



# **INTERCONNECTION FACILITIES STUDY REPORT**

GEN-2017-071

Published January 2022

By SPP Generator Interconnections Dept.

## REVISION HISTORY

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<b>DATE OR VERSION NUMBER</b>	<b>AUTHOR</b>	<b>CHANGE DESCRIPTION</b>
1/4/2022	SPP	Initial draft report issued.
1/21/2022	SPP	Updated draft issued. Updated FS from OGE to account for shared interconnection facilities.
01/25/2022	SPP	Final report issued. Updated upgrade description in Table 3.

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## SUMMARY

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### INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2017-071 is for a 124.7 MW generating facility located in Payne 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 December 1st, 2022.

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 Forty-three (43) 2.9 MW Power Electronics HEC-US V1500 FS3000 3.5 MVA@25C Solar Inverters for a total generating nameplate capacity of 124.7 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 138 kV transformation substation with associated 34.5 kV and 138 kV switchgear;
- One 138/34.5 kV 84/112/140 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An approximately .1 mile overhead kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 138 kV bus at existing Transmission Owner substation ("Greenwood 138kV Substation") 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 leadtime for completion of construction. The estimated leadtime 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>Greenwood 138kV Substation GEN-2017-071 Interconnection (TOIF) (OKGE) (133034):</u></b> Add a single 138kV line terminal to Greenwood Substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs.	\$615,000	50%	\$307,500	15 Months
<b>Total</b>	<b>\$615,000</b>		<b>\$307,500</b>	

\*GEN-2017-071 and GEN-2017-072 are sharing a gen tie line.

*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)*

<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>
<b><u>Greenwood 138kV Interconnection Expansion (DISIS-2017-001) (133037):</u></b> At Greenwood Sub, expand sub and ground grid, expand ring bus to East, Install 1- 138kV 2000A breaker, line relaying, disconnect switches, and associated equipment, Re-route Greenwood – Cushing Tap line into Greenwood Substation	Not Eligible	\$2,450,000	50%	\$1,225,000	15 Months
<b>Total</b>		<b>\$2,450,000</b>		<b>\$1,225,000</b>	

\*GEN-2017-071 and GEN-2017-072 are sharing the interconnection expansion costs at Greenwood 138kV

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 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>None</b>	\$0	N/A	\$0
<b>Total</b>	\$0		\$0

## CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 124.7 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*

<b>Description</b>	<b>Allocated Cost Estimate</b>
Transmission Owner Interconnection Facilities Upgrade(s)	\$307,500
Non-Shared Network Upgrade(s)	\$0
Shared Network Upgrade(s)	\$1,225,000
Affected System Upgrade(s)	\$0
<b>Total</b>	<b>\$1,532,500</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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Southwest Power Pool, Inc.

**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 2017-071 and 2017-072**

127.4 MW and 52.5 MW Solar Generating Facility  
In Payne/Lincoln County  
Oklahoma

January 21, 2022

Steve Hardebeck  
Manager  
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-2017-071 and Gen-2017-072. 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. This Generation Interconnection Request is being submitted for both Gen 2017-071 and Gen-2017-072, the two facilities will share the same OG&E Greenwood substation POI.

The network upgrades consist of expanding the substation, expanding the existing 4 breaker ring bus to a 5 breaker ring bus by installing one new 2000A-138kV breaker, and re-routing the Greenwood – Cushing Tap line into a new terminal. The total cost for OG&E to complete the necessary work is estimated at \$2,450,000.

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## **Introduction**

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting a solar generating facility within the service territory of OG&E Electric Services (OKGE) in Payne County Oklahoma. The proposed 138kV point of interconnection is at Greenwood Substation in Payne County. This substation is owned by OKGE. The cost for adding a new 138kV terminal to Greenwood Substation, the required interconnection facility, is estimated at \$615,000.

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 138kV terminal in an existing substation. This 138kV addition shall be constructed and maintained by OKGE. It is assumed that obtaining all necessary right-of-way for the line into the new OKGE 138kV substation facilities will be performed by the interconnection customer.

The total standalone costs for OKGE to add a new 138kV terminal in an existing substation is estimated at \$615,000. This cost does not include building the 138kV line from the Customer substation into the POI Substation. The Customer is responsible for this 138kV line up to the point of interconnection. This cost does not include the Customer's 138-34.5kV substation and the cost estimate should be determined by the Customer. The network upgrade costs of expanding Greenwood substation and re-routing the Greenwood – Cushing tap line into the expanded substation are estimated at \$2,450,000

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 127.4MW and 52.5 MW 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-2017-071 and Gen-2017-072 interconnection.

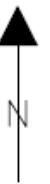
**Table 1: Required Interconnection Network Upgrade Facilities**

Facility	ESTIMATED COST (2022 DOLLARS)
Estimated Lead Time	15 months
OKGE – <b>Interconnection Facilities</b> - Add a single 138kV line terminal to Greenwood Substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs	<b>\$615,000</b>
OKGE – <b>Network Upgrades</b> – At Greenwood Sub, expand sub and ground grid, expand ring bus to East, Install 1- 138kV 2000A breaker, line relaying, disconnect switches, and associated equipment, Re-route Greenwood – Cushing Tap line into Greenwood Substation	<b>\$2,450,000</b>
OKGE - Right-of-Way for 138kV terminal addition	No Additional ROW
<b>Total</b> for Gen-2017-071 and Gen-2017-072	<b>\$3,065,000</b>

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January 21, 2022

Greenwood Substation



Gen 2017-071  
Gen 2017-072

69kV to Oak Grove

69kV

Linwood 138kV

138kV

Cushing Tap  
138kV

69kV to Highway 99 Tap

Bristow 138kV

