



# **INTERCONNECTION FACILITIES STUDY REPORT**

GEN-2016-100  
(IFS-2016-002-12)

Published January 2021

By SPP Generator Interconnections Dept.

## REVISION HISTORY

---

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
09/14/2020	SPP	Initial draft report issued.
10/14/2020	SPP	Updated final report issued and updated ILTCR eligibility.
01/08/2021	SPP	Updated final report issued. Updated cost allocation in Tables 1, 2, 3 and 6 based on DISIS Power Flow Reposting

## CONTENTS

---

Revision History .....	i
Summary .....	1
Introduction.....	1
Phase(s) of Interconnection Service .....	1
Compensation for Amounts Advanced for Network Upgrade(s).....	1
Interconnection Customer Interconnection Facilities .....	2
Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s) .....	3
Shared Network Upgrade(s).....	4
Contingent Network Upgrade(s).....	5
Affected System Upgrade(s) .....	6
Conclusion .....	7
Appendices.....	8
A: Transmission Owner’s Interconnection Facilities Study Report and NetworkUpgrades Report(s) .....	9

## SUMMARY

---

### INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-100/IFS-2016-002-12 is for a 100 MW generating facility located in Noble, OK. The Interconnection Request was studied in the DISIS-2016-002 Impact Study for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). This request was restudied in the DISIS-2016-002-2 Impact Study for ERIS. The Interconnection Customer's requested in-service date is November 1st, 2020.

The interconnecting Transmission Owner, Oklahoma Gas and Electric (OG&E), 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 (40) GE 2.5 MW Wind Turbine Generation Systems for a total generating nameplate capacity of 100 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 135/180/225 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An 8 mile overhead 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 ("Spring Creek - Sooner 345 kV") 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 Turbine 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 communications 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
<b><u>GEN-2016-100 Interconnection (TOIF) (OKGE) - 122626:</u></b> Add a single 345kV line terminal to a new EHV Substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs.	\$892,334	100%	\$892,334	14 Months
<b>Total</b>	<b>\$892,334</b>		<b>\$892,334</b>	

\*GEN-2016-100 and GEN-2016-101 are sharing interconnection facilities. The costs for these facilities are reflected in the IFS Summary for GEN-2016-100. If one request does not proceed, the cost/configuration will be incurred by the remaining request.

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<b><u>GEN-2016-100 Interconnection (Non-Shared NU) (WERE) – 122628:</u></b> Review protection settings.	Ineligible	\$16,624	100%	\$16,624	3 Months
<b>Total</b>		<b>\$16,624</b>		<b>\$16,624</b>	

Table 2: Non-Shared Network Upgrade(s)

**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
<b><u>GEN-2016-100/101 Tap – Arcadia 345 kV (DISIS-2016-002-2) – 122791:</u></b> Install one (1) 345 kV 3000A breaker, line relaying, disconnect switches, and all other associated equipment. Build approximately 47 miles of 345 kV transmission line from new EHV substation to Arcadia Substation. Bring in 345 kV line to Arcadia Substation, line relaying, and all other associated equipment. Expand Arcadia Substation by installing new rung, two (2) 345 kV breakers, dead end structure, line switch, line relaying, metering including CTs and PTs. Re-route existing 345 kV line into new terminal and two other existing lines around expanded substation	Eligible	\$67,234,906	9.67%	\$6,501,615	36 Months
<b><u>Viola 345/138 kV Transformer Ckt 2 (DISIS-2016-002-2) – 122792:</u></b> Install a new 345 kV terminal on a new rung consisting of two (2) breakers, four (4) switches, and two (2) control panels. Install a new 138 kV terminal on an existing rung consisting of one (1) breaker, three (3) switches, three (3) PTs, and one (1) 400/440 MVA 345-138 kV transformer with LTCs.	Eligible	\$9,204,587	2.48%	\$228,273	18 – 24 Months
<b><u>Soonger – Spring Creek 345kV Interconnection Substation – 122627:</u></b> Construct a new EHV substation. Install 4 – 345 kV 3000A breakers, line relaying, disconnect switches, and associated equipment.	Ineligible	\$11,145,332	11.17%	\$1,245,288	14 Months
<b>Total</b>		<b>\$87,584,825</b>		<b>\$7,975,176</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)*

Contingent Network Upgrade(s) Description	Current Cost Assignment	Estimated In-Service Date
<b><u>Blackberry – Wolfcreek 345 kV Ckt1 (AECD – 122765):</u></b> Build 86.15 miles of 345 kV line from Blackberry to Wolf Creek to achieve 1792/1792/1792/1792 (SN/SW/WN/WE) MVA ratings.	\$0	1/1/2026

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 MISO 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 Share (%)</b>	<b>Allocated Cost Estimate (\$)</b>
<b><u>AECL Affected System Study Cycle Projects:</u></b> Rebuild the 18-mile-long Hamburg to Northboro 69 kV line to 336 ASCR.	\$7,434,000	1%	\$69,826
<b><u>AECL Affected System Study Cycle Projects:</u></b> Rebuild the 4.4-mile-long Phelps to Rockport 69 kV line to 336 ASCR.	\$1,817,000	1%	\$16,943
<b><u>AECL Affected System Study Cycle Projects:</u></b> Rebuild the 11.4-mile-long Linden to Phelps 69 kV line to 336 ASCR.	\$4,708,000	1%	\$47,165
<b><u>AECL Affected System Study Cycle Projects:</u></b> Rebuild the 4.136-mile-long Bevier to Macon Lake 69 kV line to 477 ASCR.	\$2,938,000	1.1%	\$32,553
<b><u>AECL Affected System Study Cycle Projects:</u></b> Rebuild the 2.2-mile-long Macon Lake to Axtell to Macon Tap 69 kV line to 477 ASCR.	\$1,562,000	1.1%	\$16,740
<b><u>AECL Affected System Study Cycle Projects:</u></b> Upgrade the 10.92-mile-section of Neosho to Sweetwater 69 kV line to 336 ASCR.	\$6,273,000	2%	\$120,934
<b><u>AECL Affected System Study Cycle Projects:</u></b> Add 0.08 p.u. series reactor on Washburn to Seligman 69 kV line.	\$675,000	1.8%	\$12,155
<b>Total</b>	<b>\$25,407,000</b>		<b>\$316,316</b>

## CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for [Insert Interconnection Amount] 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 [Insert all upgrades (TOIF, non-shared NU, shared NU, affected system, etc)] that is required for full interconnection service is summarized in the table below.

*Table 6: Cost Summary*

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilitie Upgrade(s)	\$892,334
Non-Shared Network Upgrade(s)	\$16,624
Shared Network Upgrade(s)	\$7,975,176
Affected System Upgrade(s)	\$316,316
<b>Total</b>	<b>\$9,200,450</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

---

## **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 Interconnection Request 2016-100**

100 MW Wind Generating Facility  
In Noble County  
Oklahoma

November 7, 2019

Adam Snapp, P.E.  
Lead Engineer  
Transmission Planning  
**OG&E Electric Services**

## **Summary**

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Oklahoma Gas and Electric (OG&E) performed the following Facility Study to satisfy the Facility Study Agreement executed by the requesting customer for SPP Generation Interconnection request Gen-2016-100. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system. The requirements for interconnection consist of building a new EHV substation, with four new 345kV breakers and a terminal for the wind farm line. The total cost for OKGE to build the new substation with four new 345kV breakers, and four line terminals in a new EHV Substation, the interconnection facility, is estimated at \$12,930,000. This cost will be split with Gen-2016-119 who will be interconnecting to the same substation. The substation will take approximately (14) fourteen months to engineer and construct from the time Authorization to Proceed by both Gen-2016-119 and Gen-2016-100 is received by OG&E and site control is achieved.

**Table of Contents**

Table of Contents	3
Introduction	4
Interconnection Facilities	5
Interconnection Costs	6
One-Line diagram of Interconnection	7

## **Introduction**

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting a wind generating facility within the service territory of OG&E Electric Services (OKGE) in Logan County Oklahoma. The proposed 345kV point of interconnection is at a new EHV Substation in Logan County. This substation will be owned by OKGE. The cost for adding a new 345kV terminal to a new EHV Substation, the required interconnection facility, is estimated at \$892,334.

Network Constraints in the Southwest Public Service (SPS), OKGE and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.

Other Network Constraints in the American Electric Power West (AEPW), Southwest Public Service (SPS), OKGE, and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.



### **Interconnection Facilities**

The primary objective of this study is to identify attachment facilities. The requirements for interconnection consist of adding a new 345kV terminal in a new EHV Substation. This 345kV addition shall be constructed and maintained by OKGE. It is assumed that obtaining all necessary right-of-way for the line into the new OKGE 345kV substation facilities will be performed by the interconnection customer.

The total cost for OKGE to add a new 345kV terminal in a new EHV Substation, the interconnection facility, is estimated at \$892,334. This cost does not include building the 345kV line from the Customer substation into the new EHV Substation. The Customer is responsible for this 345kV line up to the point of interconnection. This cost does not include the Customer's 345-34.5kV substation and the cost estimate should be determined by the Customer.

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 Southwest Power Pool (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 Open Access Transmission Tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPPOATT.

The costs of interconnecting the facility to the OKGE transmission system are listed in Table 1.

### Short Circuit Fault Duty Evaluation

It is standard practice for OG&E to recommend replacing a circuit breaker when the current through the breaker for a fault exceeds 100% of its interrupting rating with re-closer de-rating applied, as determined by the ANSI/IEEE C37.5-1979, C37.010-1979 & C37.04-1979 breaker rating methods.

For this generator interconnection, no breakers were found to exceed their interrupting capability after the addition of the Customer's 100MW generation and related facilities. OG&E found no breakers that exceeded their interrupting capabilities on their system. Therefore, there is no short circuit upgrade costs associated with the Gen-2016-100 interconnection.

**Table 1: Required Interconnection Network Upgrade Facilities**

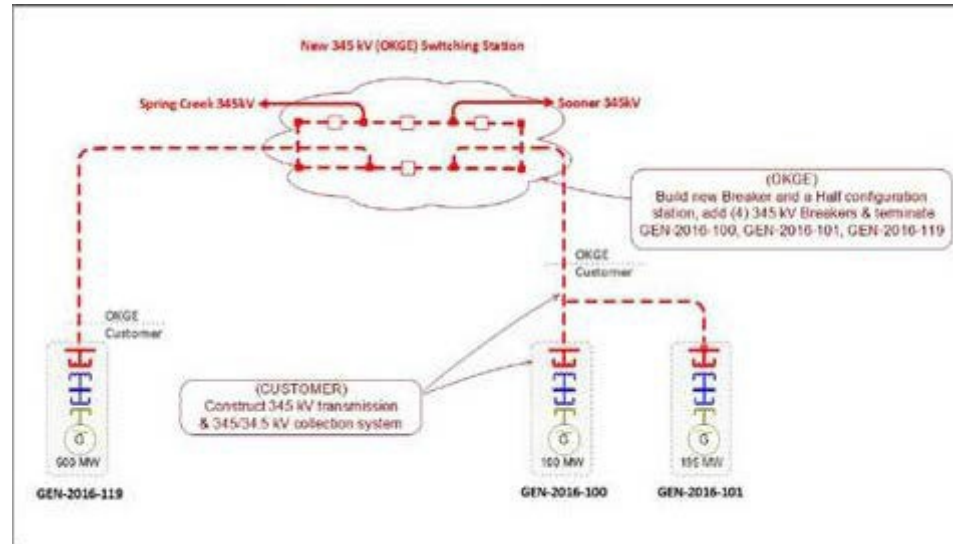
Facility	ESTIMATED COST (2018 DOLLARS)
OKGE – <b>Interconnection Facilities</b> - Add a single 345kV line terminal to a new EHV Substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs Gen 2016-100 Portion.	\$892,334
OKGE – <b>Network Upgrades</b> at a new EHV sub, Install 4-345kV 3000A breakers, line relaying, disconnect switches, and associated equipment. Gen 2016-100 Portion	\$5,572,666
OKGE – Land for substation	To Be Provided by Interconnect Customer
<b>Total</b>	<b>\$6,465,000</b>

Prepared by Adam Snapp, PE  
Lead Engineer, Transmission Planning  
OG&E Electric Services

November 7, 2019

Reviewed by:  
Steve M. Hardebeck, P.E.  
Manager, Transmission Planning

## New Substation in Logan County





**Evergy**

**Facility Study for Southwest Power Pool**

**Generation Interconnection Requests**

**GEN-2016-100**

**GEN-2016-101**

**GEN-2016-119**

**January 2020**

## 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 Kansas Central to satisfy the Facility Study Agreement executed by the requesting Interconnection Customer (Customer) for SPP Generation Interconnection Request GEN-2016-100, GEN-2016-101, and GEN-2016-119. 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(s) requests interconnection service three (3) separate wind farms for a total interconnect of 895 MW. The Customer(s) has proposed a commercial operation date for GEN-2019-119 of September 1, 2020 and November 1, 2020 for GEN-2016-100 and GEN-2016-101. The requirements for interconnection consist of reviewing relaying and protection for Evergy Kansas Central's generation at SpringCreek.

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 SPPTariff.

## Southwest Power Pool Generation Interconnection Request

Southwest Power Pool (SPP) Generation Interconnection (GI) requested and Evergy Kansas Central perform an Interconnection Facility Study (IFS).

GI Request #	Point of Interconnection	Capacity (MW)	Fuel Type
GEN-2016-100	Spring Creek – Sooner 345kV	100	Wind
GEN-2016-101	Spring Creek – Sooner 345kV	195	Wind
GEN-2016-119	Spring Creek – Sooner 345kV	600	Wind

## 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-2016-100

#### Evergy Kansas Central

There is no required substation work associated with interconnection of GEN-2016-100 for Evergy Kansas Central Substations. Costs are primarily to review the generation at Spring Creek protection coordination with the transmission system.

#### Network Upgrades

Network Upgrades on Evergy Kansas Central system include reviewing protection settings and coordination.

Network Upgrades      \$16,624

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

\$      0	TOIF
\$    16,624	Network Upgrades
<hr/>	
\$    16,624	Total

#### Time Estimate

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

Engineering Time	1 Month
Procurement Time	1 Month
<u>Construction Time</u>	<u>1 Month</u>
Total Project Length	3 Months

### GEN-2016-101

#### Evergy Kansas Central

There is no required substation work associated with interconnection of GEN-2016-101 for Evergy Kansas Central Substations. Costs are primarily to review the generation at Spring Creek protection coordination with the transmission system.

### Network Upgrades

Network Upgrades on Evergy Kansas Central system include reviewing protection settings and coordination.

Network Upgrades      \$16,624

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

\$	0	TOIF
\$	16,624	<u>Network Upgrades</u>
\$	16,624	Total

### Time Estimate

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

Engineering Time	1 Month
Procurement Time	1Month
<u>Construction Time</u>	<u>1 Month</u>
Total Project Length	3 Months

## GEN-2016-119

### Evergy Kansas Central

There is no required substation work associated with interconnection of GEN-2016-119 for Evergy Kansas Central Substations. Costs are primarily to review the generation at Spring Creek protection coordination with the transmission system.

### Network Upgrades

Network Upgrades on Evergy Kansas Central system include reviewing protection settings and coordination.

Network Upgrades      \$16,624

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

\$	0	TOIF
\$	16,624	<u>Network Upgrades</u>
\$	16,624	Total

### Time Estimate

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

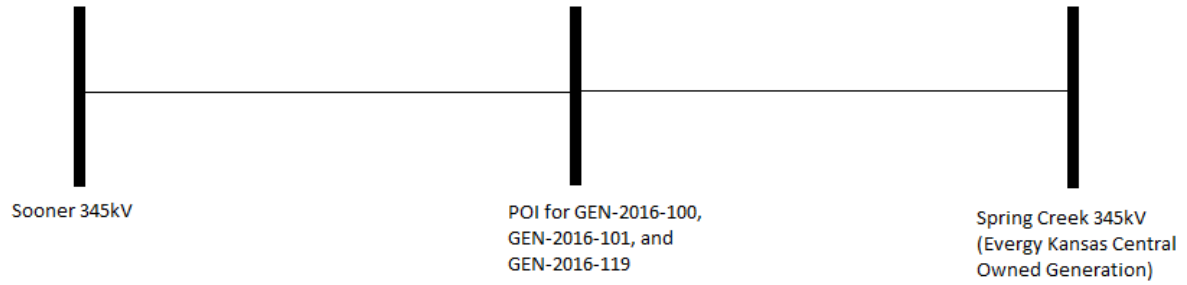
Engineering Time	1 Month
Procurement Time	1 Month
<u>Construction Time</u>	<u>1 Month</u>
Total Project Length	3 Months

## **Short Circuit Fault Duty Evaluation**

Evergy engineering staff reviewed short circuit analysis for the Spring Creek - Sooner 345 kV interconnection 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-2016-100, GEN-2016-101, and GEN-2016-119 wind farms.



## Appendix A: Topology of 345kV around Point of Interconnection





## **FACILITY STUDY**

**for**

### **IFS-2016-002-2 for GI Cluster Impact Study For DISIS-2016-002-2**

New Tap at Gen-2016-100/101/119 Substation on Sooner – Spring Creek line  
New 345kV Transmission Line from New Tap to Arcadia Substation  
In Payne, Logan, and Oklahoma Counties  
Oklahoma

August 11, 2020

Adam Snapp, P.E.  
Lead Engineer  
Transmission Planning  
**OG&E Electric Services**

## **Summary**

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Oklahoma Gas and Electric (OG&E) performed the following Facility Study for Network Upgrades to satisfy the Facility Study Agreement executed by the requesting customer for SPP DISIS-2016-002-2 for Network Upgrades. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system. The requirements for the Network Upgrade are to build a new terminal at a new substation on Sooner - Spring Creek line being built for Gen 2016-100 and 119. OGE must also build approximately 47 miles of 345 kV transmission line from new substation serving GEN-2016-100 and 119 to Arcadia Substation. Arcadia Substation needs to be expanded and one transmission line re-routed to a new terminal to allow for room for the new transmission line to be brought in. Two other lines must be re-routed at Arcadia to accommodate expanded footprint of the substation but will remain in their current terminal locations.

**Table of Contents**

Table of Contents	3
Introduction	4
Network Upgrade Facilities	5
Network Upgrade Costs	7
One-Line diagrams	8

## **Introduction**

The Southwest Power Pool has requested a Facility Study for Network Upgrades within the service territory of OG&E Electric Services (OKGE) in Payne and Oklahoma Counties in Oklahoma. The proposed Network Upgrade Facilities are for the addition of a 345kV terminal at a new substation in Payne county Oklahoma. This substation is being built to serve Gen-2016-100 and 119. Further network upgrades include the expansion of Arcadia substation, the installation of two 345kV breakers and a new terminal at Arcadia substation.

Network Constraints in the American Electric Power West (AEPW), Southwest Public Service (SPS), OKGE and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.

## **Network Upgrade Facilities**

The primary objective of this study is to identify Network Upgrades. The requirements for this Network Upgrade consist of the expansion of Arcadia substation, the building of a 345kV transmission line between the two substations, and the installation of a new terminal at Arcadia substation to re-route an existing line into in order to accommodate generator interconnection requests identified in SPP-GI DISIS-2016-002-2. These 345kV network upgrades shall be constructed and maintained by OKGE.

Network upgrades for this GI cluster study include the addition of a new 345kV terminal to the new substation built for Gen-2016-100 and 119 as well as relay equipment and other upgrades at Arcadia to allow the addition of a new transmission line.

Total cost of all Network Upgrades is estimated at \$67,234,906 and will take 36 months to construct.

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 Southwest Power Pool (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 Open Access Transmission Tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPP OATT.

The costs of interconnecting the facility to the OKGE transmission system are listed in Table 1.

### Short Circuit Fault Duty Evaluation

It is standard practice for OG&E to recommend replacing a circuit breaker when the current through the breaker for a fault exceeds 100% of its interrupting rating with re-closer de-rating applied, as determined by the ANSI/IEEE C37.5-1979, C37.010-1979 & C37.04-1979 breaker rating methods.

For this Network Upgrade, no breakers were found to exceed their interrupting capability after the addition of the line terminals at the new EHV substation and Arcadia as well as addition of related facilities. OG&E found no breakers that exceeded their interrupting capabilities on their system. Therefore, there is no short circuit upgrade costs associated with this DISIS-2016-002-2 Network Upgrade.

**Table 1: Required Interconnection Network Upgrade Facilities**

Facility	ESTIMATED COST (2020 DOLLARS)	Estimated Lead time
OKGE – <b>Network Upgrades</b> at a new EHV sub, Install 1-345kV 3000A breakers, line relaying, disconnect switches, and associated equipment.  Build approx. 47 Miles of 345kV Transmission line from new EHV substation to Arcadia Substation  Bring in 345kV line to Arcadia substation. Line relaying and all associated equipment.  Expand Arcadia substation, Install new rung, 2-345kV breakers, Dead end structure, line switch, line relaying, metering including CTs and PTs. Re-route existing 345kV line into new terminal and two other existing lines around expanded substation.	\$67,234,906	36 Months
OKGE – Transmission Line ROW obtainment	Not Included	12 Months
<b>Total</b>	<b>\$67,234,906</b>	<b>36 months</b>

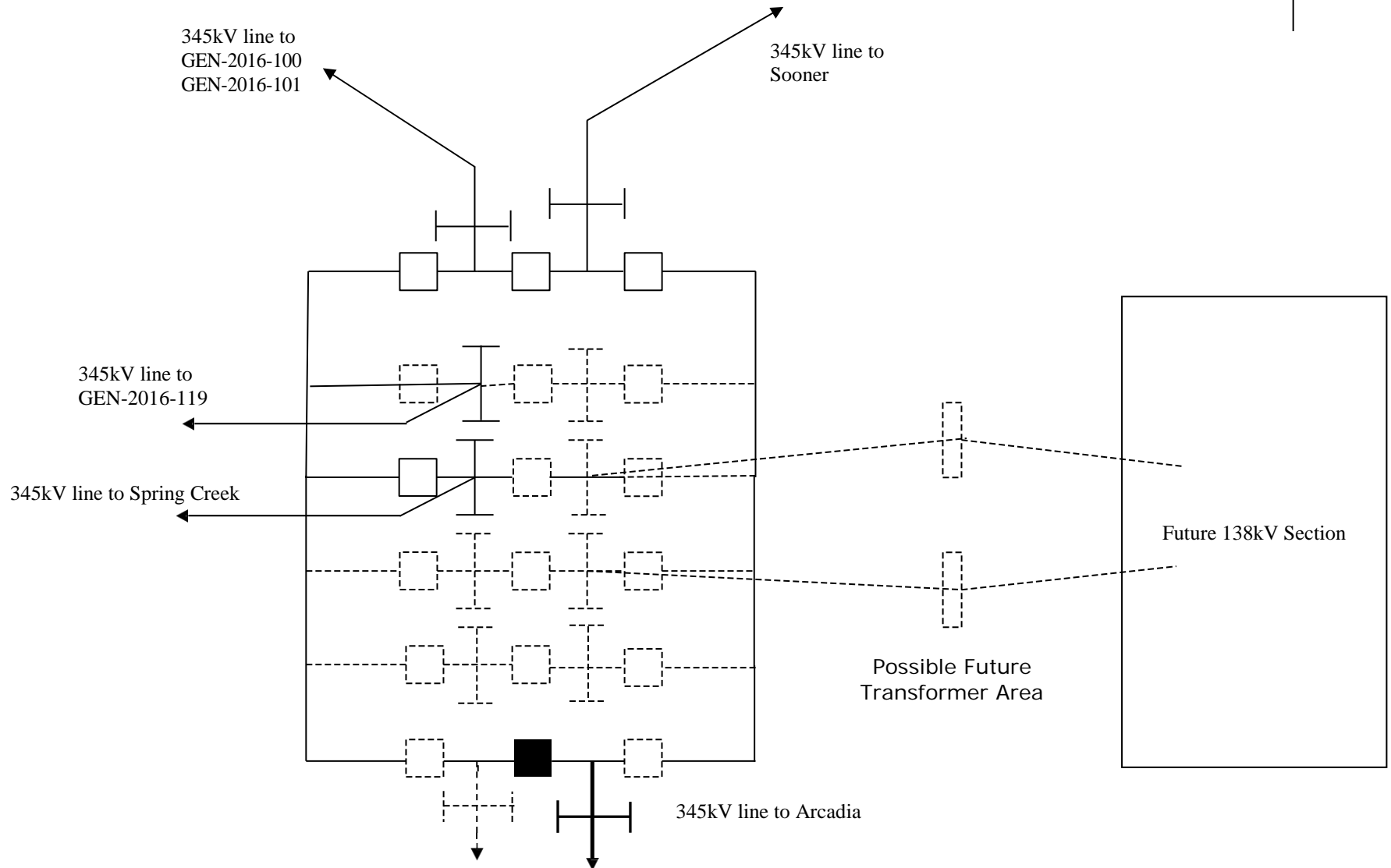
Prepared by:  
Adam Snapp, P.E.  
Lead Engineer, Transmission Planning  
snappad@oge.com

August 11, 2020

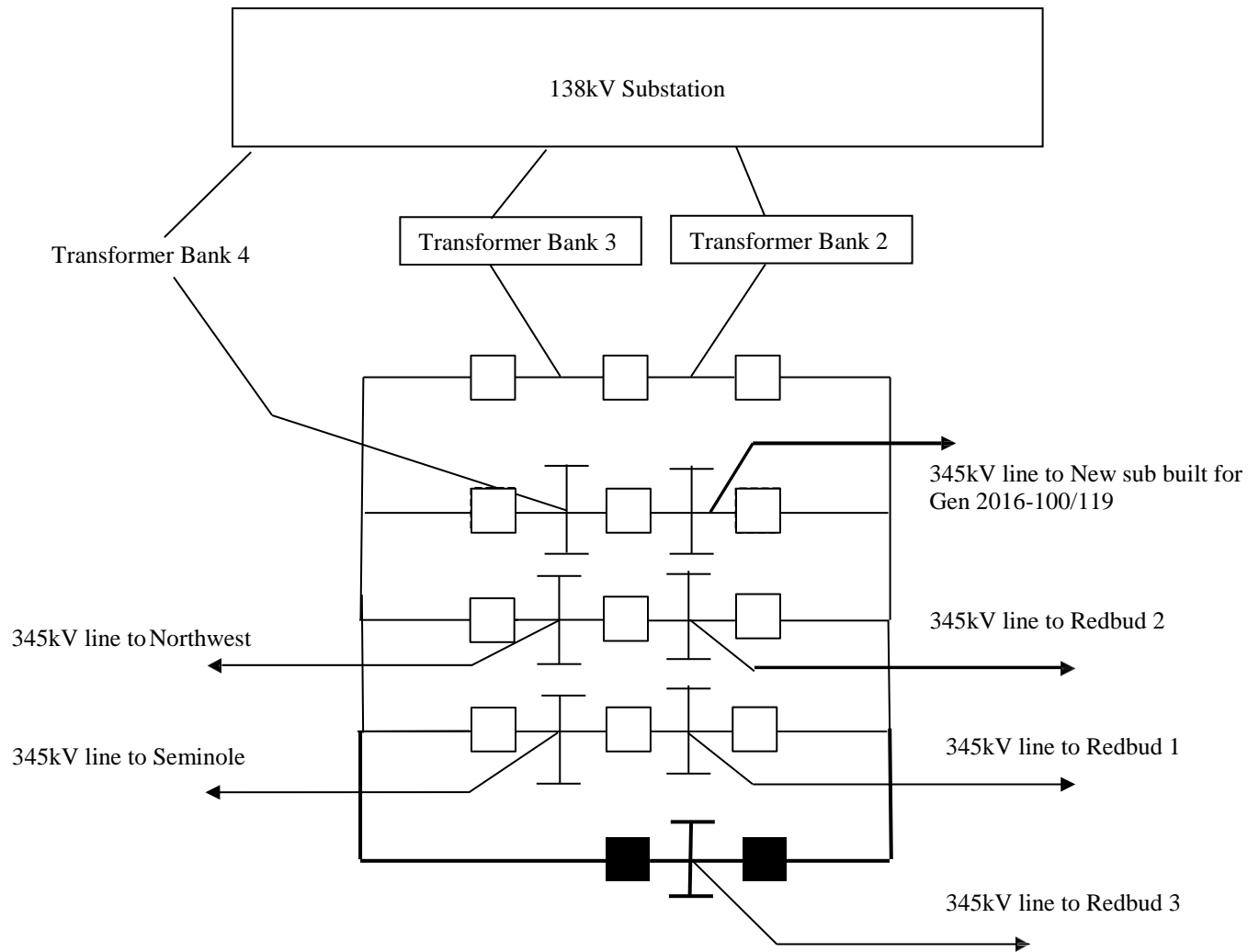
Reviewed by:  
Steve M Hardebeck PE, PMP  
Manager- Transmission Planning  
hardebsm@oge.com



# Substation developed for GEN-2016-100/119



# Arcadia Substation





## **Interconnection Facilities Study**

### **Network Upgrades associated with DISIS-2016-002-2**

**September 2020**

## **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-2016-002-2 Interconnection Request(s) mentioned below.

- GEN-2016-100
- GEN-2016-101
- GEN-2016-111
- GEN-2016-112
- GEN-2016-114
- GEN-2016-119
- GEN-2016-122
- GEN-2016-128
- GEN-2016-133 thru 146
- GEN-2016-153

## **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):

Network Upgrade	Description	SCERT UID	DISIS Estimate
<b>Hoyt - JEC 345kV Rebuild</b>	Rebuild the existing JEC - Hoyt 345 kV line as double circuit 345 kV with normal/minimal emergency rating of 1792 MVA. Network upgrade shared by four requests: GEN-2016-111, GEN-2016-112, GEN-2016-114, GEN-2016-22.	122705	\$49,284,648.00
<b>Viola 345/138kV Transformer CKT 2</b>	Build second 345/138/13.8kV transformer at Viola.	122792	\$9,038,339.00
<b>Reno 345/115 kV Transformer Ckt 1</b>	Replace existing Reno transformer with one rated 400/440.	122793	\$4,683,106.00
<b>Reno 345/115 kV Transformer Ckt 2</b>	Replace existing Reno transformer with one rated 400/440	122794	\$4,683,106.00

## **Hoyt – Jeffrey EC 345kV Rebuild**

### **345kV Transmission Line**

The estimated cost is for 24.3 miles of single 345kV circuit with new bundled 1590 Lapwing ACSR line with 64mm OPGW static wire, eight (8) steel dead end structures, one-hundred forty-three (143) steel tangent structures, four (4) steel running angle structures, and no distribution underbuild.

### **345kV Substation**

At Hoyt 345kV substation, the estimated cost is for removal of the wavetrap, replace line arrestors, add fiber, and upgrade groundmat.

At Jeffrey EC 345kV substation, the estimated cost is for removal the wavetrap, replace line arrestors, and add fiber.

### **Total Cost**

The total cost estimate for this Network Upgrade is:

\$	49,140,587	345kV Transmission Line
\$	490,863	345kV Substation
\$	153,427	AFUDC
\$	0	Contingency
<hr/>		
\$	49,784,877	Total

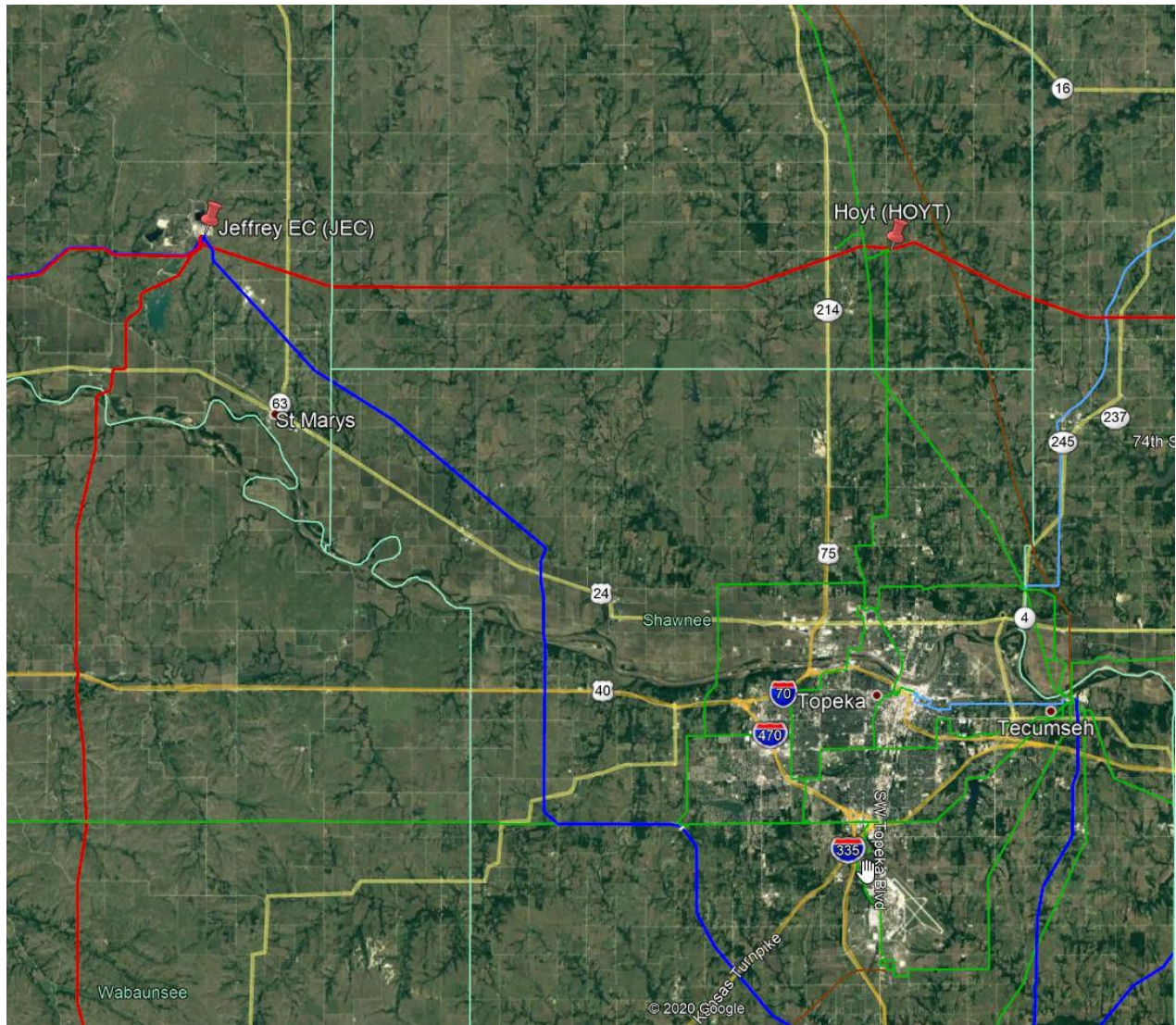
This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings 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	Months
Procurement Time	12	Months
Construction Time	12	Months
<hr/>		
Total Project Length	24-36	Months

**Figure 1 – Hoyt-Jeffrey EC 345kV Line**



## **Viola 345-138kV TX-2 Transformer Addition**

### **345kV and 138kV Substation**

At Viola 345kV substation, the estimated cost is for a new 345kV terminal on a new rung consisting of two (2) breakers, four (4) switches, and two (2) control panels. Also, at Viola 138kV substation, the estimated cost is for a new 138kV terminal on an existing rung consisting of one (1) breaker, three (3) switches, three (3) PTs, and one (1) 400/440 MVA 345-138kV transformer with LTCs.

### **Total Cost**

The total cost estimate for this Network Upgrade is:

\$	9,177,056	345kV and 138kV Substation
\$	27,531	AFUDC
\$	0	Contingency
<hr/>		
\$	9,204,587	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.

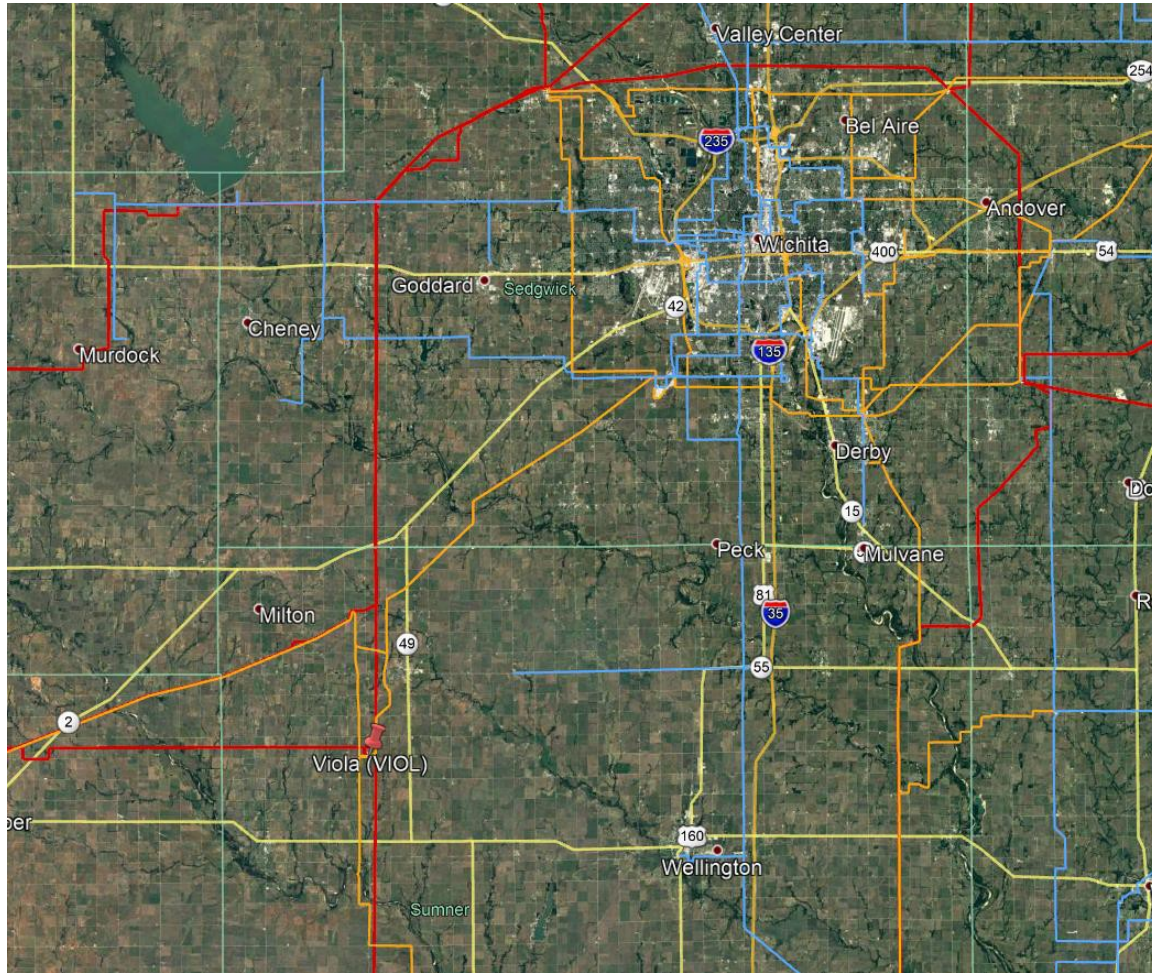
### **Time Estimate**

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
<hr/>		
Total Project Length	18-24	Months



**Figure 2 – Viola Substation**





## **Reno County 345-115kV TX-1 Transformer Replacement**

### **345kV and 115kV Substation**

At Reno County 345kV and 115kV substation, the estimated cost is for one (1) 345-115kV 400/440 MVA transformer with LTCs, and removal of the existing transformer.

### **Total Cost**

The total cost estimate for this Network Upgrade is:

\$	4,669,098	Substation
\$	14,007	AFUDC
\$	0	Contingency
<hr/>		
\$	4,683,105	Total

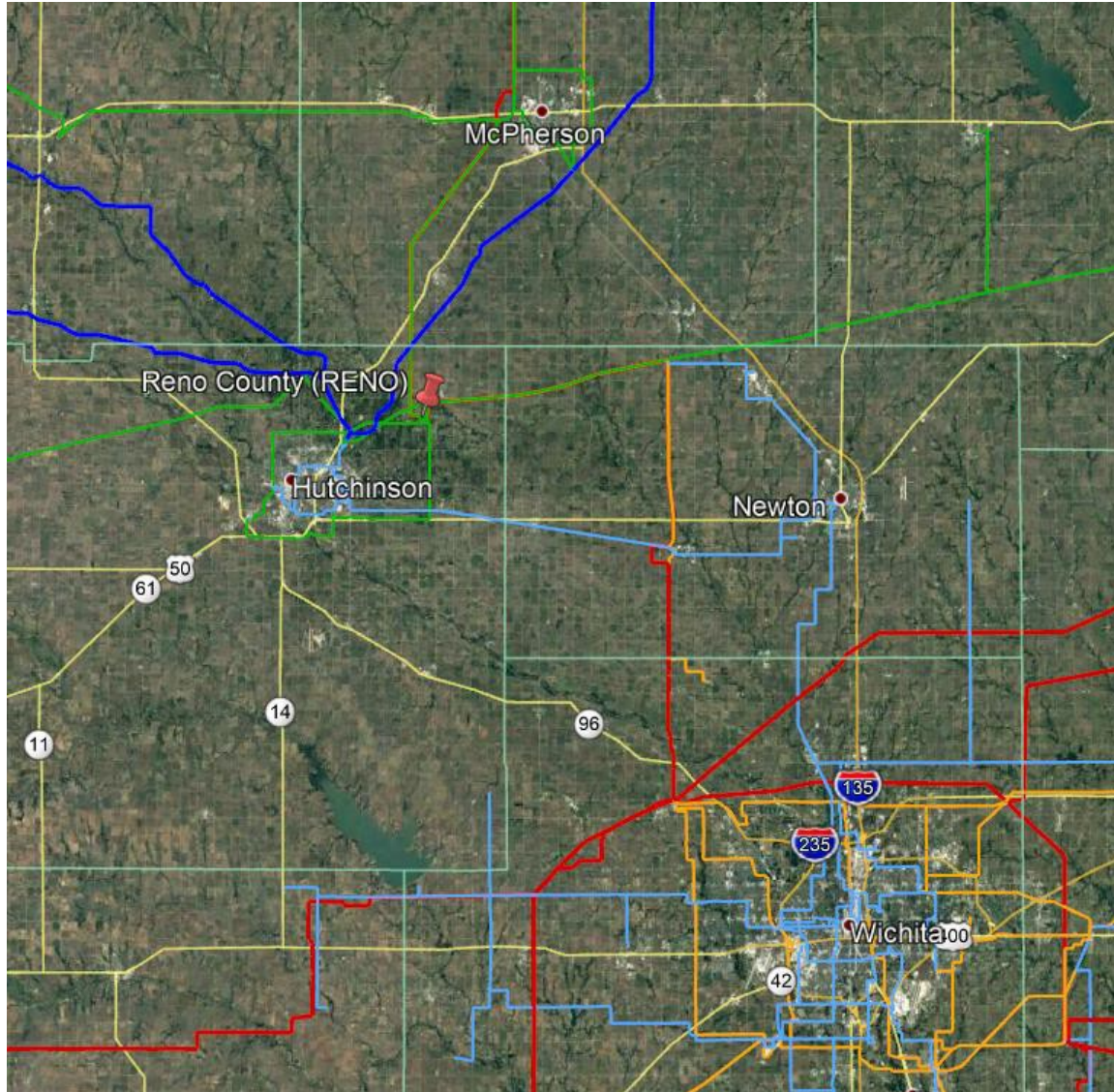
This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings 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
<hr/>		
Total Project Length	18-24	Months

**Figure 3 – Reno County Substation**



## **Reno County 345-115kV TX-2 Transformer Replacement**

### **345kV and 115kV Substation**

At Reno County 345kV and 115kV substation, the estimated cost is for one (1) 345-115kV 400/440 MVA transformer with LTCs, and removal of the existing transformer.

### **Total Cost**

The total cost estimate for this Network Upgrade is:

\$	4,669,098	Substation
\$	14,007	AFUDC
\$	0	Contingency
<hr/>		
\$	4,683,105	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
<hr/>		
Total Project Length	18-24	Months