INTERCONNECTION FACILITIES STUDY REPORT

GEN-2020-079

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
May 20, 2025	SPP	Initial draft report issued.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2020-079 is for a 225 MW generating facility located in Cherokee , KS. The Interconnection Request was studied in the DISIS-2020-001 Impact Study for NRIS. The Interconnection Customer's requested in-service date is 12/31/2025.

The interconnecting Transmission Owner, The Empire District Electric Company (EDE), 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 fifty-eight (58 Power Electronics PE HEM FS4200M solar inverters and seventy-one (71) Power Electronics PE PCSM FP4200M storage inverters for a total generating nameplate capacity of 225 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 161 kV transformation substation with associated 34.5 kV and 161 kV switchgear;
- Two 161 kV/34.5 kV 75/100/125 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An Approximately 1.8 mile overhead 161 kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 161 kV bus at existing Transmission Owner substation ("Riverton-Neosho 161kV 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 Riverton-Neosho 161kV line GEN-2020-079 Interconnection (TOIF) (UID156952): Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2020-079 (225/Hybrid), into the Point of Interconnection (POI) at Riverton-Neosho 161kV line. Estimated Lead Time: 36 Months	$2,612,528	100.00%	$2,612,528
Total	**$2,612,528**		**$2,612,528**

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
Transmission Owner's Riverton-Neosho 161kV line GEN-2020-079 Interconnection (UID156951): Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2020-079 (225/Hybrid), into the Point of Interconnection (POI) at Riverton-Neosho 161kV line. Estimated Lead Time: 36 Months	Ineligible	$13,354,013	100.00%	$13,354,013
Total		**$13,354,013**		**$13,354,013**

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	**$0**	

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 225 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)	$2,612,528
Non-Shared Network Upgrade(s)	$13,354,013
Shared Network Upgrade(s)	$0
Affected System Upgrade(s)	$0
Total	**$15,966,541**

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).

GENERATION INTERCONNECTION FACILITIES STUDY

FOR

GENERATION INTERCONNECTION REQUEST GEN-2020-079 RAINBOW SPRINGS SOLAR AND BESS PROJECT CHEROKEE COUNTY, KS

4/23/2025

INTRODUCTION

At the request of Southwest Power Pool (SPP), The Empire District Electric Company (d/b/a Liberty) has compiled the following Facility Study for SPP Generation Interconnection request GEN-2020-079, Rainbow Springs Solar and BESS.

PROJECT DESCRIPTION

GEN-2020-079 proposes to install a 225 MW solar generation and BESS facility in Cherokee County, Kansas, and connect to a nearby Liberty-owned 161kV transmission line via a 1.8 mile generation tie-line.

LIBERTY'S SCOPE OF WORK

For interconnection of the proposed generation and storage facility, Liberty requires the construction of a new three-terminal ring bus substation at the proposed intersection point with Liberty's 161kV transmission line, shown in Figure 1 as proposed Point of Interconnection (POI) location. This new substation shall be constructed and maintained by Liberty, including any re-routing of Liberty's existing 161kV transmission line. Additional minor protection system work is also required at the remote ends of the transmission line.

It is assumed that procurement of land for the new substation and obtaining all necessary right-of-way for the 161kV transmission lines into the new substation will be performed by the Interconnection Customer, all of which is not included in the cost estimate. Ownership and/or land rights are expected to be transferred to Liberty before construction is to commence. Furthermore, it is understood that the Interconnection Customer is responsible for all the connection costs associated with interconnecting GEN-2020-079 to Liberty's transmission system, as provided below in Table 1, and is also responsible for constructing and maintaining the 161kV generation tie-line from the Interconnection Customer's collector substation up to the Point of Change of Ownership (PCO), as indicated in the preliminary one-line in Figure 2.

Liberty reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

SHORT CIRCUIT EVALUATION

It is standard practice for Liberty to replace a circuit breaker when the anticipated fault current through the breaker exceeds 100% of its nameplate interrupting rating with recloser de-rating applied.

After reviewing SPP's final DISIS-2020-001-1 Restudy results posted on March 14, 2025, no circuit breakers in the Liberty system were found to exceed their interrupting capability after the addition of the above proposed generation facilities.

STABILITY EVALUATION

After reviewing SPP's final DISIS-2020-001-1 Restudy results posted on March 14, 2025, Liberty did not identify any instances where the system fails to meet TPL-001 stability performance requirements for the planning events and generation dispatch conditions that were considered in this DISIS study.

INTERCONNECTION ESTIMATED COSTS AND LEAD-TIMES

Total Cost & Lead-time	
Non-Shared Network Upgrades (NU)	$13,354,013
Transmission Owner Interconnection Facilities (TOIF)	$2,612,528
Total	**$15,966,541**
Lead time	36 Months

Table 1 – Cost Estimate

Figure 1 – Proposed POI location

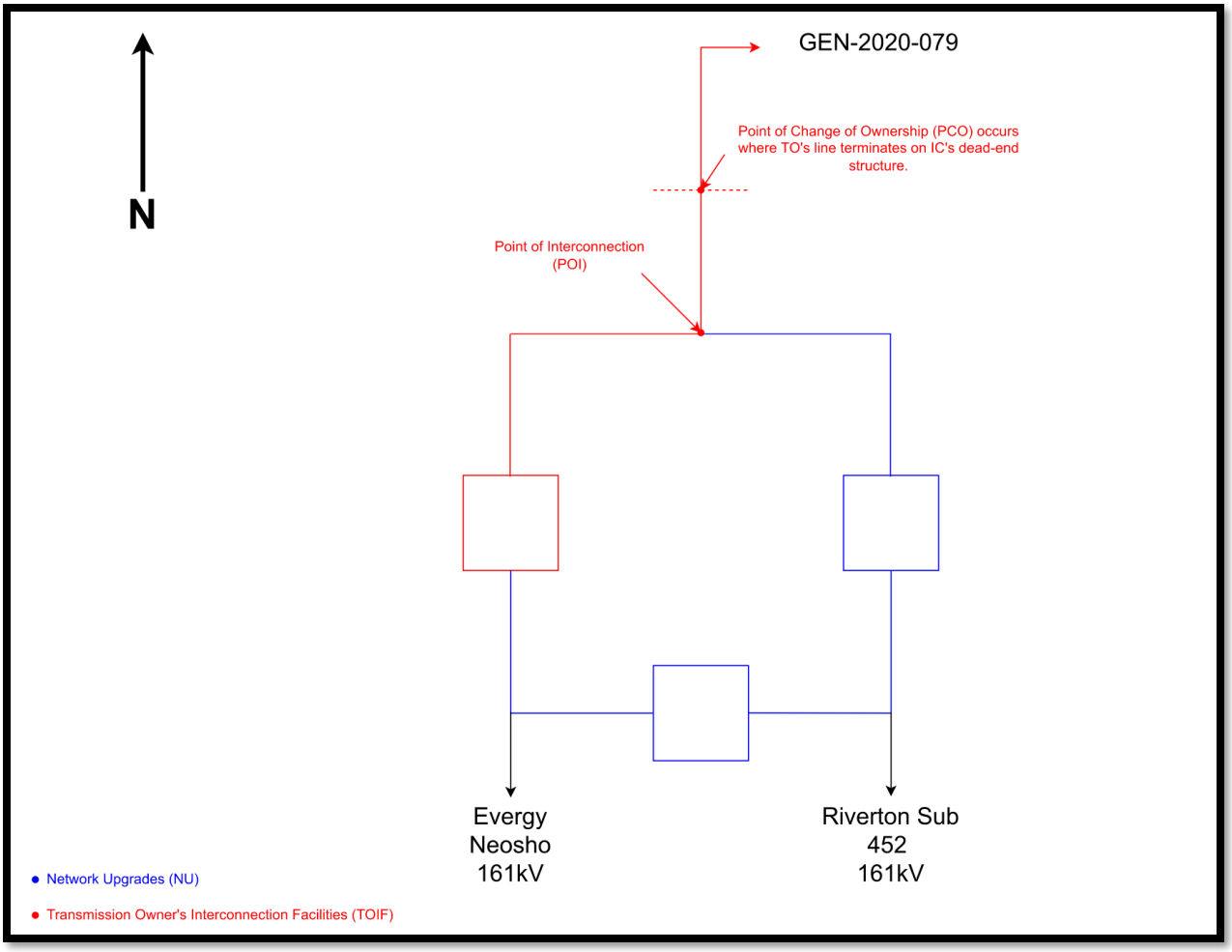

Figure 2 – Preliminary One-Line