# Interconnection Facilities Study

## GEN-2015-027
## (IFS-2015-001-11)

**July 2016**

**Generator Interconnection**

SPP Southwest Power Pool

# Revision History

| Date | Author | Change Description |
|---|---|---|
| 6/06/2016 | SPP | Draft Interconnection Facilities Study Report Revision 0 Issued |
| 7/11/2016 | SPP | Final Interconnection Facilities Study Report Revision 0 Issued |

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# Interconnection Facilities Study Summary

## Interconnection Facilities Study Introduction

This Interconnection Facilities Study (IFS) for GEN-2015-027/IFS-2015-001-11 (Interconnection Request) is for a 4.945 MW wind farm facility Interconnection Service uprate to GEN-2008-079 located in Gray County, Kansas. The Interconnection Request was studied in the DISIS-2015-001 Impact Study and DISIS-2015-001-1 Impact Restudy as an Energy Resource Interconnection Service (ERIS) only request. The Interconnection Request was provided updated Cost Allocation in DISIS-2015-001-2 Impact Restudy. Since the posting of the DISIS-2015-001 Impact Study the Interconnection Customer has executed the Interconnection Facilities Study Agreement per Appendix 4 or Appendix 4A and provided deposit securities as required by the Section 8.9 of the Generator Interconnection Produce (GIP) to proceed to the Interconnection Facilities Study. The GIP is covered under Attachment V of the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT). The request for interconnection was placed with SPP by the requesting customer (Interconnection Customer) in accordance with OATT, which covers new generation interconnections on SPP's transmission system.

Sunflower Electric Power Corporation (SUNC) performed a detailed Interconnection Facilities Study at the request of SPP for the Interconnection Request. Interconnection Customer's original in service date for the Interconnection Request is March 1, 2016. SPP has proposed the full Interconnection Service will be available after the assigned Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s) are completed. Full interconnection service will require Network Upgrade(s) listed in the "Other Network Upgrade(s)" section.

The primary objective of the Interconnection Facilities Study (IFS) is to identify necessary Transmission Owner Interconnection Facilities, network upgrade(s), other direct assigned upgrade(s), and associated upgrade lead times needed for the additional of the requested Interconnection Service into the SPP Transmission System at the specific Point of Interconnection (POI).

## 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 either credits or potentially Long Term Congestion Rights (LTCR), otherwise known as compensation, in accordance with Attachment Z2 of the SPP Tariff for any Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, and not refunded to the Interconnection Customer.

## Interconnection Customer Interconnection Facilities

The Interconnection Request's Generation Facility is currently proposed to uprate the GEN-2008-079 forty-three (43) 2.3 MW Siemens wind generators to forty-three (43) 2.415 MW Siemens wind generators with the additional wind turbine manufacturer "Power Boots" feature for a total

generating nameplate of 103.845 MW. The 34.5kV collector system for this wind farm is planned to be connect to one (1) 115/34.5/13kV 67.5/89.6/112 MVA (ONAN/ONAF/ONAF) Interconnection Customer owned and maintained transformer at the Interconnection Customer owned substation. A ten (10) mile overhead 115kV transmission circuit will connect the Generating Facility from the Interconnection Customer owned substation to the Point of Interconnection (POI) at the existing Mid-Kansas Electric Company, LLC (MKEC) owned and maintained 115kV bus at the Crooked Creek Substation. The Interconnection Customer will be responsible for all of the transmission facilities connecting the Interconnection Customer owned substation to the Point of Interconnection (POI).

The Interconnection Customer will be responsible for any equipment located at the Customer substation necessary to maintain a power factor of 0.95 lagging to 0.95 leading at the POI. Also, the Interconnection Customer will need to coordinate with the Transmission Owner for relay, protection, control, and communication system configurations.

## Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s)

To facilitate interconnection, the interconnecting Transmission Owner, MKEC, will need verify relaying and perform a FAC-002 planning study for the acceptance of the Interconnection Customer's Interconnection Facilities. In addition, constraints identified in the DISIS-2015-001 Impact Study and DISIS-2015-001-1 Impact Restudy require the following Non-Shared Network Upgrade(s) and associated Engineering and Construction (E&C) lead times after a fully executed Generator Interconnection Agreement (GIA) for completion of Non-Shared Network Upgrade(s).

1. Cimarron River Tap – Kismet 115kV circuit #1 replace structures
    - Approximately eighteen (18) months E&C lead time
2. Crooked Creek – Cudahy 115kV circuit #1 rebuild and terminal equipment upgrades
    - Approximately thirty (30) months E&C lead time
3. Kismet - Cudahy 115kV circuit #1 replace structures and terminal equipment
    - Approximately eighteen (30) months E&C lead time
4. Greenburg – Shooting Star 115kV circuit #1 replace terminal equipment
    - Approximately eighteen (18) months E&C lead time

At this time, Interconnection Customer is responsible for $8,725,058 of MKEC Transmission Owner Interconnection Facilities (TOIF) and Non-Shared Network Upgrade(s). **Table 1** displays the estimated costs for TOIF and Non-Shared Network Upgrade(s).

**Table 1: Interconnection Customer TOIF and Non-Shared Network Upgrade(s)**

| TOIF and Non-Shared Network Upgrades Description | Allocated Cost ($) | Allocated Percent (%) | Total Cost ($) |
|---|---|---|---|
| **MKEC Interconnection Substation: Transmission Owner Interconnection Facilities** | $0 | 100% | $0 |
| **MKEC Interconnection Substation - Non-Shared Network Upgrades** | $0 | 100% | $0 |
| **MKEC FAC-002 Planning Study** | $85,000 | 100% | $85,000 |
| **MKEC Cimarron River Tap – Kismet 115kV circuit #1:** Replace six (6) H-frame structures for Cimarron River Tap – Kismet 115kV circuit #1 to achieve at least 156MVA | $202,543 | 100% | $202,543 |

| | | | |
|---|---|---|---|
| (emergency rating). | | | |
| **MKEC Crooked Creek - Kismet 115kV circuit #1:** rebuild thirteen and a half (13.5) mile from Crooked Creek – Kismet circuit #1. Replace motor operated switch outside of Cudahy Substation with a new 3-way line switch. | $7,790,300 | 100% | 7,790,300 |
| **MKEC Kismet - Cudahy 115kV circuit #1:** Replace seventeen (17) H-frame structures and line motor operated switch outside of Cudahy Substation for Cimarron River Tap – Kismet 115kV circuit #1 to achieve at least 158MVA (emergency rating). | $579,965 | 100% | $579,965 |
| **MKEC Greenburg – Shooting Star 115kV circuit #1:** Replace line motor operated switch at Greenburg for Greenburg – Shooting Star 115kV circuit #1 to achieve at least 125MVA (normal rating). | $67,250 | 1000% | $67,250 |
| | | | |
| Total | $8,725,058 | 100% | $8,725,058 |

## Shared Network Upgrade(s)

The Interconnection Request was studied in the DISIS-2015-001 Impact Study and DISIS-2015-001-1 Impact Restudy as an Energy Resource Interconnection Service (ERIS) only request. The Interconnection Request was provided updated Cost Allocation in DISIS-2015-001-2 Impact Restudy. At this time, the Interconnection Customer is allocated $0 for Shared Network Upgrades. If higher queued Interconnection Request(s) withdraw from the queue, suspend or terminate their GIA, restudies will have to be conducted to determine the Interconnection Customers' allocation of Shared Network Upgrades. All studies have been conducted on the basis of higher queued Interconnection Request(s) and the Network Upgrade(s) associated with those higher queued Interconnection Requests being placed in service. At this time, the Interconnection Customer is allocated the following cost listed in **Table 2** for Shared Network Upgrade.

**Table 2: Interconnection Customer Shared Network Upgrades**

| Shared Network Upgrades Description | Allocated Cost ($) | Allocated Percent (%) | Total Cost ($) |
|---|---|---|---|
| Currently not allocated Shared Network Upgrades | $0 | n/a | $0 |
| | | | |
| Total | $0 | n/a | $0 |

## 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.

1) Walkemeyer Tap – Walkemeyer 345/115kV Project – Per SPP-NTC-200343 and SPP-NTC-200344. This project currently has an anticipated in-service date of 6/1/2018.
2) Woodward EHV Phase Shifting Transformer circuit #1 assigned to DISIS-2011-001 Interconnection Customer(s).

Depending upon the status of higher or equally queued customers, the Interconnection Request's in-service date is at risk of being delayed or their Interconnection Service is at risk of being reduced until the in-service date of these Other Network Upgrades.

## Conclusion

Interconnection Service for the Interconnection Request will be delayed until the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades are constructed. The Interconnection Customer is responsible for $8,725,058 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. At this time, the Interconnection Customer is allocated $0 for Shared Network Upgrades. After all Interconnection Facilities and Non-Shared Network Upgrades have been placed into service, Interconnection Service uprate for 4.945 MW, as requested by the Interconnection Customer can be allowed.

At this time the total allocation of costs assigned to Interconnection Customer for Interconnection Service are estimated at $8,725,058.

# Appendices

# A: SUNC Transmission Owner Interconnection Facilities Study Report

See next page for SUNC Interconnection Facilities Study Report.

## 1. Introduction

<OMITTED TEXT> (Interconnection Customer) has requested an Interconnection Facilities Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnecting a for a 4.945 MW wind farm facility Interconnection Service uprate to GEN-2008-079 located in Gray County, Kansas to the transmission system of Mid-Kansas Electric Company, LLC (MKEC). The generator facility is currently proposed to uprate the GEN-2008-079 forty-three (43) 2.3 MW Siemens wind generators to forty-three (43) 2.415 MW Siemens wind generators with the additional wind turbine manufacturer "Power Boots" feature for a total generating nameplate of 103.845 MW.

## 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-2015-027/IFS-2015-001-11 is planned to interconnect at the MKEC owned 115kV bus located at Crooked Creek 115kV Substation. The Transmission Owner (T.O.) will need verify relaying and perform a FAC-002 planning study for the acceptance of the Interconnection Customer's Interconnection Facilities. In addition, constraints identified in the DISIS-2015-001 Impact Study and DISIS-2015-001-1 Impact Restudy require the following Non-Shared Network Upgrade(s) and associated Engineering and Construction (E&C) lead times after a fully executed Generator Interconnection Agreement (GIA) for completion of Non-Shared Network Upgrade(s).

1. Cimarron River Tap – Kismet 115kV circuit #1 replace structures
    - Approximately eighteen (18) months E&C lead time
2. Crooked Creek – Cudahy 115kV circuit #1 rebuild and terminal equipment upgrades
    - Approximately thirty (30) months E&C lead time
3. Kismet - Cudahy 115kV circuit #1 replace structures and terminal equipment
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    - Approximately eighteen (18) months E&C lead time

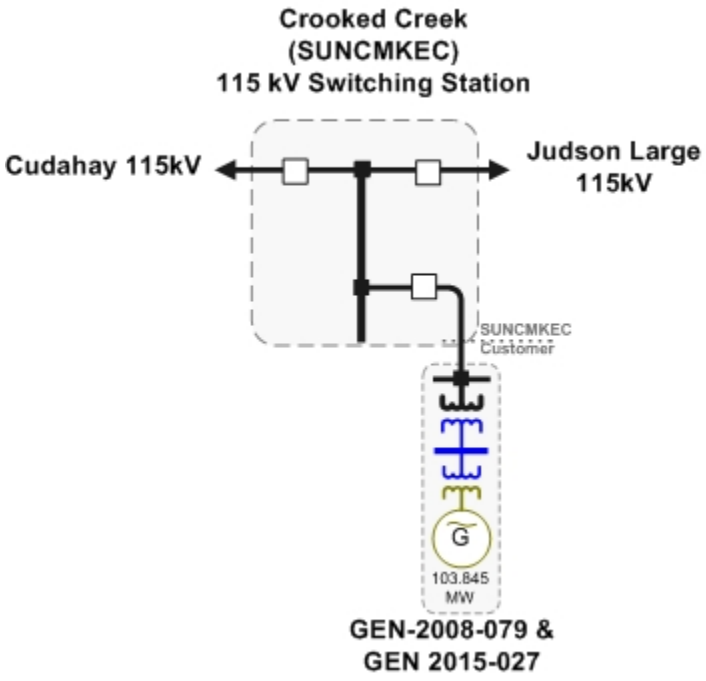
The one-line diagram is shown in **Figure 1**.

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

| Description | Estimated Cost |
|---|---|
| **FAC-002 Planning Study** | $85,000 |
| **MKEC FAC-002 Planning Study** | $85,000 |
| **MKEC Cimarron River Tap – Kismet 115kV circuit #1:** Replace six (6) H-frame structures for Cimarron River Tap – Kismet 115kV circuit #1 to achieve at least 156MVA (emergency rating). | $202,543 |
| **MKEC Crooked Creek - Kismet 115kV circuit #1:** rebuild new thirteen and a half (13.5) mile from Crooked Creek – Kismet circuit #1. Replace motor operated switch outside of Cudahy Substation with a new 3-way line switch. | $7,790,300 |

| | |
|---|---|
| **MKEC Kismet - Cudahy 115kV circuit #1:** Replace seventeen (17) H-frame structures and line motor operated switch outside of Cudahy Substation for Cimarron River Tap – Kismet 115kV circuit #1 to achieve at least 158MVA (emergency rating). | $579,965 |
| **MKEC Greenburg – Shooting Star 115kV circuit #1:** Replace line motor operated switch at Greenburg for Greenburg – Shooting Star 115kV circuit #1 to achieve at least 125MVA (normal rating). | $67,250 |
| **Total:** | **$8,725,058** |

**Figure 1: Interconnection Configuration for GEN-2015-027**




**2.1.** **Interconnection Customer Facilities** – The Interconnection Customer will be responsible for its Generating Facility and its one (1) 115/34.5/13kV 67.5/89.6/112 MVA (ONAN/ONAF/ONAF) 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 point of interconnection, 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 $8,725,058.