



INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-037

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
12/3/2021	SPP	Initial draft report issued.
12/21/2021	SPP	Final report issued.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-037 is for a 300 MW generating facility located in Washita County, OK. The Interconnection Request was studied in the DISIS-2017-001 Impact Study and the DISIS-2017-001-1 Impact Restudy for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's requested in-service date is December 31, 2022.

The interconnecting Transmission Owner, American Electric Power (AEP), 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 eighty-three (83) Vestas V136 CP 3.6 MW Mk3B Wind Turbines for a total generating nameplate capacity of 300 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;
- Two 345/34.5 kV 134/205 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An approximately 4.2 mile overhead 345 kV line to connect the Interconnection Customer's substation to the Point of Change of Ownership ("PCO") at Transmission Owner's dead-end structure outside Transmission Owner's Mato 345 kV switching station on the Chisholm – Gracemont 345 kV Transmission Line;
- 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>Chisholm - Gracemont 345 kV GEN-2016-037 Interconnection (TOIF)</u> <u>(AEPW)(132902):</u> Construct one (1) 345 kV line terminal, line switches, dead end structure, line relaying, communications, revenue metering, line arrester, and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer's Generating Facility. Install a 345 kV span from the Point of Interconnection to the PCO at Transmission Owner's dead-end structure outside the Mato switching station fence as described in Section 8 of this Appendix A.	\$1,146,800	100%	\$1,416,800	9 Months
Total	\$1,146,800		\$1,146,800	

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>Chisholm - Gracemont 345 kV GEN-2016-037 Interconnection (Non-Shared NU)</u> <u>(AEPW)(132903):</u> Construct new 345 kV Mato switching station including three (3) circuit breakers, control panels, line relaying, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials.	Ineligible	\$18,030,306	100%	\$18,030,306	9 Months

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>UID 132903 Continued:</u> Install turning structures and loop the existing Chisholm-Gracemont (OG&E) transmission line in and out of the new Mato switching station. Upgrade relays at Chisholm (if necessary).	Ineligible	\$2,309,434	100%	\$2,309,434	9 Months
<u>UID 1320903 Continued:</u> Engineering support, project oversight and construction supervision of Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades constructed by Interconnection Customer. Identify accumulated and real-time Generating Facility and ICIF data to receive from Interconnection Customer by way of ICCP.	Ineligible	\$300,000	100%	\$300,000	9 Months
<u>Gracemont 345 kV Relay Setting Adjustment (OKGE)(143127):</u> At the existing Gracemont 345 kV substation, update relay settings to accommodate new protection settings.	Ineligible	\$15,000	100%	\$15,000	4 Months
Total		\$20,654,740		\$20,654,740	

*The Interconnection cost estimates referenced above were pulled from the Interim GIA.

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
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.

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
<u>Gracemont 345 kV Substation GEN-2015-093 Interconnection (NU) (82127):</u> Install one (1) 3000A circuit breakers, control panel replacement, line relaying, disconnect switches, and all other associated work.	\$0	10/14/2022
<u>Multi – Border – Woodward 345 kV Tap NTC 210575 /210587:</u> Tap the existing Border to Woodward 345 kV line 19 miles from the Border station and build a new 345 kV substation or switching station.	\$0	3/1/2023

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)

Affected System Upgrades Description	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)
None	\$0	N/A	\$0
Total	\$0		\$0

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 300 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)	\$1,146,800
Non-Shared Network Upgrade(s)	\$20,654,740
Shared Network Upgrade(s)	\$0
Affected System Upgrade(s)	\$0
Total	\$21,801,540

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).



**AEP Generation Interconnection
Facilities Study Report
for
DISIS 2017-001
GEN-2017-037
Mato 345 kV
Washita County, OK**

September, 2021

1 FACILITIES STUDY SUMMARY

American Electric Power Southwest Transmission Planning (AEP) performed the following study at the request of the Southwest Power Pool (SPP) for SPP Generation Interconnection request DISIS-2017-001, GEN-2017-037. Per the SPP Generator Interconnection Procedures (GIP), SPP requested that AEP perform an Interconnection Facilities Studies (IFS) for Network Upgrade(s) in accordance with the Scope of Interconnection Facilities Study in GIP 8.10 and the Interconnection Facilities Study Procedures in accordance with GIP 8.13.

1.1 PROJECT DESCRIPTION

Gen-2017-037 proposes to install a 300 MW windfarm generating facility in Washita County, Oklahoma (Figure 2). The point of interconnection for the generating facility will be AEP's new 345kV Mato substation. (Figure 1).

1.2 AEP'S SCOPE OF WORK TO FACILITATE INTERCONNECTION

- To accommodate the interconnection AEP will build a new 3-breaker ring bus station - Mato. Property Purchase for the station and ROW to re-terminate all existing transmission lines (Chisholm-Gracemont 345kV) into the new substation will be included. The design and construction of the new substation will meet all AEP specifications for stations. Bus work and disconnect switches will be designed to accommodate the loading requirements, and circuit breakers will be rated to ensure adequate load and fault interrupting capability. AEP will own, operate and maintain the station.
- Installation of associated protection and control equipment, SCADA, and revenue metering will be required at the new 345kV Mato substation. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.
- AEP will extend one span of 345 kV transmission line for the generation-lead going from the Mato station to the Gen-2017-037 site. AEP will build and own the first transmission line structure outside of new Mato substation, to which AEP's transmission line conductor will attach. Right of Way (ROW) will be required for this span.
- It is understood that the Interconnection Customer is responsible for all of the connection costs associated with interconnecting Gen-2017-037 to the AEP transmission system. The cost of the customer's generating facility and the costs for the line connecting the generating facility to AEP's transmission system (Beyond the first span exiting the POI station) are not included in this report; these are assumed to be the Customer's responsibility.

- The customer will be responsible for the cost of constructing a fiber-optic connection from their telecom equipment to AEP's Mato control house.

1.3 SHORT CIRCUIT EVALUATION

- It is standard practice for AEP to recommend replacing a circuit breaker when the current through the breaker for a fault exceeds 100% of its interrupting rating with recloser de-rating applied, as determined by the ANSI/IEEE C37.5-1979, C37.010-1979 & C37.04-1979 breaker rating methods.
- In the AEP system, no breakers were found to exceed their interrupting capability after the addition of the generation and related facilities. Therefore, there are no additional short circuit upgrade costs associated with the DISIS-2017-001, GEN-2017-037 interconnection.

1.4 STABILITY EVALUATION

- Based on the results of the 2017-001 DISIS Short Circuit and Stability report, the AEP system meets the stability performance requirements for all Planning events that were considered in the study.

1.5 INTERCONNECTION COST OF FACILITIES INCLUDED IN THE FACILITIES STUDY:

Network Upgrades (Build new 345 kV three breaker ring bus station)	\$22.20M
Transmission Owner Interconnection Facilities (TOIF)	\$1.42M
Total Cost	\$23.62M

The estimates do not include the impact that delays in obtaining ROW, permits, or other approvals may have.

1.6 PROJECT LEAD TIME

Project in-service date is projected to be 24 months after the issuance of Authorization to Proceed from the Interconnection Customer.

Figure 1: Point of Interconnection (POI INFORMATION) One-Line Diagram

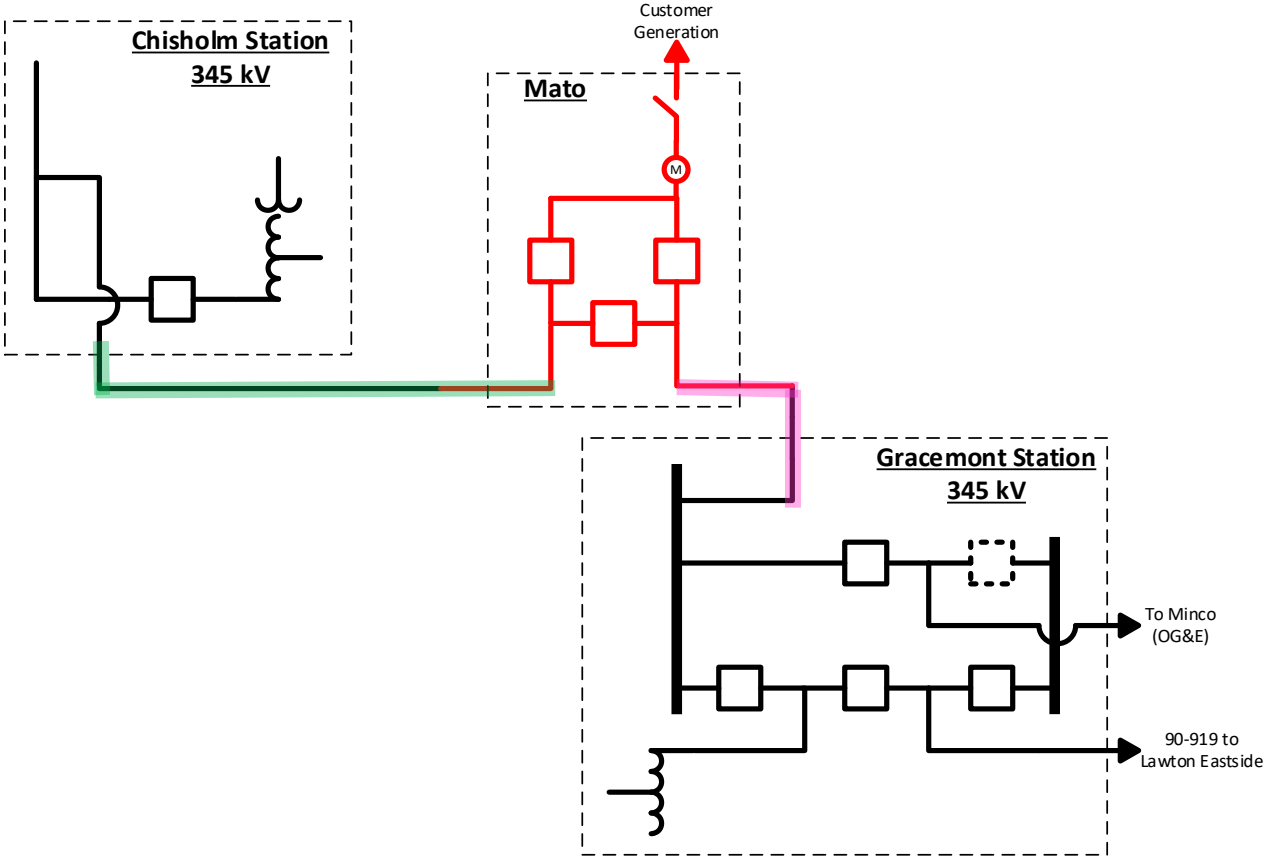
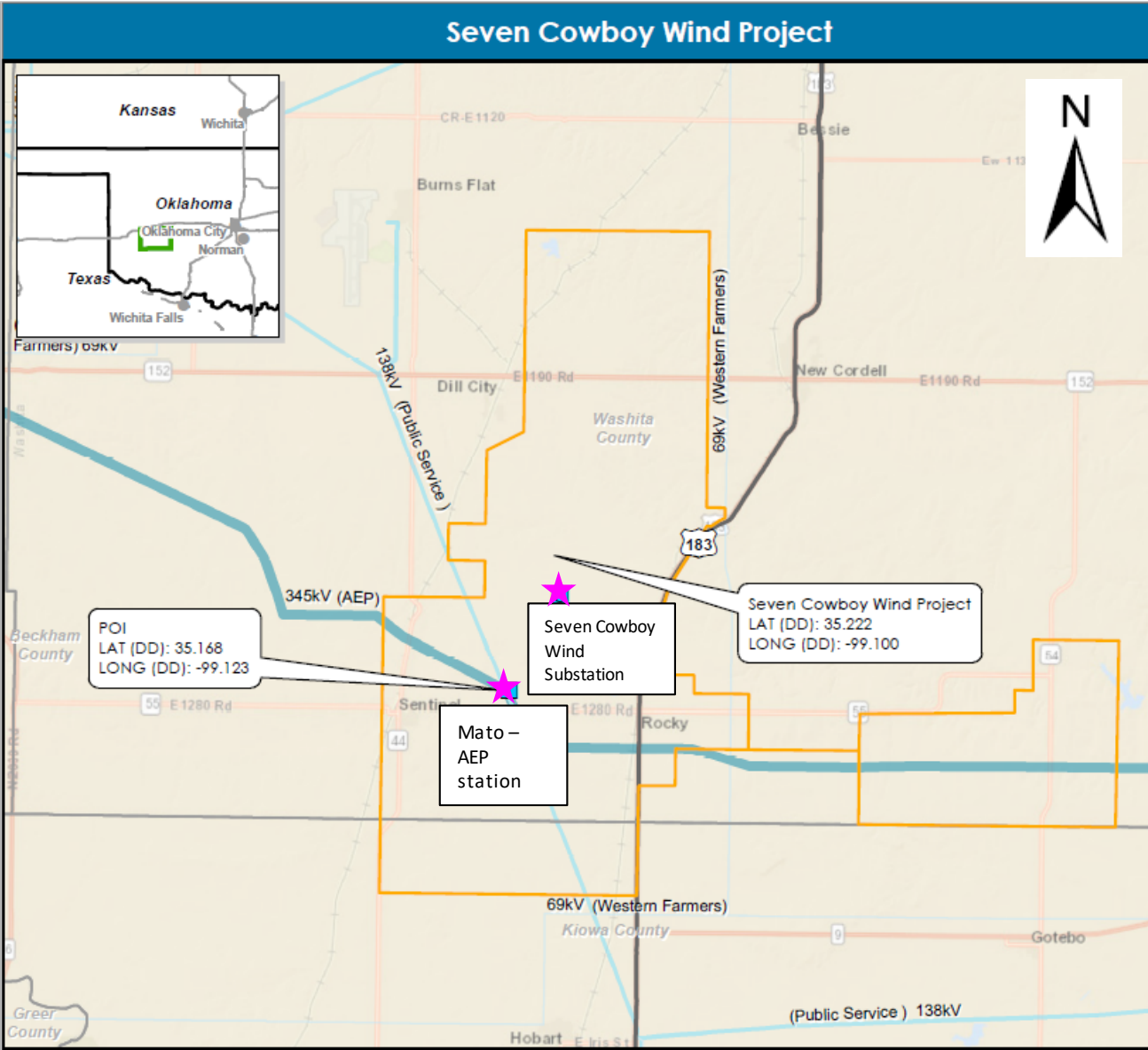


Figure 2: Point of Interconnection Map





FACILITY STUDY

for

Generation Interconnection Request 2016-037

300 MW Wind Generating Facility

In Caddo County

Oklahoma

August 17, 2020

Adam Snapp, P.E.

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-2016-037. 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 request is for adding a new 300 MW wind facility to a Point of Interconnection to be established by GEN-2016-037. No new or additional facilities on the OG&E system are necessary to accommodate the additional generation. The new generating facility will require updated relay settings and electrical modeling work at OG&E Gracemont substation estimated at \$15,000.

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Introduction

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting a wind generating facility within the service territory of OG&E Electric Services (OKGE) in Caddo County Oklahoma. The generator proposes to use establish a new substation on AEP's portion of the AEP Chisolm – OG&E Gracemont 345kV line. The cost for updating relay settings at OG&E Gracemont and electrical modeling work is estimated at \$15,000

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. There are no OG&E requirements for the Transmission Owner Interconnection Facilities at the substation to be developed for GEN-2016-037.

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 300 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-2016-037 interconnection.

Table 1: Required Interconnection Network Upgrade Facilities

Facility	ESTIMATED COST (2020 DOLLARS)
Lead time	4 months
OKGE – Interconnection Facilities - No new interconnection facilities necessary	\$0
OKGE – Network Upgrades Update relay settings and records.	\$15,000
OKGE – Land or ROW	No Additional ROW
Total	\$15,000

Southwest Power Pool, Inc.

Prepared by Adam Snapp, PE

August 17, 2020

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OG&E Electric Services

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September 11, 2020

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OKGE Gracemont Substation

