# INTERCONNECTION FACILITIES STUDY REPORT

GEN-2021-047

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By SPP Generator Interconnections Dept.

# REVISION HISTORY

| DATE OR VERSION NUMBER | AUTHOR | CHANGE DESCRIPTION |
|---|---|---|
| August 19, 2025 | SPP | Initial draft report issued. |
| September 11, 2025 | SPP | Final report issued. |
| | | |

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# SUMMARY

## INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2021-047 is for a 200 MW generating facility located in Mayes, OK. The Interconnection Request was studied in the DISIS-2021-001 Impact Study for ERIS. The Interconnection Customer's requested in-service date is 9/30/2029.

The interconnecting Transmission Owner, Grand River Dam Authority (GRDA), 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 seventy-two (72) 3.533 MW SMA Sunny Central 4200UP-US inverters for a total generating nameplate capacity of 250 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;
- Two 345 kV/34.5 kV 110/146.5/183 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An Approximately 0.5 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 Transmission Owner substation ("Tulsa (Bus #509852) - Igloo (Bus #513596) 345kV line") 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 Tulsa (Bus #509852) - Igloo (Bus #513596) 345kV line GEN-2021-047 Interconnection (TOIF) (UID 157140): Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2021-047 (250/Solar), into the Point of Interconnection (POI) at Tulsa (Bus #509852) - Igloo (Bus #513596) 345kV line. Estimated Lead Time: 36 Months | $2,930,400 | 100.00% | $2,930,400 |
| **Total** | **$2,930,400** | | **$2,930,400** |

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

| Non-Shared Network Upgrades Description | ILTCR | Total Cost Estimate ($) | Allocated Percent (%) | Allocated Cost Estimate ($) |
|---|---|---|---|---|
| Transmission Owner's Tulsa (Bus #509852) - Igloo (Bus #513596) 345kV line GEN-2021-047 Interconnection (Non-shared NU) (UID 157141): Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2021-047 (250/Solar), into the Point of Interconnection (POI) at Tulsa (Bus #509852) - Igloo (Bus #513596) 345kV line. Estimated Lead Time: 36 Months | Ineligible | $12,596,750 | 100.00% | $12,596,750 |
| **Total** | | **$12,596,750** | | **$12,596,750** |

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

## CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 250 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) | $2,930,400 |
| Non-Shared Network Upgrade(s) | $12,596,750 |
| Shared Network Upgrade(s) | $0 |
| Affected System Upgrade(s) | $0 |
| **Total** | **$15,527,150** |

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).

GRDA

# Generation Interconnection Facilities Study Report for GEN-2021-047 Grand Mayes PV Project

T&D Engineering Department| Transmission Planning
8-6-2024
(Issued)

# 1. Facilities Study Summary

Grand River Dam Authority (GRDA) Transmission Planning performed the following study at the request of the Southwest Power Pool (SPP) for SPP Generation Interconnection request DISIS-2021-001 study results for GEN-2021-047. Per the SPP Generator Interconnection Procedures (GIP), SPP requested that GRDA perform an Interconnection Facilities Studies (IFS) for Network Upgrade(s) in accordance with Section 8.11 for the following Interconnection and/or Network Upgrade(s):

## 1.1. Project Description

GEN-2021-047 proposes adding a 250.0 MW solar generation facility (Grand Mayes PV Project) at the 345 kV Tulsa North to Igloo Valley transmission line POI (see Figure 1), located in Mayes County, OK (36.117764, -95.346146), 10.85 miles southwest of GRDA's 345 kV Igloo Valley substation (see Figure 2).

## 1.2. GRDA's Scope of Work to Facilitate Interconnection

- Transmission owner interconnection facility additions required by GRDA consist of a new 345kV station including tie-line metering CTs and PTs, circuit breakers, disconnect switches, protective relays, structures, foundations, conductors, insulators, and all other associated work and materials or terminal equipment needed to interconnect the customer's gen tie line into GRDA's new POI.
- GRDA reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.
- It is understood that the Interconnection Customer is responsible for all the connection costs associated with interconnecting GEN-2021-047 to the GRDA transmission system.

## 1.3. Short Circuit Evaluation

- It is standard practice for GRDA to recommend replacing a circuit breaker when the current through the breaker for a fault exceeds 100% of its nameplate interrupting rating with recloser de-rating applied, as determined by the ANSI/IEEE C37.5-1979, C37.010-1979 & C37.04-1979 breaker rating methods.
- In the GRDA system, no breakers were found to exceed their interrupting capability after the addition of the generation and related facilities. Therefore, there are no additional short circuit upgrade costs associated with the DISIS-2021-001, GEN-2021-047 interconnection.

## 1.4. Stability Evaluation

- Based on the results of the DISIS-2021-001 short circuit and stability report, GRDA is not aware of any instances where the system does not meet TPL-001

stability performance requirements for the planning events and generation dispatch conditions that were considered in this DISIS study.

## 1.5. Interconnection Cost of Facilities Included in the Facilities Study

**Table 1**

| Description | Cost (USD) |
|---|---|
| **Non-Shared Network Upgrades:**<br>Construct one (1) new 345 kV switchyard on the Tulsa North – Igloo Valley 345 kV transmission line (10.85 miles southwest of Igloo Valley) that will consist of a three (3) breaker ring bus, three (3) 345 kV power circuit breakers, ten (10) 345 kV disconnect switches, concrete foundations, instrument transformers, associated control and protection equipment, high voltage bus work, three (3) line take-off structures, conductor, overhead optical ground wire, communications/SCADA equipment, and a control building. | $12,596,750.00 |
| **Interconnection Facilities (GRDA):**<br>Construct one (1) new 345 kV line terminal, line switches, dead-end structure, concrete foundations, line relaying, communications/SCADA equipment, tie-line metering, line arrestor, and all associated equipment and below or above ground facilities necessary to accept transmission line from interconnection customer's generation facility. | $2,930,400.00 |
| **Network Upgrades** | $0.00 |
| **Total** | **$15,527,150.00** |

## 1.6. Project Lead Time

- Specific construction schedule and milestones will be determined during the Generator Interconnection Agreement negotiations.
- GRDA is estimating an engineering and construction schedule for this project as approximately 36 months after the issuance of authorization from the interconnection customer.

- Other factors associated with clearances; equipment procurement delays and work schedules could cause additional delays.
- This is applicable after all required agreements have been signed and internal approvals are granted.

## 2. Appendices

**Figure 1: Point of Interconnection (POI INFORMATION) One-Line Diagram**

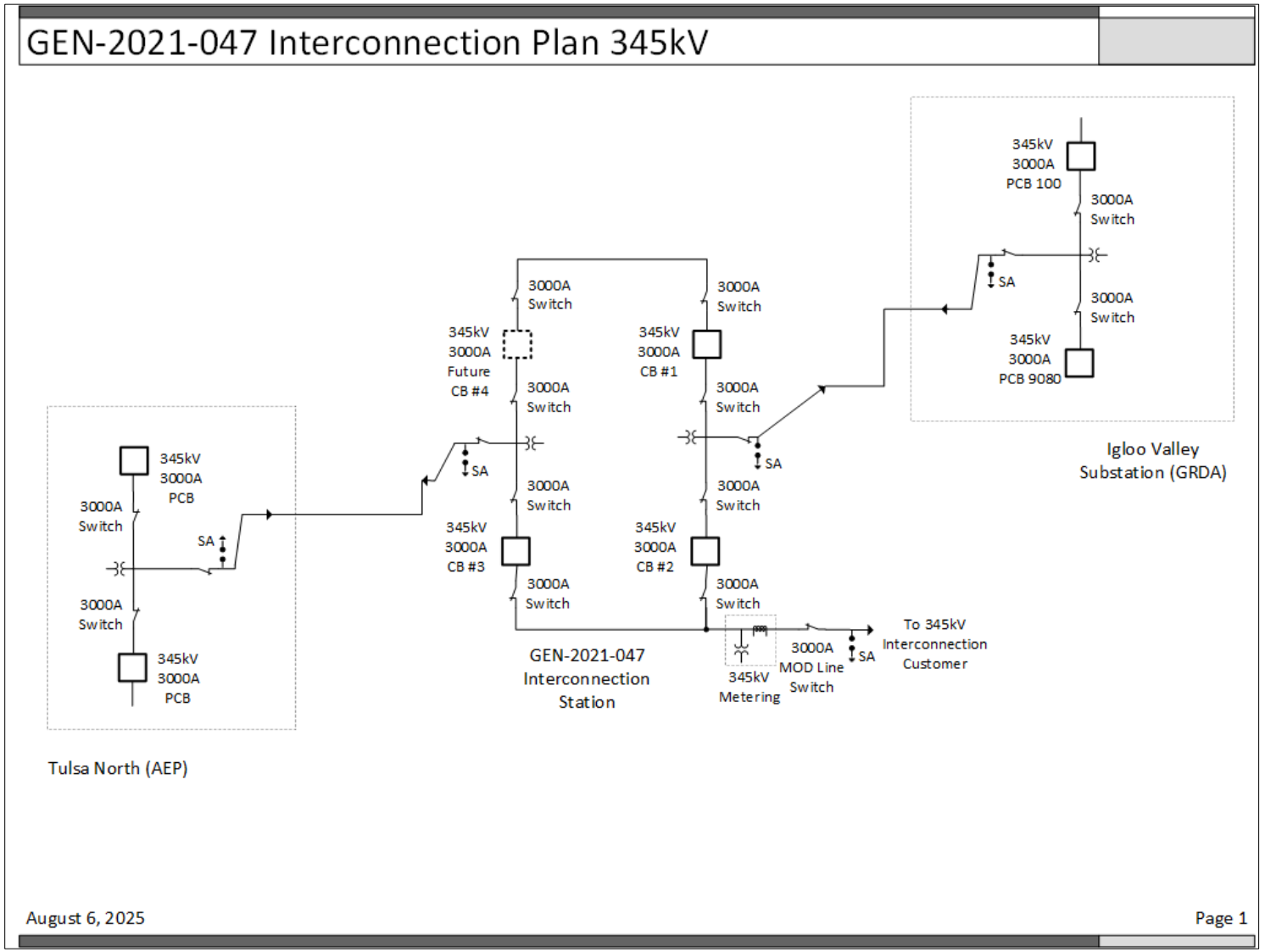

**Figure 2: Point of Interconnection Map**