



**INTERCONNECTION
FACILITIES STUDY
REPORT**

GEN-2017-195

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request is for a 500.4 MW generating facility located in Johnson County, Kansas. The Interconnection Request was studied in the DISIS-2017-002 Impact Study for ERIS. The Interconnection Customer's requested in-service date is December 30, 2026.

The interconnecting Transmission Owner, Evergy (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 (278) General Electric PV 0.90 MW/1.0 MVA inverters for a total generating nameplate capacity of 500.4 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 336/448/560 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;

Approx. 0.03 mile 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 ("West Gardner 345kV") 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
<u>West Gardner 345kV GEN-2017-195 Interconnection (TOIF) (KCPL) (143477):</u> Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2017-195 (500.4 MW/Solar), into the Point of Interconnection (POI) at West Gardner 345kV	\$947,036	100%	\$947,036	36 Months
Total	\$947,036		\$947,036	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>NA</u>	NA	NA	NA	NA	NA
Total		NA		NA	

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
<u>West Gardner 345kV Interconnection Expansion (DISIS-2017-002)(143476):</u> <u>Expand the West Gardner 345kV substation to accommodate the interconnection of GEN-2017-195 and GEN-2017-196</u>	Ineligible	\$1,079,638	79.63%	\$859,724.47	36 Months
<u>Craig to Lenexa 161 kV CKT1 & CKT 2 Rebuild (DISIS-2017-002)(156461):</u> Rebuild Craig to Lenexa 2.95 mile 161 kV CKT1 & CKT 2 to achieve a min winter emergency rating of 334 MVA and a min Summer emergency rating of 374 MVA	Eligible	\$8,294,856	63.74%	\$5,264,771.62	36 Months
Total		\$9,374,494.00		\$6,124,496.09	

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
<u>NA</u>	<u>NA</u>	<u>NA</u>

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>AECI: Upgrade relay limits at Locust Creek 161 kV on Hickory Creek line with ratings of 203 MVA Summer/291 MVA Winter</u>	\$50,000	12.04%	\$6,021
<u>AECI: Rebuild 26.49-mile-long Morgan to Brookline 161 kV line with 1192 ACSR rated at 100C</u>	\$34,450,000	11.53%	\$3,972,968
<u>AECI: Upgrade Sullivan 161/138 kV transformer #1 with 143S MVA Summer/167 MVA Winter transformer</u>	\$4,000,000	12.48%	\$499,024
<u>AECI: Rebuild 0.6-mile-long Thomas Hill to Thomas Hill Mine Tap 69 kV line with 795 ACSR at 100C</u> <u>Upgrade bushing CTs at Thomas Hill on Thomas Hill Mine Tap line with 1200A bushing CTs</u> <u>Upgrade jumpers at Thomas Hill on Thomas Hill Mine Tap line with 795 ACSR</u>	\$790,000	13.06%	\$103,175
<u>AECI: Rebuild 7.09-mile-long Santa Fe to South Fork Tap 69 kV line with 336.4 ACSR rated at 100C</u>	\$6,390,000	23.64%	\$1,510,903
<u>AECI: Rebuild 9.24-mile-long Cairo to Huntsville 69 kV line with 795 ACSR rated at 100C</u> <u>Upgrade disconnect switches at Cario 69 kV on Huntsville line with 1200A switches</u>	\$8,570,000	13.06%	\$1,119,256
<u>AECI: Rebuild 5.09-mile-long Cairo to Jacksonville 69 kV line with 795 ACSR rated at 100C</u> <u>Upgrade bushing CTs at Cario 69 kV on Jacksonville line with 1200A bushing CTs</u>	\$4,790,000	18.38%	\$880,404
<u>AECI: Rebuild 4.50-mile-long Huntsville to Thomas Hill Mine Tap 69 kV line with 795 ACSR rated at 100C</u>	\$4,050,000	13.06%	\$528,937
<u>AECI: Rebuild 9.10-mile-long Jacksonville to Macon 69 kV line with 336 ACSR rated at 100C</u>	\$8,190,000	18.38%	\$1,505,326

<u>AECI; Rebuild 4.90-mile-long Enon Bus 2 to Ethlyn Bus 2 161 kV line with 795 ACSR rated at 100C</u>	\$6,370,000	13.51%	\$860,655
<u>AECI; Rebuild 5.58-mile-long Conway to Phillipsburg 69 kV line with 336.4 ACSR rated at 100C</u>	\$5,040,000	5.13%	\$258,783
<u>AECI; Rebuild 13.2-mile-long Northboro to Tarkio 69 kV line with 336 ACSR rated at 100C</u>	\$11,880,000	18.13%	\$2,153,981
<u>AECI; Rebuild 17-mile-long Belltown to Palmyra 69 kV line with 336 ACSR rated at 100C</u> <u>Upgrade bushing CTs at Belltown 69 kV on Palmyra line with 70 MVA Summer/85 MVA Winter rated bushing CTs</u>	\$15,500,000	13.96%	\$2,163,603
<u>AECI; Rebuild 8.77-mile-long Perry to South Fork Tap 69 kV line with 336 ACSR rated at 100C</u>	\$7,830,000	27.09%	\$2,121,332
<u>AECI; Rebuild 18.4-mile-long Cairo to Letner 69 kV line with 336 ACSR rated at 100C</u>	\$16,560,000	13.33%	\$2,208,072
<u>AECI; Rebuild 5.4-mile-long Letner to Shelbina 69 kV line with 336 ACSR rated at 100C</u>	\$4,860,000	14.91%	\$724,507
<u>AECI; Rebuild 8.8-mile-long Sue City to Lovelake 69 kV line with 336 ACSR rated at 100C</u> <u>Upgrade bushing CTs at Lovelake 69 kV on Sue City line with 70 MVA Summer/85 MVA Winter rated busing CTs</u>	\$8,120,000	14.96%	\$1,215,085
<u>AECI; Rebuild 5.3-mile-long Laplata Tap to Lovelake 69 kV line with 336 ACSR rated at 100C</u> <u>Upgrade bushing CTs at Lovelake 69 kV on Laplata Tap line with 70 MVA Summer/85 MVA Winter rated busing CTs</u>	\$4,970,000	41.09%	\$2,042,096
<u>AECI; Rebuild 3.6-mile-long Macon East 3 to Macon Tap 69 kV line with 336 ACSR rated at 100C</u>	\$3,240,000	14.98%	\$485,389
<u>AECI; Rebuild 0.58-mile-long Macon to Macon Plant 69 kV line with 366 ACSR rated at 100C</u>	\$540,000	24.57%	\$132,684
<u>AECI; Rebuild 9.8-mile-long Sue City to Novelty Dist 69 kV line with 336 ACSR rated at 100C</u>	\$8,820,000	14.96%	\$1,319,834

<u>AECI: Upgrade bushing CTs at Chamois 69 kV on Reform 69 kV line with 600A rated bushing CTs</u>	\$200,000	12.42%	\$24,837
<u>AECI: Rebuild 6.50-mile-long Coffman Bend to J-7 69 kV line with 366 ACSR rated at 100C</u>	\$5,850,000	5.78%	\$338,012
<u>AECI: Rebuild 4.40-mile-long Coffman Bend to Knobby 69 kV line with 336 ACSR rated at 100C</u>	\$3,960,000	5.78%	\$228,808
<u>AECI: Rebuild 2.4-mile-long Palmyra to Bross 69 kV line with 336 ACSR rated at 100C</u>	\$2,160,000	14.00%	\$302,384
<u>AECI: Rebuild 2.8-mile-long South River to Bross 3 69 kV line with 336 ACSR rated at 100C</u>	\$2,520,000	14.00%	\$352,782
<u>AECI: Rebuild 0.2-mile-long Novelty to Novelty Distribution 69 kV line with 336 ACSR rated at 100C Upgrade bushing CTs at Novelty 69 kV on Novelty Distribution line with 600A rated bushing CTs</u>	\$380,000	15.02%	\$57,076
<u>AECI: Rebuild 2.3-mile-long Lakenan to Shelbina 69 kV line with 336 ACSR rated at 100C</u>	\$2,070,000	14.93%	\$309,027
<u>AECI: Rebuild 11.6-mile-long Belltown to Lakenan 69 kV line with 336 ACSR rated at 100C Upgrade bushing CTs at Belltown 69 kV on Lakenan line with 600A rated bushing CTs</u>	\$10,550,000	15.00%	\$1,582,529
<u>AECI: Rebuild 0.5-mile-long Macon East 3 to Ten Mile Tap 69 kV line 4/0 line section with 336 ACSR rated at 100C</u>	\$450,000	15.00%	\$67,511
<u>AECI: Upgrade 12.4-mile-long Knobby to Turkey Creek 69 kV line from 75C rating to 100C</u>	\$3,700,000	5.78%	\$213,785
<u>AECI: Upgrade wave-traps and disconnect switches at Choteau 161 kV on Maid line with 873 MVA Summer/1071 MVA Winter rated equipment</u>	\$400,000	16.30%	\$65,208
<u>AECI: Add second 161/69 kV transformer at Bevier with ratings of 112 MVA Summer/128 MVA Winter</u>	\$5,000,000	17.78%	\$889,037
<u>AECI: Rebuild to 0.1-mile-long Bevier to Bevier 69 kV line with 1192 ACSR</u>	\$130,000	18.77%	\$24,401
<u>AECI: Rebuild to 1.2-mile-long Axtell to Macon Lake 69 kV line with 1192 ACSR</u>	\$1,560,000	13.57%	\$211,686

<u>AECI; Rebuild to 1.1-mile-long Axtell to Macon Tap 69 kV line with 1192 ACSR</u>	\$1,430,000	13.57%	\$194,046
<u>AECI; Rebuild to 4.3-mile-long Macon Lake to Bevier Tap 69 kV line with 1192 ACSR</u>	\$5,590,000	13.57%	\$758,543
<u>AECI; Rebuild to 12.2-mile-long Love Lake to Macon Tap 69 kV line with 795 ACSR</u>	\$15,860,000	15.45%	\$2,449,642
Total	\$226,820,000		\$33,881,350

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 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)	\$947,036
Non-Shared Network Upgrade(s)	\$0
Shared Network Upgrade(s)	\$6,124,496.09
Affected System Upgrade(s)	\$33,881,350
Total	\$40,952,882.09

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).



Interconnection Facilities Study

Network Upgrades associated with DISIS-2017-002

March 2023

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-2017-002 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	156516	Archie 161 kV Terminal Upgrades (DISIS-2017-002) (EMW)	\$1,455,934	36 Months
Network Upgrade	156851	Archie – G17-108 Tap 161 kV Rebuild (DISIS-2017-002) (EMW)	\$41,157,960	36 Months
Network Upgrade	156461	Craig to Lenexa 161 kV Double Circuit Rebuild (DISIS-2017-002) (EM)	\$8,294,859	36 Months
Network Upgrade	156457	Post Oak 69-35 kV Transformer Replacement (DISIS-2017-002) (EKC)	\$2,470,058	36 Months
Network Upgrade	156471	Viola to G17-185 Tap 345 kV Line Rebuild (DISIS-2017-002) (EKC)	\$47,418,635	36 Months

Archie 161 kV Terminal Upgrades 161

kV Substation

All terminal equipment to be replaced to meet a 2000 Amp rating. This will require a main bus rebuild to 4" aluminum pipe bus and includes bus side disconnects for the other three line terminals.

Total Cost

The total cost estimate for this Network Upgrade is:

\$	0	161kV Transmission Line
\$	1,451,579	161kV Substation
\$	4,354	AFUDC
\$	0	Contingency
\$	1,455,934	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.

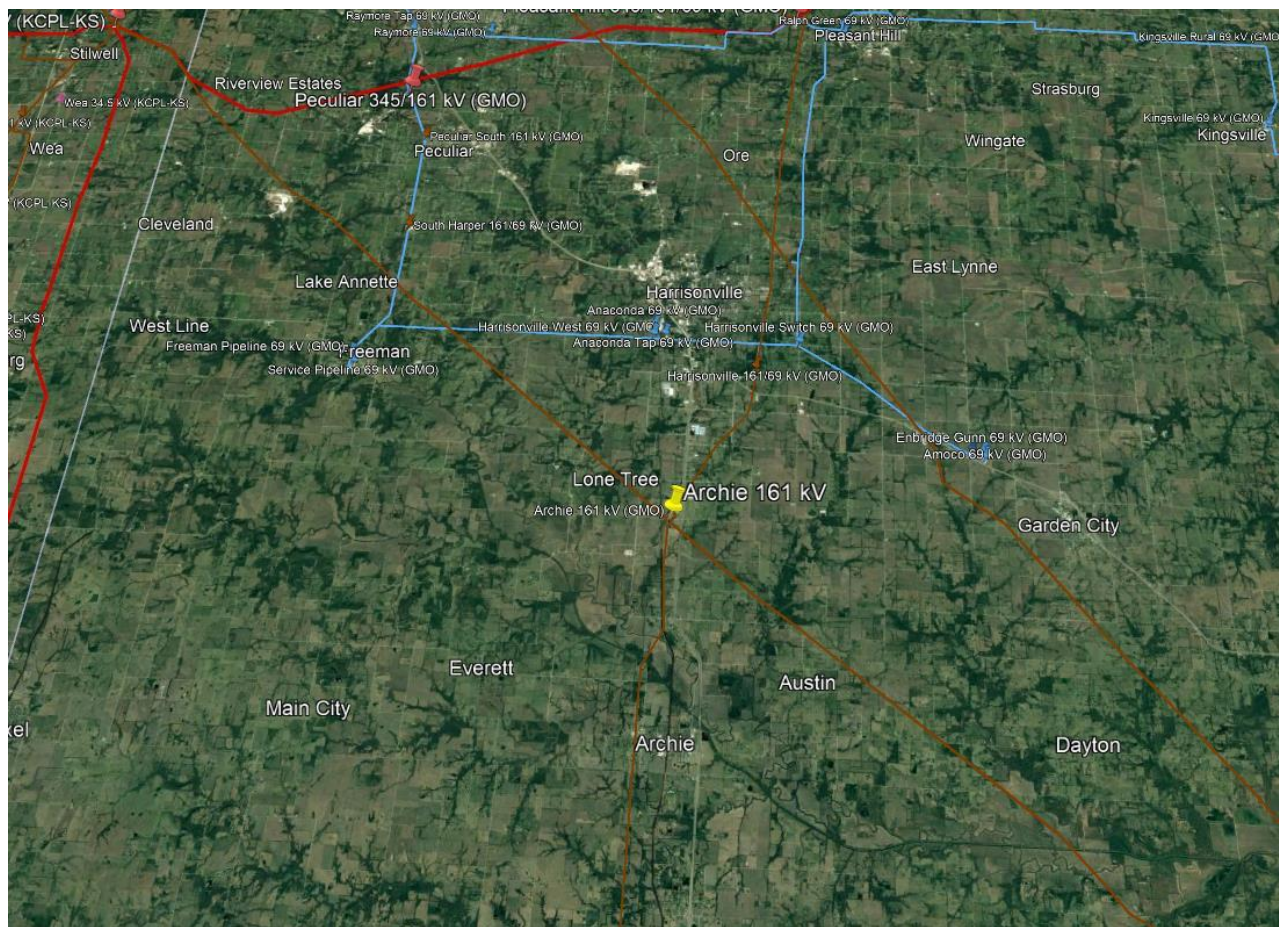
However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

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 – Archie 161 kV Sub



Archie – G17-108 Tap 161 kV Rebuild 161

kV Transmission Line

The estimated cost is for 28.73 miles of 161kV circuit. Line will be rebuilt using steel structures, with angles and dead-ends on drilled piers. Estimate assumes the conductor will be 1192 ACSS/TW and OPGW will be installed.

Total Cost

The total cost estimate for this Network Upgrade is:

\$	39,783,750	161 kV Transmission Line
\$	0	161 kV Substation
\$	1,374,210	AFUDC
\$	0	Contingency
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\$	41,157,960	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.

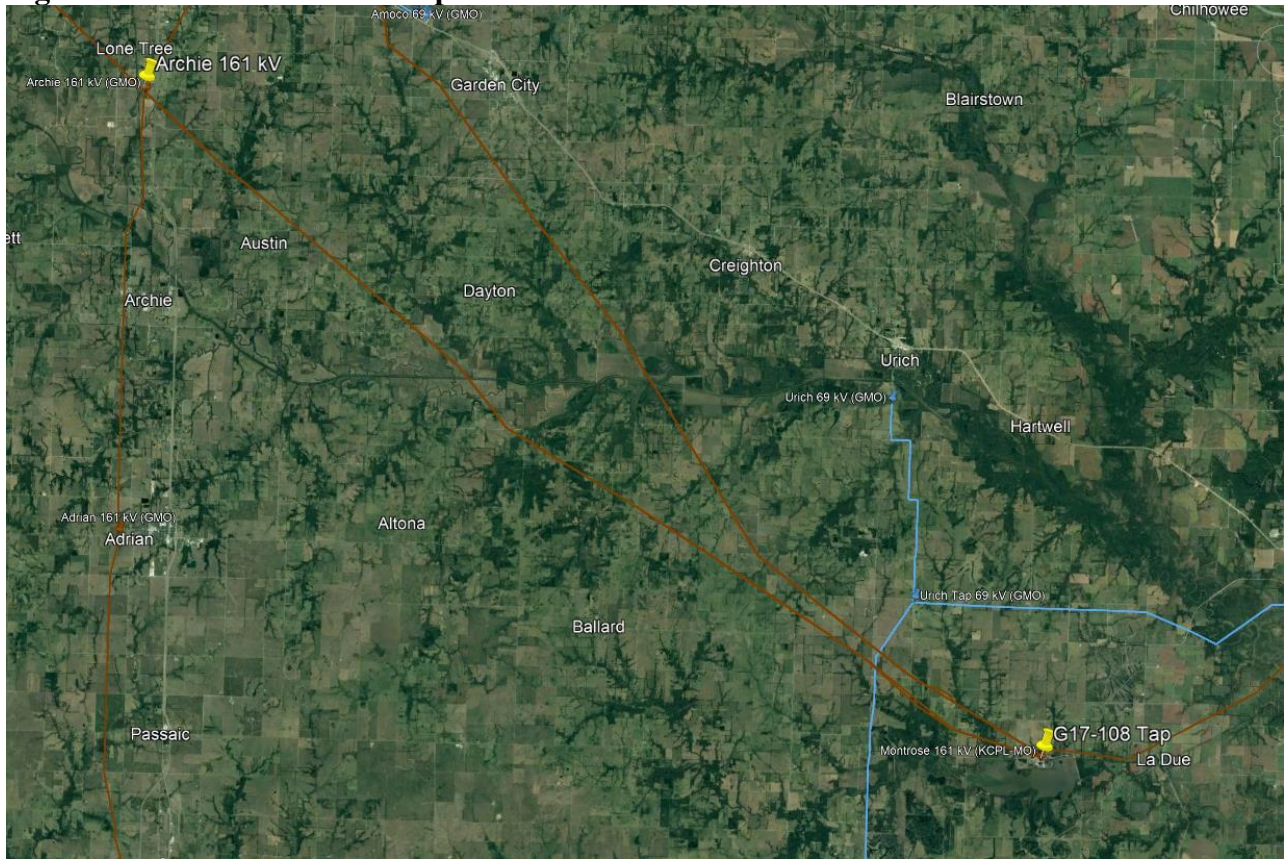
However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

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
<hr/>		
Total Project Length	36-48	Months

Figure 2 – Archie – G17-108 Tap



Craig to Lenexa 161 kV Double Circuit Rebuild 161 kV

Transmission Line

The estimated cost is for 2.95 miles of 161kV double circuit. The lines will be rebuilt with steel structures, 1192 ACSS/TW conductor and two OPGW's designed to Evergy standards.

Total Cost

The total cost estimate for this Network Upgrade is:

\$	7,763,088	161 kV Transmission Line
\$	0	161 kV Substation
\$	531,771	AFUDC
\$	0	Contingency
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\$	8,294,859	Total

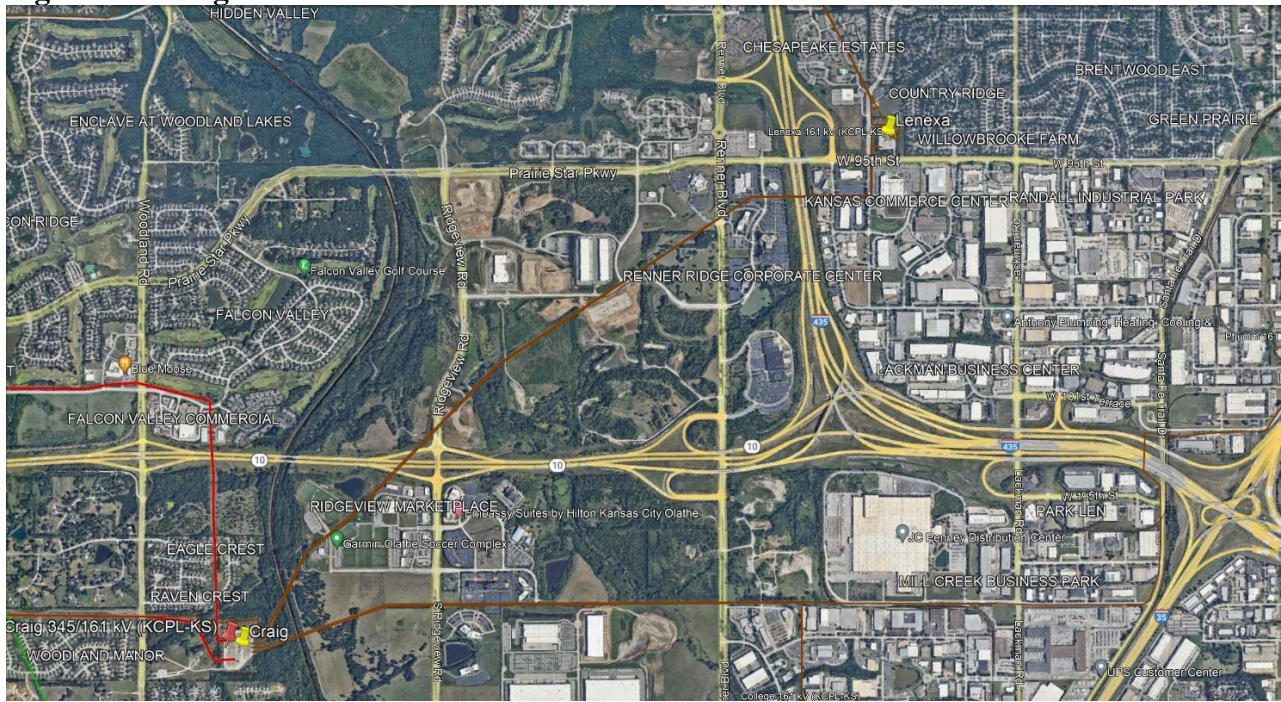
This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings 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
<hr/> Total Project Length	<hr/> 36-48	<hr/> Months

Figure 3 – Craig – Lenexa 161kV Line



Post Oak 69-35 kV Transformer Replacement

69 kV Transformer

Replace Post Oak 69/35 kV Transformer with a 50MVA 69/34kV Transformer. This will also require a 34kV bank breaker, 34kV feeder breaker, box bay, RTU, control house and metering equipment.

Total Cost

The total cost estimate for this Network Upgrade is:

\$	2,462,670	69 kV Substation Transformer
\$	7,388	AFUDC
\$	0	Contingency
\$	2,470,058	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 – Post Oak – 69kV Transformer



Viola – Renfrow 345 kV Rebuild (Evergy Portion)

345 kV Transmission Line

The estimated cost is for the rebuild of the 23-mile Evergy portion of the Viola – Renfrow 345kV line to meet a 3000 Amp line rating. Line will be rebuilt using steel structures, with angles and dead-ends on drilled piers. Estimate assumes the conductor will be 1590 Lapwing ACSR and OPGW will be installed.

Total Cost

The total cost estimate for this Network Upgrade is:

\$	47,276,805	345 kV Transmission Line
\$	0	345 kV Substation
\$	141,830	AFUDC
\$	0	Contingency
\$	47,418,635	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 – Viola – Renfrow 345 kV

