INTERCONNECTION FACILITIES STUDY REPORT

GEN-2017-090

Published February 2020

By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
02/07/2022	SPP	Initial draft report issued.
02/28/2022	SPP	Updated draft report issued. Updated Network Upgrade Facility Study from Evergy and moved 100% allocated upgrade from Table 3 to Table 2.

CONTENTS

SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2017-090 is for a 150 MW generating facility located in Bates County, MO. The Interconnection Request was studied in the DISIS-2017-001 Impact Study and the DISIS-2017-001-1 Impact Restudy for Energy Resource Interconnection Service (ERIS).The Interconnection Customer's requested in-service date is December 1, 2019.

The interconnecting Transmission Owner, Evergy Electric Services Company (KCPL), 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 forty-three (43) 3.488 MW SMA Sunny Central 4200UP-US 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 collectioncircuits;
- 34.5 kV to 161 kV transformation substation with associated 34.5 kV and 161 kV switchgear;
- One 161/34.5 kV 100/133/167 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 mile overhead mile overhead 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 ("Adrian 161kV Substation") 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 ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
Adrian 161kV Substation GEN-2017-090 Interconnection (TOIF) (KCPL) (133068): Construct one (1) new 161kV circuit breakers, three (3) new switches, three (3) new voltage transformers, three (3) new current transformers, one (1) new control panel, and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer's Generating Facility.	$867,019	100%	$867,019	24 Months
Total	**$867,019**		**$867,019**	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
Adrian 161kV Substation GEN-2017-090 Interconnection (Non-Shared NU) (KCPL) (133069): Construct one (1) new 161/12kV Transformer, one (1) new 161/25kV transformer, four (4) new 161kV circuit breakers, two (2) new wavetraps, fourteen (14) new switches, six (6) new CCVT's, eight (8) new control panels, and all other associated work and materials.	Not Eligible	$12,382,265	100%	$12,382,265	24 Months
Mullin Creek to St. Joe 345kV New Line (DISIS-2017-001) (GMO) (143699): Build 27 miles of 345kV new line with bundled 1192.5 Grackle ACSS/TW line conductor with OPGW static wire, steel dead end structures, steel tangent structures, steel running angle structures, and no distribution underbuild. At St. Joe 345kV substation, rebuild the existing 345kV to a breaker-and-a-half configuration consisting of eleven (11) breakers, twenty-eight (28) switches, four (4) wavertraps, and twenty-one (21) control panels, as well as dismantling of the exisitng equipment.	Eligible	$108,513,897	100%	$108,513,897	48 Months
Mullin Creek 345kV Terminal Upgrades (DISIS-2017-001) (TMO) (143731): At Mullin Creek 345kV substation, rebuild the existing 345kV to breaker-and-a-half configuration consisting of two (2) breakers, four (4) switches, and three (3) control panels.	Eligible	$7,040,332	100%	$7,040,332	24 Months
Total		**$127,936,494**		**$127,936,494**	

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 ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
None	N/A	$0	N/A	$0	N/A
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
None	$0	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 ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
DISIS-2017-001 AECI AFS: Rebuild 2.6 mile-long Vanduser-Morley 69kV line to 336 ASCR at 100C	$1,650,000	5.9%	$97,920
Total	$1,650,000		$97,920

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 Facilitie Upgrade(s)	$867,019
Non-Shared Network Upgrade(s)	$127,936,494
Shared Network Upgrade(s)	$0
Affected System Upgrade(s)	$97,920
Total	**$128,901,433**

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).

Evergy

Facility Study for Southwest Power Pool

Generation Interconnection Request

GEN-2017-090

September 2021

Introduction

Pursuant to the Southwest Power Pool (SPP) Open Access Transmission Tariff (Tariff) and at the request of SPP, Evergy Transmission Planning performed the following Facility Study on behalf of Evergy Missouri West to satisfy the Facility Study Agreement executed by the requesting Interconnection Customer (Customer) for SPP Generation Interconnection Request GEN-2017-090. The request for interconnection was placed with SPP in accordance with the Tariff, which covers new generation interconnections on SPP member's transmission system. The Customer requests interconnection service a 150MW solar farm. The requirements for interconnection consist of the rebuild of the Adrian 161kV substation as a ring bus with three line terminals.

This Facility Study does not guarantee the availability of transmission service necessary to deliver the additional generation to any specific point inside or outside the SPP transmission system. The transmission network facilities may not be adequate to deliver the additional generation output to the transmission system. If the Customer requests firm transmission service under the SPP Tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPP Tariff.

Southwest Power Pool Generation Interconnection Request

Southwest Power Pool (SPP) Generation Interconnection (GI) requested Evergy Missouri West perform an Interconnection Facility Study (IFS).

GI Request #	Point of Interconnection	Capacity (MW)	Fuel Type
GEN-2017-090	Adrian 161kV	150	Solar

Cost Estimates

Costs estimates are accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, cost fluctuations in materials are significant and the accuracy of this estimate at the time of actual procurement and construction cannot be assured.

GEN-2017-090

Evergy Kansas Central

Transmission Owner Interconnection Facilities (TOIF)
TOIF at the Adrian substation includes one (1) new 161kV circuit breaker, three (3) new switches, three (3) new voltage transformers, three (3) new current transformers, and one (1) new control panel.

TOIF Cost $867,019

Network Upgrades
Network Upgrades at the Adrian substation include one (1) new 161/12kV Transformer, one (1) new 161/25kV transformer, four (4) new 161kV circuit breakers, two (2) new wavetraps, fourteen (14) new switches, six (6) new CCVT's, and eight (8) new control panels.

Network Upgrades $12,382,265

The total cost for the required Transmission Owner Interconnection Facilities (TOIF) and Network Upgrades for Evergy Missouri West is shown below.

$	867,019	TOIF
$	12,382,265	Network Upgrades
$	13,249,284	Total

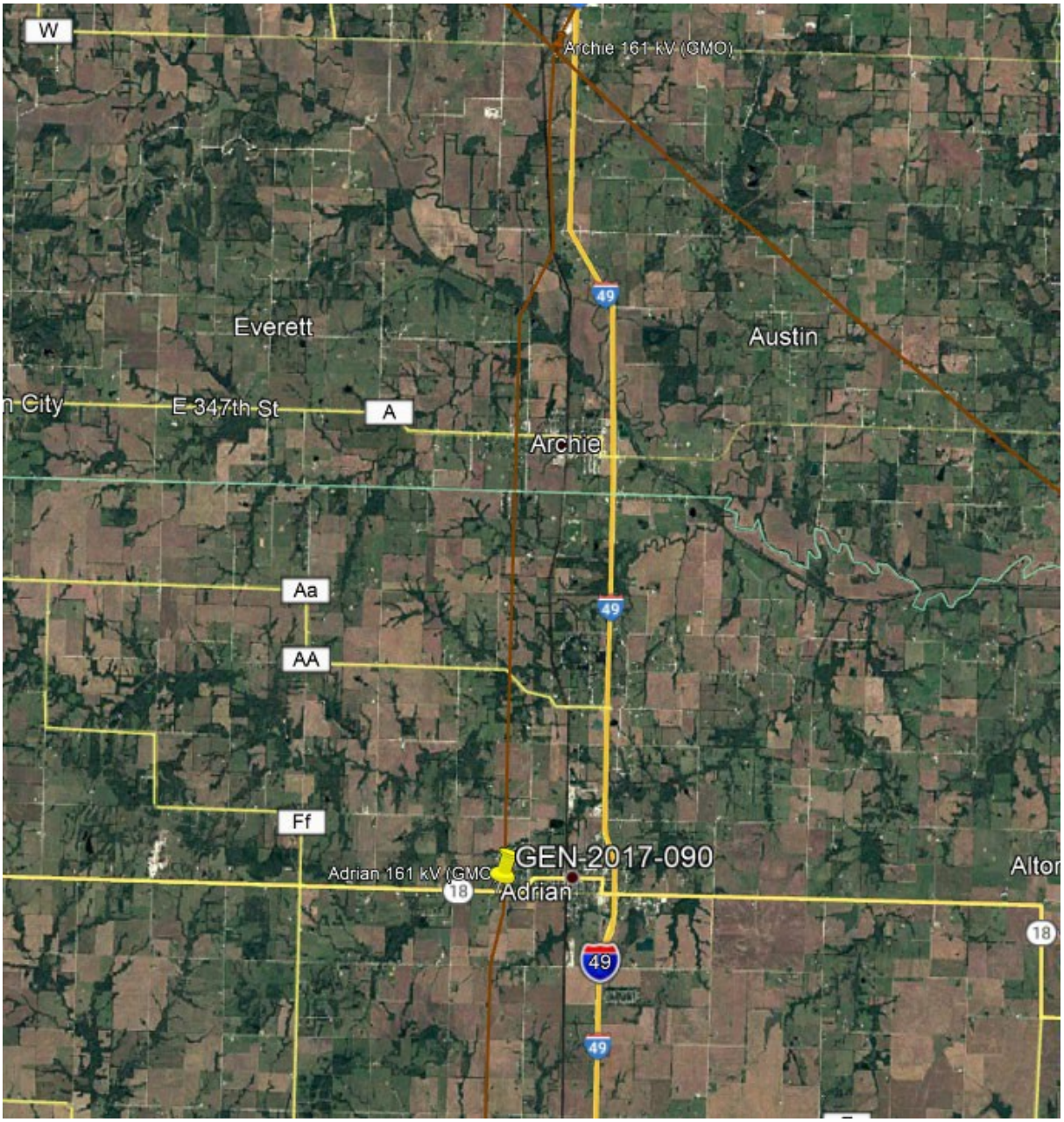
Time Estimate
Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	8 Months
Procurement Time	9 Months
Construction Time	16 Months
Total Project Length	24 Months

Short Circuit Fault Duty Evaluation

Evergy engineering staff reviewed short circuit analysis for the Adrian 161kV substation to determine if the added generation would cause the available fault currents to exceed the interrupting capability of any existing circuit breakers. The fault currents are within circuit breaker interrupting capability with the addition of the GEN-2017-090 solar farm.

Appendix A: GEN-2017-090 Interconnection Map



Interconnection Facilities Study

Network Upgrades associated with DISIS-2017-001

February 2022

Introduction

This report summarizes the scope of the Interconnection Facilities Analysis for Network Upgrade(s) to determine costs related to the addition of the SPP-GI DISIS-2017-001 Interconnection Request(s).

Southwest Power Pool Generation Interconnection Request:

Per the SPP Generator Interconnection Procedures (GIP), SPP has requested that Evergy perform an Interconnection Facilities Study (IFS) for Network Upgrade(s) 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 for the following Interconnection Request(s):

Upgrade Type	UID	Upgrade Name	DISIS Cost	DISIS Lead Time
Network Upgrade	122705	Hoyt - JEC 345kV Rebuild (DISIS-2017-001) (EKC)	$49,962,001	48 Months
Network Upgrade	143242	Smokey Hills to Summit 230kV Rebuild (DISIS-2017-001) (EKC)	$27,314,395	36 Months
Network Upgrade	143699	Mullin Creek-St Joseph 345kV New Line and St Joseph 345kV Breaker and Half (DISIS-2017-001) (EMW)	$108,513,897	48 Months
Network Upgrade	143731	Mullin Creek 345kV Terminal Upgrades (DISIS-2017-001) (TMO)	$7,040,333	36 Months
Network Upgrade	144266	St. Joe to Cooper 345kV Rebuild (DISIS-2017-001) (EMW)	$83,208,129	36 Months
Network Upgrade	144268	St. Joe to Nashua 345kV Line Rebuild (DISIS-2017-001) (EM)	$31,517,643	36 Months
Network Upgrade	144269	St. Joe to Nashua 345kV Line Rebuild (DISIS-2017-001) (EMW)	$50,677,806	36 Months

Hoyt – Jeffrey EC 345kV Rebuild

345kV Transmission Line

The estimated cost is for 24.3 miles of 345kV circuit with new bundled 1590 Lapwing ACSR line conductor with OPGW static wire, steel dead end structures, steel tangent structures, steel running angle structures, and no distribution underbuild.

345kV Substation

At Hoyt 345kV substation, the estimated cost is for two (2) control panels, as well as removal of the wavetrap, replace line arrestors, add fiber, and upgrade groundmat.

At Jeffrey EC 345kV substation, the estimated cost is for two (2) control panels, as well as removal of the wavetrap, replace line arrestors, and add fiber.

Total Cost

The total cost estimate for this Network Upgrade is:

$	49,140,588	345kV Transmission Line
$	675,327	345kV Substation
$	146,086	AFUDC
$	0	Contingency
$	49,962,001	Total

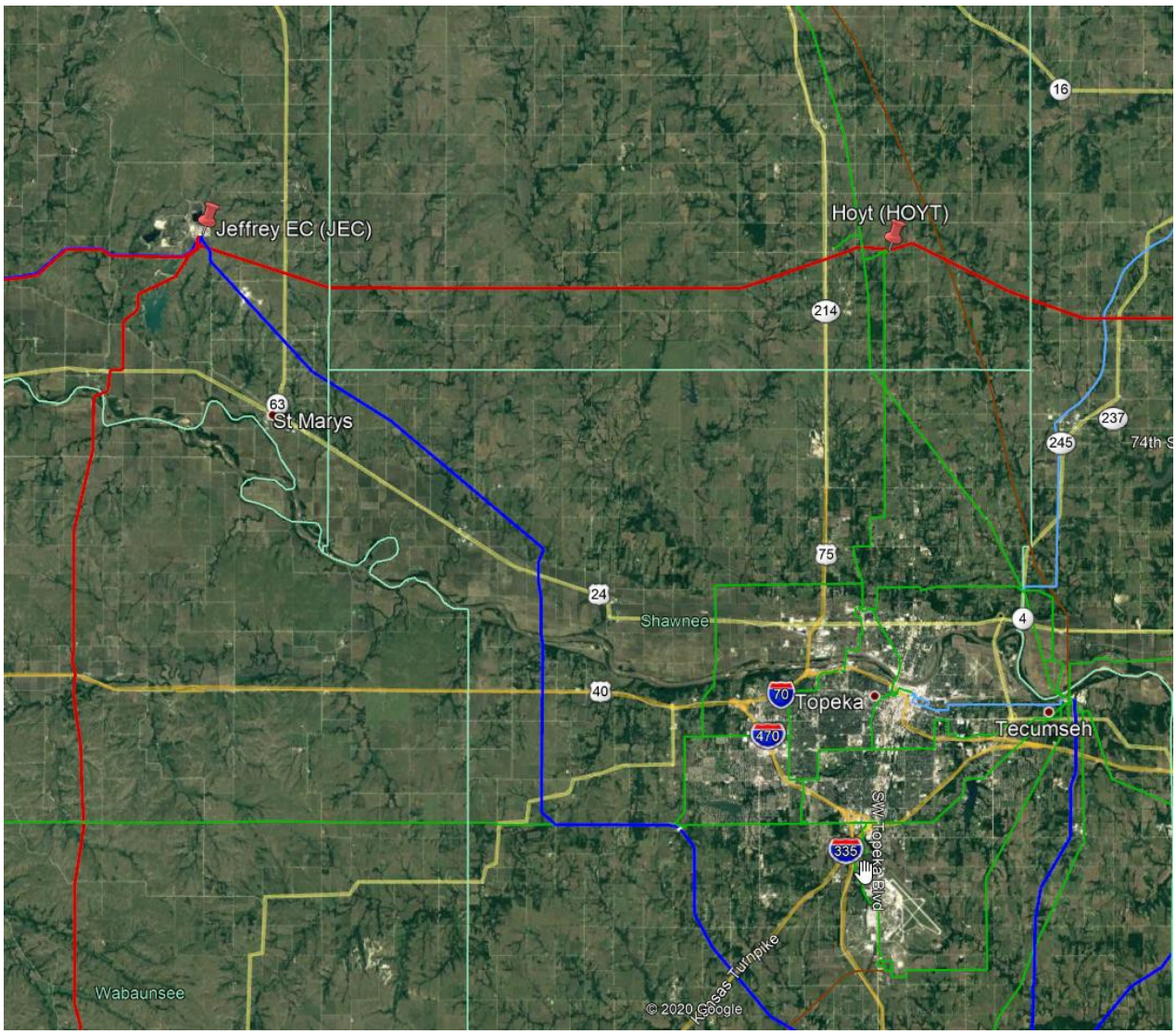
This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

Time Estimate

Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	12-18	Months
Procurement Time	12-18	Months
Construction Time	12	Months
Total Project Length	36-48	Months

Figure 1 – Hoyt-Jeffrey EC 345kV Line



Smoky Hills - Summit 230kV Rebuild

230kV Transmission Line

The estimated cost is for 16.4 miles of 230kV circuit with new bundled 1192 Bunting ACSR line conductor with OPGW static wire. There is 6.0 miles of this line with newer construction out of Summit that meets the rating requested, and 16.1 miles is owned by Midwest Energy.

230kV Substation

At Summit 230kV substation, the estimated cost is for upgrading the existing 230kV terminal equipment consisting of two (2) control panels, as well as removal of the wavetrap and add fiber.

Total Cost

The total cost estimate for this Network Upgrade is:

$	27,183,000	230kV Transmission Line
$	49670	230kV Substation
$	81,725	AFUDC
$	0	Contingency
$	27,314,395	Total

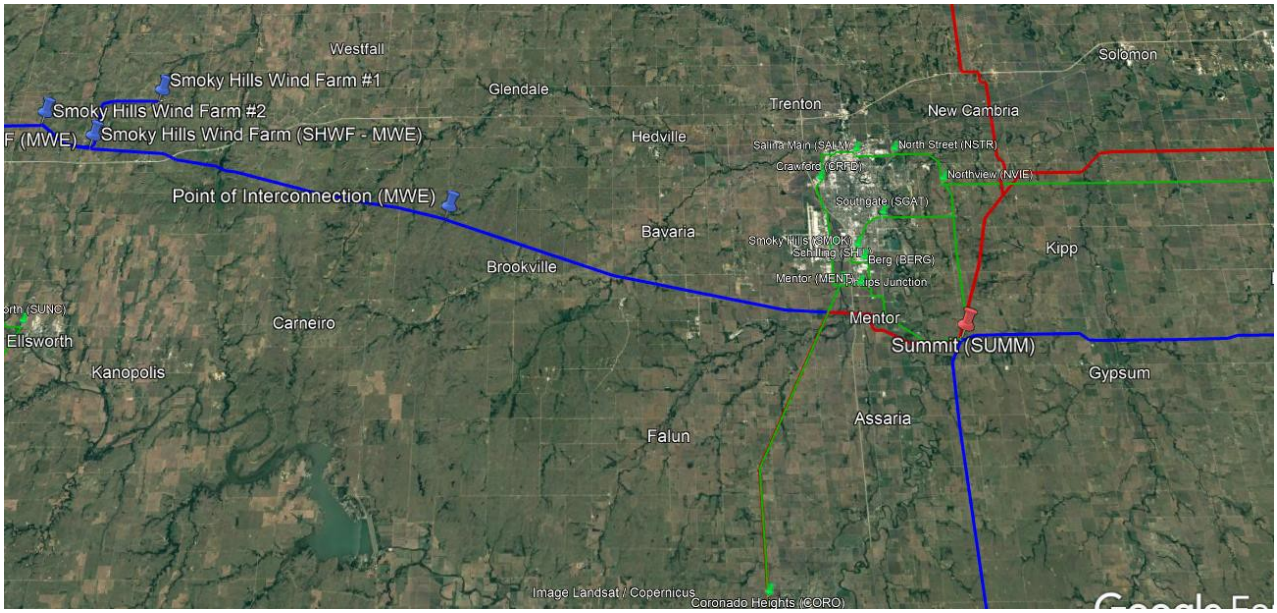
This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

Time Estimate

Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	12-18	Months
Procurement Time	12-18	Months
Construction Time	12	Months
Total Project Length	36-48	Months

Figure 2 – Smoky Hills-Summit 230kV Line



Mullin Creek-St Joseph 345kV New Line

345kV Transmission Line

The estimated cost is for 27 miles of 345kV with new bundled 1192.5 Grackle ACSS/TW line conductor with OPGW static wire, steel dead end structures, steel tangent structures, steel running angle structures, and no distribution underbuild.

345kV Substation

At St Joseph 345kV substation, the estimated cost is for a rebuild of the existing 345kV to breaker-and-a-half configuration consisting of eleven (11) breakers, twenty-eight (28) switches, four (4) wavetraps, and twenty-one (21) control panels, as well as dismantling of the existing equipment.

Total Cost

The total cost estimate for this Network Upgrade is:

$	79,026,603	345kV Transmission Line
$	27,133,920	345kV Substation
$	2,353,374	AFUDC
$	0	Contingency
$	108,513,897	Total

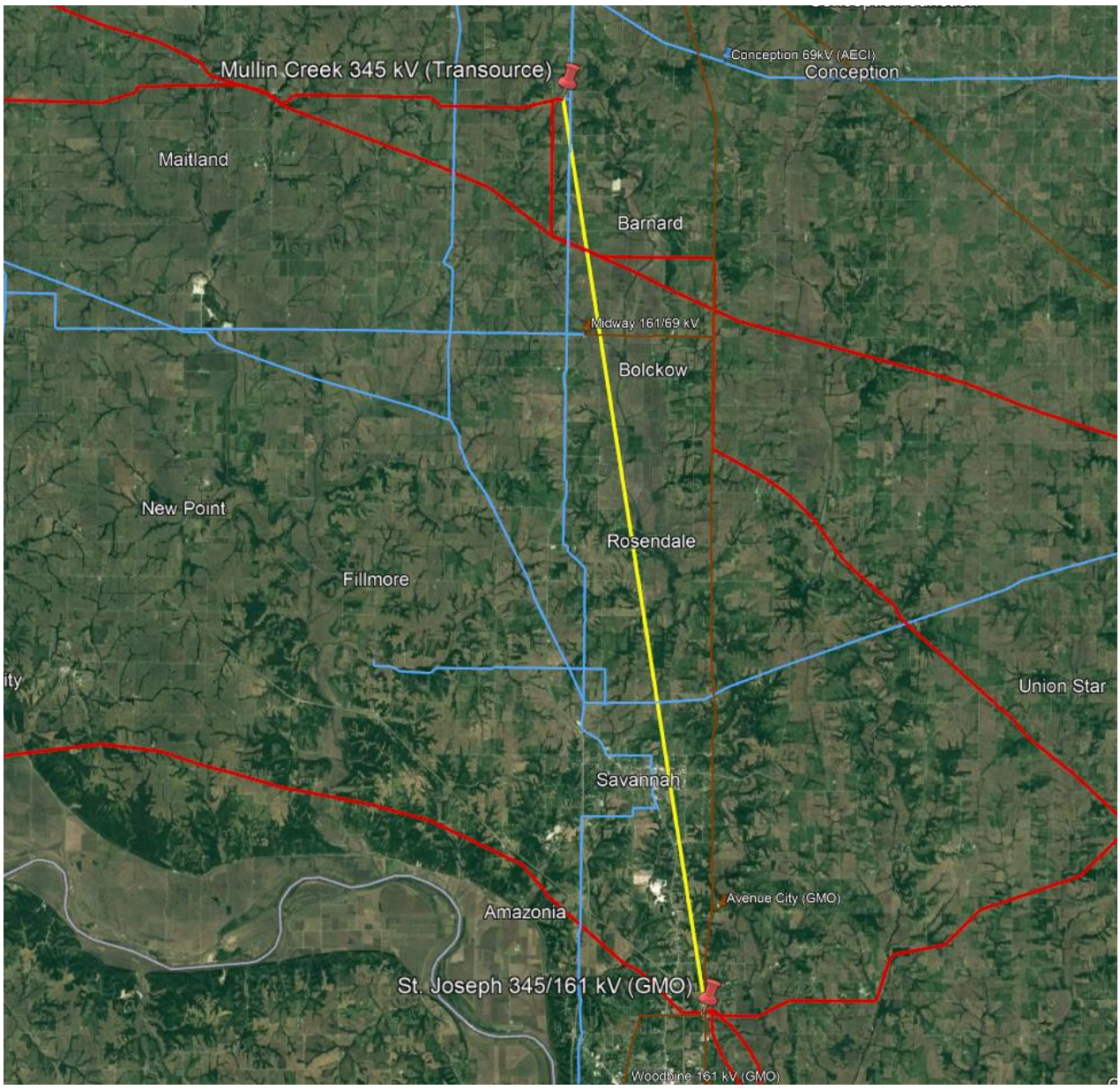
This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

Time Estimate

Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	12-18	Months
Procurement Time	12-18	Months
Construction Time	12	Months
Total Project Length	36-48	Months

Figure 3 – Mullin Creek-St Joseph 345kV New Line



Mullin Creek 345kV Terminal Upgrades

345kV Substation

At Mullin Creek 345kV substation, the estimated cost is for a rebuild of the existing 345kV to breaker-and-a-half configuration consisting of two (2) breakers, four (4) switches, and three (3) control panels.

Total Cost

The total cost estimate for this Network Upgrade is:

$	0	345kV Transmission Line
$	7,019,275	345kV Substation
$	21,057	AFUDC
$	0	Contingency
$	7,040,332	Total

This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

Time Estimate

Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	6	Months
Procurement Time	12	Months
Construction Time	6	Months
Total Project Length	18-24	Months

St Joseph-Cooper 345kV Line Rebuild

345kV Transmission Line

The estimated cost is for 38.6 miles of 345kV with new bundled 1192.5 Grackle ACSS/TW line conductor with two (2) OPGW static wire, nine (9) steel dead end structures, two-hundred sixteen (216) steel tangent structures, thirteen (13) steel running angle structures, and no distribution underbuild.

345kV Substation

At St Joseph 345kV substation, the estimated cost is for one (1) breaker, five (5) switches, removal of the wavetrap, and one (1) control panel.

Total Cost

The total cost estimate for this Network Upgrade is:

$	79,478,223	345kV Transmission Line
$	1,039,295	345kV Substation
$	2,690,611	AFUDC
$	0	Contingency
$	83,208,129	Total

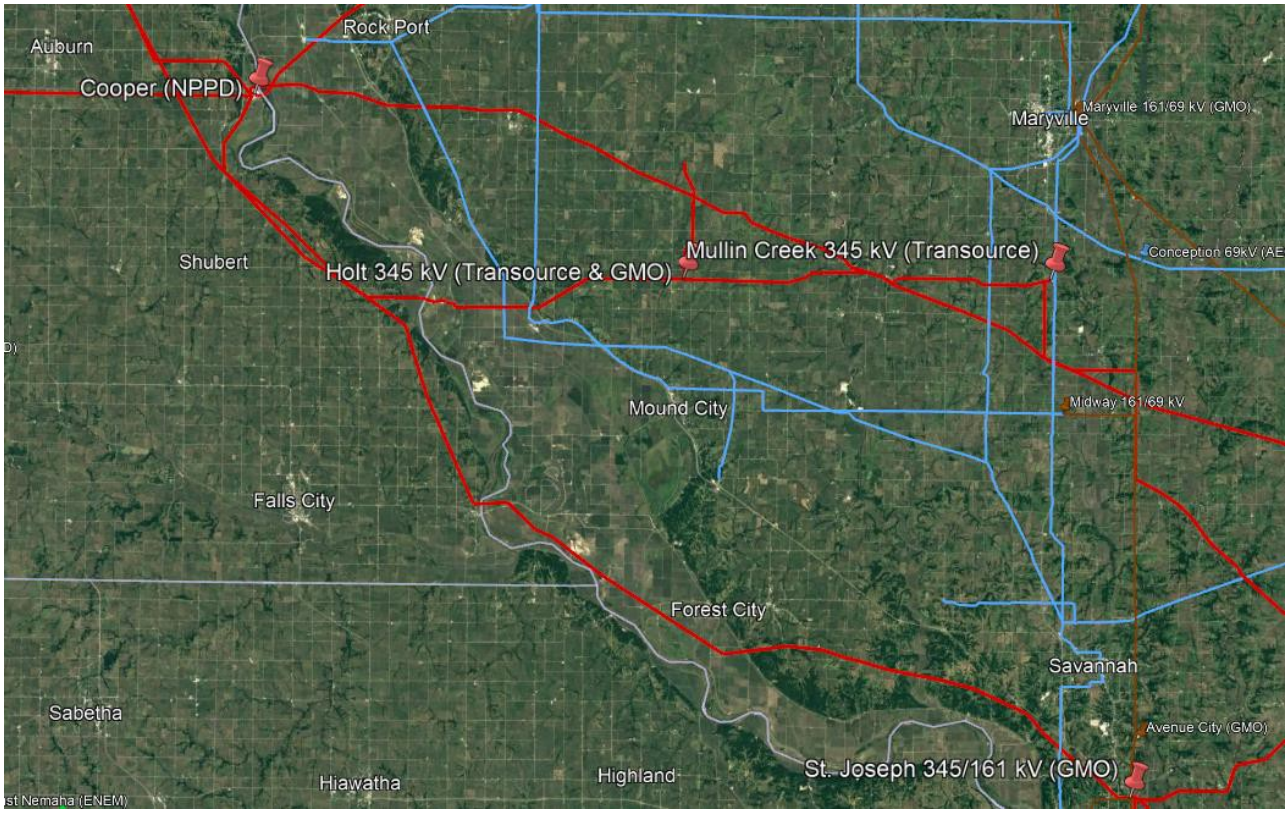
This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

Time Estimate

Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	12-18	Months
Procurement Time	12-18	Months
Construction Time	12	Months
Total Project Length	36-48	Months

Figure 4 – St Joseph-Cooper 345kV Line Rebuild



St Joseph-Nashua 345kV Line Rebuild (Evergy Metro)

345kV Transmission Line

The estimated cost is for 14.6 miles of the 38.6 miles of 345kV with new bundled 1192.5 Grackle ACSS/TW line conductor with two (2) OPGW static wire, three (3) steel dead end structures, eighty-seven (87) steel tangent structures, one (1) steel running angle structures, and no distribution underbuild.

345kV Substation

At Nashua 345kV substation, the estimated cost is consists of one (1) control panel, as well as removal of the wavetrap.

Total Cost

The total cost estimate for this Network Upgrade is:

$	29,354,123	345kV Transmission Line
$	215,541	345kV Substation
$	1,947,979	AFUDC
$	0	Contingency
$	31,517,643	Total

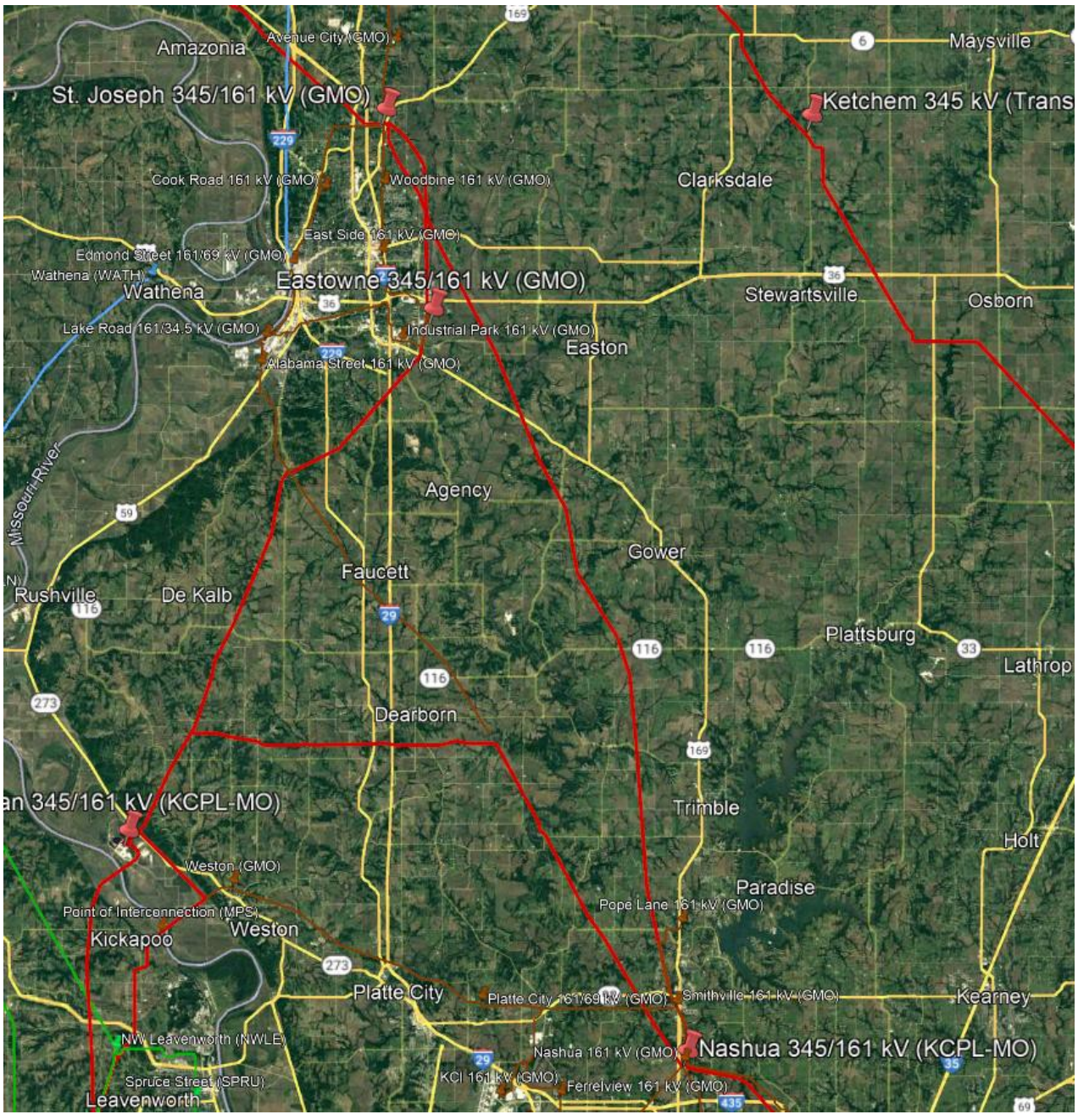
This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

Time Estimate

Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	12-18	Months
Procurement Time	12-18	Months
Construction Time	12	Months
Total Project Length	36-48	Months

Figure 5 – St Joseph-Nashua 345kV Line Rebuild



St Joseph-Nashua 345kV Line Rebuild (Evergy Missouri West)

345kV Transmission Line

The estimated cost is for 24.0 miles of the 38.6 miles of 345kV with new bundled 1192.5 Grackle ACSS/TW line conductor with two (2) OPGW static wire, eight (8) steel dead end structures, one hundred twenty-eight (128) steel tangent structures, thirteen (13) steel running angle structures, and no distribution underbuild.

345kV Substation

At St Joseph 345kV substation, the estimated cost is for five (5) switches and removal of the wavetrap.

Total Cost

The total cost estimate for this Network Upgrade is:

$	48,462,701	345kV Transmission Line
$	583,578	345kV Substation
$	1,631,527	AFUDC
$	0	Contingency
$	50,677,806	Total

This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

Time Estimate

Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	12-18	Months
Procurement Time	12-18	Months
Construction Time	12	Months
Total Project Length	36-48	Months