



**INTERCONNECTION  
FACILITIES STUDY  
REPORT**

GEN-2017-092

Published January 2022

By SPP Generator Interconnections Dept.

## REVISION HISTORY

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| DATE OR VERSION NUMBER | AUTHOR | CHANGE DESCRIPTION           |
|------------------------|--------|------------------------------|
| 1/6/2022               | SPP    | Initial draft report issued. |
| 1/24/2022              | SPP    | Final report issued.         |
|                        |        |                              |

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# SUMMARY

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## INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2017-092 is for a 200 MW generating facility located in Muskogee County, OK. The Interconnection Request was studied in the DISIS-2017-001 Impact Study and DISIS-2017-001-1 Impact Restudy for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's requested in-service date is June 1st, 2023.

The interconnecting Transmission Owner, Oklahoma Gas and Electric (OG&E), 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 sixty-seven (67) 600V (AC) Power Electronics Inverters for a total generating nameplate capacity of 200 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 345/34.5 kV 75/100/125 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 underground mile overhead 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 ("Canadian River - Muskogee - Seminole 345kV") 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>Canadian River – Muskogee – Seminole 345 kV GEN-2017-092 (TOIF) (OKGE) (133072):</u></b> Add a single 345kV line terminal to a new Substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs. | \$1,199,958                     | 50%                          | \$599,979                           | 18 Months                  |
| <b>Total</b>   | <b>\$1,199,958</b>              |                              | <b>\$599,979</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>None</b>                                    | N/A          | \$0                             | N/A                          | \$0                                 | N/A                        |
| <b>Total</b>                                   |              | <b>\$0</b>                      |                              | <b>\$0</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)*

| Shared Network Upgrades Description  | ILTC R       | Total Cost Estimate (\$) | Allocated Percent (%) | Allocated Cost Estimate (\$) | Estimated Lead Time |
|--|--------------|--------------------------|-----------------------|------------------------------|---------------------|
| <b><u>Canadian River – Muskogee – Seminole 345 kV GEN-2017-092 (Shared NU) (OKGE) (33073):</u></b> At a new sub, install 5- 345kV 3000A breakers, line relayng, bus work, disconnect switches, and associated equipment. | Not Eligible | \$11,482,642             | 50%                   | \$5,741,321                  | 18 Months           |
| <b>Total</b>   |              | <b>\$11,482,642</b>      |                       | <b>\$5,741,321</b>           |                     |

\*This portion of the interconnection upgrades is shared with GEN-2017-040

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)*

| <b>Contingent Network Upgrade(s) Description</b> | <b>Current Cost Assignment</b> | <b>Estimated In-Service Date</b> |
|--|--------------------------------|----------------------------------|
| <b>None</b>                                      | \$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 either MISO or 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)*

| <b>Affected System Upgrades Description</b>  | <b>Total Cost Estimate (\$)</b> | <b>Allocated Percent (%)</b> | <b>Allocated Cost Estimate (\$)</b> |
|--|---------------------------------|------------------------------|-------------------------------------|
| <b><u>DISIS-2017-001 AECI AFS:</u></b> Replace Sportsman 161/345 kV transformer #1 with 625/712 MVA transformer. | \$5,000,000                     | 6.5%                         | \$323,386                           |
| <b><u>DISIS-2017-001 AECI AFS:</u></b> Replace Sportsman 161/345 kV transformer #1 with 625/712 MVA transformer. | \$5,000,000                     | 6.5%                         | \$323,386                           |
| <b>Total</b>   | \$10,000,000                    |                              | \$646,722                           |

## CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 200 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 full interconnection service is summarized in the table below.

*Table 6: Cost Summary*

| Description   | Allocated Cost Estimate |
|---|-------------------------|
| Transmission Owner Interconnection Facilitie Upgrade(s) | \$599,979               |
| Non-Shared Network Upgrade(s)                           | \$0                     |
| Shared Network Upgrade(s)                               | \$5,741,321             |
| Affected System Upgrade(s)                              | \$646,722               |
| <b>Total</b>  | <b>\$6,988,022</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

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**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).



## **FACILITY STUDY**

**for**

### **Generation Interconnection Request 2017-092**

200 MW Wind Generating Facility  
In Muskogee County  
Oklahoma

September 9, 2020

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Lead Engineer  
Transmission Planning  
**OG&E Electric Services**

## Summary

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Oklahoma Gas and Electric (OG&E) performed the following Facility Study to satisfy the Facility Study Agreement executed by the requesting customer for SPP Generation Interconnection request Gen-2017-092. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system. The requirements for interconnection consist of adding one 345kV breaker, a terminal for the gen-tie line, associated metering, protection, and communications in a new substation to be established by this GIA request as well as Gen-2017-040. Since these two requests will share the same Gen-tie line and are a part of the same DISIS study group, costs for the total project will be divided equally among the two projects. If one GIA request is withdrawn or delayed for whatever reason, the GIA request that moves forward will be assumed to cover the remaining costs of the project. OG&E will build a new 5 breaker ring bus 345kV substation. OG&E will route the Muskogee – Seminole line and the Muskogee – Canadian River lines into this new substation. The final terminal will be occupied by the gen tie serving SPP-Gen-2017-040 and 2017-092. The total cost for OG&E to complete the necessary work is estimated at \$12,682,600.

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## **Introduction**

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting a generating facility within the service territory of OG&E Electric Services (OKGE) in Muskogee County Oklahoma. The proposed 345kV point of interconnection is at a new Substation in Muskogee County. This substation is owned by OKGE. The cost for adding a new 345kV terminal to this new Substation, the required interconnection facility, is estimated at \$1,199,958. Half of this cost will be borne by Gen-2017-040 and the other half by 2017-092.

Network Constraints in the Southwest Public Service (SPS), OKGE and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.

Other Network Constraints in the American Electric Power West (AEPW), Southwest Public Service (SPS), OKGE and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.



## **Interconnection Facilities**

The primary objective of this study is to identify attachment facilities. The requirements for interconnection consist of adding a new 345kV terminal into a new substation being built for this interconnection. The new substation will have 5 – 3000A breakers and require the routing of the Muskogee – Seminole line as well as the Muskogee – Canadian River line and the gen-tie into it. This 345kV substation shall be constructed and maintained by OKGE. It is assumed that obtaining all necessary right-of-way for the lines into the new OKGE 345kV substation facilities will be performed by the interconnection customer.

The total cost for OKGE to add a new 345kV terminal in a new substation, re-route the required lines into the new substation, as well as build the new substation, is estimated at \$12,682,600. This cost should be split among Gen-2017-040 and Gen-2017-092. Should one project not materialize, the other GIA request shall assume the remaining financial responsibility of these upgrades. This cost does not include building the 345kV line from the Customer substation into the POI Substation. The Customer is responsible for this 345kV line up to the point of interconnection. This cost does not include the Customer's 345-34.5kV substation and the cost estimate should be determined by the Customer.

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 Southwest Power Pool (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 Open Access Transmission Tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPP OATT.

The costs of interconnecting the facility to the OKGE transmission system are listed in Table 1.

### Short Circuit Fault Duty Evaluation

It is standard practice for OG&E to recommend replacing a circuit breaker when the current through the breaker for a fault exceeds 100% of its interrupting rating with re-closer de-rating applied, as determined by the ANSI/IEEE C37.5-1979, C37.010-1979 & C37.04-1979 breaker rating methods.

For this generator interconnection, no breakers were found to exceed their interrupting capability after the addition of the Customer's 200MW generation and related facilities. OG&E found no breakers that exceeded their interrupting capabilities on their system. Therefore, there is no short circuit upgrade costs associated with the Gen-2017-092 interconnection.

**Table 1: Required Interconnection Network Upgrade Facilities**

**Lead Time: 18 months from time site control is given to OG&E**

| Facility  | ESTIMATED COST<br>(2020 DOLLARS)<br>Cost to be shared among<br>Gen-2017-040 and Gen-<br>2017-092 | Percentage Responsible |
|---|--|------------------------|
| OKGE – <b>Interconnection Facilities</b> - Add a single 345kV line terminal to a new Substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs | <b>\$1,199,958</b>   | <b>50%</b>             |
| OKGE – <b>Network Upgrades</b> at a new sub, Install 5-345kV 3000A breakers, line relaying, bus work, disconnect switches, and associated equipment.                                    | <b>\$11,482,642</b>  | <b>50%</b>             |
| OKGE - Right-of-Way for routing of 345kV lines into substation  | To be obtained by customer   |                        |
| <b>Total</b>  | <b>\$6,341,300</b>   |                        |

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September 11, 2020

New Substation for Gen-2017-040 and 2017-092

