INTERCONNECTION FACILITIES STUDY REPORT

GEN-2018-067

Published February 2025

By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
February 7, 2025	SPP	Initial draft report issued.
February 21, 2025	SPP	Final report issued.

CONTENTS

SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2018-067 is for a 255 MW generating facility located in Williams, ND. The Interconnection Request was studied in the DISIS-2018-002/DISIS-2019-001 Impact Study for ER. The Interconnection Customer's requested in-service date is January 3, 2027.

The interconnecting Transmission Owner, Mountrail-Williams Electric Cooperative (MWEC), 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 ninety-one (91) GE Power Converter Down Tower Assembly for 1-2 MW Platform Wind Turbines for a total generating nameplate capacity of 255 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;
- Two 115/34.5 kV 100/133/167 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An Approximately 14.5 mile overhead 115 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 ("Strandahl 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** list 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 ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
Transmission Owner's Strandahl 115kV GEN-2018-067 Interconnection (TOIF) (MWEC) (UID 156803): Facilitate the interconnection of GEN-2018-067 Estimated Lead Time: 0 Months	$0	100.00%	$0
Total	**$0**		**$0**

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
Transmission Owner's Strandahl 115kV GEN-2018-067 Interconnection (Non-shared NU) (MWEC) (UID 156804): Facilitate the interconnection of GEN-2018-067 Estimated Lead Time: 18 Months	Ineligible	$2,343,530	100%	$2,343,530
Transmission Owner's New Strandahl to Black Tail 115 kV line (UID 170494): Build a new STRNDAHL-MW7 to BLKTLTAP-MW7 115 kV line 1 (15 miles) to a standard rating of 239 MVA. Estimated Lead Time: 18 Months	Eligible	$14,662,500	100%	$14,662,500

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
Transmission Owner's Rebuild Mont to STRNDAHL Line 115kV (includes ½ cost of 2 mile double ckt and old line removal) (UID 170493): A rebuilt Strandahl-Mont 115kV line which shall have a continuous rating of 220MVA. Estimated Lead Time: 18 Months	Eligible	$15,710,000	100%	$15,710,000
Total		**$32,716,030**		**$32,716,030**

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 ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
NA				
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
NA		

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 ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
Midcontinent Independent System Operator "MISO": Add 4×40 MVAR switched cap at Panther 230 kV (615529)	$9,000,000	25.34%	$2,280,822
Midcontinent Independent System Operator "MISO": Add 4×40 MVAR switched cap at McLeod 230 kV (658276)	$5,500,000	24.08%	$1,324,572
Midcontinent Independent System Operator "MISO": Add 1×40 MVAR switched cap at Paynesville 230 kV (602036)	$2,000,000	25.52%	$510,560
Total	**$16,500,000**		**$4,115,954**

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 255 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)	$0
Non-Shared Network Upgrade(s)	$32,716,030
Shared Network Upgrade(s)	$0
Affected System Upgrade(s)	$4,115,954
Total	**$36,831,984**

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).

Mountrail Williams Electric Cooperative

Facility Study Report

Strandahl 115kV Substation

SPP GI: GEN-2018-067
SPP DISIS: 2018-02

Customer: 255MW Wind Generation

1. Background:

1.1 Per the Generator Interconnection Procedures (GIP), Attachment V, Section 8.11, SPP requests that Mountrail Williams Electric Cooperative (MWEC) perform a facilities study in for the following Interconnection and/or Network Upgrade(s):

Upgrade Type	UID	Upgrade Name	Cost Estimate
Interconnection	156804	Strandahl 115kV GEN-2018-067 Interconnection (Non-shared NU) (MWEC)	$2,343,530
Interconnection	156803	Strandahl 115kV GEN-2018-067 Interconnection (TOIF) (MWEC)	$0.00
Network	170494	Build Strandahl to Black Tail 115 kV line (includes ½ cost of 2 mile double ckt)	$14,662,500
Network	170493	Rebuild Mont to STRNDAHL Line_115kV (includes ½ cost of 2 mile double ckt and old line removal)	$15,710,000

Does not include contingency estimate.

2. Study Requirements:

MWEC has performed this Facility Study report in accordance with the Generator Interconnection Procedures (GIP), Attachment V, Section 8.11 for the Interconnection and/or Network Upgrade(s) as described in Section 1.

2.1. The Facility Study report includes an evaluation of the following:

2.1.1. Perform/develop a substation layout, perform a preliminary bus design, determine all electrical equipment requirements, and if required determine a suitable site location to accommodate the Request. Develop/compile cost estimates for all MWEC labor, overheads, equipment additions, modifications, etc. to accommodate the generator interconnection.

2.1.2. Develop an overall construction schedule for completion of the necessary additions and/or modifications.

2.1.3. Point Of Change of Ownership. For the purposes of this Facility Study report, the Point of Change of Ownership location is defined as the take-off structure(s) at the MWEC Strandahl Substation where the Interconnection Customer's transmission line(s) connects to the take-off structure(s). Interconnection Customer will furnish and install the conductor jumper and insulator assembly to the take-off structure(s).

2.1.4. Other Interconnection/Metering Requirements. Basic indication, metering, monitoring, control, and relaying requirements due to a generator interconnection are included in the cost estimate. MWEC's generation metering requirements, as an SPP Transmission Owner, must be met. A list of specific needs will be provided by MWEC once the design has progressed. A complete review of all protection and metering configurations will occur. Any changes to field equipment will be commissioned to verify operation and accuracy. All equipment will follow MWEC's internal design standards for minimum BIL, ampacity, and fault capabilities.

3. Deliverables:

3.1. Strandahl Substation and Transmission Line Additions

According to the SPP DISIS 2018-02 impact study the following upgrades are required;

1. The addition of two 115kV terminals, one for the generation interconnection and one for the 115kV line to the Blacktail tap.
2. A new Strandahl-Blacktail 115kV line which shall have a continuous rating of 239MVA.
3. A rebuilt Strandahl-Mont 115kV line which shall have a continuous rating of 220MVA.

Strandahl Substation is presently a 115kV ring bus with 3 terminals populated and one terminal vacant. The vacant terminal has all major apparatus except the 115kV circuit breaker. There is also a control house and a 115/25kV transformer with several 25kV terminals. The substation is constrained to the south and west by the control house, the 25kV terminals, and a steep drop-off.

Strandahl Substation Layout:

Refer to the general arrangement in Attachment #2. The 115kV line to Blacktail will use the vacant terminal. The generation interconnection115kV transmission line will be connected to an extension of the ring bus. This arrangement will use the available space efficiently and have a minimal disruption to the existing facility. The change of ownership is identified on the drawing.

Strandahl – Blacktail 115kV line addition:

The line will consist of 12.75 miles of single circuit line plus 2 miles of double circuit. The double circuit will share the 115kV line to Blacktail and the 115kV line to Mont.

Strandahl – Mont 115kV line rebuild:

The line will consist of 12.5 miles of single circuit line plus 2 miles of double circuit. The double circuit will share the 115kV line to Blacktail and the 115kV line to Mont. The existing Strandahl-Mont 115kV line has a conductor rating of 115MVA. The line is in poor condition and the structures cannot accommodate the heavier rated conductor. Also, the line route will be adjusted in certain areas to accommodate land use needs. Therefore, the old line will be demolished and a new line constructed.

The cost estimate for these 3 projects is provided in Attachment #1.

3.2 Construction Schedule

The preliminary project schedule forecasts an in-service date of December 2027. This may be adjusted with additional project definition and planning. If it is determined that NEPA and/or ROW condemnation is required, 12-18 months will be added to the In-Service date.

Attachment #1 Cost Estimates

Strandahl Ring Bus Expansion Opinion of Probable Cost		
Expansion of Four Position Ring Bus Substation to Five Position Ring		
DESCRIPTION	**COSTS**	
Equipment	$	740,404.38
Steel Structures and Bus	$	567,625.04
Foundations	$	326,747.10
Conduit, Cable & Grounding	$	284,692.56
Site Work & Fence	$	129,060.99
Removal	$	50,000.00
Miscellaneous	$	30,000.00
Engineering/Management Fees	$	215,000.00
SUBTOTAL	$	2,343,530.07
Strandahl Substation to Blacktail Switch Opinion of Probable Cost		
Twelve and Three Quarter Miles of 115kV Transmission Line		
Material	$	7,012,500.00
Labor	$	5,737,500.00
Right of Way	$	382,500.00
Engineering/Management Fees	$	190,000.00
SUBTOTAL	$	13,322,500.00
Old Mont Line Removal Opinion of Probable Cost		
Twelve Miles of 115kV Transmission Line Removal		
Labor	$	1,320,000.00
SUBTOTAL	$	1,320,000.00
Strandahl Substation to Mont Substation Opinion of Probable Cost		
Twelve and Half Miles of 115kV Transmission Line		
Material	$	6,875,000.00
Labor	$	5,625,000.00
Right of Way	$	375,000.00
Engineering/Management Fees	$	175,000.00
SUBTOTAL	$	13,050,000.00
Two Miles of 115kV Transmission Line		
shared double ckt segment for Mont and Blacktail line ROW at Strandahl		
Material	$	1,500,000.00
Labor	$	1,100,000.00
Right of Way	$	60,000.00
Engineering/Management Fees	$	20,000.00
SUBTOTAL	$	2,680,000.00
SUBSTATION, TRANSMISSION, DISTRIBUTION SUBTOTAL	**$**	**32,716,030.07**
10% CONTINGENCY	**$**	**3,271,603.01**
TOTAL OPINION OF PROBABLE COST	**$**	**35,987,633.08**

Attachment #2 General Arrangement