



**INTERCONNECTION
FACILITIES STUDY
REPORT**

GEN-2017-150

Published April 2023

By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
04/12/2023	SPP	Initial draft report issued.
05/02/2023	SPP	Updated upgrade information and cost for UIDs 156445 & 156471 in Table 3.
06/06/2023	SPP	Updated 156496, 156497 and 156493 allocation costs.
07/05/2023	SPP	Cost revisions made for UIDs 156858 in Table 3.
07/26/2023	SPP	Final report issued.
06/28/2024	SPP	Upgrades revised to reflect latest study.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request is for a 250 MW generating facility located in Grady County, OK. The Interconnection Request was studied in the DISIS-2017-002 Impact Study for ERIS. The Interconnection Customer's requested in-service date is 12/01/2025.

The interconnecting Transmission Owner, Oklahoma Gas & Electric Company (OGE), performed a detailed IFS at the request of SPP. The full report is included in Appendix A. SPP 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 one-hundred thirty eight (138) 1.8 MW inverters and one (1) 1.6 MW inverter for a total generating nameplate capacity of 250 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 168/224/280 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;

31 miles 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 ("Minco 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)

Transmission Owner Interconnection Facilities (TOIF)	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>Minco 345kV GEN-2017-150 Interconnection (TOIF) (OGE) (143403)</u> Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2017-150 (250 MW/Solar), into the Point of Interconnection (POI) at Minco 345kV	\$795,827	100%	\$795,827	20 Months
Total	\$795,827		\$795,827	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>NA</u>	NA	NA	NA	NA	NA
Total		NA		NA	

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	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>Minco 345kV Interconnection Expansion (DISIS-2017-002)(143402)(OGE): Expand the Minco 345kV substation to accommodate the interconnection of GEN-2017-150 and GEN-2017-233</u>	Ineligible	\$1,790,448	53.76%	\$962,606	20 Months
Total		\$1,790,448		\$962,606	

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
<p><u>NTC 210627- Multi - Border - Woodward 345 kV Tap (122796/122823/14382)</u>: Build 0.84-miles of new 345 kV line from a new tap on the Woodward to Border 345 kV line to Chisholm</p>	\$0	3/31/2025
<p><u>NTC 210616, 210656, 210000 - Multi - Minco - Pleasant Valley - Draper 345 kV (122863, 122848, 122849, 122850, 122851, 122858, 133085, 133106, 143176, 143257)</u>: Upgrade any necessary terminal equipment at Midwest 138 kV on the Midwest to Franklin 138 kV line to achieve a summer emergency rating of 308 MVA</p> <p>Install terminal equipment at Minco substation 345 kV to support a new 345 kV line from Minco with a summer emergency rating of 1792 MVA</p> <p>Expand the existing Pleasant Valley 138 kV substation to 345 kV with new terminals to accommodate new line from Minco to Pleasant Valley to Draper and terminals to accommodate cut in of existing Cimarron to Draper 345 kV line. Tie into existing Cimarron to Draper 345 kV line. This description is specific to the 345 kV components.</p> <p>Install a new 345/138 kV transformer to achieve a summer emergency rating of 478 MVA</p> <p>Install a new 345/138 kV transformer to achieve a summer emergency rating of 478 MVA</p> <p>Upgrade any necessary terminal equipment on the Cimarron to Draper 345 kV line to achieve a summer emergency rating of 1540 MVA</p> <p>Build 34.8 miles of 345 kV line from Minco to Pleasant Valley 345 kV to achieve a 1792 MVA summer emergency rating.</p> <p>Build a second 13.2-mile 345 kV line from Draper 345 kV substation to Pleasant Valley 345 kV substation with a summer emergency rating of 1792 MVA</p> <p>Install a new line terminal at Draper 345 kV to accommodate new 345 kV line from Pleasant Valley</p>	\$0	1/1/2025

Expand the existing Pleasant Valley 138 kV substation to 345 kV with new terminals to accommodate new line from Minco to Pleasant Valley to Draper. This description is specific to the 138 kV components.		
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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 AEI 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 (\$)
NA	NA	NA	NA
Total	NA		NA

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 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 Facilities Upgrade(s)	\$795,827
Non-Shared Network Upgrade(s)	\$0
Shared Network Upgrade(s)	\$962,606
Affected System Upgrade(s)	\$0
Total	\$1,758,433

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).



FACILITY STUDY

for

Generation Interconnection Request 2017-150

250 MW Solar Generating Facility
Grady County
Oklahoma

February 28, 2023

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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-2017-150. 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 a breaker and a new line terminal for a new Solar Farm at Minco 345kV to be this GIA request as well as Gen-2017-233. 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. The total cost for OKGE to add a breaker, and a new line terminal for a new Solar Farm at Minco 345kV substation, the interconnection facility, is estimated at \$3,382,103.

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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 Grady County Oklahoma. The proposed 345kV point of interconnection is at Minco Substation in Grady County. This substation is owned by OKGE. The cost for adding a new 345kV terminal to Minco Substation, the required interconnection facility, is estimated at \$1,591,654.

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 at Minco substation. This 345kV addition shall be constructed and maintained by OKGE. It is assumed that obtaining all necessary right-of-way for the line into Minco substation will be performed by the interconnection customer.

The total cost for OKGE to add a new 345kV terminal to Minco Substation, the interconnection facility, is estimated at \$3,382,103. This cost does not include building the 345kV line from the Customer substation into Minco 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 250MW 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-2017-150 interconnection.

Table 1: Required Interconnection Network Upgrade Facilities

Facility	ESTIMATED COST (2023 DOLLARS) Shared Costs Gen-2017-233 and Gen-2017-150	PERCENTAGE RESPONSIBLE
Lead Time	20 Months	
OKGE – Interconnection Facilities - Add one 345kV line terminals to Minco Substation. one dead end structures, line switch, line relaying, revenue metering including CTs and PTs	\$1,591,654	50%
OKGE – Network Upgrades at Minco sub, install One-345kV 3000A breaker, line relaying, disconnect switches, and associated equipment.	\$1,790,448	50%
OKGE - Right-of-Way for 345kV terminal addition	No Additional ROW	
Total Cost for Gen-2017-150	\$1,691,051	

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February 28, 2023

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MINCO Substation

