# INTERCONNECTION FACILITIES STUDY REPORT

GEN-2018-116

Published February 2025

By SPP Generator Interconnections Dept.

# REVISION HISTORY

| DATE OR VERSION NUMBER | AUTHOR | CHANGE DESCRIPTION |
|---|---|---|
| February 6, 2025 | SPP | Initial draft report issued. |
| | | |
| | | |

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# SUMMARY

## INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2018-116 is for a 150 MW generating facility located in Barton, KS. The Interconnection Request was studied in the DISIS-2018-002/DISIS-2019-001 Impact Study for ER/NR. The Interconnection Customer's requested in-service date is January 17, 2027.

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 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 one (1) Sungrow SG3150U-MV Inverter for a total generating nameplate capacity of 150 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;
- One 115/34.5 kV 108/144 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An Approximately 0.04 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 ("Frey Street 115kV bus") 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 Frey Street 115kV GEN-2018-116 Interconnection (TOIF) (SUNC) (UID 156706): Facilitate the interconnection of GEN-2018-116 Estimated Lead Time: 36 Months | $1,808,025 | 100.00% | $1,808,025 |
| **Total** | **$1,808,025** | | **$1,808,025** |

*Table 2: Non-Shared Network Upgrade(s)*

| Non-Shared Network Upgrades Description | ILTCR | Total Cost Estimate ($) | Allocated Percent (%) | Allocated Cost Estimate ($) |
|---|---|---|---|---|
| NA | | | | |
| **Total** | | **$0** | | **$0** |

## 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 ($) | Allocated Percent (%) | Allocated Cost Estimate ($) |
|---|---|---|---|---|
| Transmission Owner's Frey Street 115kV Interconnection Expansion (DISIS-2018-002 - DISIS-2019-001) (UID 156707): Facilitate the interconnection of GEN-2018-116 Estimated Lead Time: 36 Months | Ineligible | $22,876,491 | 78.95% | $18,060,388 |
| Transmission Owner's Great Bend Frey Street to 2ND -KS 115 kV Rebuild (UID 170502): Rebuild the existing 24-FREY3 to 2ND-KS 3 115 kV line 1 (1.82 miles) to a standard rating of 185 MVA. Estimated Lead Time: 36 Months | Eligible | $1,528,342 | 78.95% | $1,206,586 |
| Transmission Owner's Great Bend Frey Street to Great Bend Northwest 115 kV Rebuild (UID 17501): Rebuild the existing 24-FREY3 to N-GBEND3 115 kV line 1 (5.1 miles) to a standard rating of 185 MVA. Estimated Lead Time: 36 Months | Eligible | $4,282,715 | 78.95% | $3,381,091 |
| Transmission Owner's Great Bend Tap to 2nd-KS 115 kV Rebuild (UID 170503): Rebuild the existing 24-FREY3 to N-GBEND3 115 kV line 1 (5.1 miles) to a standard rating of 185 MVA. Estimated Lead Time: 36 Months | Eligible | $2,435,269 | 78.95% | $1,922,581 |
| Transmission Owner's Great Bend Tap to Seward 115 kV Terminal Equipment Upgrade (UID 170500): Rebuild the existing GBENDTP3 to SEWARD 3 115 kV line 1 (13.1 miles) to a standard rating of 109 MVA. Estimated Lead Time: 36 Months | Eligible | $240,000 | 60.06% | $144,138 |
| Transmission Owner's Great Bend to Great Bend Northwest 115 kV Rebuild (UID 170504): Rebuild the existing GBENDTP3 to SEWARD 3 115 kV line 1 | Eligible | $3,006,298 | 79% | $2,373,393 |

| | | | | |
|---|---|---|---|---|
| (13.1 miles) to a standard rating of 109 MVA. Estimated Lead Time: 36 Months | | | | |
| **Total** | | **$34,369,115** | | **$27,088,177** |

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 |
|---|---|---|
| Transmission Owner's ELLSWTP3 to GRTBEND3 115kV Line 1 Terminal Upgrade(157186): Rebuild the existing ELLSWTP3 to GRTBEND3 115 kV line 1 (30.21 miles) to a standard rating of 105 MVA | **$0** | 36 Months |

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 ($) | Allocated Percent (%) | Allocated Cost Estimate ($) |
|---|---|---|---|
| NA | | | |
| **Total** | **$0** | | **$0** |

## CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 150 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) | $1,808,025 |
| Non-Shared Network Upgrade(s) | $0 |
| Shared Network Upgrade(s) | $27,088,177 |
| Affected System Upgrade(s) | $0 |
| **Total** | **$28,896,202** |

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).

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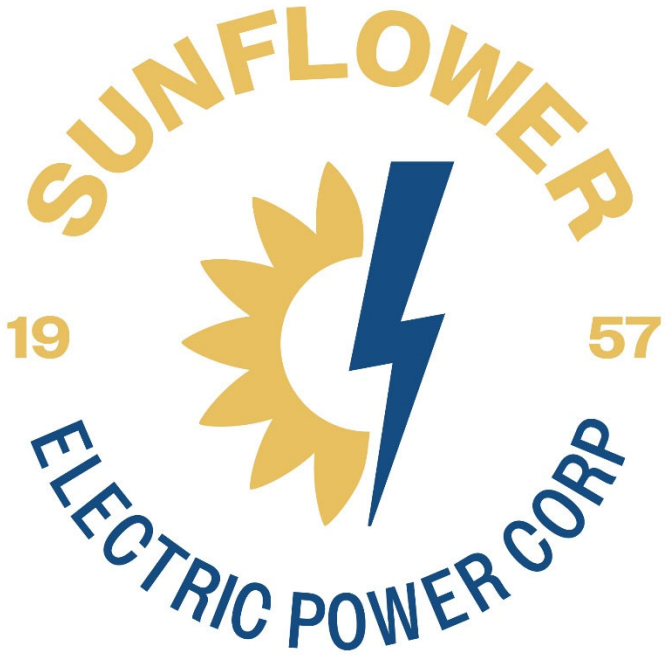
# Interconnection Facilities Study
# for GEN-2018-116 & GEN-2019-051 Network Upgrades and TOIF upgrades at the 24th & Frey 115 kV Substation

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## STUDY OVERVIEW:

The Southwest Power Pool has requested a Facility Study for Interconnection Facilities and Network Upgrades from Sunflower Electric Power Corporation (Sunflower) at the 24th & Frey 115 kV Substation for request GEN-2018-116 and GEN-2019-051. The GEN-2018-116 and GEN-2019-051 request consists of a total of 150 MW of solar and 40 MW battery storage generation interconnecting at the 24th & Frey 115 kV bus.

The Non-Shared Network Upgrades (NU) identified to accept a new generator lead include terminal equipment to accept a new line into the existing Sunflower 115 kV bus. The significant interconnection cost associated with GEN-2018-116 and GEN-2019-051 relates to the fact that the POI is being requested on a normally open 115 kV loop around the city of Great Bend, KS. This solar and battery project will cause a three-terminal line. To alleviate this situation there will be an interconnect substation and a network upgrade of a ring-bus substation. The normally open city loop would go to a normally closed city loop and is then expected to be BES. The addition of the new ring-bus substation will also include costs of a double circuit 115 kV transmission line (0.9 miles) from the new substation to the existing Great Bend River Tap and removal of Great Bend River Tap. The cost for these Network Upgrades is estimated at $22,876,491.

The Transmission Owner Interconnection Facility (TOIF) addition identified is a new 115 kV generator lead connection into the existing 115 kV Substation. The cost for adding the new 115 kV generator lead is estimated at $3,616,050.

The purpose of this study is to provide estimated costs of facilities required for interconnection of the proposed generation to Sunflower's transmission system and to identify scope and estimated costs for network upgrades required on Sunflower's transmission system to allow the generation to run at the full requested capacity.

Additional network upgrades required for facilities of other transmission owners are not included in this study and will be identified by SPP.

## INTERCONNECTION FACILITIES AND NON-SHARED NETWORK UPGRADES:

Non-shared Network Upgrades (NU) additions required by Sunflower consist of the addition of a 115 kV line terminal with circuit breakers, PTs, disconnect switches, structures, foundations, conductors, insulators, an addition of a new 115 kV Substation (ring bus configuration), and all other associated work and materials.

Transmission Owner Interconnection Facility (TOIF) additions required by Sunflower consist of the addition of (1) circuit breaker, revenue metering CTs and PTs, disconnect switch, protective relays, and terminal equipment needed to interconnect the customer's generator lead line to Sunflower's 24th & Frey 115 kV substation.

This 115 kV addition at 24th & Frey and the new 115 kV Substation shall be constructed and maintained by Sunflower. It is assumed that obtaining all necessary right-of-way for the line into the Sunflower 115 kV substation facilities will be performed by the interconnection customer. The addition of the generator 115 kV lead line from the

customer substation into the existing Sunflower 24th & Frey substation and the step-up transformer that connects to the customer's collector substation is not included and is the responsibility of the interconnection customer.

The proposed arrangement for interconnection of GEN-2018-116 and GEN-2019-051 is shown in Figure 1, Figure 2, & Figure 3.

**Figure 1: One-line Diagram Facilities for GEN-2018-116 & GEN-2019-051**

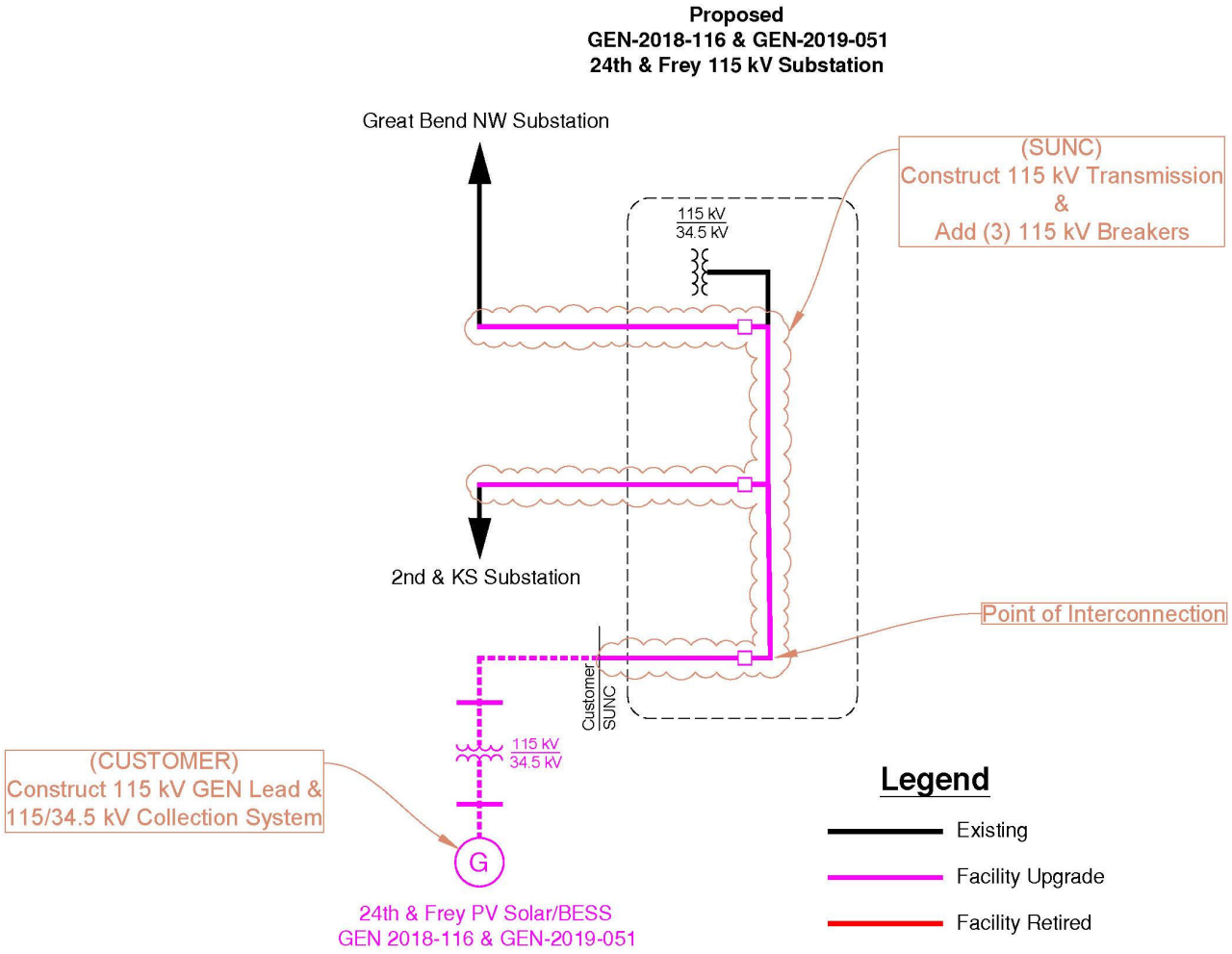


**Figure 2: One-line Diagram Facilities for New 115 kV Substation and new double circuit 115 kV Transmission Line**

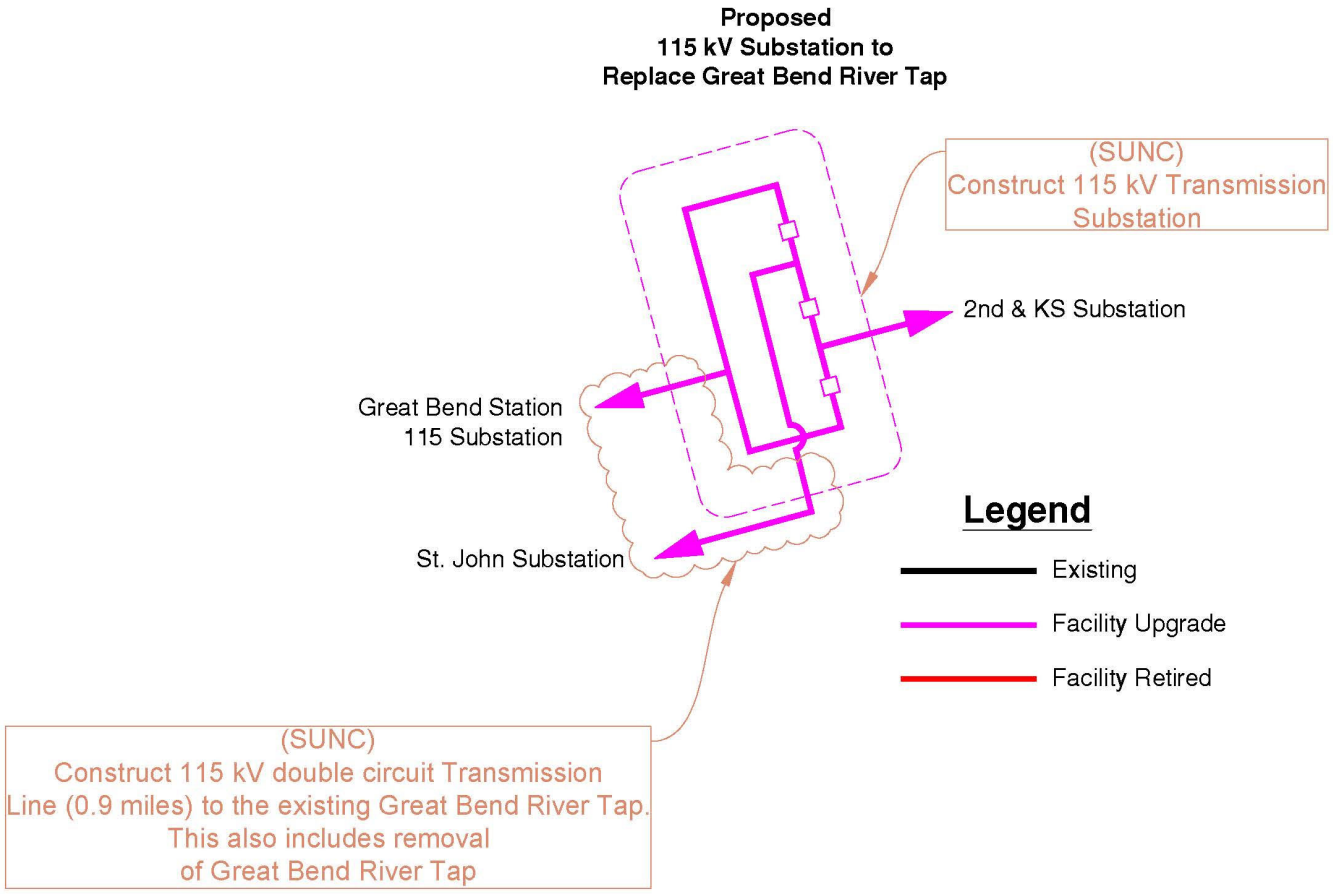
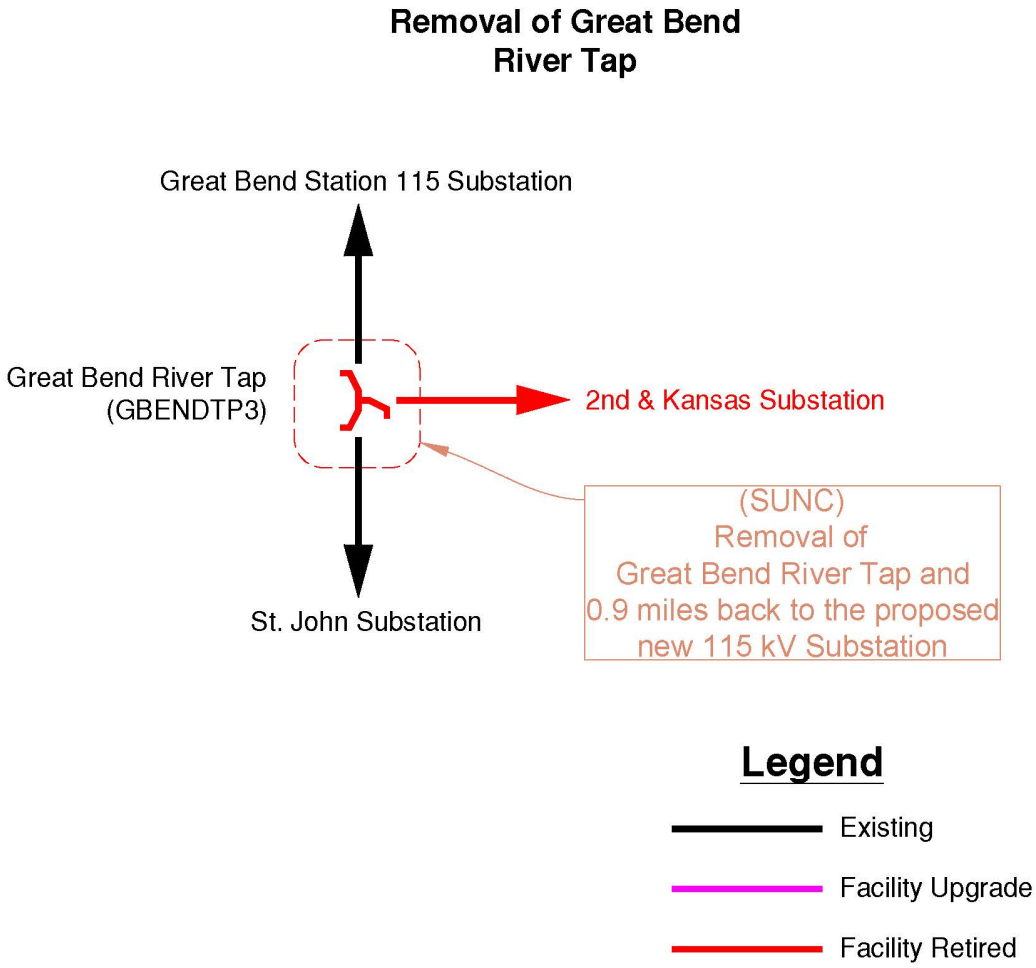


**Figure 2: One-line Diagram Facilities for the removal of Great Bend River Tap**



## INTERCONNECTION COSTS:

Summary of interconnection costs for both Interconnection Facilities and Sunflower identified Network Upgrades can be found in the following table.

| Facilities | Estimated Cost (2025 Dollars) |
|---|---|
| **Transmission Owner Interconnection Facilities (TOIF)**<br>Construct one (1) line terminal addition in the existing 24th & Frey 115 kV substation with (1) circuit breaker, revenue metering CTs and PTs, disconnect switch, protective relays, and terminal equipment needed to interconnect the customer's generator lead line. | $3,616,050 |
| **Non-shared Network Upgrades**<br>Construct the addition of a single 115 kV line terminal, two (2) 115 kV circuit breakers, PTs, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials in the existing Sunflower 24th & Frey 115 kV substation. This also includes an addition of a new 115 kV Substation (ring bus configuration), 0.9 miles of double circuit 115 kV T-line build, and the removal of Great Bend River Tap. | $22,876,491 |
| **Total Interconnection Cost:** | $26,492,541 |

## PROJECT TIMELINE:

Specific construction schedule and milestones will be determined during the Generator Interconnection Agreement negotiations. Sunflower is estimating an engineering and construction schedule for this project as approximately 36 months. Other factors associated with clearances, equipment procurement delays and work schedules could cause additional delays. This is applicable after all required agreements are signed and internal approvals are granted.

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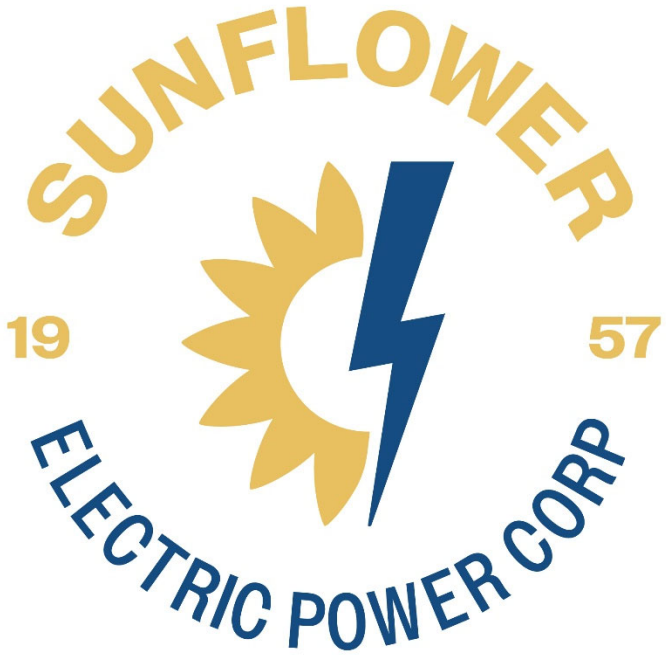
# Interconnection Facilities Study
# for DISIS-2018-002/2019-001 Network Upgrades:
# Great Bend City 115 kV Transmission Line Upgrades

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## STUDY OVERVIEW:

The Southwest Power Pool has requested a Facility Study for Network Upgrades from Sunflower Electric Power Corporation (Sunflower). The following Network Upgrades have been identified:

- Great Bend Station to Great Bend Northwest 115 kV Rebuild
- Great Bend Northwest to 24th & Frey 115 kV Rebuild
- 24th & Frey to 2nd & KS 115 kV Rebuild
- 2nd & KS to Great Bend River Tap 115 kV Rebuild

The cost of Sunflower's portion of rebuilding the Great Bend city is estimated at $11,252,624:

- Great Bend Station to Great Bend Northwest 115 kV Rebuild
  - $3,006,298
- Great Bend Northwest to 24th & Frey 115 kV Rebuild
  - $4,282,715
- 24th & Frey to 2nd & KS 115 kV Rebuild
  - $1,528,342
- 2nd & KS to Great Bend River Tap 115 kV Rebuild
  - $2,435,269

SPP's DISIS-2018-002/2019-001 identified Network Upgrades included with this Facilities Study are associated with GEN-2018-116 & GEN-2019-051.

The purpose of this study is to provide estimated costs of facilities required for interconnection of the proposed generation to Sunflower's transmission system and to identify scope and estimated costs for network upgrades required on Sunflower's transmission system to allow the generation to run at the full requested capacity.

Additional network upgrades required for facilities of other transmission owners are not included in this study and will be identified by SPP.

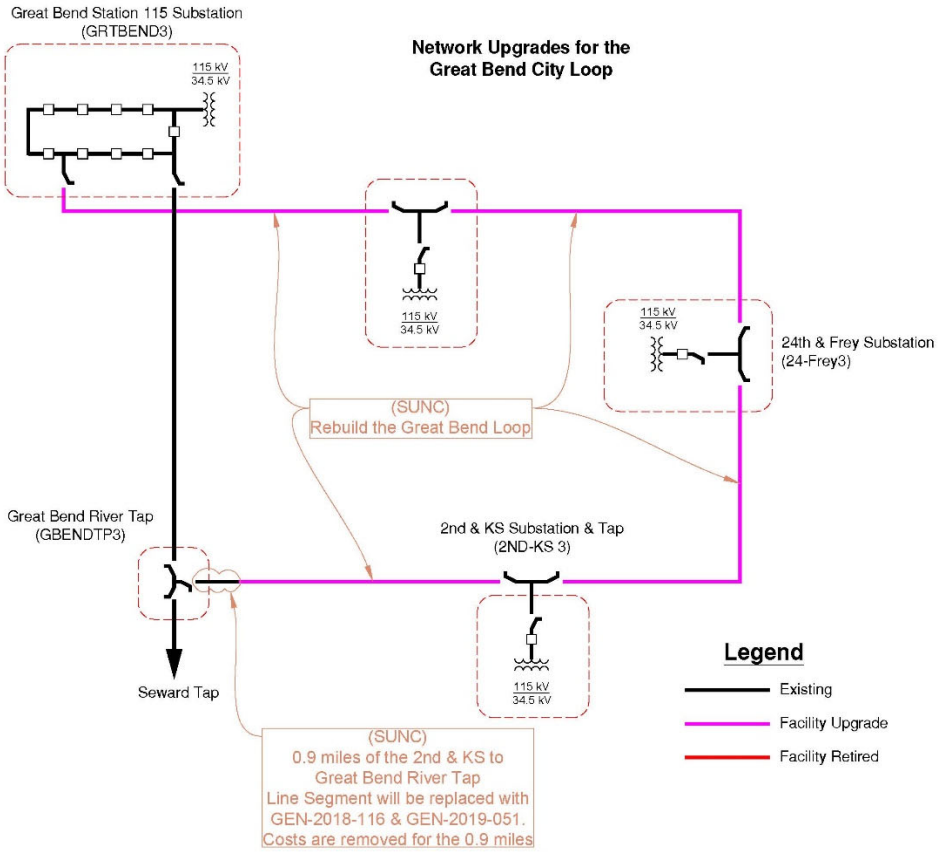
## INTERCONNECTION FACILITIES AND NON-SHARED NETWORK UPGRADES:

There are no Transmission Owner Interconnection Facility (TOIF) upgrades or additions required by Sunflower currently identified.

Network Upgrades included in this study consist of rebuilding the Great Bend city to achieve the minimum MVA required by SPP. The rebuilding of the Great Bend city shall be constructed and maintained by Sunflower.

The proposed arrangement for upgrades for GEN-2018-002/2019-001 is shown in Figure 1.

**Figure 1: One-line Diagram Facilities for DISIS-2018-002/2019-001**



## INTERCONNECTION COSTS:

Summary of interconnection costs for both Interconnection Facilities and Sunflower identified Network Upgrades can be found in the following table.

| Facilities | Estimated Cost (2025 Dollars) |
|---|---|
| **Transmission Owner Interconnection Facilities (TOIF)**<br>N/A | $0 |
| **Non-shared Network Upgrades**<br>Rebuild the Great Bend city to achieve the minimum MVA required. | $11,252,624 |
| **Total Interconnection Cost:** | $11,252,624 |

## PROJECT TIMELINE:

Specific construction schedule and milestones will be determined during the Generator Interconnection Agreement negotiations. Sunflower is estimating an engineering and construction schedule for this project as approximately 36 months. Other factors associated with clearances, equipment procurement delays and work schedules could cause additional delays. This is applicable after all required agreements are signed and internal approvals are granted.

# Interconnection Facilities Study for DISIS-2018-002/2019-001 Network Upgrade: Great Bend River Tap to Seward 115 kV Transmission Line Upgrade

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## STUDY OVERVIEW:

The Southwest Power Pool has requested a Facility Study for a Network Upgrade from Sunflower Electric Power Corporation (Sunflower). The Network Upgrade identified includes structure replacements on the Great Bend River Tap to Seward 115 kV Transmission Line.

The cost of Sunflower's portion of replacing structures on the Great Bend River Tap to Seward 115 kV Transmission Line is estimated at $240,000.

SPP's DISIS-2018-002/2019-001 identified Network Upgrades included with this Facilities Study are associated with the following GEN's:

- GEN-2018-116
  - $60,000
- GEN-2019-051
  - $60,000
- GEN-2019-054
  - $60,000
- GEN-2019-068
  - $60,000

The purpose of this study is to provide estimated costs of facilities required for interconnection of the proposed generation to Sunflower's transmission system and to identify scope and estimated costs for network upgrades required on Sunflower's transmission system to allow the generation to run at the full requested capacity.

Additional network upgrades required for facilities of other transmission owners are not included in this study and will be identified by SPP.

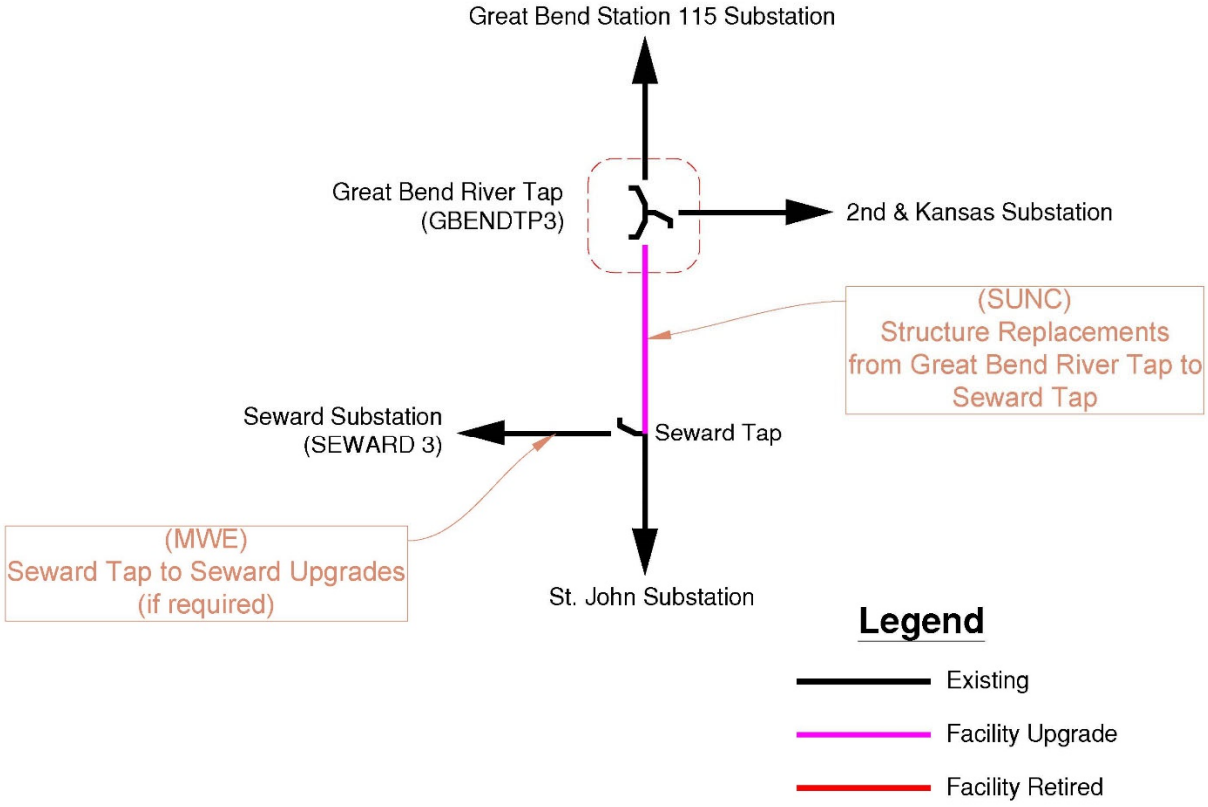
## INTERCONNECTION FACILITIES AND NON-SHARED NETWORK UPGRADES:

There are no Transmission Owner Interconnection Facility (TOIF) upgrades or additions required by Sunflower currently identified.

Network Upgrades included in this study consist of replacing structures on the Great Bend River Tap to Seward 115 kV Transmission Line to achieve the minimum MVA required by SPP. The structure replacements on Sunflower's portion of the Great Bend River Tap to Seward 115 kV Transmission Line shall be constructed and maintained by Sunflower.

The proposed arrangement for upgrades for GEN-2018-002/2019-001 is shown in Figure 1.

**Figure 1: One-line Diagram Facilities for DISIS-2018-002/2019-001**



## INTERCONNECTION COSTS:

Summary of interconnection costs for both Interconnection Facilities and Sunflower identified Network Upgrades can be found in the following table.

| Facilities | Estimated Cost (2025 Dollars) |
|---|---|
| **Transmission Owner Interconnection Facilities (TOIF)**<br>N/A | $0 |
| **Non-shared Network Upgrades**<br>Replace structures on the Great Bend River Tap to Seward 115 kV Transmission Line to achieve the minimum MVA required for GEN-2018-116. | $60,000 |
| **Non-shared Network Upgrades**<br>Replace structures on the Great Bend River Tap to Seward 115 kV Transmission Line to achieve the minimum MVA required for GEN-2019-051. | $60,000 |
| **Non-shared Network Upgrades**<br>Replace structures on the Great Bend River Tap to Seward 115 kV Transmission Line to achieve the minimum MVA required for GEN-2019-054. | $60,000 |
| **Non-shared Network Upgrades**<br>Replace structures on the Great Bend River Tap to Seward 115 kV Transmission Line to achieve the minimum MVA required for GEN-2019-068. | $60,000 |
| **Total Interconnection Cost:** | $240,000 |

## PROJECT TIMELINE:

Specific construction schedule and milestones will be determined during the Generator Interconnection Agreement negotiations. Sunflower is estimating an engineering and construction schedule for this project as approximately 36 months. Other factors associated with clearances, equipment procurement delays and work schedules could cause additional delays. This is applicable after all required agreements are signed and internal approvals are granted.