



**INTERCONNECTION  
FACILITIES STUDY  
REPORT**

GEN-2019-035

Published February 2025

By SPP Generator Interconnections Dept.

## REVISION HISTORY

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<b>DATE OR VERSION NUMBER</b>	<b>AUTHOR</b>	<b>CHANGE DESCRIPTION</b>
February 5, 2025	SPP	Initial draft report issued.

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# SUMMARY

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## INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2019-035 is for a 80 MW generating facility located in Barry, MO. 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 February 3, 2027.

The interconnecting Transmission Owner, Empire District Energy 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 twenty-five (25) Power Electronics HEM FS3350M Inverters for a total generating nameplate capacity of 80 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;
- One 161/34.5 kV 55/73/91 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An Approximately 0.038 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 ("Reeds Spring-Aurora 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)*

<b>Transmission Owner Interconnection Facilities (TOIF)</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Allocated Cost Estimate (\$)</b>
<u>Transmission Owner's Reeds Spring-Aurora 161kV GEN-2019-035 Interconnection (TOIF) (EDE) (UID 156773): Facilitate the interconnection of GEN-2019-035 Estimated Lead Time: 36 Months</u>	\$2,273,572	100.00%	\$2,273,572
<b>Total</b>	<b>\$2,273,572</b>		<b>\$2,273,572</b>

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

<b>Non-Shared Network Upgrades Description</b>	<b>ILTCR</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Allocated Cost Estimate (\$)</b>
<u>Transmission Owner's Reeds Spring-Aurora 161kV GEN-2019-035 Interconnection (Non-shared NU) (EDE) (UID 156774): Facilitate the interconnection of GEN-2019-035 Estimated Lead Time: 36 Months</u>	Ineligible	\$8,421,776	100%	\$8,421,776
<b>Total</b>		<b>\$8,421,776</b>		<b>\$8,421,776</b>

**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 (\$)
<u>NA</u>				
<b>Total</b>		<b>\$0</b>		<b>\$0</b>

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)*

<b>Contingent Network Upgrade(s) Description</b>	<b>Current Cost Assignment</b>	<b>Estimated In-Service Date</b>
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)*

<b>Affected System Upgrades Description</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Allocated Cost Estimate (\$)</b>
NA			
<b>Total</b>	<b>\$0</b>		<b>\$0</b>

## CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 80 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*

<b>Description</b>	<b>Allocated Cost Estimate</b>
Transmission Owner Interconnection Facilities Upgrade(s)	\$2,273,572
Non-Shared Network Upgrade(s)	\$8,421,776
Shared Network Upgrade(s)	\$0
Affected System Upgrade(s)	\$0
<b>Total</b>	<b>\$10,695,348</b>

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

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**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-2019-035**

**Hawthorn Solar Project**

**Barry County, MO**

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1/16/2025

## **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-2019-035, Hawthorn Solar.

## **Project Description**

GEN-2019-035 proposes to install a 80 MW solar generation facility in Barry County, Missouri, and connect to a nearby Liberty-owned 161kV transmission line via a 0.1 mile generation tie-line.

## **Liberty's Scope of Work**

For interconnection of the proposed generation facility, Liberty requires the construction of a new three-terminal ring bus substation at the proposed 161kV transmission line intersection point, shown in Figure 1 as Point of Interconnection. This new substation shall be constructed and maintained by Liberty, including any re-routing of Liberty's existing 161kV transmission line. Additional minor terminal 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-2019-035 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 results Phase 2 restudy submitted on December 10, 2024, 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**

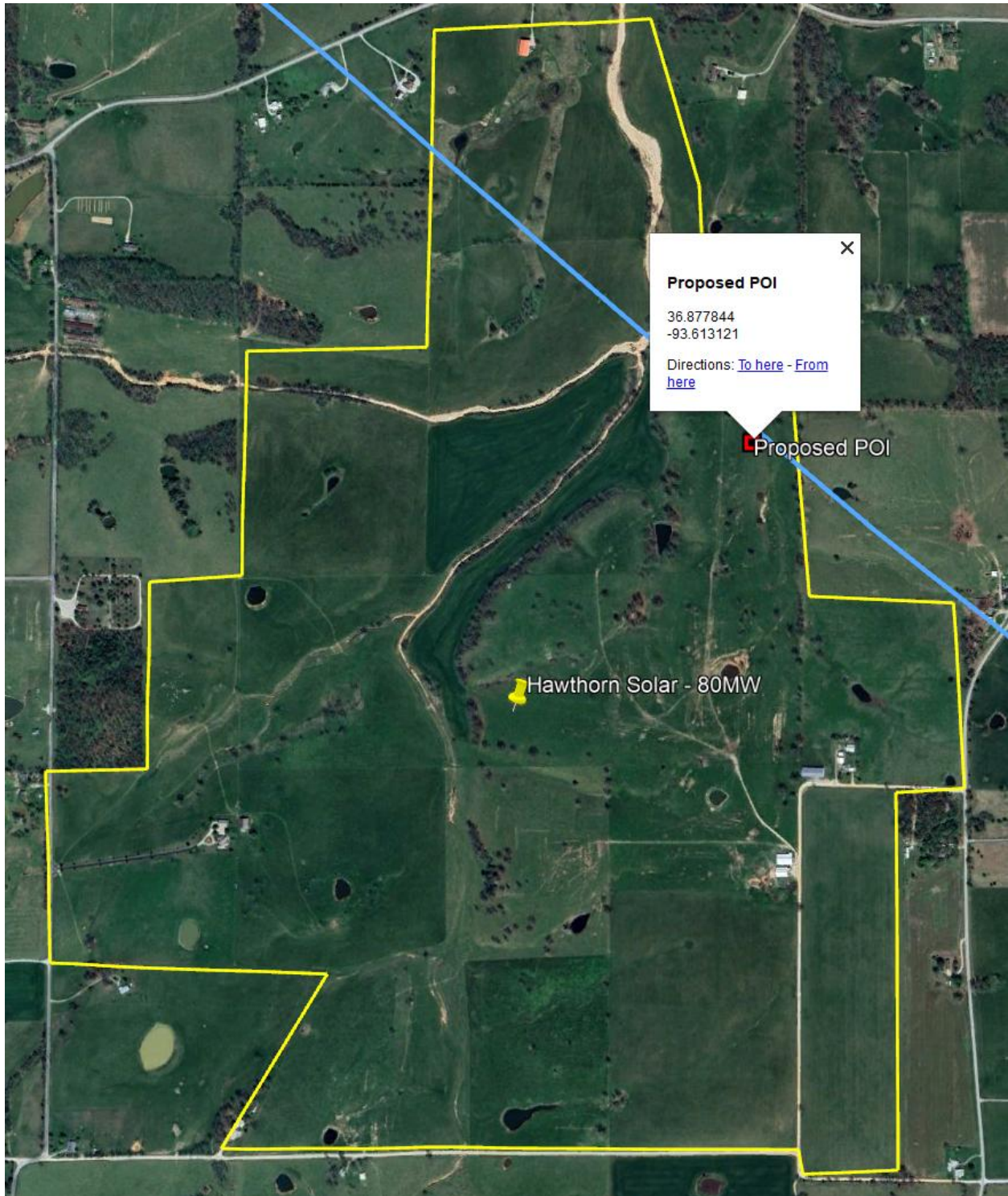
After reviewing SPP’s final DISIS results Phase 2 restudy submitted on December 10, 2024, Liberty did not identify any instances where the system fails to meet TPL-001 stability performance requirements for the planning events and generation dispatch conditions that were considered in this DISIS study.

**Interconnection Estimated Costs and Lead-Times**

<b>Total Cost &amp; Lead-time</b>	
Non-Shared Network Upgrades (NU)	\$8,421,775.64
Transmission Owner Interconnection Facilities (TOIF)	\$2,273,571.67
<b>Total</b>	<b>\$10,695,347.31</b>
<b>Lead time</b>	36 Months

**Table 1 – Cost Estimate**

**Figure 1 – Hawthorn Solar Project and Approved POI location**





**Figure 2 – Preliminary One-Line for new POI substation**

