INTERCONNECTION FACILITIES STUDY REPORT

GEN-2017-168

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.

CONTENT

SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request is for a 250 MW generating facility located in McClain 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 (278) General Electric 0.9MW/1.0 MVA inverters 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 138 kV transformation substation with associated 34.5 kV and 138 kV switchgear;
- One 138/34.5 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;
- Approx. 35 miles 138 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 ("McClain 138kV") 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
McClain 138kV GEN-2017-168 Interconnection (TOIF) (OGE) (143431): Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2017-168 (250 MW/Solar), into the Point of Interconnection (POI) at McClain 138kV	$311,542	100%	$311,542	30 Months
Total	**$311,542**		**$311,542**	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
NA	**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
McClain 138kV New Interconnection Substation on the McClain to Southwest 134 Tap 138 kV Line (DISIS-2017-002)(143406): Expand the McClain 138kV substation to accommodate the interconnection of GEN-2017-152, GEN-2017-153, GEN-2017-168, and GEN-2017-169	Ineligible	$12,411,523	45.13%	$5,600,867.78	30 Months
New 138 kV line from G17-152 Tap to Pleasant Valley(156855): Build a new 6.78 mile 138 kV line from G17-152 Tap to Pleasant Valley	Eligible	$12,635,344	44.43%	$5,613,520.12	42 Month
Renfrow 345 kV Terminal Equipment Upgrade (DISIS-2017-002)(OGE)(156445): Upgrade terminal equipment at point of change (OK/KS State Line) to accept Viola 345 kV line rebuild to achieve minimum summer/emergency rating of 1195 MVA.	Eligible	$250,000	4.87%	$12,172.81	36 Months
SW134 Tap to Westmoore 138 kV Rebuild (DISIS-2017-002)(156490): Rebuild the existing SW134 Tap to Westmoore 138 kV 0.77 mile line to achieve a min winter emergency rating of 375 MVA and a min summer emergency rating of 415 MVA	Eligible	$962,500	45.80%	$440,834.49	30 Months
Viola to Renfrow 345 kV Rebuild (WERE) (DISIS-2017-002) (156471): Rebuild the existing Viola to Renfrow 345 kV line from Viola to the OK/KS State Line (23 miles) to achieve a minimum	Eligible	$47,418,633	4.87%	$2,308,871.46	36 Months

summer/emergency rating of 1195 MVA					
Total		**$73,678,000**		**$13,976,266.66**	

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)	$311,542
Non-Shared Network Upgrade(s)	$0
Shared Network Upgrade(s)	$13,976,266.66
Affected System Upgrade(s)	$0
Total	**$14,287,808.66**

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).

INTERCONNECTION FACILITIES STUDY REPORT

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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.

FACILITY STUDY

for

Generation Interconnection Request 2017-168

250 MW Solar Generating Facility
In McClain County
Oklahoma

March 3, 2023

Chris Rich, P.E.
Transmission Planning Engineer
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-2017-168. 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 building a new substation, three new 138kV breakers and a terminal for the Gen-tie to be shared with Gen-2017-152, Gen-2017-168, and Gen-2017-169. Since these three 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 three 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. In addition, an engineering EMTP study will need to be completed. Costs for any mitigation steps taken due to EMTP study results will need to be added to the facility study's estimate. The total cost for OKGE to build the new substation with three new 138kV breakers, and three line terminals in the new Substation, the interconnection facility, is estimated at $13,346,149.

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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 McClain County Oklahoma. The proposed 138kV point of interconnection is at McClain Substation in McClain County. This substation will be owned by OKGE. The cost for adding a new 138kV terminal to a new substation, the required interconnection facility, is estimated at $934,626.

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 a new 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 cost for OKGE to add a new 138kV terminal in a new substation, the interconnection facility, is estimated at $13,346,149. 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.

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 250 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-2017-168 interconnection.

Table 1: Required Interconnection Network Upgrade Facilities

Facility	ESTIMATED COST (2023 DOLLARS)	Total Cost Responsible
Lead Time	30 months	
OKGE – **Interconnection Facilities**- Add a single 138kV line terminal to a new Substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs	$934,626	1/3
OKGE – **Network Upgrades** at a new sub, Install 3-138kV 3000A breaker, line relaying, disconnect switches, and associated equipment.	$12,411,523	1/3
OKGE - Right-of-Way for 138kV terminal addition	No Additional ROW	
Total cost for Gen-2017-168	**$4,448,716**	

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March 3, 2023

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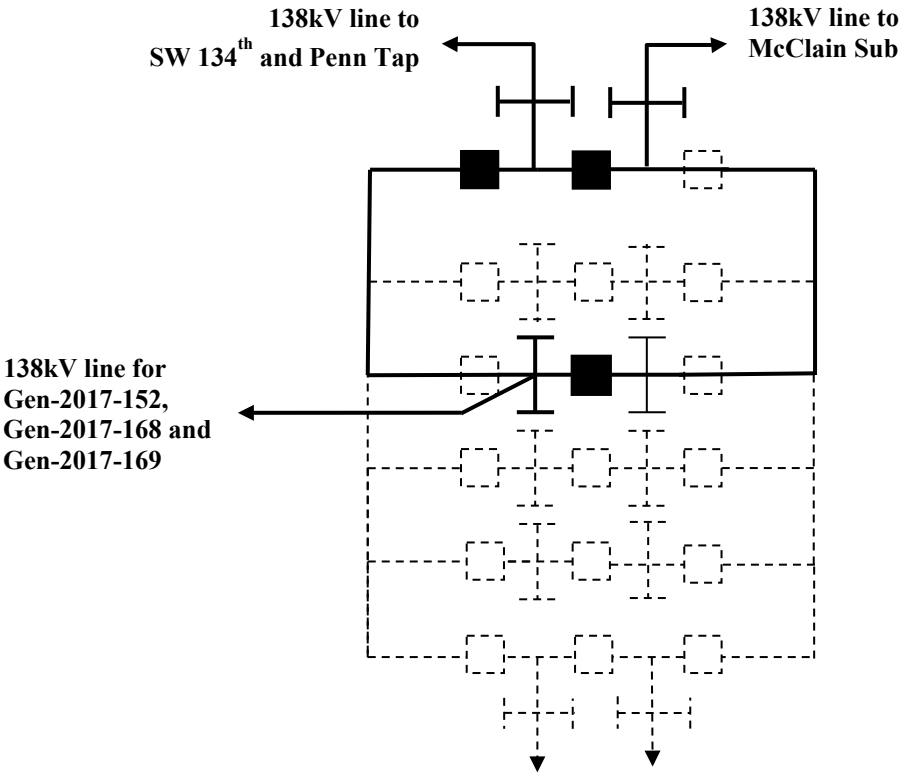
March 11, 2020

New Substation in McClain County



FACILITY STUDY

for

IFS-2017-002-156490 Network Upgrades
For
DISIS-2017-002

SW 134th & Penn Tap to Westmoore Line
In Cleveland County
Oklahoma

March 21, 2023

Chris Rich, P.E.
Transmission Planning Engineer
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 for Network Upgrades to satisfy the Facility Study Agreement executed by the requesting customer for SPP IFS-2017-002 for Network Upgrades. 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 the Network Upgrade is to reconductor the SW 134th & Penn Tap to Westmoore 138kV line. The total cost for OKGE to complete these upgrades is $962,500.

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Introduction

The Southwest Power Pool has requested a Facility Study for Network Upgrades within the service territory of OG&E Electric Services (OKGE) in Cleveland County, Oklahoma. The proposed Network Upgrade Facilities are to reconductor the SW 134th & Penn Tap to Westmoore 138kV line to facilitate a minimum of 415 MVA.

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.

Network Upgrade Facilities

The primary objective of this study is to identify network upgrades. The requirements for this Network Upgrade consist of installing a new 138kV line to replace the existing SW 134th & Penn Tap to Westmoore line on the OG&E transmission system to accommodate generator interconnection requests identified in SPP-GI DISIS-2017-002. These 138kV network upgrades shall be constructed and maintained by OKGE.

The total cost for the reconductor to facilitate 415 MVA on the 138kV SW 134th & Penn Tap to Westmoore is estimated at $962,500.

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 Network Upgrade, no breakers were found to exceed their interrupting capability after the upgrades to the line 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 this DISIS-2017-002 Network Upgrade.

Table 1: Required Interconnection Network Upgrade Facilities

Facility	ESTIMATED COST (2023 DOLLARS)
Lead time	30 months
OKGE – **Network Upgrades** Install .77 miles of 138kV Transmission Line and associated relay and control equipment.	$962,500
Total	**$962,500**

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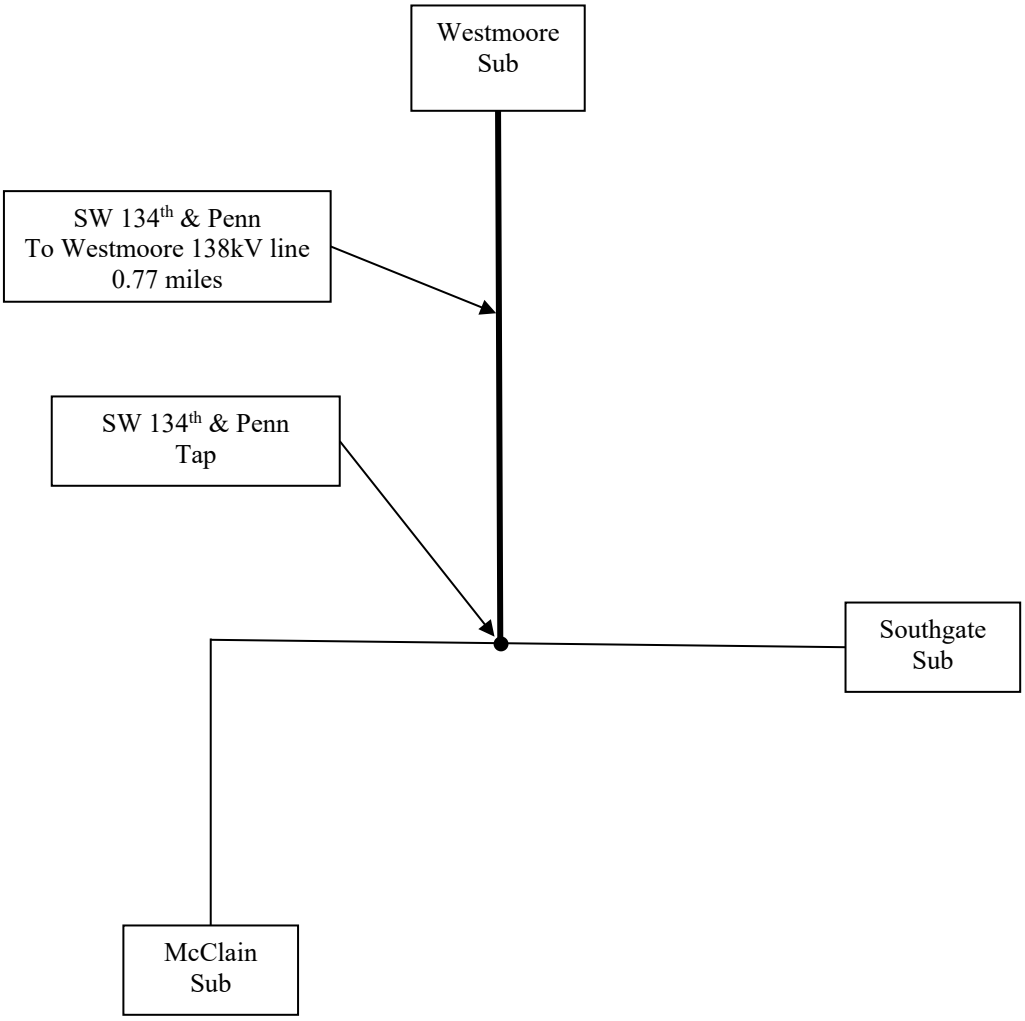
March 27, 2023

SW 134th & Penn Tap



FACILITY STUDY

for

IFS-2017-002-156855 Network Upgrades
For
DISIS-2017-002

Pleasant Valley to Gen-2017-152 POI New Line
In McClain and Cleveland Counties
Oklahoma

March 21, 2023

Chris Rich, P.E.
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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 for Network Upgrades to satisfy the Facility Study Agreement executed by the requesting customer for SPP IFS-2017-002 for Network Upgrades. 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 the Network Upgrade is to add a new 138kV Transmission line from sub established in Gen 2017-152 to Pleasant Valley, approximately 6.78 miles, and to add an additional terminal in each sub. The total cost for OKGE to complete these upgrades is $12,635,344.

Table of Contents

Introduction

The Southwest Power Pool has requested a Facility Study for Network Upgrades within the service territory of OG&E Electric Services (OKGE) in McClain and Cleveland Counties, Oklahoma. The proposed Network Upgrade Facilities are to add a new 138kV Transmission line from sub established in Gen 2017-152 to Pleasant Valley which is approximately 6.78 miles in length.

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.

Network Upgrade Facilities

The primary objective of this study is to identify network upgrades. The requirements for this Network Upgrade consist of installing a new 138kV Transmission line from sub established in Gen 2017-152 to Pleasant Valley, approximately 6.78 miles, and a new terminal at each sub on the OG&E transmission system to accommodate generator interconnection requests identified in SPP-GI DISIS-2017-002. These 138kV network upgrades shall be constructed and maintained by OKGE.

The total cost for adding a new 138kV Transmission line from sub established in Gen 2017-152 to Pleasant Valley and adding a new terminal at each sub is estimated at $12,635,344.

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 Network Upgrade, no breakers were found to exceed their interrupting capability after installing a new line 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 this DISIS-2017-002 Network Upgrade.

Table 1: Required Interconnection Network Upgrade Facilities

Facility	ESTIMATED COST (2023 DOLLARS)
Lead time	**42 months**
OKGE – **Network Upgrades** Install 6.78 miles of 138kV Transmission Line, line terminals, two PCBs and associated relay and control equipment.	$12,635,344.
Total	**$12,635,344.**

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Pleasant Valley Sub to Sub established by Gen-2017-152