



INTERCONNECTION FACILITIES STUDY REPORT

GEN-2015-089

IFS-2016-001-05

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
8/27/2018	SPP	Initial draft report issued.
9/7/2018	SPP	Final report issued.
5/3/2019	SPP	Final Revised Report Posted – Updated Per DISIS-2016-001-4. Table 3, Table 4 and Table 6 updated.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2015-089/IFS-2016-001-05 is for a 200.00 MW generating facility located in Bon Homme, South Dakota. The Interconnection Request was studied in the DISIS-2016-001 Impact Study and DISIS-2016-001-1 Impact Restudy for ERIS only. The Interconnection Customer's requested in-service date is 6/30/2017.

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, Previous 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, Interconnection Service will not be available until all Interconnection Facilities and Network Upgrade(s) can be placed in service.

CREDITS/COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)

Interconnection Customer shall be entitled to compensation in accordance with Attachment Z2 of the SPP OATT for the cost of SPP creditable-type Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, that are not otherwise refunded to the Interconnection Customer. Compensation shall be in the form of either revenue credits or incremental Long Term Congestion Rights (iLTCR).

INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES

The Generating Facility is proposed to consist of one hundred (100) GE 2.0 MW wind generators for a total generating nameplate capacity of 200.00 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 collector circuits;
- 34.5 kV to 230 kV transformation substation with associated 34.5 kV and 230 kV switchgear;
- One (1) 230/34.5 kV, 132/176/220 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- A 20 mile overhead 230 kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 230 kV bus at existing WAPA substation ("Utica 230kV") that is owned and maintained by WAPA;
- 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. Additionally approximately 29.1 Mvars¹ of reactors will be required to compensate for injection of reactive power into the transmission system under no/reduced generating conditions. 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.

The Interconnection Customer shall coordinate relay, protection, control, and communication system configurations and schemes with the Transmission Owner.

¹ This approximate minimum reactor amount is needed for the current configuration of GEN-2015-089 as studied in the DISIS-2016-001 Impact Study and restudy.

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
WAPA Utica 230kV Interconnection Substation: Construct one (1) 230 kV 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.	\$216,180	100%	\$216,180	10 months
Total	\$216,180	100%	\$216,180	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	Z2 Type ²	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
WAPA Utica 230kV Interconnection Substation: Construct four (4) 230-kV power circuit breakers, eight (8) 230-kV disconnect switches, instrument transformers, associated control and protection equipment, high voltage bus, a transmission line take-off-structure, and conductor.	Non-Creditable	\$4,268,820	100%	\$4,268,820	10 months
Total		\$4,268,820	100%	\$4,268,820	

² Indicates the method used for calculating credit impacts under Attachment Z2 of the Tariff.

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 Upgrades

Shared Network Upgrades Description	Z2 Type	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
None	N/A	0	0	0	0
Total					

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.

PREVIOUS NETWORK UPGRADE(S)

Certain Previous Network Upgrades are **currently not the cost responsibility** of the Interconnection Customer but will be required for full Interconnection Service.

Table 4: Interconnection Customer Previous Network Upgrade(s)

Previous Network Upgrade(s) Description	Current Cost Assignment	Estimate In-Service Date
SPP-NTC-200220 (R-Plan) Build new 222 mile, 345 kV line from Gentleman - Cherry Co - Holt Co. Build new 345 kV substations at Cherry Co and Holt Co. Terminal upgrades at Gentleman.	\$408,565,094	5/1/2021

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 Previous 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 MISO 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 Share (%)	Allocated Cost Estimate (\$)
None	0	0	0
Total			

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 200.00 MW can be granted. Interconnection Service will be delayed until the transmission owner interconnect facilities (TOIF), non-shared network upgrades, shared network upgrades, previously allocated, and affected system upgrades that are required for full interconnection service are completed. The Interconnection Customer’s estimated cost responsibility is summarized in the table below.

Table 6: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities	\$216,180
Network Upgrades	\$4,268,820
Affected System Upgrades	None
Total	\$4,485,000

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

See next page for the Transmission Owner's Interconnection Facilities Study Report.

Interconnection Facilities Study Report

*Southwest Power Pool, Inc. (SPP) Generator
Interconnection Request GEN-2015-089*



**Western Area
Power Administration**

Upper Great Plains Region (WAPA-UGP)

August 2018

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 Yankton County, South Dakota to WAPA-UGP's Utica Junction 230/115-kV Substation. SPP generator interconnection request GEN-2015-089 represents a 200 MW nameplate wind generation facility with Point of Interconnection at WAPA-UGP's Utica Junction 230kV bus.

The wind generation facility's proposed collector station would be located approximately 23 miles west of WAPA-UGP's Utica Junction 230/115-kV Substation. The collector substation will consist of one (1) 115/34.5-kV transformer and multiple 34.5-kV deliveries to interconnect the individual wind turbines. The Interconnection Customer will construct, own, and maintain approximately 23 miles of 115-kV transmission line between the collector substation and a 230/115-kV step-up substation in close vicinity to WAPA-UGP's Utica Junction 230/115-kV Substation. The Point of Interconnection will be at the 230-kV breaker and a half bus at WAPA-UGP's Utica Junction 230/115-kV Substation. The Point of Change of Ownership between Interconnection Customer and WAPA-UGP will be at WAPA-UGP's Utica Junction 230/115-kV Substation at the points where Interconnection Customer's conductors, jumpers, and insulators connect to WAPA-UGP's 230-kV take-off structure and the rigid bus underhung from the 230-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 substation layout, perform a preliminary bus design, 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.

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



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.

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

- Conversion of existing 230-kV, 4 breaker ring bus at Utica Junction Substation to breaker and a half configuration.
- Addition of a new 230-kV bay at Utica Junction Substation

Construction of the GEN-2015-089 230-kV bus upgrade and bay addition at the Utica Junction Substation will require four (4) 230-kV power circuit breakers, eight (8) 230-kV disconnect switches, instrument transformers, associated control and protection equipment, high voltage bus, a transmission line take-off-structure, and conductor.

WAPA-UGP's estimated cost for labor, overhead, equipment additions, modifications, replacements, and other miscellaneous costs are outlined in Attachment A. The total cost is estimated at \$4,485,000.

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 \$216,180 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: Network Upgrades to be designed, procured, constructed, installed and owned by WAPA-UGP that are the cost responsibility of the Interconnection Customer. This includes the conversion of the existing 230-kV, 4 breaker ring bus at Utica Junction Substation to breaker and a half configuration and the addition of a new 230-kV bay at Utica Junction Substation. The cost estimate for the Network Upgrades



constructed by Transmission Owner is \$4,268,820. 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. These upgrades would not be subject to the transmission service credits described in Article 11.5 of the SPP Generator Interconnection Agreement (GIA).

3.2 Contractual Agreements:

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.

The SPP Tariff also provides for the offer of an Engineering & Procurement Agreement (E&P Agreement) prior to the execution of a GIA in order to begin engineering and procurement of long lead-time items necessary for establishment of the interconnection. WAPA-UGP and Interconnection Customer executed an E&P Agreement under Contract No. 18-UGPR-19.

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 230/115-kV step up substation 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. Based upon the proposed facility additions, WAPA-UGP anticipates the new 230-kV bay addition and bus reconfiguration at the Utica Junction Substation would be completed by the end of June 2019. This schedule is based on the GIA/Interim GIA being executed prior to October 1, 2018, and issuance of the NEPA Finding of No Significant Impact or Record of Decision by December 1, 2018.

3.6 Environmental Review:

The Environmental Review for this project, as described in Attachment V, Sections 3.3.5, and 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-04. 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

GEN-2015-089 UTICA JUNCTION 230-KV ADDITIONS

PROJECT ACTIVITY	ESTIMATED START DATE	ESTIMATED COST, MILESTONE PAYMENT DUE
Preconstruction activities – planning, project management, etc.	Collected via E&P Agreement	\$160,000
Provide staff and other resources to engineer, design, and plan construction	Collected via E&P Agreement	\$425,000
Procure equipment, parts, and control equipment necessary to construct	Collected via E&P Agreement	\$1,200,000
Development & Solicitation of Construction Contract(s)	9/15/2018	\$1,500,000
WAPA-UGP Construction Activities	10/15/2018	\$750,000
Commissioning, Energization, and construction supervision	1/15/2019	\$450,000
In-Service (Estimated Completion Date)	6/30/2019	
TOTAL ESTIMATED COSTS		\$4,485,000*

*Includes Transmission Owner Interconnection Facilities costs estimated at \$216,180 and Network Upgrades constructed by Transmission Owner costs estimated at \$4,268,820. 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

