INTERCONNECTION FACILITIES STUDY REPORT

GEN-2017-149

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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 UID 156493 to Table 3.
06/28/2023	SPP	Cost revisions made for UIDs 156858 in Table 3.
07/26/2023	SPP	Final report issued.
08/06/2024	SPP	Upgrades revised to reflect latest study.

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) 5
Conclusion 6
Appendices 7
A: Transmission Owner's Interconnection Facilities Study Report and Network Upgrades Report(s) 8

SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request is for a 258 MW generating facility located in Johnston 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 December 01, 2026.

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 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 (129) General Electric 2.0 wind turbines for a total generating nameplate capacity of 258 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 174/232/290 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;

Approx. 68 mile 345 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 ("Johnson County 345kV 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 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
Johnson County 345kV GEN-2017-149 Interconnection (TOIF) (OGE)(143401): Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2017-149 (258 MW/Wind), into the Point of Interconnection (POI) at Johnson County 345kV	$795,827	100%	$795,827	36 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
Johnson County 345kV GEN-2017-149 Interconnection (Non-shard NU) (AEP) (143572): Potential interconnection impacts from the following generating facility, GEN-2017-149 (258 MW/Wind), into the Point of Interconnection (POI) at Johnson County 345kV	Ineligible	$250,000	100%	$250,000	36 Months
Total		**$250,000**		**$250,000**	

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
Johnson County 345kV Interconnection Expansion (DISIS-2017-002)(143400): Expand the Johnson County 345kV substation to accommodate the interconnection of GEN-2017-149 and GEN-2017-154	Ineligible	$11,024,448	50.29%	$5,544,459	36 Months
Build Tolk to Potter County 345 kV Circuit 1 (159070) (SPS): Build approximately 115 miles of 345 kV from Tolk - Potter County with minimum normal/emergency rating of 1195 MVA	Eligible	$240,503,975	36.99%	$88,959,329	36 Months
Total		**$251,528,423**		**$94,503,788**	

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
NA	**NA**	**NA**

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 ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
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)	$250,000
Shared Network Upgrade(s)	$94,503,788
Affected System Upgrade(s)	$0
Total	**$95,549,615**

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

GEN-2017-149

GEN-2017-154

Pittsburg 345 kV station

Beckham County, Texas

FACILITIES STUDY SUMMARY

American Electric Power (AEP) Southwest Transmission Planning performed the following study at the request of the Southwest Power Pool (SPP) for SPP Generation Interconnection requests GEN-2017-149 and GEN-2017-154. Per the SPP Generator Interconnection Procedures (GIP), SPP requested that AEP perform an Interconnection Facilities Studies (IFS) for Network Upgrade(s) in accordance with Section 8.11 for the following Interconnection and/or Network Upgrade(s):
AEP Pittsburg 345 kV
Update line relay settings for remote end (OGE Johnston County) generator interconnection

PROJECT DESCRIPTION

Per the GEN-2017-149 and GEN-2017-154 study requests, AEP proposes to update line relay settings at the AEP Pittsburg station in Beckham County, Oklahoma (Figure 1).

AEP'S SCOPE OF WORK TO FACILITATE INTERCONNECTION

To accommodate the generation request at the Pittsburg 345 kV station, AEP will update the line relay settings for remote end (OGE Johnston County) generator interconnection
It is understood that the Interconnection Customers are responsible for the cost of all of this work.

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-2017-002, GEN-2017-149 and GEN-2017-154 interconnections.

STABILITY EVALUATION

Based on the results of the 2017-002 DISIS short circuit and stability report, AEP is not aware of any instances where the system does not meet TPL-001 stability performance requirements for the planning events and generation dispatch conditions that were considered in this DISIS study.

INTERCONNECTION COST OF FACILITIES INCLUDED IN THE FACILITIES STUDY:

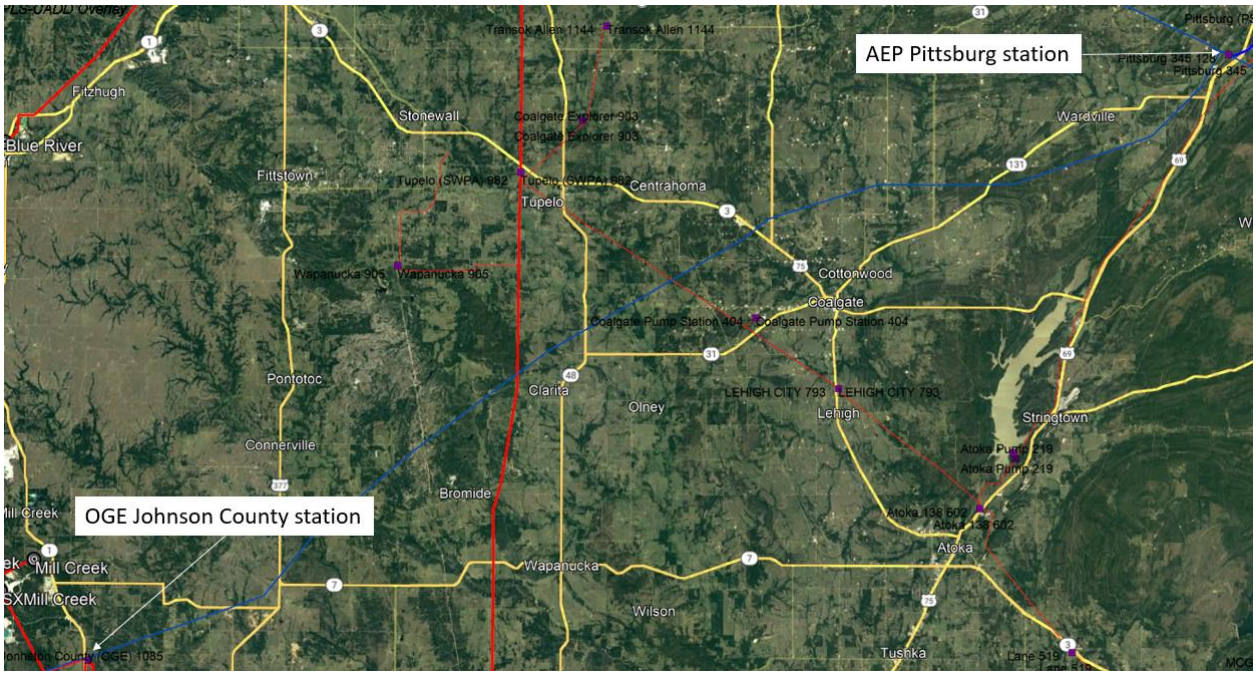
Update Line Relay Settings at AEP Pittsburg station	$250,000
Total Cost	$250,000

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

PROJECT LEAD TIME

Project in-service date is projected to be 12 months after the issuance of Authorization to Proceed from the Interconnection Customer.

Figure 1: Geographic Map



Facilities Study For
Southwest Power Pool (SPP)

DISIS-2017-002
Network Upgrades
Potter Co. to Tolk Station 345 kV Line

Xcel Energy Services, Inc.
Transmission Planning South

August 5, 2024

Executive Summary

Southwestern Public Service Co. ('SPS' or "Transmission Owner") was retained by SPP ("Transmission Provider") to perform a facilities study for the upgrades necessary to install a new 345 kV transmission line from SPS' Potter County Substation to SPS' Tolk Substation for the Definitive Interconnection System Impact Study (DISIS-2017-002).

The straight-line distance between these substations is approximately 115 miles. The estimates in this facility study assumes a total estimated line length of 135 miles. Estimated substation costs, communication costs, transmission line costs and right-of-way/easement costs are included in the estimates for this facility study. [UID 159070]

It is anticipated that the entire process of engineering, procuring, and constructing this project will require approximately 36-48 months to complete after an authorization to proceed is received by all regulatory bodies.

Table 7, - Cost Summary[a]

Description	Cost
Potter Co. Substation 345 kV Expansion	Error! Reference source not found. **7,900,042**
Tolk Station Substation 345 kV Expansion	Error! Reference source not found. **7,180,673**
345 kV Transmission Line	**$ 205,543,489**
Communication	**$ 1,580,835**
ROW/Easements/Land Purchase	**$ 18,258,937**
Total:	**$ 240,503,975**

[a] The cost estimates are 2024 dollars with an accuracy level of ±20%.

General Description of SPS[b] Facility Upgrades

1. **Potter County Substation Expansion**:

    - Expand 345kV portion of the substation to the west.
    - Add one additional "rung" to the breaker and one-half arrangement.
    - A 30 MVAR Switchable Shunt Line Reactor was estimated. *

2. **Tolk Substation Expansion**:

    - Expand 345kV portion of the substation to the west.
    - Add one additional "rung" to the double-bus/double-breaker arrangement.
    - A 30 MVAR Switchable Shunt Line Reactor was estimated. *

3. **345kV Transmission Line:**

    - Straight-line mileage from substation to substation is approximately 115 miles; This estimate assumes a total length of approximately 135 miles.
    - Weathered steel transmission structures were estimated throughout.
    - Phase conductors (2 per phase) of 795 ACSS "Drake" along with 48 count OPGW and 3/8" EHS steel shield conductors were estimated.

4. **Communications:**

    - Install AR-15 communications equipment at Potter County, Tierra Blanca and Tolk substations.
    - Tierra Blanca substation is used as a repeater station for OPGW communications.
    - Upgrade communication equipment at Potter County and Tolk substations.

5. **Siting and Land Rights:**

    - Purchase additional property at Potter County for substation expansion.
    - Secure ROW, easements and CCN costs for 345kV transmission line.

*** NOTE:** In addition, an engineering EMT[c] study will need to be completed. Costs for any mitigation steps taken due to EMT study results will need to be added to this facility study's estimate. The 30 MVAR line reactors were estimated as a "placeholder" in this facility study. The EMT study results will determine the actual size of the line reactors needed for this project, and the estimates will be adjusted accordingly.

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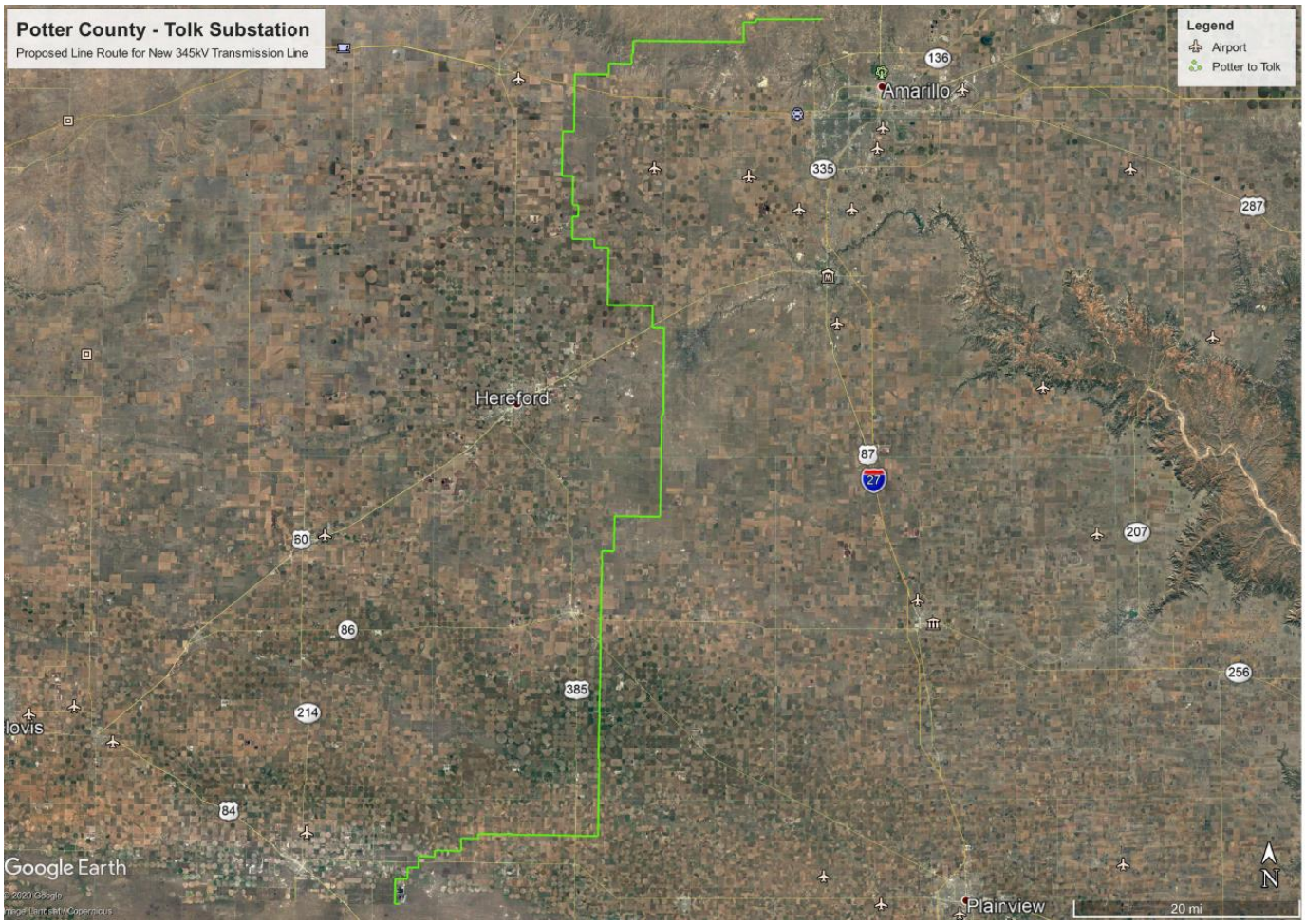
[b] All modifications to SPS facilities will be owned, maintained, and operated by SPS.

[c] Electro-Magnetic Transient

6. Engineering and Construction:

An engineering and construction schedule for this project is estimated at approximately 36-48 months. Other factors associated with transmission work clearances, Texas Public Utility requirements, equipment delays, and work schedules could cause additional delays. This work is applicable after all required agreements are signed and internal approvals are granted.



Approximate Transmission Line Route

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