



INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-067
(IFS-2016-001-33)

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By SPP Generator Interconnections Dept.

REVISION HISTORY

| DATE OR VERSION NUMBER | AUTHOR | CHANGE DESCRIPTION |
|---------------------------|--------|------------------------------|
| 6/19/2018 | SPP | Initial draft report issued. |
| 6/26/2018 | SPP | Final report issued. |
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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-067/IFS-2016-001-33 is for a 73.60 MW generating facility located in Thomas County, Kansas. The Interconnection Request was studied in the DISIS-2016-001 Impact Study and DISIS-2016-001-1 Impact Restudy for Energy Resource Interconnection Service (ERIS) only. The Interconnection Customer's requested in-service date is November 1, 2017.

The interconnecting Transmission Owner, Sunflower Electric Power Corporation (SUNC), 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 Non-Shared Network Upgrades 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 thirty-two (32) Siemens 2.3 MW wind generators for a total generating nameplate capacity of 73.60 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 345 kV transformation substation with associated 34.5 kV and 345 kV switchgear;
- One (1) 345/3.45 kV 135/180/225 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation.
- A five and a half (5.5) mile overhead 345 kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 345 kV bus at existing SUNC substation ("Mingo") that is owned and maintained by SUNC;
- 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 2.97 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-2016-067 as studied in the DISIS-2016-001 Impact Study and DISIS-2016-001-01 Impact 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 |
|---|---------------------------------|------------------------------|-------------------------------------|----------------------------|
| None | \$0 | N/A | \$0 | N/A |
| Total | \$0 | N/A | \$0 | |

Table 2: Non-Shared Network Upgrade(s)

| Non-Shared Network Upgrades Description | Z2 Type² | Total Cost Estimate (\$) | Allocated Percent (%) | Allocated Cost Estimate (\$) | Estimated Lead Time |
|---|----------------------------|---------------------------------|------------------------------|-------------------------------------|----------------------------|
| <u>SUNC Mingo Interconnection</u> <u>Substation:</u> Revised FAC-002 Restudy and relay setting modification. | Non-Creditable | \$15,000 | 100% | \$15,000 | 18 Months |
| Total | | \$15,000 | 100% | \$15,000 | |

² Indicates the method used for calculating credits 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 | N/A | \$0 | N/A |
| Total | | \$0 | N/A | \$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.

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 |
|---|-------------------------|--------------------------|
| 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 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 | N/A | \$0 |
| Total | \$0 | N/A | \$0 |

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 73.60 MW can be granted. Interconnection Service will be delayed until the Non-Shared Network Upgrades are completed. The Interconnection Customer's estimated cost responsibility for Non-Shared Network Upgrades are summarized in the table below.

Table 6: Cost Summary

| Description | Allocated Cost Estimate |
|---|-------------------------|
| Transmission Owner Interconnection Facilities | \$0 |
| Network Upgrades | \$15,000 |
| Total | \$15,000 |

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.

1. Introduction

Interconnection Customer has requested an Interconnection Facilities Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnecting a 73.60 MW wind generation facility in Thomas County, Kansas to the transmission system of Sunflower Electric Power Corporation (SUNC). The generator facility, GEN-2016-067, is comprised of thirty-two (32) 2.3 MW Siemens wind generators for a total generating nameplate capacity of 73.60 MW.

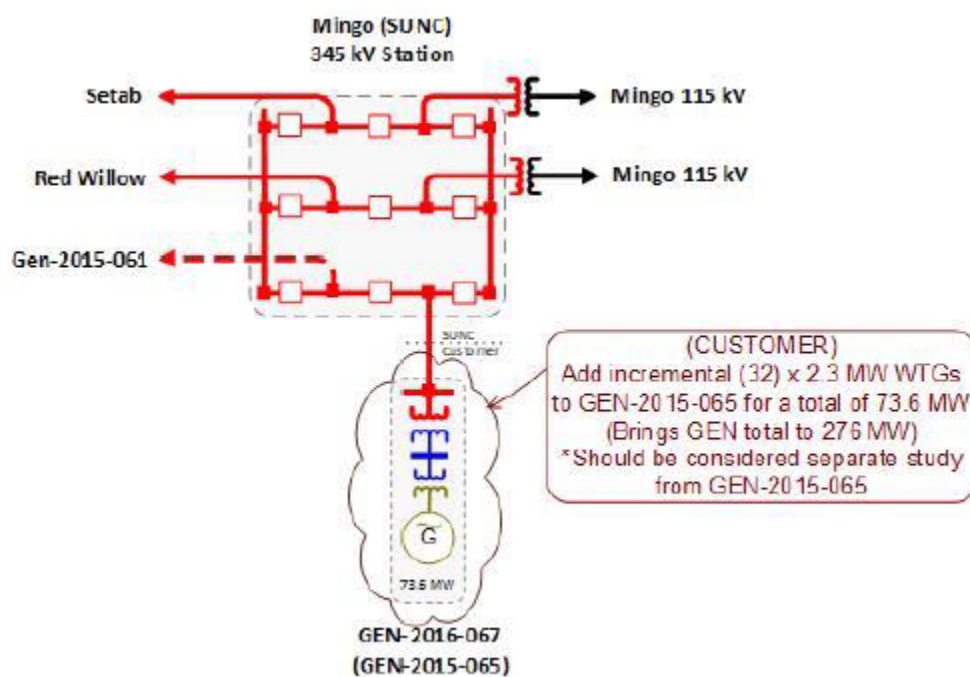
2. Transmission Owner Non-Shared Network Upgrades

The cost for the Transmission Owner Non-Shared Network Upgrades are listed below in **Table 1**. GEN-2016-067/IFS-2016-001-33 is planned to interconnect at the SUNC owned 345 kV bus located at Mingo Substation. The estimated lead time for Transmission Owner Non-Shared Network Upgrades are eighteen (18) months after a fully executed Generator Interconnection Agreement (GIA). The one-line diagram is shown in **Figure 1**.

Table 1: Required Transmission Owner Non-Shared Network Upgrades

| Description | Allocated Cost | Total Project Cost |
|--|----------------|--------------------|
| <u>SUNC Mingo Interconnection Substation:</u> Revised FAC-002 Restudy and relay setting modification. | \$15,000 | \$15,000 |
| Total: | \$15,000 | \$15,000 |

Figure 1: Interconnection Configuration for GEN-2016-067



2.1. Interconnection Customer Facilities – The Interconnection Customer will be responsible for its Generating Facility and its one (1) 345/34.5 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 Non-Shared Network Upgrades are estimated at \$15,000.