



AFFECTED SYSTEM INTERCONNECTION FACILITIES STUDY REPORT

Energy and Western Area Power
Administration (WAPA)
Network Upgrade(s)

ASGI-2018-001

Published August 2022

By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
2/6/2019	SPP	Initial draft report issued.	
4/4/2019	SPP	Revised draft report issued to account for change in facility capacity.	
4/8/2019	SPP	Revision to draft report regarding full interconnection service provisions	
06/13/2021	SPP	Updated final report issued. Updated the appended network upgrade facilities studies and cost allocation in Tables 1 and 4	
08/15/2022	SPP	Revision to report due to updated cost estimates	

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SUMMARY

INTRODUCTION

This Affected System Interconnection Facilities Study (AS-IFS) for Interconnection Request ASGI-2018-001 (GIA-61) is for a proposed 242 MW generating facility to be connected to the facilities of Associated Electric Cooperative, Inc. located in Nodaway County, MO. The Affected System Interconnection Request was studied prior queued to the DISIS-2017-001 Impact Study for Affected System Impact Review for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). The Interconnection Customer's Commercial Operation Date was May 4th, 2020.

The affected Transmission Owners, Evergy and Western Area Power Administration (WAPA), performed a detailed AS-IFS at the request of SPP. The full reports are included in Appendix A. SPP has determined that full Interconnection Service will be available after the SPP Network Upgrades are completed.

The primary objective of the AS-IFS is to identify necessary Network Upgrades, cost estimates, and associated construction lead times needed to grant the full 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.

CREDITS/COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADES

Interconnection Customer shall be entitled to compensation in accordance with Attachment Z2 of the SPP OATT for the cost of SPP creditable-type Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, that are not otherwise refunded to the Interconnection Customer. Compensation shall be in the form of either revenue credits or incremental Long Term Congestion Rights (iLTCR).

GENERATING FACILITY

The Generating Facility is proposed to consist of 11 Vestas V110-2.0 MW and 100 Vestas V116-2.2 MW turbines for a total of 242 MW total capacity at the Maryville 161 kV substation in Nodaway County, MO.

AFFECTED SYSTEM NETWORK UPGRADE(S)

To facilitate interconnection, the Affected System Transmission Owner will perform work as shown below necessary for the acceptance of the Interconnection Customer’s Interconnection Facilities.

Table 1 lists the Interconnection Customer’s estimated cost responsibility for Affected System Non-Shared Network Upgrade(s) and provides an estimated lead time for completion of construction. The estimated lead time begins when the Facilities Construction Agreement has been fully executed.

Table 1: Affected System Non-Shared Network Upgrade(s)

Affected System Network Upgrades Description	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Lead Time
Maryville to Creston 161kV Rebuild (GIA-61) (143691): Reconductor 62.4 miles using 556.5 ACSS Parakeet conductor.	\$14,900,000	100%	\$14,900,000	24 Months
Maryville to Midway 161kV Rebuild (GIA-61) (144285): Install new switches, ccvts, control panel, and remove wavetraps on line 10 terminal at the Maryville substation. Remove wavetraps on line 10 terminal and remove wavetraps on line 3 terminal at Midway substation.	\$27,899,746	100%	\$27,899,746	36 Months
Midway to Avenue City 161kV Rebuild (GIA-61) (144286): Replace existing structures and conductor with new structures and 1192.5 ACSS conductor.	\$27,950,136	100%	\$27,950,136	36 Months
Avenue City to St. Joseph 161kV Rebuild (GIA-61) (144287): Replace existing structures and conductor with new structures and 1192.5 ACSS conductor. Remove wavetraps on line 3 terminal at Avenue City substation. Replace 3 sets of 477 AAC jumpers at St. Joseph substation.	\$6,346,906	100%	\$6,346,906	30 Months
Nashua to Roanridge 161kV Rebuild (GIA-61) (144288 and 144289): Replace existing structures and conductor with new structures and 1192.5 ACSS conductor. Replace switch, jumper and remove wavetraps on the line 4 terminal. Upgrade CT/Relays associated with 2 breakers and upgrade control panels at the Roanridge substation.	\$13,466,879	100%	\$13,466,879	36 Months

Southwest Power Pool, Inc.

<p>Nashua 345/161kV Ckt 2 New Transformer (GIA-61) (144290): Install a new 345-161 kV transformer with one rated for 650 MVA normal, 715 MVA Emergency. Install 2 breakers, jumpers, 6 switches, and 4 CCVTs, and corresponding CT/Relays to accommodate new</p>	<p>\$11,391,368</p>	<p>100%</p>	<p>\$11,391,368</p>	<p>36 Months</p>
<p>Total</p>	<p>\$ 101,955,035</p>		<p>\$ 101,955,035</p>	

The Interconnection Customer’s share of costs for Shared Network Upgrades is estimated in **Table 2** below.

Table 2: Interconnection Customer Shared Network Upgrades

Shared Network Upgrades Description	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)
None	\$0	N/A	\$0
Total	\$0	N/A	\$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.

OTHER AFFECTED SYSTEM NETWORK UPGRADE(S)

Certain Other Affected System Network Upgrades are **currently not the cost responsibility** of the Interconnection Customer but will be required for full Interconnection Service.

Table 3: Interconnection Customer Other Affected System Network Upgrade(s)

Other Network Upgrade(s) Description	Current Cost Assignment	Estimate In-Service Date
None	N/A	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 full Interconnection Service is at risk of being reduced until the in-service date of these Other Network Upgrades.

CONCLUSION

After all Affected System Network Upgrades have been placed into service, full Interconnection Service for 242 MW can be granted. Full Interconnection Service will be delayed until the Affected System Non-Shared Network Upgrade(s) and Other Affected System Network Upgrade(s) are completed. The Interconnection Customer’s estimated cost responsibility for Affected System Non-Shared Network Upgrades is summarized in the table below.

Table 4: Cost Summary

Description	Allocated Cost Estimate
Evergy Affected System Network Upgrades	\$87,055,035
WAPA Affected System Network Upgrades	\$14,900,000
Total	\$101,955,03

A draft Facilities Construction Agreement (FCA) will be provided to the Interconnection Customer consistent with the final results of this AS-IFS report. The Affected System Transmission Owner and Interconnection Customer will have 60 days to negotiate the terms of the CA consistent with the SPP OATT.

APPENDIX A: TRANSMISSION OWNER'S INTERCONNECTION FACILITIES STUDY REPORT

Affected System Facilities Study Report

Southwest Power Pool, Inc. ASGI-2018-001



**Western Area
Power Administration**
Upper Great Plains Region

January 2019



Revision History

- Revised April 2019 to address change in requested uprate from 216 MVA to 237MVA.
- Revised September 2021 to update Estimated Schedule in Attachment A.



1.0 Background:

The Western Area Power Administration Upper Great Plains Region (WAPA-UGP¹) received a request from the Southwest Power Pool Inc. (SPP) for an Affected System Facilities Study in accordance with the SPP Open Access Transmission Tariff (Tariff). Associated Electric Cooperative Inc. (AECI) has a generator interconnection request GIA-61 for an interconnection customer in their queue for a 242 MW wind generating facility with Point of Interconnection at the Maryville 161 kV Substation in Nodaway County, MO. WAPA-UGP owns the Creston-Maryville 161 kV Transmission Line and has included this facility under the SPP Tariff. AECI submitted a request to SPP for an Affected System Impact Study (ASIS). SPP assigned queue identifier ASGI-2018-001 to AECI's request.

2.0 Status of Existing Studies applicable to Request:

SPP completed the SPP ASGI-2018-001 ASIS with report dated November 2018. The SPP ASGI-2018-001 ASIS identified the need to reconductor WAPA-UGP's Creston-Maryville 161 kV Transmission Line to at least 237 MVA in order to accommodate the additional loading due to ASGI-2018-001.

This Affected System Facility Study evaluates impacts of ASGI-2018-001 to the Creston-Maryville 161 kV Transmission Line and the required facility upgrades to accommodate the 237 MVA rating.

3.0 Study Requirements:

WAPA-UGP has performed this Affected System Facilities Study to determine a good faith estimate of (i) the cost estimate for the required upgrades, and the interconnection customer's appropriate share of the cost of any required upgrades, and (ii) the time required to complete construction. This Affected System Facilities Study includes an evaluation of the following:

3.1 Develop/compile cost estimates for all WAPA-UGP labor, overheads, equipment additions, modifications, etc.

3.2 Review and document any other interconnection/control area requirements. Document these additional requirements (such as indication/metering, monitoring, control, relaying) and include these in the cost estimate.

3.3 Develop an overall time schedule for completion of the necessary addition/modifications.

4.0 Study Results:

WAPA-UGP performed the following tasks to evaluate the additions to the system to accommodate the line rating increase request as studied and outlined in Section 3.0 above:

¹ WAPA-UGP is also referred to as "Western-UGP" in the SPP Tariff.



4.1 Facility additions: The evaluation of facilities to accommodate the required rating of 237 MVA for WAPA-UGP's Creston-Maryville kV Transmission Line identified the following requirements:

- Reconductor 62.4 miles of the Creston-Maryville 161 kV Transmission Line using 556.5 ACSS Parakeet conductor, including new insulators assemblies and hardware to accommodate the high temperature conductor. The proposed use of the ACSS type conductor eliminates the need to replace the existing transmission line structures previously identified in the earlier conceptual cost estimates.

WAPA-UGP's estimated cost for labor, overhead, materials, and other miscellaneous costs to address the ASGI-2018-001 impacts (i.e. to achieve the identified 237 MVA rating) are outlined in Attachment A. The total cost is estimated to be \$14,900,000. The interconnection customer is responsible for the entire cost of the project.

4.2 Contractual Agreements: A construction agreement and Environmental Review agreement are required for the advancement of funds and to address environmental requirements for the work at WAPA-UGP's Creston-Maryville 161 kV Transmission Line to proceed. SPP will tender a facilities construction agreement for negotiation and execution between the parties. The interconnection customer will be responsible for the actual costs of the line reconductor, and WAPA-UGP will require advance funding to proceed with the project. Upon completion of the work WAPA-UGP will own, operate, and maintain the modifications and improvements to WAPA-UGP's Creston-Maryville 161 kV Transmission Line.

4.3 Interconnection/Control Area Requirements: N/A

4.4 Schedule: WAPA-UGP's estimated milestone schedule for the reconductor of WAPA-UGP's Creston-Maryville 161 kV Transmission Line is shown in Attachment A. The schedule is subject to execution of a facilities construction agreement, advance funding being provided, outage availability, and completion of an Environmental Review by the timeframes identified in the facilities construction agreement.

5.0 Environmental Review:

WAPA-UGP is a federal agency under the U.S. Department of Energy and is subject to the National Environmental Policy Act (NEPA), 42 U.S.C §4321, et seq., as amended. WAPA-UGP anticipates an Environmental Assessment (EA) level of NEPA review will be required for the reconductor of the Creston-Maryville 161 kV Transmission Line. WAPA-UGP's general cost estimate for an EA level of NEPA review is \$100,000. WAPA-UGP will tender an Environmental Review agreement authorizing WAPA-UGP, at interconnection customer's expense, to perform the Environmental Review including EA level of NEPA review.



6.0 Facilities Study Cost:

WAPA-UGP will audit the Affected System Facilities Study costs and provide a summary of these costs to SPP.



ATTACHMENT A

ESTIMATED COSTS FOR CRESTON-MARYVILLE 161 KV TRANSMISSION LINE RECONDUCTOR

ITEM	ESTIMATED COST	PAYMENT SCHEDULE
Planning and project management	\$325,000	Upon Execution of Construction Agreement
Design, Specifications, and Contract Administration	\$425,000	Upon Execution of Construction Agreement
Creston-Maryville 1061 kV Reconductor	\$14,150,000	November 2021
TOTAL ESTIMATED PROJECT COST	\$14,900,000	

ESTIMATED SCHEDULE

ACTIVITY	BEGIN	COMPLETE
Planning / Engineering Design	July 2019*	November 2021
Issue Construction Contract	January 2022	N/A
Award Construction Contract	May 2022	N/A
Procurement and Construction	May 2022	May 2023
In-Service-Date	(milestone)	May 2023*

*Subject to execution of facilities construction agreement, advance funding being provided, outage availability, and completion of an Environmental Review prior to the start of construction.





**Evergy Affected System Interconnection
Facilities Study for Southwest Power Pool
Generation Interconnection Request AECI
GIA-61 ASGI-2018-001**

Revision 3

Prepared by: Evergy Long Term Planning
August 12, 2022

Executive Summary

In accordance with the Southwest Power Pool (SPP) Generator Interconnection Procedures (GIP) 8.10 and 8.11, SPP Generator Interconnection (GI) Staff requested an Affected System Interconnection Facilities Study with associated interconnection costs and lead times for the proposed Network Upgrades of the Evergy Maryville-Midway 161 kV line, the Evergy Midway-Avenue City 161kV line, the Evergy Avenue City – St. Joseph 161kV line, the Evergy Nashua-Roanridge 161kV line, and the Nashua 345/161 kV substation. These upgrades are assigned to the Affected System Interconnection Customer(s) as part of the completed ASGI-2018-001 SPP Affected System Impact Study.

Evergy performed the following update to the Facility Study to satisfy the SPP GI Staff request for a generator interconnection request on the Associated Electric Cooperative Incorporated (AECI) transmission system. The request for interconnection was placed with AECI and designated as AECI GIA-61. The customer requested interconnection service for a 238-MW wind farm at the existing Maryville AEC 161kV substation in Northwest Missouri, near Maryville, Missouri. The customer proposed a commercial operation date of December 31, 2019. Required Network Upgrades on the Evergy transmission system include rebuilding the Maryville-Midway 161kV line, rebuilding the Midway-Avenue City 161kV line, rebuilding the Avenue City-St. Joseph 161kV line, rebuilding the Nashua-Roanridge 161kV line, and adding a second 345/161kV transformer at Evergy's Nashua substation.

Evergy's Maryville substation will require the installation of three switches, three ccvt's, and a new control panel. The Maryville-Midway 161kV line is approximately 19.5 miles of existing transmission line, of which 15.8 miles is built using 397 ACSR conductor. The proposed upgrade would rebuild this 15.8 section of line using 1192 ACSS conductor to achieve a minimum summer emergency rating of 251 MVA. The Midway substation will require the removal of the wavetraps associated with line 10 and line 3 terminals. The Midway-Avenue City 161kV line is approximately 20.5 miles of existing transmission line, of which 16.5 miles is built using 397 ACSR conductor. The proposed upgrade would rebuild this 16.5 mile section of line using 1192 ACSS conductor to achieve a minimum summer emergency rating of 240 MVA. The Avenue City substation will require the removal of the wavetraps on the line 3 terminal. The Avenue City-St. Joseph 161kV line is approximately 3.32 miles of existing transmission line, of which 3.04 miles is built using 397 ACSR conductor. The proposed upgrade would rebuild this 3.04 mile section of line using 1192 ACSS conductor to achieve a minimum summer emergency rating of 237 MVA. The St. Joseph substation will require the replacement of 3 sets of 477 AAC jumpers. The Nashua-Roanridge 161 kV line is approximately 6.1 miles of existing transmission built using 1192.5 ACSR conductor. The proposed upgrade would rebuild this 6.1 mile line using 1192 ACSS conductor to achieve a minimum summer emergency rating of 350 MVA. The

Roanridge substation will require the removal of the wavetrap and upgrades to the 2 Hawthorn AAC jumpers and 161 kV switch on the line 4 terminal as well as upgrades to the CT/Relays associated with 161kV breakers R1-4 and R2-4. The Nashua substation has a single 650 MVA 345/161kV transformer currently installed. The proposed upgrade would add a second 650 MVA 345/161kV transformer, 2 breakers, conductor, 6 switches and 4 CCVT's, and corresponding CT/Relays to achieve a minimum winter emergency transfer rating of 747 MVA between the 345 and 161 kV busses.

On July 27, 2022, SPP requested that Evergy update their cost estimates and incorporate them in the Affected System Interconnection Facilities Study. The cost estimates have increased due to increased material costs of steel (30%), conductor (44%), and OPGW (10%) over the previous year. Additionally, labor costs were increased by 20% to align with actual labor costs on recent Evergy projects.

The total cost for Evergy to rebuild the Maryville-Midway 161kV line is \$27,899,746. The total cost for Evergy to rebuild the Midway-Avenue City 161kV line is \$27,950,136. The total cost for Evergy to rebuild the Avenue City-St. Joseph 161kV line is \$6,346,906. The total cost for Evergy to rebuild the Nashua-Roanridge 161kV line is \$13,466,879. The total cost for Evergy to add a new 345/161kV transformer to Nashua 345/161kV substation is \$11,391,368. These estimates are accurate to +/- twenty (20) percent, based on current prices. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual procurement and construction cannot be assured.

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.

Identification of Facilities Requiring Network Upgrades

SPP conducted an affected system study for AECI’s GIA-61 request and observed overloads on the Maryville-Midway 161kV line, Midway-Avenue City 161kV line, Avenue City-St. Joseph 161 kV line, Nashua-Roanridge 161kV line, and the Nashua 345/161kV transformer. No voltage exceedances were identified on the Evergy transmission system.

SPP requested that Evergy provide mitigations for the thermal overloads on its system in the affected system study. Evergy Long Term Planning determined that rebuilding the existing transmission lines with larger conductor and replacing switches and jumpers would eliminate the thermal overloads. Evergy Engineering was asked to provide cost estimates to rebuild the existing transmission lines to the following limits. Achieve a Summer Emergency rating of 251 MVA on the Maryville to Midway 161kV line. Achieve a summer emergency rating of 240 MVA on the Midway to Avenue City 161kV line. Achieve a summer emergency rating of 237 MVA rating on the Avenue City to St. Joseph 161kV line. Achieve a summer emergency rating of 350 MVA on the Nashua to Roanridge 161kV line. Achieve a transformation capability of 747 MVA between the Nashua 345 kV and 161kV busses. Those estimates are provided below.

<u>Project</u>	<u>Cost</u>
Evergy Maryville to Midway 161kV Rebuild	\$27,899,746
Midway to Avenue City 161kV Rebuild	\$27,950,136
Avenue City to St. Joseph 161kV Rebuild	\$6,346,906
Nashua to Roanridge 161kV Rebuild	\$13,466,879
Nashua 345/161kV New Transformer	\$11,391,368
Total	\$87,055,035

Description of transmission owner network upgrades

Maryville to Midway 161kV Rebuild: Maryville to Midway 161kV Rebuild: Install new switches, CCVT, control panel, and remove the wavetrapp on line 10 terminal at the Maryville substation. Remove the wavetrapp on line 10 terminal and remove the wavetrapp on line 3 terminal at Midway substation.

Midway to Avenue City 161kV Rebuild: Replace existing structures and conductor with new structures and 1192.5 ACSS conductor. Remove the wavetrapp on line 3 terminal at Avenue City Substation

Avenue City to St. Joseph 161kV Rebuild: Replace existing structures and conductor with new structures and 1192.5 ACSS conductor. Replace

three sets of 477 AAC jumpers at the St. Joseph substation.

Evergy Nashua-Roanridge 161kV Rebuild: Replace existing structures and conductor with new structures and 1192.5 ACSS conductor. Replace switch, jumper and remove wavetrapp on the line 4 terminal. Upgrade CT/Relays associated with 2 breakers and upgrade control panels.

Evergy Nashua 345-161kV New Transformer: Install a new 345-161 kV transformer with one rated for 650 MVA normal, 715 MVA Emergency. Install 2 breakers, jumpers, 6 switches and 4 CCVT's, and corresponding CT/Relays to accommodate new transformer.

Engineering, Procurement, and Construction Schedule: A nominal schedule for Evergy to design, procure equipment and construct the proposed upgrades is as follows. The Maryville to Midway 161kV Rebuild would require approximately 36 months. The Midway to Avenue City 161 kV Rebuild would require approximately 36 Months. The Avenue City to St. Joseph 161 kV Rebuild would require approximately 30 Months. The Nashua to Roanridge 161kV Rebuild would require approximately 36 months. The Nashua 345-161kV New Transformer project would require approximately 36 months. According to good business practice, the Evergy engineering and procurement process cannot begin until the parties have executed a mutually agreeable Engineering & Construction Agreement. Additionally, for these projects lead all lead times given should not be considered as concurrent.

Short Circuit Fault Duty Evaluation

Evergy engineering staff reviewed short circuit analysis performed by AECI for the proposed generation interconnections at the AECI Maryville substation to determine if the added generation would cause the available fault currents to exceed the interrupting capability of any existing Evergy circuit breakers. The calculated fault currents were within Evergy's circuit breaker interrupting capability with the addition of the AECI GIA-61 wind farm.

Other Required Network Upgrades

No other network upgrades are required to facilitate this interconnection.

Figure 1: Evergy Maryville-Midway 161kV transmission line (Brown)

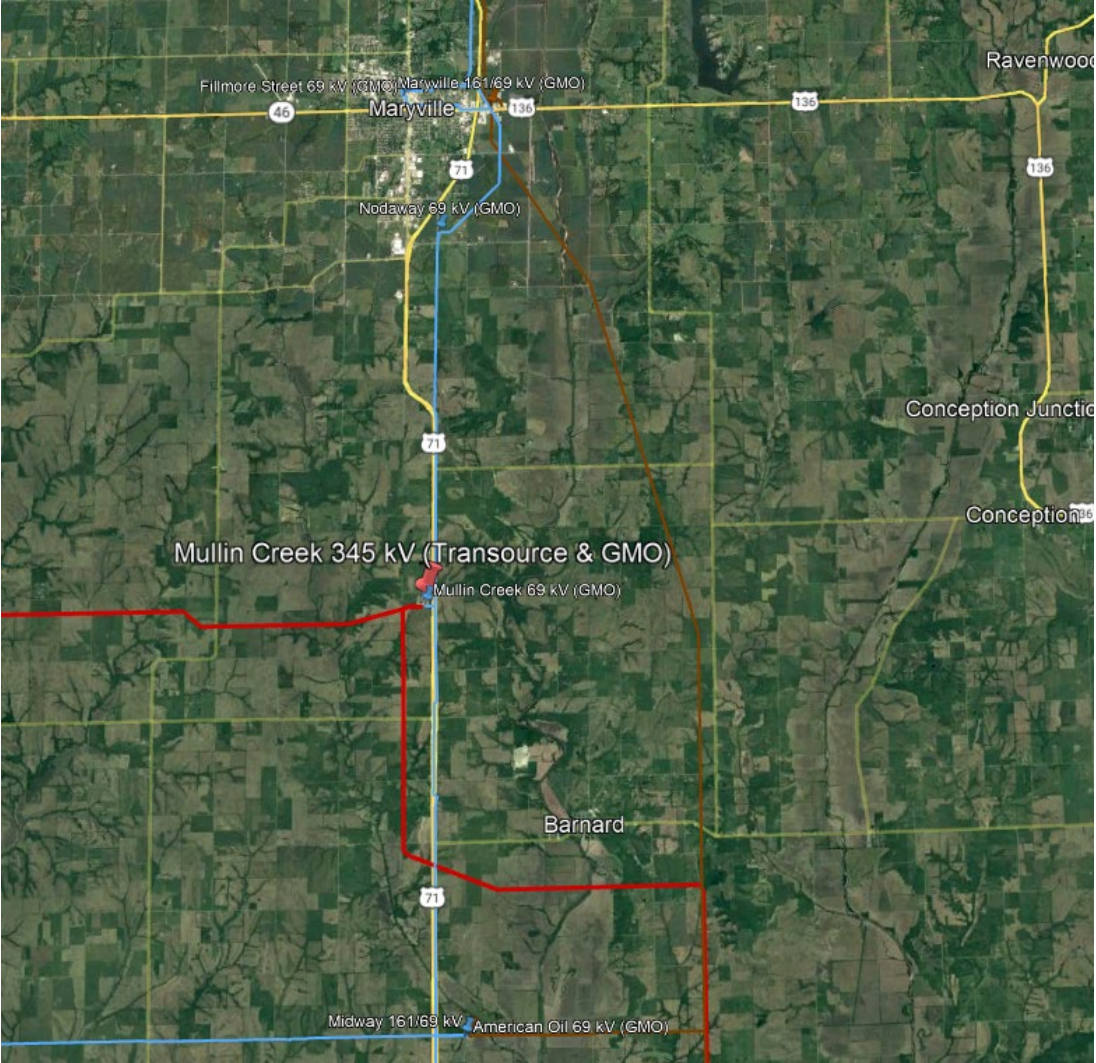


Figure 2: Evergy Midway-Avenue City 161kV transmission line (Brown)

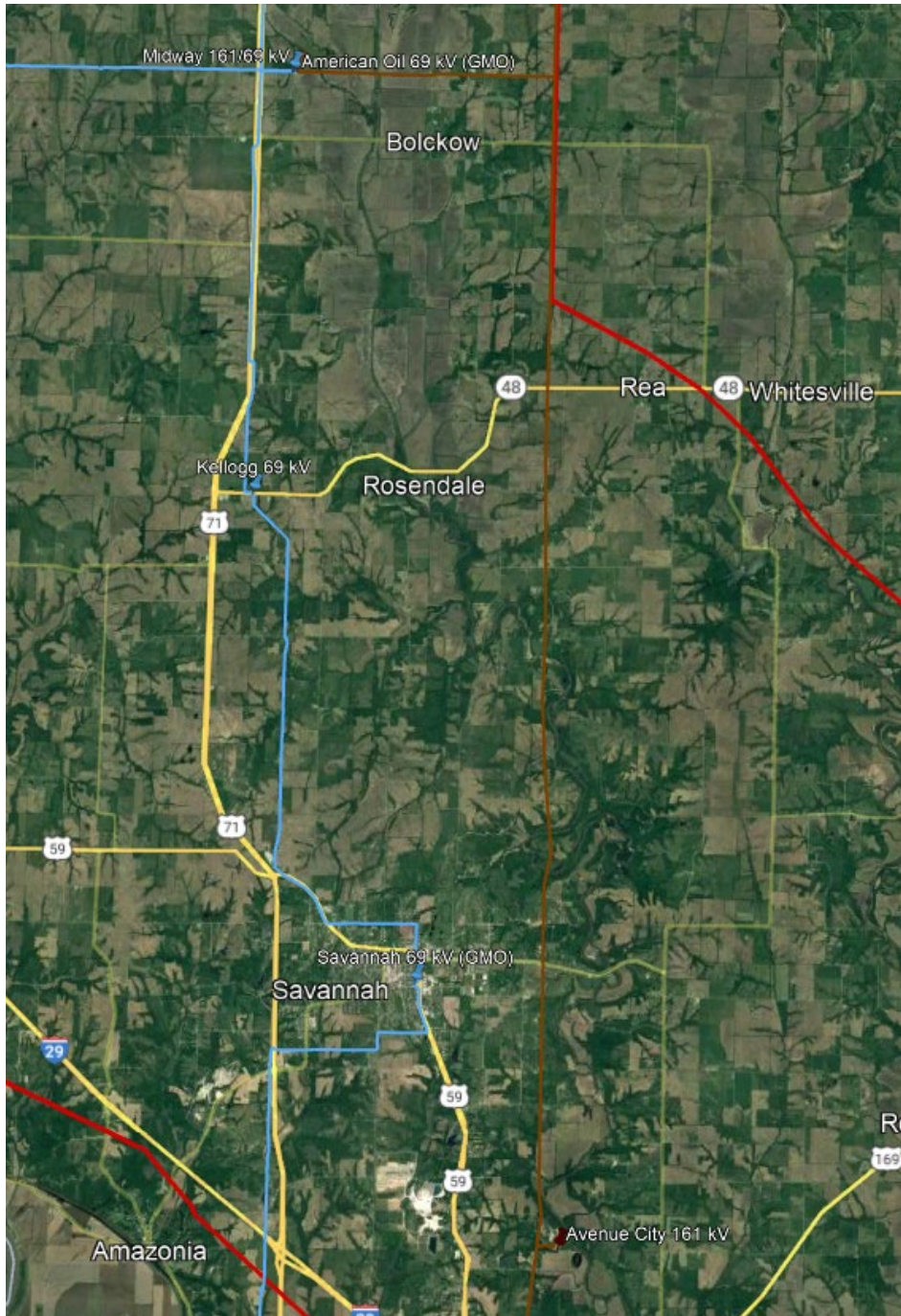


Figure 3: Evergy Avenue City-St. Joseph 161kV transmission line (Brown)

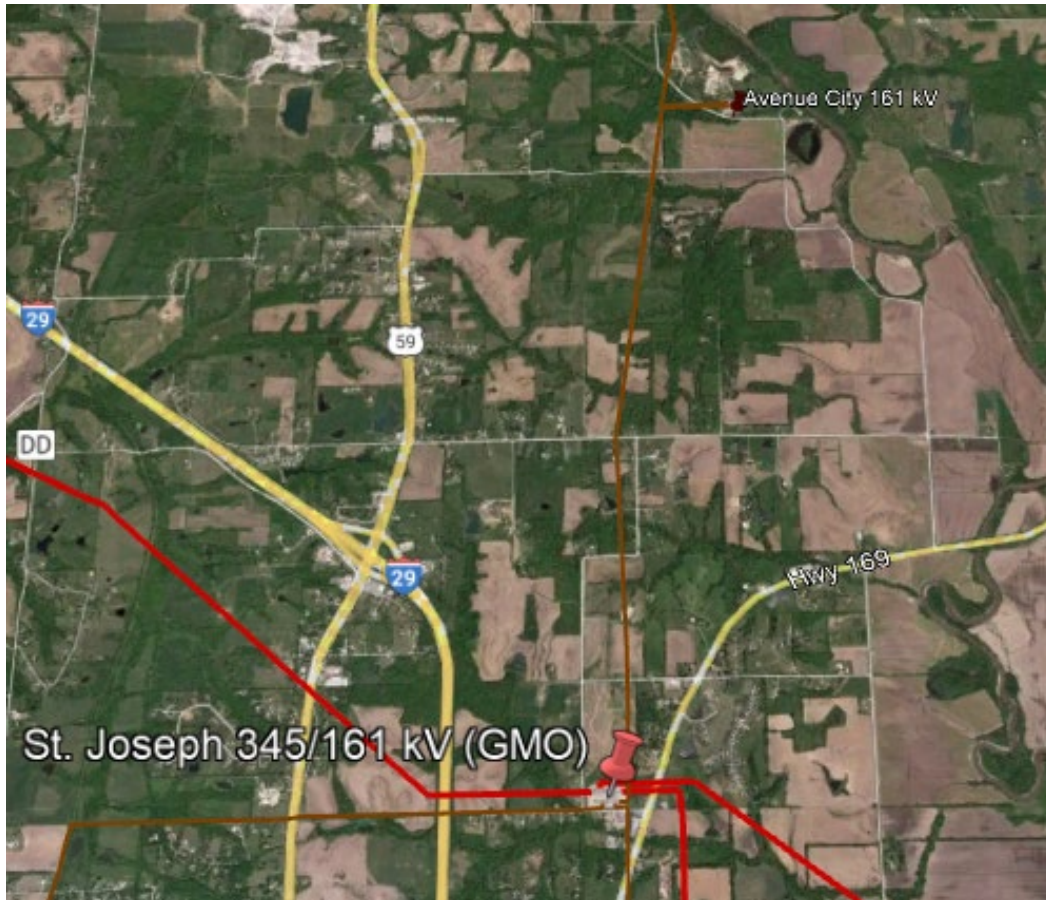


Figure 4: Evergy Nashua-Roanridge 161kV transmission line (Brown)

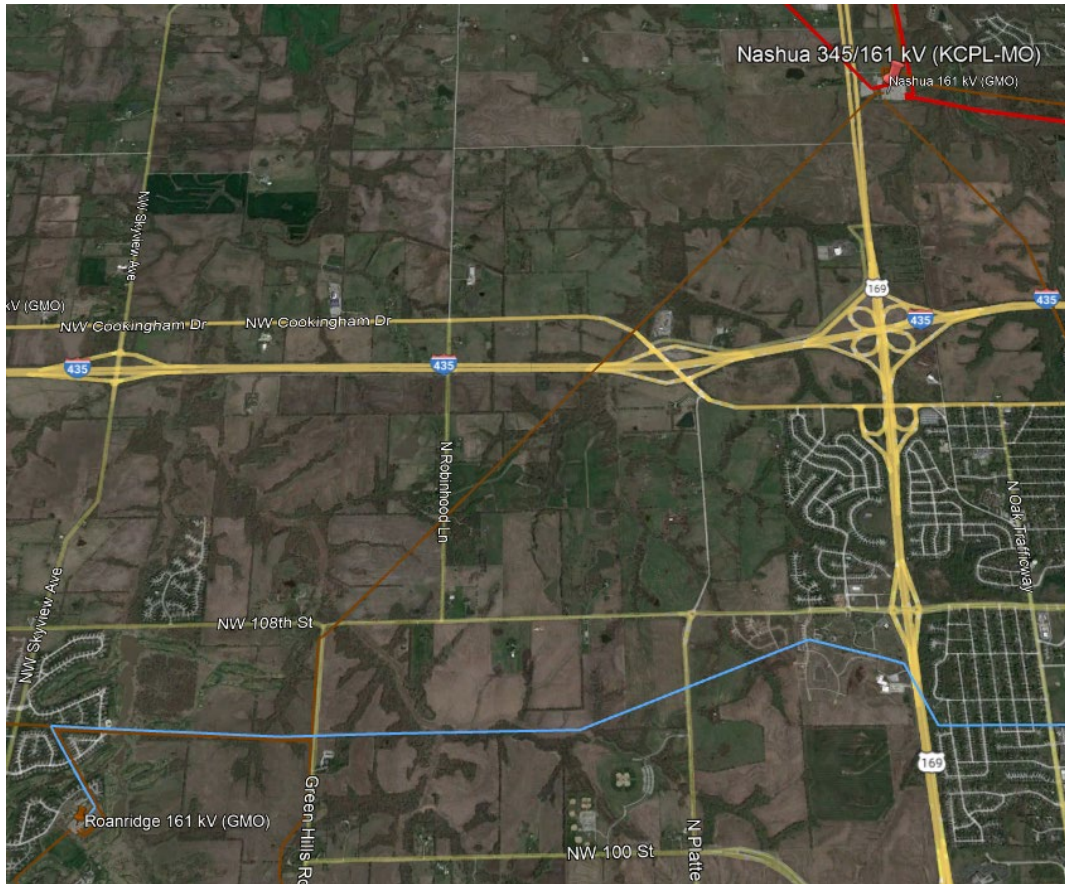


Figure 5: Evergy Nashua 345/161kV substation

