INTERCONNECTION FACILITIES STUDY REPORT

GEN-2017-117

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.
06/27/2024	SPP	Upgrades revised per latest study.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request is for a 19.8 MW generating facility located in Canadian 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 31, 2021.

The interconnecting Transmission Owner, Western Farmers Electric Co-Op (WFEC), 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 (8) SMA Sunny Central storage 2470KW/2600KVA for a total generating nameplate capacity of 19.8 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 49/65/82 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;

Unspecified lead distance 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 ("El Reno") 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
El Reno SW 138kV GEN-2017-117 Interconnection (TOIF) (WFEC) (143359): Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2017-117 (19.8 MW/Battery), into the Point of Interconnection (POI) at El Reno SW 138kV	$500,000	100%	$500,000	36 Months
Total	**$500,000**		**$500,000**	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
EL Reno SW 138kV GEN-2017-117 Interconnection (Non-Shared NU) (OGE) (143580): Potential interconnection impacts from the following generating facility, GEN-2017-117 (19.8 MW/Battery), into the Point of Interconnection (POI) at El Reno SW 138kV	Ineligible	$15,000	100%	$15,000	4 Months

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
EL Reno SW 138kV GEN-2017-117 Interconnection (Non-Shared NU) (WFEC) (143358): Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2017-117 (19.8 MW/Battery), into the Point of Interconnection (POI) at El Reno SW 138kV	Ineligible	$500,000	100%	$500,000	36 Months
Total		**$515,000**		**$515,000**	

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
N/A	N/A	N/A	N/A	N/A	N/A
Total		**N/A**		**N/A**	

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
Multi - Park Community - Sunshine 138 kV (UID: 72013-72016, 72018 - 72027, 72029 – 72031); Convert 17.2 mile 69 kV line from Okeene - Watonga SW to 138 kV. Complete necessary terminal upgrades at Okeene. **Convert 16.8 mile 69 kV line from Calumet - Watonga SW to 138 kV.** **Convert 9.0 mile 69 kV line from Calumet - Concho to 138 kV. Complete necessary terminal upgrades at Concho.** **Convert 9.1 mile 69 kV line from Calumet - Cana to 138 kV. Complete necessary terminal upgrades at Cana.** **New Calumet 138 kV substation with 4-terminal ring bus.** **Convert 3.3 mile 69 kV line from Cana - El Reno Jct to 138 kV. Complete necessary terminal upgrades at El Reno Jct.** **Convert 6.5 mile 69 kV line from El Reno - El Reno Jct to 138 kV. Complete necessary terminal upgrades at El Reno.** **Convert 21.3 mile 69 kV line from El Reno - Mustang to 138 kV. Complete necessary terminal upgrades at Mustang.** **Convert 2.1 mile 69 kV line from Mustang - Sara Road to 138 kV. Complete necessary terminal upgrades at Sara Road.** **Convert 10.0 mile 69 kV line from Sara Road - Sunshine to 138 kV.** **Convert 10.6 mile 69 kV line from Cogar - El Reno Jct to 138 kV.** **Construct new 9.0 mile 138 kV line from Kingfisher SW - Park Community.**	**$0**	**7/31/2026**

Tap the East Kingfisher - Reeding 138 kV line and construct new Kingfisher SW 138 kV substation with 4-terminal ring bus. **Construct new 8.5 mile 138 kV line from Concho - Kingfisher SW.(NTC - 210483, 210669)"**		

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)	$500,000
Non-Shared Network Upgrade(s)	$515,000
Shared Network Upgrade(s)	$0
Affected System Upgrade(s)	$0
Total	**$1,015,000**

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 2017-117

19.8 MW Battery Generating Facility
Canadian County
Oklahoma

February 14, 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-2017-117. 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 19.8 MW Battery facility to a Point of Interconnection to be established by GEN-2017-117. 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 setting and electrical modeling work at OG&E Jensen Rd substation estimated at $15,000. OG&E will need to be notified 4 months prior to energization to accommodate the update to relay settings and electrical modeling.

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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 Canadian County Oklahoma. The generator proposes to interconnect to WFEC's EL Reno substation. The cost for updating relay settings at OG&E Jensen Rd, the 138kV substation owned by OG&E and tied to WFEC El Reno, and electrical modeling work is estimated at $15,000. OG&E will need to be notified 4 months prior to energization to accommodate the update to relay settings and electrical modeling.

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 Facility at the substation to be developed for GEN-2017-117.

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 19.8 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-2017-117 interconnection.

Table 1: Required Interconnection Network Upgrade Facilities

Facility	ESTIMATED COST (2023 DOLLARS)
Lead Time	4 months
OKGE – **Interconnection Facilities**- No new interconnection facilities necessary	**$0**
OKGE – **Network Upgrades** Update relay settings and records at Jensen Rd substation	**$15,000**
OKGE – Land or ROW	No Additional ROW
Total	**$15,000**

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February 14, 2023

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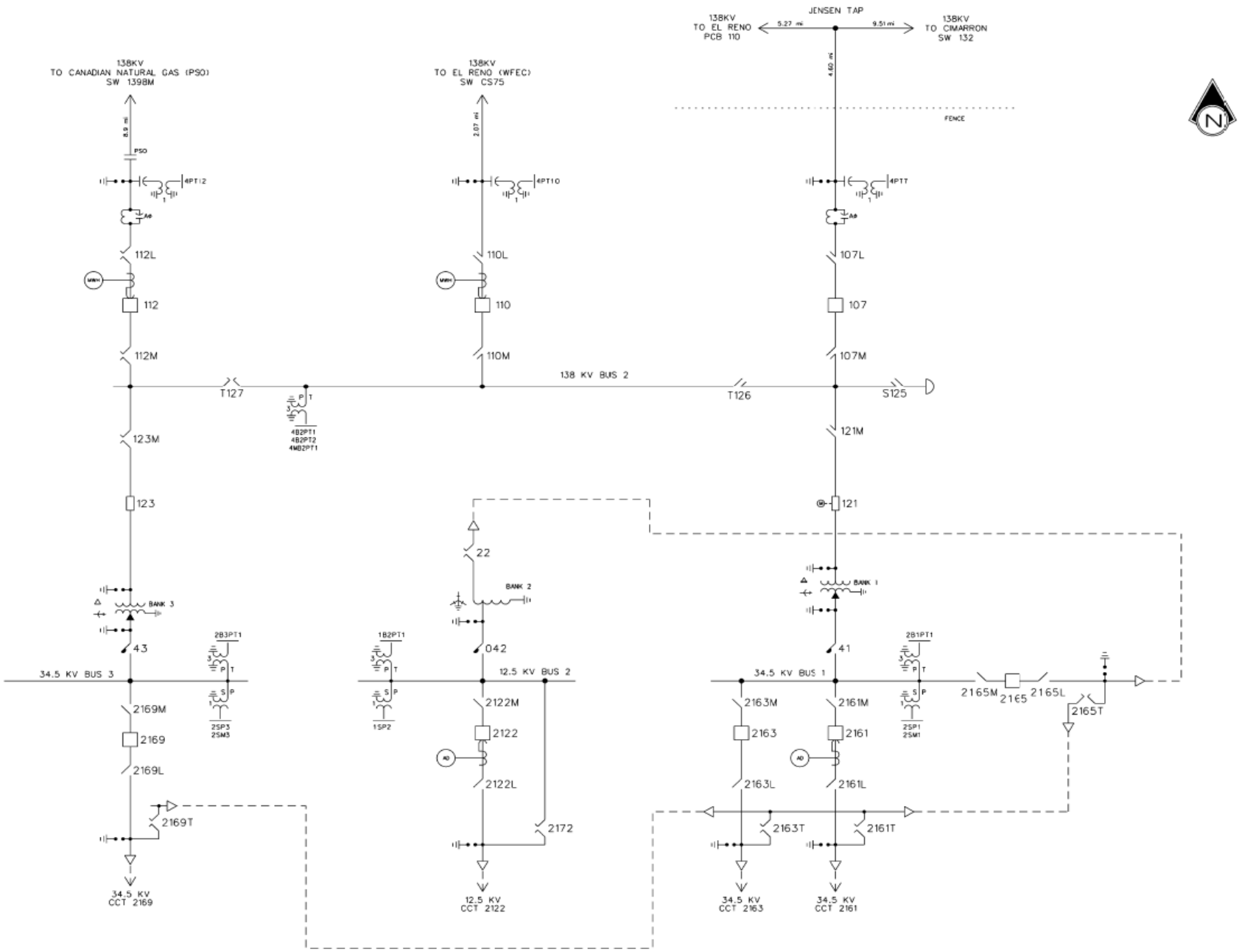
February 28, 2023

JENSEN RD(OGE) SUBSTATION



wfec
western farmers
electric cooperative
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INTERCONNECTION FACILITY STUDY

for

Generation Interconnection Request 2017-117

19.8MW Battery/Storage Generation Interconnection in Canadian County, OK.

March 2022

SUMMARY

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Western Farmers Electric Cooperative (WFEC) performed the following facility Study to satisfy the Facility Study agreement executed by the requesting customer for SPP Generation Interconnection request GEN-2017-117. The request for interconnection was placed with SPP in accordance with SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system. The requirements for interconnection consist of equipping a 138kV terminal including one breaker and associated relaying at WFEC El Reno Switch Station. The total cost for WFEC to accommodate the interconnection request at El Reno Switch Station 138kV is $1,000,000.

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Introduction

The Southwest Power Pool has requested a facility Study for the purpose of interconnecting 19.8MW of Battery Energy Storage within the service territory of WFEC in Canadian County, Oklahoma. The proposed 138kV interconnection is at the El Reno Switch Station, this station is owned by WFEC.

The cost for adding a 138kV terminal including a breaker and relaying at El Reno Switch Station is estimated at $1,000,000.

Network constraints within WFEC, OG&E, and AEP may be verified with a transmission service request and associated studies.

Interconnection Facilities

The primary objective of this study is to identify WFEC interconnection facilities. Figure 1 below shows the proposed interconnection of GEN-2017-117.

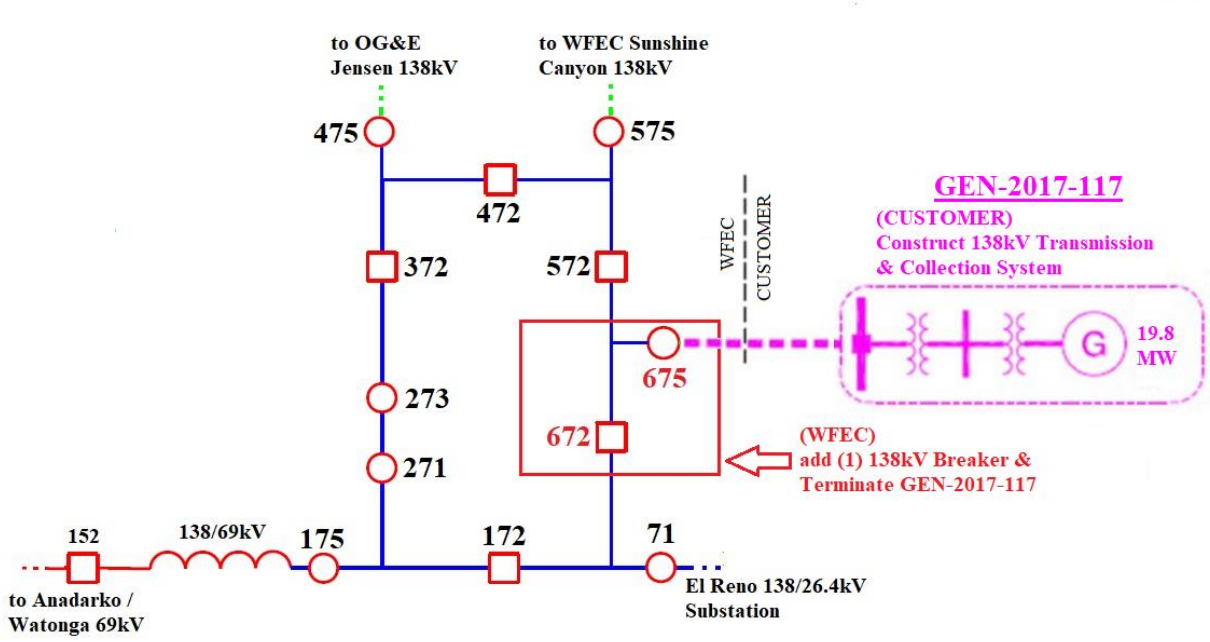

Figure 1: One-line Diagram Facilities for GEN-2017-117

To accommodate an interconnection for GEN 2017-117 WFEC will add a 138kV breaker and associated terminal equipment at the El Reno 138kV Switch station. The customer will construct a new 138kV transmission line from their collector sub to the point of demarcation. WFEC will require the customer to install OPGW for communications from Customer's collector sub to WFEC's switch station.

The total cost for the interconnection facilities at El Reno Switch Station 138kV is estimated at $1,000,000. This cost does not include the construction of the 138kV line from the customer substation to the point of demarcation at the edge of WFEC's property. The customer is responsible for this 138kV line up to the point of interconnection.

This facility study does not guarantee the availability of transmission service necessary to deliver additional generation to any specific point inside or outside of the SPP transmission system. The transmission network facilities may not be adequate to deliver any additional generation output to the 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.

Short Circuit Fault Duty Evaluation:

It is standard practice for WFEC to recommend replacing a circuit breaker when the current through the breaker for a potential fault exceeds 100% of its interrupting rating, as determined by the ANSI/IEEE standard C37-010-2016 breaker rating methods. Existing levels of maximum fault current the switchgear at WFEC El Reno Switch Station may have to interrupt is shown below in Table 1. As an inverter based interconnection the maximum fault current contribution is estimated at 1.4 times peak load current of the Inverter during the subtransient period. This equates to an increase in available fault current of approximately 120A at El Reno Switch Station, so no breakers are expected to exceed capacity with the proposed interconnection.

WFEC has evaluated the potential maximum fault current in this area and no issues with short circuit duty ratings are expected on existing WFEC breakers with the proposed interconnection of 19.8MW of Battery Energy Storage at El Reno Switch Station 138kV.

Table 1: El Reno Switch Station 138kV Breaker Capacity

BUS	BREAKER	DUTY %	DUTY (A)	BKR CAPACITY (A)
El Reno 138.kV	172	34.9%	13950	40000
	372			
	472			
	572			

Interconnection Cost

Table 2: Transmission Owner Interconnection Facilities

Transmission Owner Interconnection Facilities (TOIF)	Cost Estimate ($)	Estimated Lead Time
WFEC El Reno Switch Station Interconnection: Construct one 138kV line terminal, line switches, dead end structure, line relaying, communications, revenue metering, line arrestor, and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer's Generating Facility.	Engineering: $50,000 ROW: $0 Material: $225,000 Construction: $225,000 **TOTAL: $500,000**	**36 Months**

Table 3: Non-Shared Network Upgrades

Non-Shared Network Upgrades Description	Cost Estimate ($)	Estimated Lead Time
WFEC El Reno Switch Station Interconnection: Install one (1) 138kV 2000A continuous ampacity breaker, control panels, line relaying, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials.	Engineering: $50,000 ROW: $0 Material: $225,000 Construction: $225,000 **TOTAL: $500,000**	**36 Months**