SPP DISIS-2018-002 & 2019-001 AFS STUDY REPORT

INTRODUCTION

Associated Electric Cooperative Inc. (AECI), through coordination with the Southwest Power Pool (SPP), has identified generator interconnection requests (GIRs) within the DISIS-2018-002 & 2019-001 Study Cycle (the "Study Cycle") for an Affected System Study (AFS) evaluation on the AECI transmission system (the "Study"). The full list of Study Cycle requests included in the Study is listed in Table 1.

Table 1: Study Cycle Requests Evaluated

Project #	TO	Capacity (MW)	Service Type	Fuel Type	POI	Cluster Group
GEN-2018-063	EDE	57	ER	Solar	Sedalia Marshfield Springfield Nichols Street 69kV circuit	03 CENTRAL
GEN-2018-064	GRDA	80	ER/NR	Solar	Tonnece Substation 69kV	04 SOUTHEAST
GEN-2018-068	NPPD	302.4	ER/NR	Wind	Antelope 345 kV Substation	02 NEBRASKA
GEN-2018-071	OGE	151	ER/NR	Battery Storage	Ranch Road 345kV Substation	04 SOUTHEAST
GEN-2018-072	OGE	151	ER/NR	Battery Storage	Ranch Road 345kV Substation	04 SOUTHEAST
GEN-2018-074	WAPA	78	ER	Wind	Denison 230kV Substation	01 NORTH
GEN-2018-079	AEP	148	ER	Solar	Farmland-Delaware 138kV line	04 SOUTHEAST
GEN-2018-082	AEP	215	ER	Wind	Pittsburg 345kV Substation	04 SOUTHEAST
GEN-2018-083	NPPD	250	ER	Wind	Shell Creek-Hoskins 345kv Line Break	02 NEBRASKA
GEN-2018-088	AEP	130	ER	Solar	Lydia 345kV Substation	04 SOUTHEAST
GEN-2018-089	SPS	196	ER	Wind	Newhart 230kV Substation	05 SOUTHWEST
GEN-2018-099	SPS	300	ER	Wind	Tolk 230kV Substation	05 SOUTHWEST
GEN-2018-106	AEP	165	ER	Solar	Longwood 345kV Substation	04 SOUTHEAST
GEN-2018-108	ITCGP	95	ER	Battery Storage	Thistle 345kV Substation	03 CENTRAL
GEN-2018-115	AEP	250	ER/NR	Hybrid[1]	Lawton East Side 345kV/138kV Substation	04 SOUTHEAST
GEN-2018-116	SUNC	150	ER/NR	Solar	Frey Street 115kV bus	03 CENTRAL
GEN-2018-125	NPPD	231	ER/NR	Wind	Gentleman to Sweetwater 345kV line	02 NEBRASKA
GEN-2018-128	WERE	200.22	ER/NR	Wind	Renfrow-Viola 345 kV	03 CENTRAL
GEN-2018-131	NPPD	221.4	ER/NR	Solar	Antelope 345 kV Substation	02 NEBRASKA
GEN-2018-132	NPPD	201.6	ER/NR	Solar	Antelope 345 kV Substation	02 NEBRASKA
GEN-2019-002	GRDA	100	ER	Battery Storage	Maid 161kV substation	04 SOUTHEAST
GEN-2019-003	SPS	150	ER/NR	Solar	Roosevelt 230kV Substation	05 SOUTHWEST
GEN-2019-009	OPPD	100	ER	Solar	S1263 Brock 161kV substation	02 NEBRASKA
GEN-2019-011	SPS	230	ER/NR	Battery Storage	Yoakum 345kV Substation	05 SOUTHWEST
GEN-2019-012	OGE	200	ER/NR	Battery Storage	Woodward 345kV substation	04 SOUTHEAST
GEN-2019-014	SUNC	125	ER/NR	Hybrid[1]	Holcomb 115kV substation	03 CENTRAL
GEN-2019-016	EDE	200	ER	Solar	Dadeville 161kV Substation	03 CENTRAL
GEN-2019-030	ITCGP	252	ER/NR	Wind	Spearville to Clark County 345 kV line	03 CENTRAL
GEN-2019-035	EDE	80	ER/NR	Solar	Reeds Spring-Aurora 161kV Line	03 CENTRAL

[1] Generation fuel type is hybrid (solar + storage) but was studied as its main fuel source – solar.

Project #	TO	Capacity (MW)	Service Type	Fuel Type	POI	Cluster Group
GEN-2019-039	NPPD	174.5	ER/NR	Solar	Columbus Southeast-Rising City 115kV	02 NEBRASKA
GEN-2019-044	SUNC	100	ER	Solar	North Fort Dodge 115kV Substation	03 CENTRAL
GEN-2019-045	OGE	155	ER	Solar	DeGrasse 138kV Substation	04 SOUTHEAST
GEN-2019-054	SUNC	150	ER/NR	Solar	Great Bend- Circle 230kV line	03 CENTRAL
GEN-2019-055	SUNC	150	ER/NR	Solar	Great Bend-Spearville 230kV line	03 CENTRAL
GEN-2019-058	ITCGP	150	ER/NR	Solar	Clark County 345kV substation	03 CENTRAL
GEN-2018-073[2]	SPS	250	ER	Solar	Crawfish 345kV Substation	05 SOUTHWEST
GEN-2018-082[2]	SPS	175	ER	Solar	Plant X 230kV Substation	05 SOUTHWEST
GEN-2018-090[2]	OPPD	125	ER	Battery Storage	Raun-Fort Calhoun 345kV Line	02 NEBRASKA
GEN-2018-092[2]	SPS	400	ER	Solar	Oklaunion-Tuco 345kV Line Break	05 SOUTHWEST
GEN-2018-097[2]	SPS	100	ER	Solar	Tolk 230kV Substation	05 SOUTHWEST
GEN-2018-111[2]	SPS	75	ER	Battery Storage	Tolk 230kV Substation	05 SOUTHWEST
GEN-2018-112[2]	SPS	185	ER	Solar	Tolk 230kV Substation	05 SOUTHWEST
GEN-2018-121[2]	GMO	50	ER	Battery Storage	KC South-N. Raymore 161kV Line	03 CENTRAL
GEN-2018-124[2]	SPS	200	ER	Solar	Tolk 230kV Substation	05 SOUTHWEST
GEN-2019-029[2]	NPPD	404	ER/NR	Wind	Sidney to Keystone 345 kV line	02 NEBRASKA
GEN-2019-033[2]	NPPD	182	ER/NR	Solar	Sidney to Keystone 345 kV line	02 NEBRASKA
GEN-2019-056[2]	SPS	100	ER	Battery Storage	Randall 115kV substation	05 SOUTHWEST
GEN-2019-062[2]	WERE	90	ER	Battery Storage	Pony Meadows - El Paso 138kV Line Break	03 CENTRAL
GEN-2019-074[2]	SPS	100	ER	Battery Storage	Plant X 230kV Substation	05 SOUTHWEST

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-2018-002 & 2019-001 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

[2] GIR withdrew from SPP DISIS queue after the start of the analysis, the impact of the withdrawal will be captured in a future restudy.

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 60 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 60 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.

STEADY STATE ANALYSIS RESULTS

Steady state analysis results showed no new constraints reported on the AECI transmission system which would have been attributed to the Study Cycle requests. As a result, no new transmission upgrades were evaluated to mitigate impacts reported from the analysis as a result of the Study Cycle requests.

CONTINGENT FACILITY RESULTS

Twenty-six (26) facilities were reported as Contingent Facilities with the addition of the Study Cycle requests, as shown in Table 2. 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 would 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 contingent network upgrades included. The upgrades shown in Table 4 were evaluated in order to mitigate the reported constraints as listed in Table 2 below.

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

Constraint ID	Event	Monitored Facility	Season	Base Loading	Project Loading	Upgrade Loading	Contingent Generator(s)
CF01	P1	301553 4WELEETKA 138.00 521026 PHAROAH4 138.00 1	27H	118.6	125.2	77.9	AECI[3]
			27S	110.8	118.2	69.7	
			32S	100.6	108.2	52.9	
			32W	95.0	101.3	65.4	
CF02	P1	300131 4FISHERTP 138.00 300140 4SILVCTY 138.00 1	27L	101.5	105.3	93.4	AECI[3]
CF03	P1	300192 2RCKWOLT 69.000 300292 2CAMERN 69.000 1	27H	98.1	108.2	62.5	GI-101
			27S	124.7	134.2	81.8	
			27W	109.8	114.2	71.1	
			32S	122.4	131.4	80.6	
			32W	113.7	117.6	74.0	
CF04	P1	300192 2RCKWOLT 69.000 300293 2CAMRNJ 69.000 1	27H	92.6	102.8	56.6	GI-101
			27S	117.9	127.3	74.2	
			27W	106.1	110.5	67.2	
			32S	115.2	124.2	72.5	

[3] Thermal overload on listed facilities will be mitigated by network upgrade currently included in AECI's transmission expansion plan.

Constraint ID	Event	Monitored Facility	Season	Base Loading	Project Loading	Upgrade Loading	Contingent Generator(s)
			32W	109.9	113.8	69.9	
CF05	P0	300297 2HOLT 69.000 300302 2LATHRP 69.000 1	27H	94.4	100.3	47.5	GI-101
			27S	115.2	120.5	58.1	
			32S	115.0	120.1	58.1	
	P1		27H	190.6	203.8	67.7	
			27L	187.0	191.1	57.5	
			27S	222.3	234.2	80.7	
			27W	193.2	198.1	77.2	
			32S	220.0	231.3	80.2	
			32W	197.6	203.1	79.2	
	P2EHV		27H	98.7	105.9	50.0	
			27S	151.5	157.0	70.5	
			32S	150.5	155.5	70.1	
CF06	P0	300297 2HOLT 69.000 300311 2SMRSET 69.000 1	27S	99.6	105.0	50.1	GI-101
			32S	98.8	104.0	49.9	
	P1		27H	179.1	192.3	61.3	
			27L	183.0	187.1	55.4	
			27S	207.3	219.0	72.5	
			27W	181.5	186.4	70.0	
			32S	204.5	215.7	71.8	
			32W	185.6	191.1	71.9	
	P2EHV		27S	136.4	142.0	62.5	
			32S	134.8	139.9	61.9	
CF07	P1	300301 2KEARNY 69.000 300311 2SMRSET 69.000 1	27S	93.8	100.7	31.0	GI-101
CF08	P1	300302 2LATHRP 69.000 300313 2WESTBR 69.000 1	27H	127.5	135.0	81.7	GI-101
			27S	140.4	146.8	92.4	
			32S	138.2	144.5	92.3	
			32W	118.3	121.5	70.4	
CF09	P1	300302 2LATHRP 69.000 301627 2LATHRPLD 69.000 1	27H	122.4	137.4	80.4	GI-101
			27L	126.5	131.1	96.4	
			27S	156.9	170.7	89.7	
			27W	143.9	150.4	84.3	
			32S	152.6	165.8	86.1	
			32W	149.4	155.2	88.3	
CF10	P1	300312 2TURNEY 69.000 300316 2LATHRPEMG 69.000 1	27H	130.6	145.5	38.8	GI-101
			27L	129.4	134.0	46.5	
			27S	166.5	180.3	51.0	
			27W	151.7	158.2	54.1	
			32S	162.4	175.5	49.5	

Constraint ID	Event	Monitored Facility	Season	Base Loading	Project Loading	Upgrade Loading	Contingent Generator(s)
			32W	157.3	163.1	56.5	
CF11	P1	300316 2LATHRPEMG 69.000 301627 2LATHRPLD 69.000 1	27H	130.4	145.3	38.7	GI-101
			27L	129.3	133.9	46.5	
			27S	166.3	180.1	50.9	
			27W	151.5	158.0	54.0	
			32S	162.2	175.3	49.4	
			32W	157.1	163.0	56.4	
CF12	P1	300133 5THMHLB3 161.00 543062 SALSBRY5 161.00 1	27S	97.0	100.4	98.9	GI-101
			32S	98.3	101.5	99.9	
CF13	P1	300290 2OSBORN 69.000 301629 2OSBORNTPS 69.000 1	27S	100.0	106.8	69.6	GI-102
			27W	99.1	102.8	66.7	
			32S	98.5	105.0	69.2	
			32W	102.5	105.8	69.2	
CF14	P1	300292 2CAMERN 69.000 301629 2OSBORNTPS 69.000 1	27S	100.0	106.8	69.6	GI-102
			27W	99.0	102.8	66.7	
			32S	98.5	105.0	69.2	
			32W	102.5	105.8	69.2	
CF15	P0	300036 5ELATHRP 161.00 300091 5LATHRP 161.00 1	27H	111.1	118.1	48.8	GI-101
			27S	124.2	130.9	54.2	
			27W	122.0	125.5	51.2	
			32S	122.5	128.8	53.5	
			32W	125.0	128.3	52.3	
	P2EHV		27H	118.0	126.4	51.8	
			27S	165.4	172.2	67.4	
			27W	152.6	156.4	60.4	
			32S	162.7	169.0	66.2	
			32W	155.4	159.0	61.3	
CF16	P0	300091 5LATHRP 161.00 301563 5MOCITYB1 161.00 1	27S	97.5	104.1	39.6	GI-101
			27W	99.6	103.0	39.3	
			32S	95.6	101.8	38.7	
			32W	102.4	105.6	40.4	
	P2EHV		27H	94.3	102.6	39.2	
			27S	137.0	143.6	52.8	
			27W	128.9	132.4	48.6	
			32S	134.1	140.2	51.4	
			32W	131.4	134.8	49.6	
CF17	P0		27H	118.7	125.7	0.0[4]	GI-101

[4] Monitored Facility no longer exists due to upgrade necessary for mitigating overload, as such no loading reported for this scenario.

Constraint ID	Event	Monitored Facility	Season	Base Loading	Project Loading	Upgrade Loading	Contingent Generator(s)
		300036 5ELATHRP 161.00 301310 5REX 161.00 1	27S	134.4	141.0	0.0[4]	
			27W	128.9	132.4	0.0[4]	
			32S	132.4	138.7	0.0[4]	
			32W	131.9	135.2	0.0[4]	
	P2EHV		27H	125.6	134.1	0.0[4]	
			27S	175.6	182.4	0.0[4]	
			27W	159.5	163.3	0.0[4]	
			32S	172.6	178.9	0.0[4]	
			32W	162.4	166.0	0.0[4]	
CF18	P1	300091 5LATHRP 161.00 300302 2LATHRP 69.000 1	27H	216.4	225.6	79.0	GI-101
			27S	236.5	244.1	79.2	
			27W	240.1	244.3	74.7	
			32S	234.8	242.3	79.4	
			32W	243.5	248.0	75.5	
CF19	P1	300889 2BRIISTOW 69.000 513092 BEGGS 2 69.000 1	27H	129.7	133.3	77.0	GI-103
			27S	136.6	141.2	81.9	
			27W	134.6	139.5	74.7	
			32S	132.3	137.0	79.2	
			32W	137.5	142.1	76.3	
CF20	P1	300139 4FAIRFAX 138.00 300929 2FAIRFAX 69.000 1	27S	106.4	110.8	76.6	GI-104
			32S	108.8	113.2	78.6	
CF21	P1	300937 2NAVLRES 69.000 300940 2PAWYA 69.000 1	27S	80.3	104.4	37.6	GI-105
			32S	83.2	106.2	38.2	
CF22	P2EHV	300069 5CHOTEAU1 161.00 512648 MAID 5 161.00 1	27H	115.8	119.0	94.7	SPP DISIS-2017-001/ GI-112
			27L	122.3	125.7	105.6	
CF23	P2EHV	300740 7SPORTSMAN 345.00 300741 5SPORTSMAN 161.00 2	27L	98.2	102.8	87.2	SPP DISIS-2017-001
CF24	P2EHV	300740 7SPORTSMAN 345.00 300741 5SPORTSMAN 161.00 1	27L	98.2	102.8	87.2	SPP DISIS-2017-001
CF25	P1	300107 5OSBORN 161.00 300290 2OSBORN 69.000 1	27H	155.8	163.0	52.7	SPP DISIS-2018-001
			27S	178.2	184.8	60.7	
			27W	179.7	183.4	57.5	
			32S	177.5	183.7	61.3	
			32W	183.6	187.4	58.7	
CF26	P1	300293 2CAMRNJ 69.000 300312 2TURNEY 69.000 1	27H	134.9	149.7	41.2	GI-101/ SPP DISIS-2018-001
			27L	131.1	135.7	45.6	
			27S	171.7	185.4	54.0	
			27W	155.9	162.4	56.9	
			32S	167.8	180.9	52.8	
			32W	161.5	167.1	59.2	

NEIGHBORING SYSTEM RESULTS

The Study has identified impacts from the Study Cycle requests on the AECI ties with neighboring systems. The most limiting component of the AECI owned portion of the facility was evaluated and if found inadequate, a network upgrade for the AECI equipment was determined. Network upgrades for transmission facilities limited by non-AECI equipment are not captured and may need to be coordinated with the appropriate transmission owner.

Three (3) facilities were reported on the AECI ties with the addition of the Study Cycle requests. The most severe constraints are shown in Table 3.

Table 3: Steady State Neighboring System Constraints for the Study Cycle Requests

Constraint ID	Event	Monitored Facility	Area	Season	Base Loading	Project Loading
AFS01	P1	300098 5MOCITYB2 161.00 541248 LBRTYST5 161.00 1	AECI/KCPL	27L	92.0	113.3
				27S	81.3	113.1
				27W	78.8	107.8
				32S	78.0	108.9
				32W	80.6	109.9
AFS02	P1	300740 7SPORTSMAN 345.00 512650 GRDA1 7 345.00 1	AECI/GRDA	27H	97.5	101.5
				27L	103.7	108.7
AFS03	P1	300889 2BRIISTOW 69.000 513092 BEGGS 2 69.000 1	AECI/GRDA	27H	129.7	133.3
				27S	136.6	141.2
				27W	134.6	139.5
				32S	132.3	137.0
				32W	137.5	142.1

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 2.

Table 4: Network Upgrades for the Study Cycle Contingent Constraints

Constraint ID	Monitored Facility	Network Upgrade
CF01	301553 4WELEETKA 138.00 521026 PHAROAH4 138.00 1	**Contingent on AECI** Rebuild and convert 9.4-mile-long section of Bristow to Gypsy 69 kV line to 138 kV 1192.5 ACSR at 100C. Rebuild and convert 0.3-mile-long section of Gypsy to Stroud 69 kV line to 138 kV 1192.5 ACSR at 100C.
CF02	300131 4FISHERTP 138.00 300140 4SILVCTY 138.00 1	
CF03	300192 2RCKWOLT 69.000 300292 2CAMERN 69.000 1	**Contingent on GI-101/102** Build a new 27.8-mile-long Shoal Creek-Missouri City 161 kV line to 1192 ACSR at 100C. Line will be overbuilt on the 69 kV line from Turney-Lathrop Load-Lathrop-Holt-Summerset-Kearney-Missouri City. The 69 kV lines will be replaced with 336 ACSR at 100C. Add a new 161 kV terminal and reconfigure Missouri City 161 kV bus to accommodate the new 161 kV line between Missouri City and Shoal Creek.
CF04	300192 2RCKWOLT 69.000 300293 2CAMRNJ 69.000 1	
CF05	300297 2HOLT 69.000 300302 2LATHRP 69.000 1	
CF06	300297 2HOLT 69.000 300311 2SMRSET 69.000 1	
CF07	300301 2KEARNY 69.000 300311 2SMRSET 69.000 1	
CF08	300302 2LATHRP 69.000 300313 2WESTBR 69.000 1	
CF09	300302 2LATHRP 69.000 301627 2LATHRPLD 69.000 1	
CF10	300312 2TURNEY 69.000 300316 2LATHRPEMG 69.000 1	
CF11	300316 2LATHRPEMG 69.000 301627 2LATHRPLD 69.000 1	
CF12	300133 5THMHLB3 161.00 543062 SALSBRY5 161.00 1	
CF13	300290 2OSBORN 69.000 301629 2OSBORNTPS 69.000 1	
CF14	300292 2CAMERN 69.000 301629 2OSBORNTPS 69.000 1	
CF15	300036 5ELATHRP 161.00 300091 5LATHRP 161.00 1	**Contingent on GI-101** Rebuild 2.2-mile-long Lathrop-Lathrop East 161 kV line to 1192 ACSR at 100C. Upgrade jumpers at Lathrop East and Lathrop on line to 1192 ACSR. Upgrade disconnect switches at Lathrop on line to 2,000 amp switches.
CF16	300091 5LATHRP 161.00 301563 5MOCITYB1 161.00 1	**Contingent on GI-101** Rebuild 23.2-mile-long Missouri City-Lathrop 161 kV line to 1192 ACSR at 100C. Upgrade jumpers at Lathrop and Missouri City on line to 1192 ACSR. Upgrade disconnect switches at Lathrop on line to 2,000 amp switches. Upgrade relay limits at Missouri City to 372 MVA Summer, 456 MVA Winter.
CF17	300036 5ELATHRP 161.00 301310 5REX 161.00 1	**Contingent on GI-101** Rebuild 5.2-mile-long Shoal Creek-Lathrop East 161 kV line to 1192 ACSR at 100C. Upgrade jumpers at Lathrop East on line to 1192 ACSR.
CF18	300091 5LATHRP 161.00 300302 2LATHRP 69.000 1	**Contingent on GI-101** Upgrade existing Lathrop 161/69 kV transformer to 112 MVA Summer, 127 MVA Winter unit.
CF19	300889 2BRIISTOW 69.000 513092 BEGGS 2 69.000 1	**Contingent on GI-103** Rebuild 0.90 mile KAMO owned line section of Bristow-Beggs 69 kV line to 336 ACSR at 100C. AFS3 addresses GRDA limitation on facility.
CF20	300139 4FAIRFAX 138.00 300929 2FAIRFAX 69.000 1	**Contingent on GI-104** Add a second 138/69 kV transformer at Fairfax with a rating of 56 MVA Summer, 63 MVA Winter.
CF21	300937 2NAVLRES 69.000 300940 2PAWYA 69.000 1	**Contingent on GI-105** Rebuild 11.1-mile-long Naval Reserve-Pawya 69 kV line to 336 ACSR at 100C.

Constraint ID	Monitored Facility	Network Upgrade
CF22	300069 5CHOTEAU1 161.00 512648 MAID 5 161.00 1	**Contingent on SPP DISIS-2017-001/GI-112** Overload will be mitigated by upgrades tagged to higher queue request. Final scope of the upgrades tagged to higher queue request are still being developed.
ACF23	300740 7SPORTSMAN 345.00 300741 5SPORTSMAN 161.00 2	**Contingent on SPP DISIS-2017-001** GRDA Upgrade Reroute Kerr - 412 161 kV line to run between Sportsman and 412. Rebuild existing 161 kV double circuit from Maid-Kerr. KAMO Upgrade Construct a new 161 kV terminal at Sportsman.
CF24	300740 7SPORTSMAN 345.00 300741 5SPORTSMAN 161.00 1	
CF25	300107 5OSBORN 161.00 300290 2OSBORN 69.000 1	**Contingent on SPP DISIS-2018-001** Upgrade existing Osborn 161/69 kV transformer to 112 MVA Summer, 127 MVA Winter unit.
CF26	300293 2CAMRNJ 69.000 300312 2TURNEY 69.000 1	**Contingent on SPP DISIS-2018-001** Rebuild 7.7-mile-long Cameron Junction-Turney 69 kV line to 336 ACSR at 100C.

No upgrades were evaluated for the neighboring system constraints listed in Table 3. The upgrades for these impacts may need to be resolved through coordination with the transmission owner as listed in Table 5 below.

Table 5: Neighboring System Constraints

Constraint ID	Monitored Facility	Network Upgrade
AFS01	300098 5MOCITYB2 161.00 541248 LBRTYST5 161.00 1	KCPL owned; no upgrade evaluated.
AFS02	300740 7SPORTSMAN 345.00 512650 GRDA1 7 345.00 1	GRDA owned; no upgrade evaluated.
AFS03	300889 2BRIISTOW 69.000 513092 BEGGS 2 69.000 1	GRDA owned; no upgrade evaluated. CF19 addresses AECI limitation on facility.

Since no upgrades were required as a result of the addition of the Study Cycle requests, AECI did not develop any cost estimates for the SPP DISIS-2018-002/2019-001 Study Cycle.

VERSION HISTORY

Version Number and Date	Author	Change Description
V0 – 10/23/2023	AECI	Initial release