        |
| \$ | 0          | <b>AFUDC</b>                        |
| \$ | 1,039,484  | <b>Contingency</b>                  |
| \$ | 12,650,805 | <b>Total</b>                        |

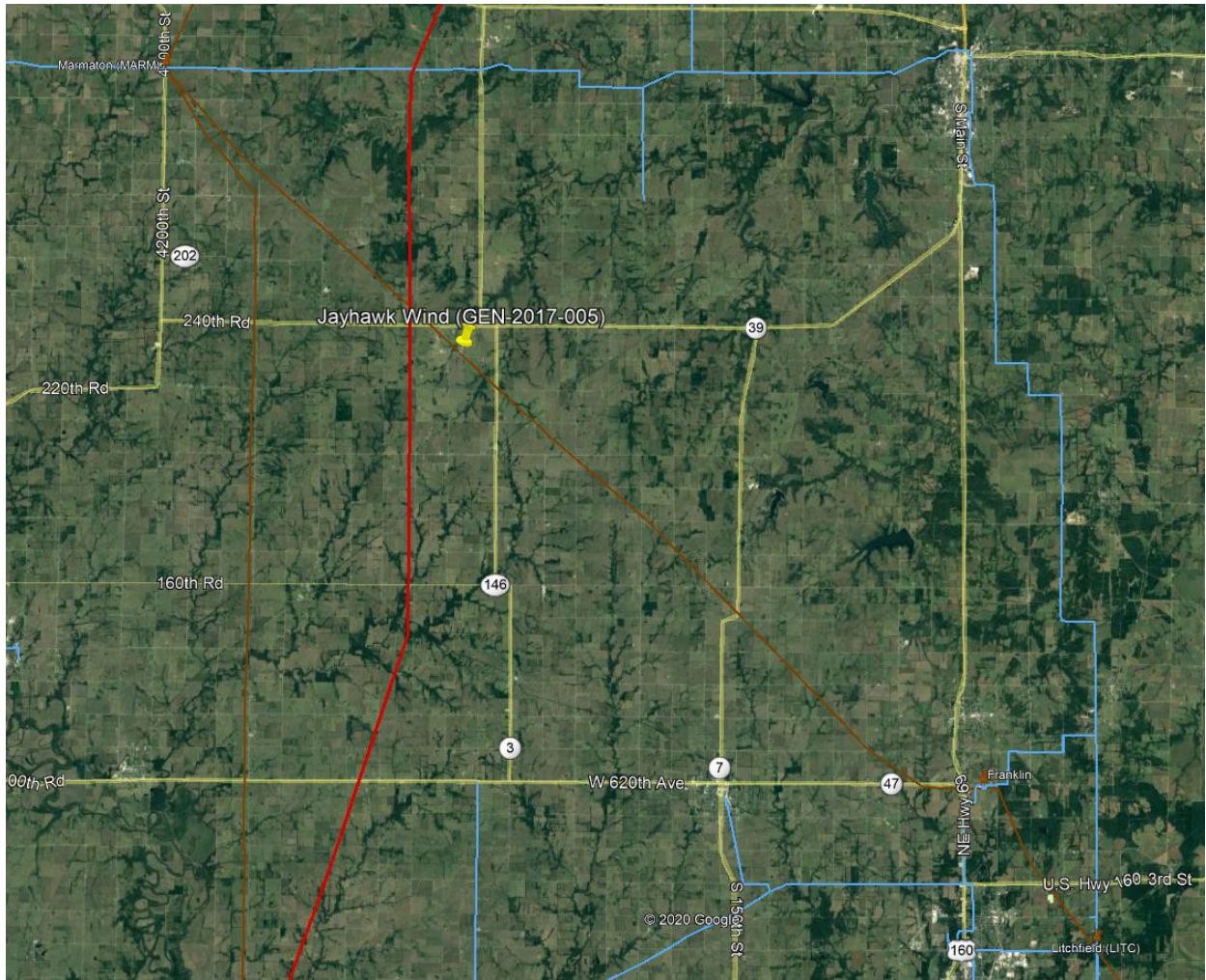
These estimates are accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are significant and the accuracy of these estimates at the time of actual settings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

**Time Estimate**

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

|                             |                  |
|-----------------------------|------------------|
| Engineering Time            | 5 Months         |
| Procurement Time            | 6 Months         |
| Construction Time           | 7 Months         |
| <b>Total Project Length</b> | <b>18 Months</b> |

**Figure 1 – Interconnection Map**



The proposed interconnection project is located approximately 13 miles from the Marmaton 161kV substation on the Marmaton-Franklin 161kV line.



## **Results of Short Circuit Analysis**

As a part of this Interim Facility Study, a short circuit study was performed to determine the available fault current at the interconnection bus using PSS/E's activity ASCC. The 2021 Summer Peak case from the 2020 Series MDWG Classical, Max Fault Short-Circuit models was used. The GEN-2017-005 wind farm generation facility was taken out of service for this analysis, and all other transmission facilities are in service. As a result, the numbers generated represent the available utility interconnection fault current:

### **2021 Summer:**

| 3-PH FAULT |         | 1-PH FAULT |         | THEVENIN IMPEDANCE (PU on 100 MVA and bus base KV) |                    |                    |
|------------|---------|------------|---------|--|--------------------|--------------------|
| AMP        | MVA     | AMP        | MVA     | Positive Sequence                                  | Negative Sequence  | Zero Sequence      |
| 6068.1     | 1692.16 | 4546.4     | 1267.81 | 0.010257+j0.059399                                 | 0.010245+j0.059409 | 0.029315+j0.117356 |