



**INTERCONNECTION
FACILITIES STUDY
REPORT**

GEN-2018-030

Published November 2023

By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
December 8, 2023	SPP	Initial draft report issued.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2018-030 is for a 200 MW generating facility located in Prowers, CO. The Interconnection Request was studied in the DISIS-2018-001 Impact Study for ER. The Interconnection Customer's requested in-service date is December 31, 2026.

The interconnecting Transmission Owner, Southwestern Public Service (SPS), 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 Sixty-eight (68) 2.9MW Inverters (PE FP3510M integrated skid) for a total generating nameplate capacity of 200 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;
- One 345/34.5 kV 144/192/240 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 kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 345 kV bus at new interconnection substation ("Hamilton County 345kV Substation") on existing (Lamar-Finney 345 kV 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** lists 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 (\$)
<u>Transmission Owner’s Lamar-Finney 345kV Substation GEN-2018-030 Interconnection (UID156162): Facilitate the interconnection of GEN-2018-030 Estimated Lead Time: 36 Months</u>	\$1,793,249	100.00%	\$1,793,249
Total	\$1,793,249		\$1,793,249

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)
<u>SEPC’s Holcomb 345 kV Substation Expansion (UID158569): Add four 345 kV breakers, expand yard to a breaker-and-a-half substation layout, relocate two 345 kV line terminals, add of one 345 kV line terminal, and any other associated line or terminal equipment. Estimated Lead Time: 48 Months</u>	Ineligible	\$22,950,332	100.00%	\$22,950,332
<u>Transmission Owner’s Lamar-Finney 345kV Substation Interconnection Expansion (DISIS-2018-001) (UID156163): Build a new 345 kV switching station with 3-breaker terminals expandable to breaker and a half arrangement to accommodate the customer’s 200 MW battery/storage generation facility for GEN-2018-030. Estimated Lead Time: 36 Months</u>	Ineligible	\$19,088,535	100.00%	\$19,088,535

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)
<u>Transmission Owner's Build a second circuit from Holcomb 345 kV to Finney 345 kV (UID158626): Install a new 345 kV SPS transmission circuit from Finney Substation to a dead-end, terminal structure located outside of Holcomb Substation. Expand the 345 kV bus at Finney Substation and add a new line terminal for the new Finney to Holcomb 345 kV Line #2 Estimated Lead Time: 36 Months</u>	Eligible	\$13,573,473	100.00%	\$13,573,473
Total		\$55,612,340		\$55,612,340

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>N/A</u>				
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
N/A		

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 (\$)
<u>N/A</u>			
Total	\$0		\$0

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 200 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)	\$1,793,249
Non-Shared Network Upgrade(s)	\$55,612,340
Shared Network Upgrade(s)	\$0
Affected System Upgrade(s)	\$0
Total	\$57,405,589

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).



**Facility Study for Generation Interconnections
as Requested by Southwest Power Pool (SPP)**

DISIS 2018-001
Group 5
GEN-2018-030

Xcel Energy Services, Inc.
Southwestern Public Service Co.
Transmission Planning South
Updated 11/2/2023

Executive Summary

The Southwest Power Pool (SPP or Transmission Provider) evaluated the generation facilities requesting to interconnect to the SPS transmission system in the Definitive Interconnection System Impact Study (DISIS-2018-001), which was completed in September 2023. The requests for interconnection were placed with SPP in accordance with the Scope of Interconnection Facilities Study GIP Section 8.10 and the Interconnection Facilities Study Procedures in accordance with GIP Section 8.11.

To accommodate the Interconnection Customer’s (IC) request, Southwestern Public Service Company (SPS or Transmission Owner) determined what modifications/upgrades were needed on the SPS transmission system. Below are the Generation Interconnection requests and associated modification/upgrade costs:

<u>Request Number</u>		<u>TAM</u>	<u>TOIF</u>
GEN-2018-030		\$ 19,088,534	\$ 1,793,249

NOTE: The cost estimates are 2023 dollars with an accuracy of ± 20%. The estimates do not include escalation costs.

General Description of SPS Modifications/Upgrades

The Objective of this study is to identify the modification/upgrades and the costs associated with them. Below is a description of the different project(s) and the scoping level costs associated with each. All costs identified below are without escalation. All projects, routes, and costs are subject to change.

New 345 kV Substation “Hamilton County”

A new 345 kV, three breaker ring bus, substation to be installed on existing SPS transmission line J05 (Finney-Lamar) to provide point-of-interconnection for GEN-2018-030. The substation will be located at or near 38.205394444 N, -102.00091389 W, in Hamilton County, Kansas.

Transmission Line Details

Cut-In SPS transmission circuit J05 ‘in-and-out’ of the new Hamilton County Substation.

Substation Details

Build a new 345 kV switching station with 3-breaker terminals expandable to breaker and a half arrangement to accommodate the customer’s 200 MW battery/storage generation facility for GEN-2018-030.

Total Cost

The total cost estimate for this Network Upgrade is:

\$	19,088,534 TAM
\$	1,793,249 TOIF
<hr/>	
\$	20,881,784 Total Cost

The estimate is accurate to +/- 20%

Time Estimate

The information listed below is the expected duration for construction from the date of execution of the agreement to project in-service date.

Total Project Duration	36	Months
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Figure 1 – New Hamilton County Substation Location



Figure 2 below shows the expected communication between the IC, SPP and SPS.
SPS will not serve as a proxy for communication from the IC to SPP.

Figure 2 – Hamilton County Communication Information

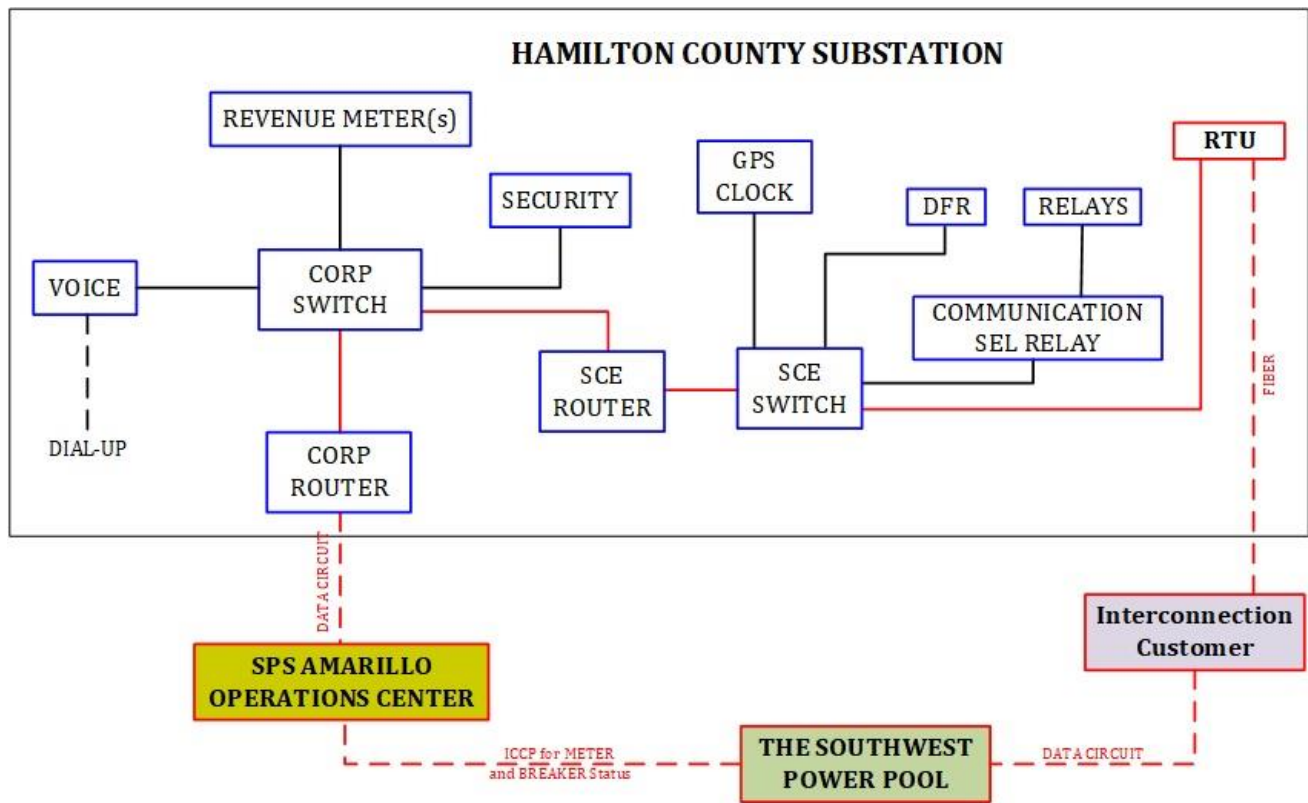


Table 3 – Hamilton County Fault Current Information

Table 3, - Available fault current at interconnection location

Short Circuit Information without contribution from new Generator Facilities (GEN 2017-146)				
Fault Location	Fault Current (Amps)		Impedance (Ω)	
	Line-to-Ground	3-Phase	Z^+	Z^0

Line J05	2756.95	2927.28	6.20669+j67.7611	12.7253+j79.5204
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Other

Please see the Xcel Energy [Interconnection Guidelines For Transmission Interconnected Producer-Owned Generation Greater Than 20 MW](#) for additional requirements.

– END OF REPORT –



**Facility Study for Network Upgrades
as Requested by Southwest Power Pool (SPP)**

DISIS 2018-030
Group 3

Xcel Energy Services, Inc.
Transmission Planning South
Updated 12/7/2023

Executive Summary

The Southwest Power Pool (SPP or Transmission Provider) evaluated the generation facilities requesting to interconnect to the SPS transmission system in the Definitive Interconnection System Impact Study (DISIS-2018-001), which was completed in November 2023. The requests for interconnection were placed with SPP in accordance with the Scope of Interconnection Facilities Study GIP Section 8.10 and the Interconnection Facilities Study Procedures in accordance with GIP Section 8.11.

To accommodate the Interconnection Customer’s (IC) requests, SPP identified multiple network upgrades required as part of the DISIS study results. Southwestern Public Service Company (SPS or Transmission Owner) performed this Facility Study for the Network Upgrades. Below are the projects identified by SPP:

<u>Upgrade Name</u>	<u>SCERT UID</u>	<u>DISIS Estimate</u>
Finney to Holcomb 345 kV Line #2	158626	13,573,473.00

General Description of SPS Modifications/Upgrades

The Objective of this study is to identify the modification/upgrades and the costs associated with them. Below is a description of the different project(s) and the scoping level costs associated with each. All costs identified below are without escalation. All projects, routes, and costs are subject to change.

New 345 kV Transmission Line ‘Finney to Holcomb #2’

A new 345 kV, transmission line will be installed from the existing SPS Substation “Finney” to the existing Sunflower Electric Cooperative Substation “Holcomb”. This will be the second 345 kV transmission lines connecting the two substations.

Transmission Line Details

Install a new 345 kV SPS transmission circuit from Finney Substation to a dead-end, terminal structure located outside of Holcomb Substation; this is where transmission line ownership will change from SPS to Sunflower Electric Cooperative. The transmission circuit will continue from the ownership change structure into Holcomb Substation and this portion will belong to Sunflower Electric Cooperative.

Substation Details

Expand the 345 kV bus at Finney Substation and add a new line terminal for the new Finney to Holcomb 345 kV Line #2.

Total Cost

The total cost estimate for this Network Upgrade is:

\$	5,438,711	Transmission Line
\$	8,134,762	Substation
<hr/>		
\$	13,573,473	Total SPS Cost

The estimate is accurate to +/- 20%

Time Estimate

The information listed below is the expected duration for construction from the date of execution of the agreement to project in-service date.


Total Project Duration	36	Months
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NOTE: The above-named cost estimates are for the SPS portion of this project. SPP will have the cost estimates for the Sunflower Electric Cooperative's portion of the project.

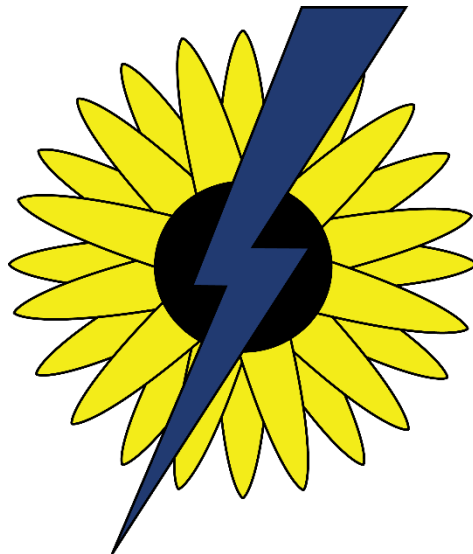
– END OF REPORT –



SUNFLOWER ELECTRIC POWER CORPORATION

A Touchstone Energy® Cooperative 

**Interconnection Facilities Study
for DISIS-2018-001 Network Upgrade:
Holcomb to Finney 345 kV Line Upgrades**



November 1, 2023

*Interconnection Facilities Study – Network Upgrade: Holcomb to Finney 345 kV
Line Upgrade*

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Interconnection Facilities Study – Network Upgrade: Holcomb to Finney 345 kV Line Upgrade

STUDY OVERVIEW:

The Southwest Power Pool has requested a Facility Study for a Network Upgrade within portions of the service territory of Sunflower Electric Power Corporation (Sunflower). The Network Upgrade identified is a second circuit from Holcomb 345 kV Substation to Finney Co. 345 kV Substation. The new equipment included in the estimate as part of this Network Upgrade will be owned by Sunflower Electric Power Corporation.

The cost of Sunflower's portion of a second circuit from Holcomb 345 kV Substation to Finney Co. 345 kV Substation for the required Network Upgrades is estimated at \$22,950,332.

This estimate is greater than 20% of the cost provided for DISIS-2018-002 & DISIS-2019-001 Phase 2 Stability Network Upgrade Review, which was provided to SPP's consultant. The increased cost is due to avoiding adjacent terminals with the existing Holcomb to Finney line, a yard expansion from a ring to breaker-and-a-half, and line re-routes to avoid several 345kV line crossings.

SPP's DISIS-2018-001 identified Network Upgrades included with this Facilities Study are associated with GEN-2018-030.

INTERCONNECTION FACILITIES AND NETWORK UPGRADES:

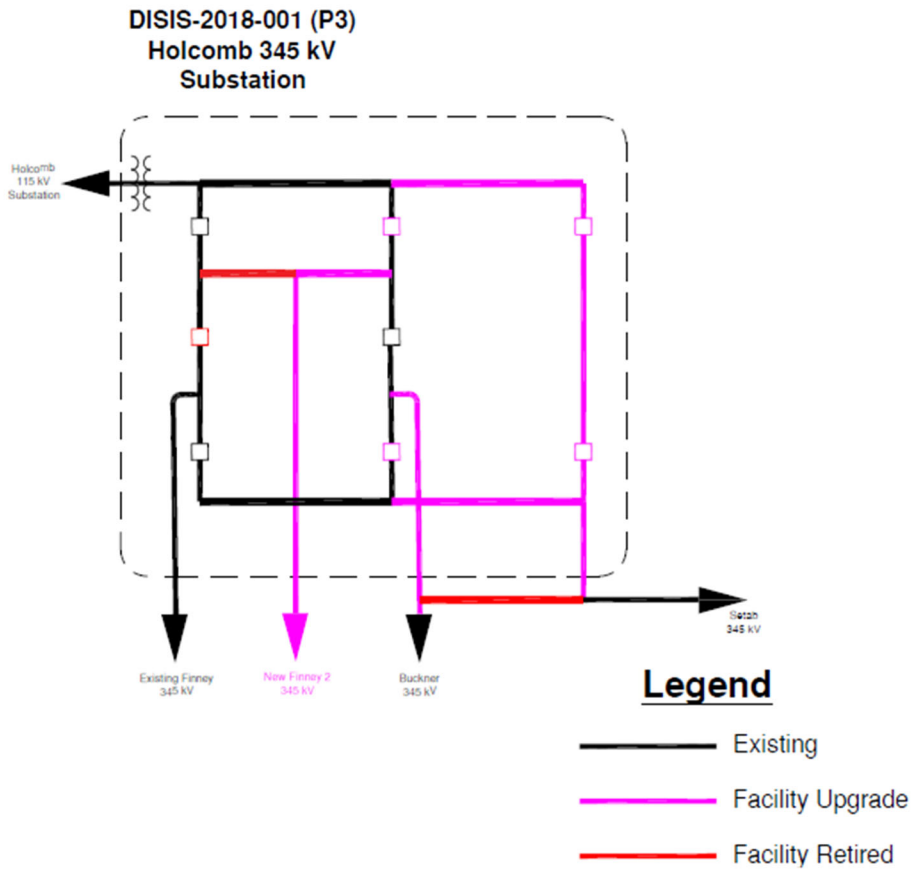
There are no Transmission Owner Interconnection Facility (TOIF) upgrades or additions required by Sunflower currently identified.

Network Upgrades included in this study consist of the addition of four 345 kV breakers, yard expansion to a breaker-and-a-half substation layout, relocating two 345 kV line terminals, the addition of one 345 kV line terminal, and any other associated line or terminal equipment.

The proposed arrangement for upgrades for DISIS-2018-001 is shown in Figure 1.

Interconnection Facilities Study – Network Upgrade: Holcomb to Finney 345 kV Line Upgrade

Figure 1: One-line Diagram Facilities for DISIS-2018-001



Interconnection Facilities Study – Network Upgrade: Holcomb to Finney 345 kV Line Upgrade

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 (2023 Dollars)
Transmission Owner Interconnection Facilities (TOIF) N/A	\$0.00
Network Upgrades Addition of a second circuit from Holcomb 345 kV Substation to Finney Co. 345 kV Substation.	\$22,950,332
Total Interconnection Cost:	\$22,950,332

PROJECT TIMELINE:

Due to major material lead time fluctuation, specific project schedule and milestones will be determined once a Notice to Proceed occurs. Sunflower is currently estimating an engineering, procurement, and construction schedule for this project as approximately 48 months. Other factors associated equipment procurement delays and work schedules could cause additional delays. This is applicable after all required agreements are signed and internal approvals are granted.