



**INTERCONNECTION  
FACILITIES STUDY  
REPORT**

GEN-2017-023

Published March 2022

By SPP Generator Interconnections Dept.

## REVISION HISTORY

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DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
03/08/2022	SPP	Initial draft report issued.
03/29/2022	SPP	Final report issued.

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## SUMMARY

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### INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2017-023 is for a 85 MW generating facility located in Choctaw County, OK. The Interconnection Request was studied in the DISIS-2017-001 Impact Study and the DISIS-2017-001-1 Impact Restudy for Network Resource Interconnection Service (NRIS). The Interconnection Customer's requested in-service date is December 1st, 2019.

The interconnecting Transmission Owner, Western Farmers Electric Cooperative (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 thirty-four (34) TMEIC Solar Ware Samurai (PHV-L2700GR) Solar Inverters for a total generating nameplate capacity of 85 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 60/80/100 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An approximately 1 mile overhead mile overhead 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 ("Hugo 138 kV 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)*

<b>Transmission Owner Interconnection Facilities (TOIF)</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Allocated Cost Estimate (\$)</b>	<b>Estimated Lead Time</b>
<b><u>Hugo 138kV Substation GEN-2017-023 Interconnection (TOIF) (WFEC) (132966):</u></b> Construct one (1) 138kV terminal connection with breaker, line switches, dead-end structure, line relaying, communications, revenue metering, line arrester, transmission line to edge of property and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer's Generating Facility.	\$2,000,000	100%	\$2,000,000	36 Months
<b>Total</b>	<b>\$2,000,000</b>		<b>\$2,000,000</b>	

*Table 2: Non-Shared Network Upgrade(s)*

<b>Non-Shared Network Upgrades Description</b>	<b>ILTCR</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Allocated Cost Estimate (\$)</b>	<b>Estimated Lead Time</b>
<b>None</b>	N/A	\$0	N/A	\$0	N/A
<b>Total</b>		<b>\$0</b>		<b>\$0</b>	

**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)*

<b>Shared Network Upgrades Description</b>	<b>ILTCR</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Allocated Cost Estimate (\$)</b>	<b>Estimated Lead Time</b>
<b>None</b>	N/A	\$0	N/A	\$0	N/A
<b>Total</b>		<b>\$0</b>		<b>\$0</b>	

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)*

<b>Contingent Network Upgrade(s) Description</b>	<b>Current Cost Assignment</b>	<b>Estimated In-Service Date</b>
<b>None</b>	\$0	N/A

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)*

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

**CONCLUSION**

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 85 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 Facilitie Upgrade(s)	\$2,000,000
Non-Shared Network Upgrade(s)	\$0
Shared Network Upgrade(s)	\$0
Affected System Upgrade(s)	\$0
<b>Total</b>	<b>\$2,000,000</b>

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

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**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).

*wfec*  
western farmers  
electric cooperative

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## **INTERCONNECTION FACILITY STUDY**

**for**

## **Generation Interconnection Request 2017-023**

**85MW Solar Generation in Choctaw County near Sawyer, OK.**

**February 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-2017-023. 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 at WFEC Hugo Switch Station with a 138kV line to the edge of the Hugo Plant Property. The total cost for WFEC to accommodate the interconnection request at Hugo 138kV is \$2,000,000.

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## Introduction

The Southwest Power Pool has requested a facility Study for the purpose of interconnecting 85MW of solar generation within the service territory of WFEC in Choctaw County, Oklahoma. The proposed 138kV interconnection is at the Hugo Switch Station, this station is owned by WFEC.

The cost for adding a 138kV terminal and transmission line to the edge of the Hugo Power Plant property is estimated at \$2,000,000.

SPP's DISIS-2017-001 identified network upgrades required on the transmission system associated with GEN-2017-023. Cost for those upgrades are not included in this Facility Study as only stand-alone interconnection cost are considered, and the allocated cost of network upgrades to the customer may fluctuate depending on withdrawal of higher queued projects.

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 interconnection facilities. Figure 1 below shows the current running arrangement of Hugo Switch 138kV.

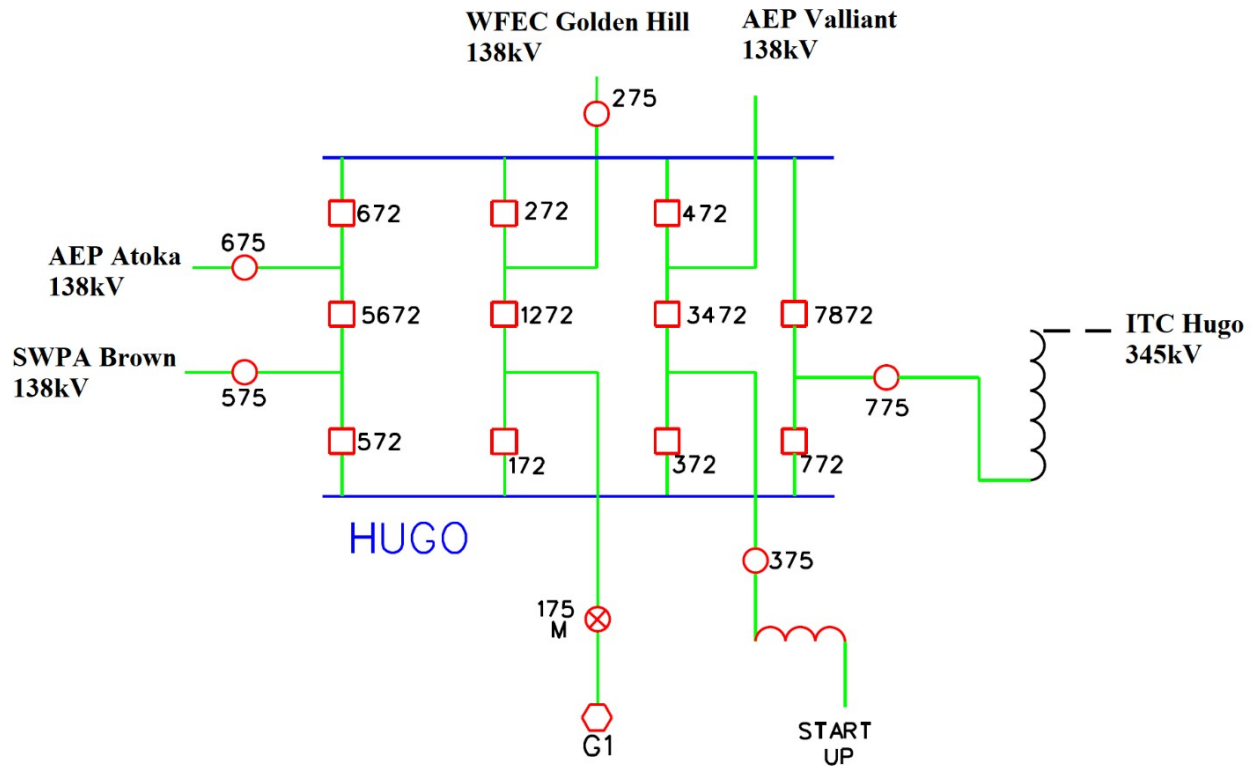


Figure 1: Existing WFEC Hugo Switch Station

To accommodate an interconnection for GEN 2017-023 WFEC will add a 138kV breaker and associated terminal equipment at the Hugo Switch station. It will also be required to build approximately 0.4 miles of transmission from the terminal at Hugo Switch Station to the edge of the Hugo Power Plant property, approximated in Figure 2 below. The customer will construct a new 138kV transmission line from their solar farm collector sub to the point of demarcation at the Hugo Power Plant. WFEC will require the customer to install OPGW for communications from Customer's solar farm collector sub to WFEC's switch station.



Figure 2: Hugo Switch Station Satellite Image

The total cost for the interconnection facilities at Hugo 138kV is estimated at \$2,000,000. This cost does not include the construction of the 138kV line from the customer substation to the point of demarcation at the edge of the Hugo Plant property. 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 this cost estimate should be determined by the Customer.

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 Hugo may have to interrupt is shown below in Table 1. As an inverter based generator the increase in fault current is expected to be approximately 1.2 times peak load current of the PV array during the subtransient period. This equates to an increase in available fault current of approximately 450A at Hugo Switch Station, so no breakers are expected to exceed capacity with the 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 85MW of Solar at Hugo Switch 138kV.

Table 1: Hugo 138kV Breaker Capacity

<b>BUS</b>	<b>BREAKER</b>	<b>DUTY %</b>	<b>DUTY (A)</b>	<b>BKR CAPACITY (A)</b>
HUGO PP4 138.kV	1272	54.8	34527.6	63000
HUGO PP4 138.kV	172	56.7	35717.7	63000
HUGO PP4 138.kV	272	89.3	35717.7	40000
HUGO PP4 138.kV	3472	56.7	35717.7	63000
HUGO PP4 138.kV	372	56.7	35717.7	63000
HUGO PP4 138.kV	472	89.3	35717.7	40000
HUGO PP4 138.kV	5672	54.8	34493.8	63000
HUGO PP4 138.kV	572	56.7	35717.7	63000
HUGO PP4 138.kV	772	89.3	35717.7	40000
HUGO PP4 138.kV	7872	89.3	35717.7	40000

## Interconnection Cost

Table 2: Required Interconnection Facilities

Facilities	Estimated Cost	Lead Time
<p><b>Transmission Owner Interconnection Facilities (TOIF)</b>                      WFEC Hugo Switch Interconnection Substation: Construct one (1) 138kV terminal connection with breaker, line switches, dead end structure, line relaying, communications, revenue metering, line arrestor, transmission line to edge of property and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer's Generating Facility.</p>	\$2,000,000	36 Months
<p><b>Non-Shared Network Upgrades</b>                      N/A</p>	\$0	N/A

# One-Line diagram of Interconnection

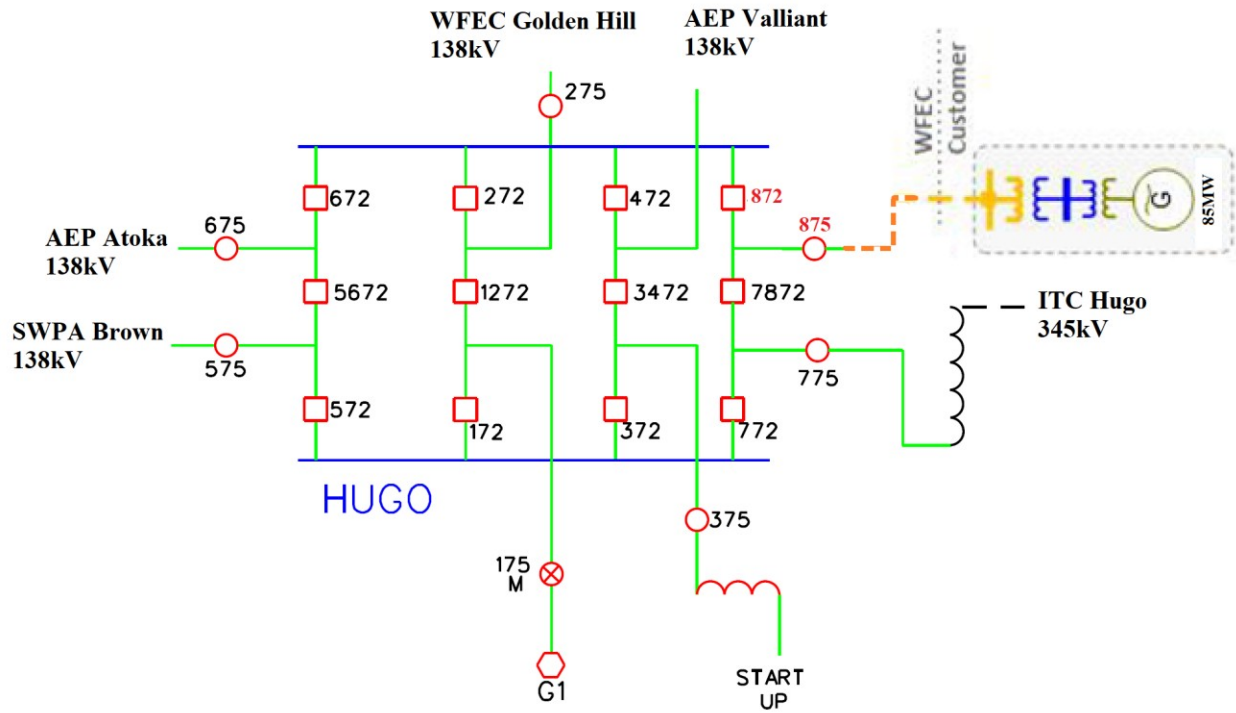


Figure 3: Proposed WFEV Hugo Switch Station 138kV Interconnection