



INTERCONNECTION FACILITIES STUDY REPORT

GEN-2015-096
(IFS-2015-002-43)

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
4/10/2017	SPP	Initial draft report issued.	
2/05/2018	SPP	Final report issued.	To account for DISIS-2015-002-4 Upgrades and MISO DISIS-2015-002 Restudy (1/19/2018)
4/12/2019	SPP	Final report revision 2 issued.	Moved Dickinson Upgrade to Non-Share Network Upgrade section, revised Other Network Upgrades and Affected System Upgrades table per DISIS-2015-002-8 results.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2015-096/IFS-2015-002-43 is for a 150.00 MW generating facility located in Hettinger County, North Dakota. The Interconnection Request was studied in the DISIS-2015-002 Impact Study for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). Prior to an executed IFS agreement, the Interconnection Customer requested to withdraw NRIS per Section 4.4.1 of the Southwest Power Pool (SPP) Generator Interconnection Procedures (GIP), therefore ERIS-only was analyzed for this request in the DISIS Restudies. The Interconnection Customer's requested in-service date is December 31, 2017.

The interconnecting Transmission Owner, Basin Electric Power Cooperative (BEPC), performed a detailed IFS at the request of SPP. The full report is included in Appendix A. Additionally, the Affected System, Midcontinent Independent System Operator (MISO), has identified the need to perform a detailed Affected System Facilities Study for impacts on the MISO transmission system. SPP has determined that full Interconnection Service will be available after the assigned Transmission Owner Interconnection Facilities, Non-Shared Network Upgrade(s), Other Network Upgrade(s), Shared Network Upgrade(s), and Affected System Upgrade(s) 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 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 sixty-five (65) 2.1 MW General Electric (G.E.) and seven (7) 1.79 G.E. wind generators for a total generating nameplate capacity of 149.03 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 230 kV transformation substation with associated 34.5 kV and 230 kV switchgear;
- One (1) 230/34.5 kV 102/136/170 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- A less than one (<1) mile overhead 230 kV line to connect the Interconnection Customer's substation to the Point of Change of Ownership (PCO) to GEN-2014-014IS (Western Area Power administration GI-1414) 230 kV substation; utilize the GEN-2014-014IS/GI-1414 fifteen-and-a-half (15.5) mile overhead 230 kV line to the Point of Interconnection (POI) at the 230 kV bus at the existing BEPC substation ("Daglum") that is owned and maintained by BEPC;
- All transmission facilities required to connect the Interconnection Customer's substation to the POI;
- To accommodate the "shared usage," Interconnection Customer will be required to attain a Shared Facilities Agreement and provide a copy of the Shared Facilities Agreement with the Transmission Provider and Transmission Owner before Interconnection Customer energizes its facilities;
- Equipment at the Interconnection Customer's substation necessary to maintain a power factor at the POI between 95% lagging and 95% leading, including approximately 13 Mvars¹ of reactors to compensate for injection of reactive power into the transmission system under no/reduced generating conditions. The Interconnection Customer may use wind turbine 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 the wind farm as studied in the GEN-2015-096 Turbine 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 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: Interconnection Customer TOIF and Non-Shared Network Upgrade(s)

TOIF and Non-Shared Network Upgrades Description	Z2 Type²	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)
<p><u>BEPC Dickinson 230/115/13kV Transformer Circuit #2 (Non-Shared Network Upgrades):</u> Expand Dickinson Substation, build new 230kV line terminal, build new three (3) breaker ring “East” bus for 115kV configuration, one (1) 230kV 2000 continuous ampacity breaker, three (3) 115kV 1200 continuous ampacity breakers, new 230/115/13kV 166MVA transformer, control panels, line relaying, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials. Estimated Lead Time: 23 Months</p>	creditable	\$12,643,659	100%	\$12,643,659
Total		\$12,643,659		\$12,643,659

A Shared Facilities Usage Agreement for the shared facilities with GEN-2014-014IS/GI-1414 shall be required for Generator Interconnection Service. Shared Facilities Usage Agreement details will be determined during the negotiation phase of the GIA.

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 2** below.

Table 2: Interconnection Customer Shared Network Upgrade(s)

Shared Network Upgrades Description	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)
None	\$0	N/A	\$0
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.

OTHER NETWORK UPGRADE(S)

Certain Other Network Upgrades are **currently not the cost responsibility** of the Interconnection Customer but will be required for full Interconnection Service are listed in **Table 3** below.

Table 3: Interconnection Customer Other 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 Other 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 4** 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 4: Interconnection Customer Affected System Upgrade(s)

Affected System Upgrades Description	Total Cost Estimate	Allocated Share	Allocated Cost Estimate
None	\$0	N/A	\$0
Total Affected System Upgrades	\$0		\$0

Big Stone South – Ellendale MVP Project was also included in MISO analysis with an anticipated in-service date by 12/31/2019. Therefore, the DISIS-2015-002 Group 9 and Group 16 request are conditional to the MVP project being in-service.

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 150.00 MW can be granted. Interconnection Service will be delayed until the Transmission Owner Interconnection Facilities, Non-Shared Network Upgrade(s), Other Network Upgrade(s), Shared Network Upgrade(s), and Affected System Upgrade(s) are completed. The Interconnection Customer’s estimated cost responsibility for Transmission Owner Interconnection Facilities, Non-Shared Network Upgrade(s), and Shared Network Upgrade(s) is summarized in the table below.

Table 5: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities	\$0
Network Upgrades	\$12,643,659
Total	\$12,643,659

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.

1. Introduction

Interconnection Customer has requested an Interconnection Facilities Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnecting a 150.00 MW wind generation facility in Hettinger County, North Dakota to the transmission system of Basin Electric Power Cooperative (BEPC). The generator facility, GEN-2015-096, is comprised of sixty-five (65) 2.1 MW General Electric (G.E.) and seven (7) 1.79 G.E. wind generators for a total generating nameplate capacity of 149.03MW.

2. Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades

The cost for the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades is listed below in Table 1. GEN-2015-096/IFS-2015-002-43 is planned to interconnect at the BEPC owned 230 kV bus located at Daglum Substation.

Table 1: Required Transmission Owner Interconnection Facilities and Non Shared Network Upgrades

Description	Total Project Cost	Allocated Cost
<p><u>Dickinson 230/115/13kV Transformer Circuit #2 (Non-Shared Network Upgrades):</u> Expand Dickinson Substation, build new 230kV line terminal, build new three (3) breaker ring “East” bus for 115kV configuration, one (1) 230kV 2000 continuous ampacity breaker, three (3) 115kV 1200 continuous ampacity breakers, new 230/115/13kV 166MVA transformer, control panels, line relaying, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials.</p>	<p>\$12,643,659</p>	<p>\$12,643,659</p>
Total:	\$12,643,659	\$12,643,659

2.1. Interconnection Customer Facilities – The Interconnection Customer will be responsible for its Generating Facility and its one (1) 230/34.5 kV transformer that connect to the wind generators to the Point of Interconnection. In addition, the Interconnection Customer will be required to install the following equipment in its facilities.

2.1.1. Reactive Power Equipment – The Customer will be responsible for reactive power compensation equipment to maintain 95% lagging (providing vars) and 95% leading (absorbing vars) power factor at the POI, which may be provided in part by the reactive power capability of the generators. Any capacitor banks installed by the Interconnection Customer shall not cause voltage distortion in accordance with Article 9.7.4 of the standard SPP Generator Interconnection Agreement.

3. Conclusion

The Interconnection Customer’s Interconnection Facilities and Non-Shared Network Upgrades are estimated at \$12,643,659.