



**INTERCONNECTION
FACILITIES STUDY
REPORT**

GEN-2017-097

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
02/10/2022	SPP	Initial draft report issued.
2/14/2022	SPP	Final report issued.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2017-097 is for a 128 MW generating facility located in Pennington County, SD. The Interconnection Request was studied in the DISIS-2017-001 Impact Study and DISIS-2017-001-1 Impact Restudy for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's requested in-service date is December 1st, 2022.

The interconnecting Transmission Owner, Western Area Power Administration (WAPA), 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 forty-one (41) Power Electronics Inverters for a total generating nameplate capacity of 128 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 115 kV transformation substation with associated 34.5 kV and 115 kV switchgear;
- One 115/34.5 kV 75/100/125 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An approximately .75 mile overhead mile overhead kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 115 kV bus at existing Transmission Owner substation ("Underwood 115kV 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
<u>Underwood 115kV Substation GEN-2017-097 Interconnection (TOIF) (WAPA) (133076)</u> : Construct one (1) new WAPA-UGP-owned bay consisting of one (1) 115kV power circuit breakers, three (3) 115kV disconnect switches, instrument transformers, associated control and protection equipment, high voltage bus, one (1) transmission line take-off-structures, and conductor.	\$1,225,000	100%	\$1,225,000	17 Months
Total	\$1,225,000		\$1,225,000	

Table 2: Non-Shared Network Upgrade(s)

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

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
None	\$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)

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 128 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)	\$1,225,000
Non-Shared Network Upgrade(s)	\$0
Shared Network Upgrade(s)	\$0
Affected System Upgrade(s)	\$0
Total	\$1,225,000

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).

Interconnection Facilities Study Report

*Southwest Power Pool, Inc. (SPP) Generator
Interconnection Request GEN-2017-097*

(DISIS-2017-001)



**Western Area
Power Administration**

Upper Great Plains Region (WAPA-UGP)

February 2022



1.0 Background:

The Western Area Power Administration Upper Great Plains Region (WAPA-UGP¹) received a request for an Interconnection Facilities Study in accordance with the Southwest Power Pool Inc. (SPP) Open Access Transmission Tariff (Tariff) for interconnection of a Generating Facility in Pennington County, South Dakota to the 115kV bus at WAPA-UGP's New Underwood Substation. SPP generator interconnection request GEN-2017-097 represents a 128-MW alternating current ground-mounted solar photovoltaic project.

The Generating Facility's collector substation will be approximately 0.75 miles from the New Underwood Substation. The collector substation will consist of one (1) 115/34.5-kV transformer and four (4) feeders with approximately 32 MW each. The Interconnection Customer will construct, own, and maintain the 115kV transmission line between the collector site and the New Underwood Substation. The Point of Interconnection will be at the 115kV bus at the New Underwood Substation. The Point of Change of Ownership between Interconnection Customer and WAPA-UGP will be at the points where Interconnection Customer's conductors, jumpers, and insulators connect to WAPA-UGP's 115kV take-off structure and the rigid bus underhung from the 115-kV take-off structure, as illustrated in Attachment B.

This Interconnection Facilities Study does not address transmission service or any delivery component of transmission service, only the interconnection requirements and operating impacts of the interconnection service component of the Generating Facility.

2.0 Study Requirements:

This Interconnection Facilities Study includes an evaluation of the following:

- 2.1** Prepare/develop a 115kV bay addition layout and determine all electrical equipment requirements to accommodate the Request. Develop/compile cost estimates for all WAPA-UGP labor, overheads, equipment additions, modifications, etc. to accommodate the generator interconnection.
- 2.2** Review and document any other interconnection/control area requirements. Document these additional requirements (such as indication/metering, monitoring, control, relaying) and include these in the cost estimate.
- 2.3** Determination of need to develop an Operating Guide for WAPA-UGP's Dispatch to document the conditions under which the new Generating Facility must be operated to protect against unacceptable pre- or post-contingent transient voltage and loading conditions.

¹WAPA-UGP is also referred to as "Western-UGP" in the SPP Tariff.



2.4 Develop an overall time schedule for completion of the necessary addition/modifications.

3.0 Study Results:

The following results document the analysis of the addition of the Generating Facility to WAPA-UGP's transmission system and fulfill the tasks outlined in Section 2.0 above:

3.1 Required Facility Additions by WAPA-UGP:

WAPA-UGP has determined that the following addition is required to maintain a safe and reliable interconnection to WAPA-UGP's transmission system:

- A new 115kV bay addition to the New Underwood Substation. Construction of the new WAPA-UGP-owned bay will require one (1) 115kV power circuit breakers, three (3) 115kV disconnect switches, instrument transformers, associated control and protection equipment, high voltage bus, one (1) transmission line take-off-structures, and conductor.

WAPA-UGP's estimated cost for labor, overhead, equipment, construction, and other miscellaneous costs for the new WAPA-UGPR owned 115kV bay addition are outlined in Attachment A. The total cost is estimated at \$1,225,000.

3.1.1 Transmission Owner's Interconnection Facilities: Equipment installed by WAPA-UGP for the sole purpose of this interconnection, such as the Transmission Owner's Interconnection Facilities, which includes equipment between of the Point of Interconnection and Point of Change of Ownership, interrogation, and communication equipment, are considered direct assignment facilities and not subject to inclusion as Network Upgrades. The direct assigned costs for such equipment are estimated at \$1,225,000 based upon WAPA-UGP's understanding of the SPP Tariff provisions and are included in the total cost estimate provided in Attachment A.

3.1.2 Network Upgrades constructed by Transmission Owner: n/a

3.2 Contractual Agreements:

As provided by the SPP Tariff, WAPA-UGP and Interconnection Customer executed an Engineering & Procurement (E&P) Agreement in order to advance the implementation of the interconnection prior to the execution of a Generator Interconnection Agreement (GIA). The E&P Agreement, executed under Contract No. 21-UGPR-06, provided terms allowing WAPA-UGP to begin engineering and procurement of long lead time items necessary for establishment of the interconnection.

Pursuant to the SPP Tariff, SPP and WAPA-UGP will need to execute a GIA (or initially an Interim GIA, if applicable, with a subsequent execution of a GIA) with Interconnection Customer for the



interconnection of the Generating Facility. The GIA will address specific funding requirements and provide an advanced payment schedule for facility additions and upgrades to address WAPA-UGP's requirements. The GIA, which discusses the construction and interconnection aspects of this project, will need to be developed and offered by SPP, pursuant to their obligations and procedures under the SPP Tariff, and forwarded to the Interconnection Customer for review and signature. A schedule for payment(s) based on design, procurement, and construction activities will be included in the GIA consistent with the SPP Tariff provisions.

3.3 Other Interconnection, Metering Requirements:

Basic indication, monitoring, control, and relaying requirements due to a generator interconnection are included in the cost estimate. A list of specific needs will be provided by WAPA-UGP's Operations Office and WAPA-UGP's South Dakota Maintenance Office once design has progressed.

Interconnection Customer shall install metering at their collector substations in accordance with SPP and WAPA-UGP metering requirements. WAPA-UGP's generation metering requirements, as an SPP Transmission Owner, must be also met, unless specific SPP's metering requirements are more restrictive, in accordance with the most current **Western Area Power Administration Meter Policy** posted at the "WAPA Meter Policy" link at the following page:

<http://www.oasis.oati.com/WAPA/WAPAdocs/Western-Common-Business-Practices.html>

Any WAPA-UGP specific implementation of more restrictive SPP metering requirements are also posted on WAPA-UGP's OASIS home page under the "Effective Business Practices" folder at the "UGP Meter Policy Modifications" link at the following URL:

<http://www.oasis.oati.com/wapa/index.html>

Western's **General Requirements for Interconnection** must also be met in accordance with the *General Requirements for Interconnection* document posted at the "General Requirements for Interconnection (GRI)" link at the following page:

<http://www.oasis.oati.com/WAPA/WAPAdocs/Western-Common-Business-Practices.html>

3.4 Operating Guide/Operating Agreement:

Prior to energization, an Operating Guide will need to be developed by WAPA-UGP in coordination with SPP, if necessary, to outline any required operating restrictions under which the generation interconnection must be energized (or de-energized) to protect against unacceptable system stability limits and/or pre-contingent and post-contingent voltage and loading conditions. The Operating Guide will be developed by WAPA-UGP's Transmission System Planning Division in coordination with SPP Staff. In addition, an Operating Agreement will be developed by WAPA-UGP's Operations Office, jointly with the Interconnection Customer and SPP, if necessary, as will be set forth in the GIA to outline the necessary operations coordination and requirements not otherwise set forth in the GIA.



3.5 Schedule:

Attachment A outlines WAPA-UGP's estimated schedule for planning, design and construction of the facilities required to accommodate the Interconnection Customer's Request. WAPA-UGP anticipates the new 115kV bay addition at the New Underwood Substation to be completed by August 2023. This schedule is based on the GIA/Interim GIA being executed prior to May 1, 2022.

3.6 Environmental Review:

The Environmental Review for this project, as described in Attachment V, Section 3.3.5, Section 8.6.1, and any other applicable sections of the SPP Tariff, is being coordinated between WAPA-UGP and Interconnection Customer under Contract No. 17-UGPR-78. The Environmental Review is performed at the Interconnection Customer's expense, and those costs are considered direct assigned costs and are ineligible for credits under the SPP Tariff.

4.0 Facilities Study Cost:

WAPA-UGP will audit the Interconnection Facilities Study costs and provide a summary of costs once the study is completed or the interconnection request is withdrawn.



ATTACHMENT A

115kV Bay Addition at WAPA's New Underwood Substation

PROJECT ACTIVITY	ESTIMATED START DATE	ESTIMATED COST, MILESTONE PAYMENT DUE
Provide staff and other resources to engineer, design, and plan construction	April 19, 2021 per E&P Agreement	\$270,000
Procure equipment, parts, and control equipment necessary to construct	Under E&P Agreement	\$350,000
Development & Solicitation of Concrete Construction Contract	Upon contract signing	\$400,000
WAPA-UGP Construction Activities	March 2023	\$150,000
Commissioning and Energization	May 2023	\$55,000
In-Service (Estimated Completion Date)	August 2023	
TOTAL ESTIMATED COSTS		\$1,225,000*

*Includes Transmission Owner Interconnection Facilities costs estimated at \$1,225,000 and Network Upgrades constructed by Transmission Owner costs estimated at \$0. Based on WAPA-UGP's understanding of the SPP Tariff, these Network Upgrades are considered Non-Capacity Network Upgrades and would be evaluated under Attachment Z2 of the SPP Tariff as Non-Capacity Network Upgrades.



ATTACHMENT B

