SPP DISIS-2017-002 AFS STUDY REPORT

INTRODUCTION

Associated Electric Cooperative Inc. (AECI), through coordination with the Southwest Power Pool (SPP), has updated the analysis for generator interconnection requests (GIRs) within the DISIS 2017-002 Study Cycle (the "Study Cycle") for an Affected System Study (AFS) evaluation on the AECI transmission system (the "Study"). The updated report has been modified to take into consideration the withdraw of GEN-2017-119 and GEN-2017-120.

The full list of Study Cycle requests included in the Study are listed in Table 1.

Table 1: Study Cycle Requests Evaluated

Project #	CA	Capacity (MW)	Service Type	Fuel Type	POI	Cluster Group
GEN-2017-108	KCPL	400	ER/NR	Solar	Stillwell - Clinton 161kV Line	03 CENTRAL
GEN-2017-121	WERE	200	ER/NR	Wind	Sumner 138kV Substation	03 CENTRAL
GEN-2017-133	OGE	200	ER/NR	Wind	Arcadia 345kV Substation	04 SOUTHEAST
GEN-2017-134	OGE	250	ER/NR	Wind	Arcadia 345kV Substation	04 SOUTHEAST
GEN-2017-137	OGE	295	ER/NR	Wind	Arcadia 345kV Substation	04 SOUTHEAST
GEN-2017-140	AEP	160	ER/NR	Solar	Clarksville 345kV Switching Substation	04 SOUTHEAST
GEN-2017-141	AEP	241.7	ER/NR	Solar	Clarksville 345kV Switching Substation	04 SOUTHEAST
GEN-2017-144	NPPD	200	ER	Wind	Holt County 345kV Substation	02 NEBRASKA
GEN-2017-146	SPS	151.8	ER	Wind	Deaf Smith - Plant X 230kV Line	05 SOUTHWEST
GEN-2017-149	OGE	258	ER/NR	Wind	Johnson County 345kV Substation	04 SOUTHEAST
GEN-2017-233	OGE	215	ER/NR	Wind	Minco 345kV Substation	04 SOUTHEAST
GEN-2017-150	OGE	250	ER/NR	Solar	Minco 345kV Substation	04 SOUTHEAST
GEN-2017-151	SPS	300	ER	Wind	TUCO - Oklaunion 345kV Line	05 SOUTHWEST
GEN-2017-158	SPS	265	ER	Wind	Tolk 230kV Substation	05 SOUTHWEST
GEN-2017-164	OGE	250	ER/NR	Solar	Woodring 345kV Substation	04 SOUTHEAST
GEN-2017-171	AEP	150	ER/NR	Solar	Lawton Eastside - Terry Road 345kV Line	04 SOUTHEAST
GEN-2017-175	WAPA	300	ER	Wind	Vfodnes - Utica Jct. 230kV Line	01 NORTH
GEN-2017-181	NPPD	300	ER/NR	Wind	Tobias 345kV Substation	02 NEBRASKA
GEN-2017-182	NPPD	128	ER/NR	Wind	Tobias 345kV Substation	02 NEBRASKA
GEN-2017-183	KCPL	400	ER/NR	Wind	Nashua - St. Joe 345kV Line	03 CENTRAL
GEN-2017-184	KCPL	400	ER/NR	Solar	Nashua - St. Joe 345kV Line	03 CENTRAL
GEN-2017-187	SPS	150	ER	Solar	Flatland 115 kV Substation	05 SOUTHWEST
GEN-2017-188	EDE	130	ER	Solar	Asbury 161 kV Substation	03 CENTRAL
GEN-2017-195	KCPL	500.4	ER/NR	Solar	West Gardner 345kV Substation	03 CENTRAL
GEN-2017-196	KCPL	128	ER/NR	Battery/Storage	West Gardner 345kV Substation	03 CENTRAL
GEN-2017-201	NPPD	250	ER/NR	Wind	Hoskins 345kV Substation	02 NEBRASKA

Project #	CA	Capacity (MW)	Service Type	Fuel Type	POI	Cluster Group
GEN-2017-210	NPPD	310	ER	Hybrid	McCool 345kV Substation	02 NEBRASKA
GEN-2017-220	WERE	201.6	ER/NR	Solar	Buffalo Flats 345kV Substation	03 CENTRAL
GEN-2017-221	WERE	152	ER/NR	Battery/Storage	Buffalo Flats 345kV Substation	03 CENTRAL
GEN-2017-222	WAPA	180	ER	Wind	Denison 230kV Substation	01 NORTH
GEN-2017-226	WERE	201.6	ER/NR	Solar	Gordon Evans 138kV Substation	03 CENTRAL
GEN-2017-227	WERE	201.6	ER/NR	Battery/Storage	Gordon Evans 138kV Substation	03 CENTRAL
GEN-2017-231	OGE	72.5	ER/NR	Solar	Branch 161kV Substation	04 SOUTHEAST
GEN-2017-234	NPPD	115	ER	Wind	Spalding - North Loup 115kV Line	02 NEBRASKA
GEN-2017-239	SPS	300	ER	Solar	Mahoney 230kV Substation	05 SOUTHWEST

Further details of higher queued assumptions and changes can be found in Appendix A.

Network upgrades from the following studies were added to models prior to the addition of the Study Cycle requests:

- MISO Tranche 1 System Upgrades
- Network Upgrades from AECI GI-083 request
- Network Upgrades from AECI's AFS of MISO DPP-2019-Cycle requests
- Evergy System Upgrade identified by SPP in the SPP DISIS-2017-002 Phase 2 Study:
    - Build a new 161 kV line from Archie to G17-108-Tap and place in service.

These network upgrades were included in the mitigation analysis to identify if the upgrades were able to resolve impacts seen on the AECI system as a result of the Study Cycle. Should any of these upgrades no longer be tagged in the listed studies, AECI will have to restudy the Study Cycle.

INPUTS AND ASSUMPTIONS

Each of the SERC member transmission planners is responsible for submitting system modeling data to SERC for development of the power flow models. Power flow analysis utilized the latest Long-Term Working Group (LTWG) models as developed by SERC Reliability Corporation (SERC). Each of the power flow models for the steady state analysis was modified to include appropriate higher-queued generation interconnection requests. Modeling parameters in the SPP DISIS 2017-002 steady state models were referenced for each of the Study Cycle requests.

Full details of the inputs and assumptions are provided in Appendix A.

METHODOLOGY

Steady state analysis was performed to confirm the reliability impacts on the AECI system under a variety of system conditions and outages. AECI's transmission system must be capable of operating within the applicable normal ratings, emergency ratings, and voltage limits of AECI planning criteria. AECI is a member of SERC, one of eight Electric Reliability Organizations under the North American Electric Reliability Corporation (NERC). As a member of SERC, AECI develops its planning criteria consistent with NERC Reliability Planning Standards and the SERC planning criteria. The NERC TPL-001-5 Planning Standard Table 1 requires that, for normal and contingency conditions, line and equipment loading shall be within applicable thermal limits, voltage levels shall be maintained within applicable limits, all customer demands shall be supplied (except as noted), and stability of the network shall be maintained.

In evaluating the impacts of the Study Cycle requests, the following thermal and voltage limits were applied to the analysis for P0 or normal system conditions:

- Thermal Limits within Applicable Rating – Applicable Rating shall be defined as the Normal Rating. The thermal limit shall be 100% of Rating A.
- Voltage Limits within Applicable Rating – Applicable Rating shall have the meaning of Nominal Voltage. Voltage limits shall be set at plus or minus five percent (+/- 5%), 0.95 p.u. - 1.05 p.u. for systems operating at 69 kV or above on load serving buses.

The following thermal and voltage limits were applied to the analysis for contingency conditions under P1 and P2EHV planning events:

- Thermal Limits within Applicable Rating – Applicable Rating shall be defined as the Emergency Rating. The thermal limit shall be 100% of Rating B.
- Voltage Limits within Applicable Rating – Applicable Rating shall have the meaning of Nominal Voltage. Voltage limits shall be set at plus five percent to minus ten percent (+5%/-10%), 0.90 p.u. – 1.05 p.u. for systems operating at 69 kV or above on load serving buses.

In order for the Study Cycle requests to have a negative impact (i.e., criteria violation) on the system, the Study Cycle must cause a three percent (3%) or greater increase in flow on an overloaded facility based upon the rating of the facility. In order for the Project to have a negative voltage impact on the system, the Project must cause a voltage violation and have a two percent (2%) or greater change in the voltage.

System upgrades are required for constraints resulting from the addition of the Study Cycle requests under P0, P1, P2.1, P2.2 (EHV only), and P2.3 (EHV only) system conditions. For the purpose of this study, P2.1

events are included as part of the P1 contingency file. As such, these events will be denoted as a P1 event in the results. All improvements were developed and studied in coordination with AECI.

AECI will perform an annual limited operations study which will indicate seasonal operating limits for SPP/MISO/AECI generation interconnection requests that will reach commercial operation in the 12 month horizon but whose AECI network upgrades have not yet been energized.

STEADY STATE ANALYSIS RESULTS

A sensitivity was performed to evaluate the impacts the withdraw of GEN-2017-119 and GEN-2017-120 have on the steady state analysis. It was determined that these withdraws did not materially impact power flow results thus a full steady state restudy was not required. The steady state analysis results shown in this report match those shown in Version 3 of AECI's AFS report for DISIS-2017-002.

Steady state analysis results showed one (1) constraint reported on the AECI transmission system, as shown in Table 2, which is attributed to the Study Cycle requests. A transmission upgrade was evaluated to mitigate the impacts reported from the analysis as a result of the Study Cycle requests. Simulations were performed on each of the scenarios with the identified network upgrade and contingent network upgrades included.

The upgrade shown in Table 5 was evaluated in order to mitigate the reported steady state constraint for the Study Cycle requests; results from the simulations found that the network upgrades were able to mitigate the reported overload conditions as shown in Table 2.

Table 2: Steady State Constraints for the Study Cycle Requests with Upgrades

Constraint ID	Event	Monitored Facility	Contingency	Season	Base Loading	Project Loading	Upgrade Loading
NU1	P1	300069 5CHOTEAU1 161.00 512648 MAID 5 161.00 1	OPEN LINE FROM BUS 300740 [7SPORTSMAN 345.00] TO BUS 512650 [GRDA1 7 345.00] CKT 1	26H	94.7	103.7	58.6
				26L	99.4	104.8	59.2
				26S	96.7	104.3	59.0
				31S	97.3	104.9	59.3

CONTINGENT FACILITY RESULTS

Nine (9) facilities were reported as Contingent Facilities with the addition of the Study Cycle requests, as shown in Table 3. Contingent Facilities are those facilities identified that are the responsibility of higher-queued generators or are included in the Transmission Provider's transmission expansion plan and that if not included in the Study may otherwise be the responsibility of the Study Cycle requests as necessary to interconnect to the transmission system.

The transmission upgrades for the Contingent Facilities were evaluated in order to confirm that the planned system adjustments were sufficient to mitigate the overload seen for the addition of the Study Cycle requests. Simulations were performed on each of the scenarios with the identified network upgrade and contingent network upgrades included. The upgrades shown in Table 4 were evaluated in order to mitigate the reported constraints as listed in Table 3 below.

Table 3: Steady State Contingent Facilities for the Study Cycle Requests with Upgrades

Constraint ID	Event	Monitored Facility	Season	Base Loading	Project Loading	Upgrade Loading	Contingent Generator(s)
CF01	P1	300119 5SULLVN 161.00 300142 4SULVN 138.00 1	26L	108.5	112.8	45.4	AECI
CF02	P1	300773 2ELKTON 69.000 300817 2OSCEOLA 69.000 1	26S	76.9	101.6	77.7	AECI
			31S	77.9	102.5	78.6	
CF03	P1	300530 2GEOGT2 69.000 300541 2SEDALI 69.000 1	26H	104.5	141.5	84.3	GI-091
			26S	93.5	132.5	78.6	
			26W	68.3	109.5	53.5	
			31S	96.9	136.3	82.4	
			31W	67.4	108.6	53.2	
CF04	P0	300071 5CLINTN 161.00 761278 G17-108-TAP 161.00 1	26W	8.9	101.3	78.4	SPP DISIS-2017-002 Network Upgrades
			31W	8.9	101.4	78.4	
	P1		26H	0.7	118.3	68.6	
			26S	0.7	118.8	68.6	
			26W	0.7	118.5	79.5	
			31S	0.7	118.9	72.8	
			31W	0.7	118.6	79.4	
	P2EHV		26W	13.5	100.1	81.0	
CF05	P1	300323 2CENTRV 69.000 300336 2HOLDEN 69.000 1	26H	88.9	101.0	90.3	SPP DISIS-2017-002 Network Upgrades
			26S	92.1	105.1	94.1	
			31S	90.9	103.8	93.7	
CF06	P1	300688 2AUSTIN 69.000 300696 2CREIGH 69.000 1	26H	76.5	102.8	76.7	

Constraint ID	Event	Monitored Facility	Season	Base Loading	Project Loading	Upgrade Loading	Contingent Generator(s)
			26S	75.3	103.6	76.8	SPP DISIS-2017-002 Network Upgrades
CF07	P1	300651 2LAMR 69.000 300794 5LAMAR 161.00 1	26S	97.8	105.1	62.6	MISO Tranche 1
			31S	99.1	106.4	63.0	
	P2EHV		26S	101.1	109.2	65.1	
			26W	94.8	102.1	64.0	
			31S	103.5	110.7	65.2	
CF08	P1	300780 2KNOBBY 69.000 301401 2TURKEYCRK 69.000 1	26H	65.7	104.6	31.2	MISO Tranche 1
			26S	80.1	113.8	31.0	
			26W	95.0	107.4	35.2	
			31S	80.3	112.5	31.0	
			31W	95.9	108.7	35.8	
CF09	P1	300772 2COFMAN 69.000 300780 2KNOBBY 69.000 1	26S	63.1	101.5	26.2	MISO Tranche 1
			26W	70.3	102.7	34.5	
			31W	70.7	103.4	34.7	

NEIGHBORING SYSTEM RESULTS

No facilities were impacted on AECI tie lines with neighboring systems with the addition of the Study Cycle requests.

NETWORK UPGRADES

The upgrades shown in Table 4 were evaluated in order to mitigate the reported steady state contingent constraints for the Study Cycle requests as listed in Table 3.

Table 4: Network Upgrades for the Study Cycle Contingent Constraints

Constraint ID	Monitored Facility	Network Upgrade
-	300172 2TMHILLB1 69.000 300387 2BEVIER 69.000 1	**Contingent on GI-083** Kingdom City/Auxvasse/Salt River Upgrades: Rebuild 8 mile-long Kingdom City to Auxvasse 69 kV line to 161 kV. - Utilize 795 ACSR at 100C. - Re-terminate the line on the 161 kV Bus #2 at Kingdom City. Rebuild 9 mile Auxvasse to Salt River Tap 69 kV line to 161 kV. - Utilize 795 ACSR at 100C. - Re-terminate the line on the 161 kV bus at Salt River. Rebuild 1 mile-long Salt River Tap to Salt River line to 161/69 kV D.C. - 161 kV will be 795 ACSR at 100C. - 69 kV will be 336 ACSR at 100C. Modify the Salt River 69 kV station to include a 161/69 kV 84 MVA Summer/96 MVA Winter transformer and 2 161 kV terminal positions. Construct new 69 kV section between Salt River and Vandiver. Convert Auxvasse 69 kV station to 161 kV.
-	300512 2AUXVAS 69.000 300517 2KINGDM 69.000 1	
-	300517 2KINGDM 69.000 301497 5KINGDMB2 161.00 2	
-	300517 2KINGDM 69.000 301497 5KINGDMB2 161.00 3	
-	300115 5STFRANB2 161.00 338202 5JIM HILL% 161.00 1	**Contingent on MISO DPP-2019** Rebuild 9.9 mile-long St. Francis to Jim Hill 161 kV line to 1192 ACSS at 250C. Add a second 161/69 kV transformer at Holden with rating of 84 MVA Summer, 95 MVA Winter. Rebuild 3 mile-long section of Gobbler Knob to Poplar Bluff South 69 kV line to 795 ACSR at 100C. Rebuild 3.1 mile 336 ACSR segment of Elm-Holden (existing double circuit). -Utilize 556 ACSR at 100C for 69 kV circuit. Rebuild 0.1 mile-long Bevier to Bevier Tap 69 line to 795 ACSR at 100C. Rebuild 1.15 mile-long Axtell to Macon Lake 69 line to 795 ACSR. Rebuild 1.05 mile-long Axtell to Macon Tap 69 kV line to 795 ACSR. Rebuild 4.25 mile-long Macon Lake to Bevier Tap 69 line to 795 ACSR at 100C. Rebuild 2.9-mile-long Vanduser to Morley 69 kV line to 336 ACSR at 100C.
-	300124 5HOLDENB2 161.00 300336 2HOLDEN 69.000 1	
-	300173 2GOBKNOB 69.000 301218 2PBSOUTH 69.000 1	
-	300327 2ELM 69.000 300336 2HOLDEN 69.000 1	
-	300387 2BEVIER 69.000 301623 2BEVIERTP 69.000 1	
-	300388 2AXTELL 69.000 300400 2MACNLK 69.000 1	
-	300388 2AXTELL 69.000 300401 2MACNTP 69.000 1	
-	300400 2MACNLK 69.000 301623 2BEVIERTP 69.000 1	
-	301251 2VANDSR 69.000 301255 2MORLEY 69.000 1	
-	300087 5HICKCK 161.00 300094 5LOCUST 161.00 1	**Contingent on MISO Tranche 1** Build new 345 kV line from Orient 345 kV substation (Ameren) to Fairport 345 kV substation (Ameren/AECI). Build new 345 kV line from Fairport 345 kV substation to Zachary 345 kV substation (Ameren). Build new 345 kV line from Thomas Hill 345 kV substation (AECI) to Zachary 345 kV substation. Build new 345 kV line from Zachary 345 kV substation to Maywood 345 kV substation (Ameren). Build new 345 kV line from Meredosia 345 kV substation (Ameren) to Maywood 345 kV substation. Tap the existing 161 kV line from Adair 161 kV substation to Appanoose 161 kV substation with the Zachary 161 kV substation.
CF01	300119 5SULLVN 161.00 300142 4SULVN 138.00 1	**Contingent on AECI** Replace Sullivan 161/138 kV transformer with a unit rated 250 MVA Summer, 285 MVA Winter.

Constraint ID	Monitored Facility	Network Upgrade
CF02	300773 2ELKTON 69.000 300817 2OSCEOLA 69.000 1	**Contingent on AECI** Buffalo Area 161 kV Conversion -Add 84 MVA 161/69 kV transformer at Buffalo. -Rebuild March to Buffalo to Long Lane 69 kV lines as 161 kV at 795 ACSR at 100C. -Convert Long Lane and March load substations to 161 kV. -Convert Long Lane to Pittsburg and Cross Way to March to 161 kV operation. They are currently designed for 161 kV but operated at 69 kV.
CF03	300530 2GEOGT2 69.000 300541 2SEDALI 69.000 1	**Contingent on GI-091** Upgrade bushing CTs (via breaker upgrade), breaker switchers on Georgetown to Sedalia 69 kV line (at Sedalia) to 1200 amp rating.
CF04	300071 5CLINTN 161.00 761278 G17-108-TAP 161.00 1	**Contingent on SPP DISIS-2017-002 NU** Build Archie to G17-108-Tap 161 kV and put into service.
CF05	300323 2CENTRV 69.000 300336 2HOLDEN 69.000 1	
CF06	300688 2AUSTIN 69.000 300696 2CREIGH 69.000 1	
CF07	300651 2LAMR 69.000 300794 5LAMAR 161.00 1	**Contingent on MISO Tranche 1** Install a second Lamar 161/69 kV transformer rated at 84 MVA Summer, 95 MVA Winter unit.
CF08	300780 2KNOBBY 69.000 301401 2TURKEYCRK 69.000 1	**Contingent on MISO Tranche 1** Rebuild Knobby to Turkey Creek 69 kV with 795 ASCR, 100 C (12.1 mi).
CF09	300772 2COFMAN 69.000 300780 2KNOBBY 69.000 1	**Contingent on MISO Tranche 1** Rebuild 69 kV 4.70 mile-long line from Coffman Bend to Knobby as 795 ACSR rated at 100C.

AECI developed non-binding, good faith estimates of the timing and cost estimates for upgrades needed as a result of the addition of the Study Cycle requests as shown in Table 5.

Table 5: Network Upgrade Costs

ID	Option / Description	Estimated Cost	Estimated Lead Time[1]
NU00A	Modification to Clinton 161 kV station required for GEN-2017-108 to interconnect on Stillwell-Clinton 161 kV line.	$ 250,000	30 months
NU01	Construct a new 161 kV switchyard ("Patrol Road") on the Maid to Gerald Gay 161 kV line ~1 mile from Maid. Replace (4) 69 kV switches and associated jumpers/hardware at Afton substation. Construct a new 0.8 mile-long 161 kV line from Chouteau to Patrol Road switchyard: - Construct as double bundle 1590 ACSR conductor, rated at 100C. - Series reactor installed on line to match impedance reactor on existing Chouteau-Maid line. - Reactor Impedance: 5 ohms, 12.263 mH - All terminal equipment/reactors rated for 4,000 amps. At Chouteau Substation: -Add a 4,000 amp 161 kV breaker and associated equipment to the existing Chouteau to Maid line. -Add a new 161 kV terminal and associated equipment for the new 161 kV line to Patrol Road. At Chouteau West Yard: - Upgrade East to West bus from 5" to 6" bus.	$ 22,011,000	60 months
	Total Cost:	$ 22,261,000	

Cost allocations for each of the impacted facilities are discussed in the Cost Allocation section below.

[1] Estimate Lead Time is the estimated time to place a network upgrade in service once AECI has received Provision of Security equal to the total Estimated Cost of the Network Upgrade.

COST ALLOCATION

Network upgrade costs are allocated to each of the Study Cycle projects based on the worst MW impact[2] each project had on the constraint and as described in the steps below:

1. Determine the MW impact each Study Cycle project had on each constraint using the size of each request:

$$Project\ X\ MW\ Impact\ on\ Constraint\ 1 = DFAX\ (X) * MW\ (X) = X1$$

$$Project\ Y\ MW\ Impact\ on\ Constraint\ 1 = DFAX\ (Y) * MW\ (Y) = Y1$$

$$Project\ Z\ MW\ Impact\ on\ Constraint\ 1 = DFAX\ (Z) * MW\ (Z) = Z1$$

2. Determine the maximum MW% impact each generator has as a percentage of the total Study Cycle impact on a given constraint.

$$X2\ =\ Project\ X\ MW\ impact\ \%\ = \frac{X1}{Total\ MW\ Impact\ of\ Study\ Cycle\ on\ Constraint}$$

$$Y2\ =\ Project\ Y\ MW\ impact\ \%\ = \frac{Y1}{Total\ MW\ Impact\ of\ Study\ Cycle\ on\ Constraint}$$

$$Z2\ =\ Project\ Z\ MW\ impact\ \%\ = \frac{Z1}{Total\ MW\ Impact\ of\ Study\ Cycle\ on\ Constraint}$$

3. Apply three percent (3%) MW impact De Minimis Threshold: If a Study Cycle project MW% impact is less than 3% for a particular constraint then the project MW% impact is adjusted to 0 for that constraint and the Study Cycle project will not be allocated cost for that particular constraint.

4. Determine the cost allocated to each remaining Study Cycle project for each upgrade using the total cost of a given upgrade:

$$Project\ X\ Upgrade\ 1\ Cost\ Allocation\ (\$) = \frac{Network\ Upgrade\ 1\ Cost\ (\$) * X2}{X2 + Y2 + Z2}$$

The associated cost allocation of the network upgrades to each of the Study Cycle projects is shown below in Table 6. Further breakdown of costs is provided in Appendix B.

[2] All negative MW impacts (helpers) were set to 0 MW impact.

Table 6: Network Upgrade Cost Allocation

Project	Cluster Group	POI	MW	Total Estimated Cost
GEN-2017-108	03 CENTRAL	Stillwell - Clinton 161kV Line	400	$3,234,307
GEN-2017-121	03 CENTRAL	Sumner 138kV Substation	200	$ -
GEN-2017-133	04 SOUTHEAST	Arcadia 345kV Substation	200	$ -
GEN-2017-134	04 SOUTHEAST	Arcadia 345kV Substation	250	$ -
GEN-2017-137	04 SOUTHEAST	Arcadia 345kV Substation	295	$ -
GEN-2017-140	04 SOUTHEAST	Clarksville 345kV Switching Substation	160	$ -
GEN-2017-141	04 SOUTHEAST	Clarksville 345kV Switching Substation	241.7	$ -
GEN-2017-144	02 NEBRASKA	Holt County 345kV Substation	200	$861,794
GEN-2017-146	05 SOUTHWEST	Deaf Smith - Plant X 230kV Line	151.8	$ -
GEN-2017-149	04 SOUTHEAST	Johnson County 345kV Substation	258	$ -
GEN-2017-150	04 SOUTHEAST	Minco 345kV Substation	250	$ -
GEN-2017-151	05 SOUTHWEST	TUCO - Oklaunion 345kV Line	300	$ -
GEN-2017-158	05 SOUTHWEST	Tolk 230kV Substation	265	$ -
GEN-2017-164	04 SOUTHEAST	Woodring 345kV Substation	250	$ -
GEN-2017-171	04 SOUTHEAST	Lawton Eastside - Terry Road 345kV Line	150	$ -
GEN-2017-175	01 NORTH	Vfodnes - Utica Jct. 230kV Line	300	$1,344,955
GEN-2017-181	02 NEBRASKA	Tobias 345kV Substation	300	$1,407,803
GEN-2017-182	02 NEBRASKA	Tobias 345kV Substation	128	$ -
GEN-2017-183	03 CENTRAL	Nashua - St. Joe 345kV Line	400	$2,447,204
GEN-2017-184	03 CENTRAL	Nashua - St. Joe 345kV Line	400	$2,447,204
GEN-2017-187	05 SOUTHWEST	Flatland 115 kV Substation	150	$ -
GEN-2017-188	03 CENTRAL	Asbury 161 kV Substation	130	$ -
GEN-2017-195	03 CENTRAL	West Gardner 345kV Substation	500.4	$3,679,163
GEN-2017-196	03 CENTRAL	West Gardner 345kV Substation	128	$941,113
GEN-2017-201	02 NEBRASKA	Hoskins 345kV Substation	250	$1,155,528
GEN-2017-210	02 NEBRASKA	McCool 345kV Substation	310	$1,421,916
GEN-2017-220	03 CENTRAL	Buffalo Flats 345kV Substation	201.6	$772,662
GEN-2017-221	03 CENTRAL	Buffalo Flats 345kV Substation	152	$ -
GEN-2017-222	01 NORTH	Denison 230kV Substation	180	$837,537
GEN-2017-226	03 CENTRAL	Gordon Evans 138kV Substation	201.6	$854,907
GEN-2017-227	03 CENTRAL	Gordon Evans 138kV Substation	201.6	$854,907
GEN-2017-231	04 SOUTHEAST	Branch 161kV Substation	72.5	$ -
GEN-2017-233	04 SOUTHEAST	Minco 345kV Substation	215	$ -
GEN-2017-234	02 NEBRASKA	Spalding - North Loup 115kV Line	115	$ -
GEN-2017-239	05 SOUTHWEST	Mahoney 230kV Substation	300	$ -
Total Cost				$ 22,261,000

VERSION HISTORY

Version Number and Date	Author	Change Description
V0 – 11/18/2022	AECI	Initial release
V1 – 06/30/2023	AECI	Withdrawal of twenty (20) SPP requests from Study Cycle Withdrawal of MISO, SPP, and AECI higher queued requests
V2 – 06/06/2025	AECI	Withdrawal of seventeen (17) SPP requests from Study Cycle Withdrawal of MISO, SPP, and AECI higher queued requests
V3 – 11/06/2025	AECI	Minor adjustment made to NU01 scope and cost.
V4 – 12/22/2025	AECI	Updated report for the withdraw of GEN-2017-115.
V5 – 04/20/2026	AECI	Updated report for the withdraw of GEN-2017-119 and GEN-2017-120.