** DRAFT ** **Report Number: R051-25**

MISO Affected System Study on SPP DISIS 2022-001 Phase 2 Projects

Prepared for

MISO

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03/18/2025

Siemens PTI Project Number: 62OT-002656-B-1

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Revision History

Date	Rev.	Description
03/18/2025	A	Initial draft

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Executive Summary

This report presents the results of an Affected System Impact Study (AFSIS) on MISO transmission system performed for Phase 2 generator interconnection requests in the Southwest Power Pool (SPP) queue 2022-001 cycle (Study Projects). The AFSIS results are summarized below.

1.1 Project List

Because of a wide geographical region of the DISIS 2022-001 Phase 2 Study Projects, the MISO AFSIS was divided into two groups to identify the impacts on the MISO West and MISO South regions.

1.1.1 Phase 2 Study Projects in MISO South

The DISIS 2022-001 Phase 2 Study Projects in MISO South region (Study Projects in MISO South) have 58 generation projects with combined energy of 11474.3 MW, which are listed in Table ES-1.

Table ES-1: DISIS 2022-001 Phase 2 Study Projects in MISO South

Project #	Fuel type	Town / County	State	Point of Interconnection	MW request	SH (MW)	SPK (MW)
GEN-2022-001	Battery	Rogers	OK	Catoosa 138 kV	100	100	100
GEN-2022-011	Solar	Tillman	OK	Oklaunion-Lawton Eastside 345 kV	374	0 0	187 187
GEN-2022-016	Solar	Woodward	OK	Woodward 345 kV	288	0 0	144 144
GEN-2022-019	Battery	Tillman	OK	Oklaunion-Lawton Eastside 345 kV	100	100	100
GEN-2022-021	Battery	Tillman	OK	Oklaunion-Lawton Eastside 345 kV	100	100	100
GEN-2022-038	Solar	Harrison	TX	Longwood-Scottville 138 kV	200	0	200
GEN-2022-042	Solar	Carter	OK	Sunnyside-Pooleville 138 kV	174	0	174
GEN-2022-048	Wind	Woodward	OK	Mooreland 138 kV	250	123.6 126.4	19.28 19.72
GEN-2022-055	Solar	Grady	OK	Sunshine North-Anadarko 138 kV	200	0	200
GEN-2022-071	Solar	Pittsburg	OK	Talawanda-Canadian River 138 kV	90.824	0	90.824
GEN-2022-072	Solar	Mayes	OK	Grand River Dam-Claremore 161 kV	181	0	181
GEN-2022-074	Wind	Eufaula, McIntosh	OK	Hanna 138 kV	220.86	220.86	34.45
GEN-2022-082	Solar	Hale	TX	Tuco-Carlisle 230 kV	180	0	180

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Project #	Fuel type	Town / County	State	Point of Interconnection	MW request	SH (MW)	SPK (MW)
GEN-2022-085	Wind	Ofuskee, Hughes	OK	Seminole-Muskogee 345 kV	241.4	241.4	37.66
GEN-2022-088	Solar	Little River	AR	South Foreman 138 kV	74.99	0	74.99
GEN-2022-089	Battery	Little River	AR	South Foreman 138 kV	74.99	74.99	74.99
GEN-2022-090	Solar	McCurtain	OK	Valiant 138 kV	150	0	150
GEN-2022-091	Battery	McCurtain	OK	Valiant 138 kV	150	150	150
GEN-2022-092	Wind	Nowata, Craig	OK	Neosho-Delaware 345 kV	299.2	299.2	46.68
GEN-2022-093	Solar	Hempstead	AR	Turk-Hope 115 kV	83	0	83
GEN-2022-098	Solar	Johnston	OK	Bison 345 kV	200	0	200
GEN-2022-103	Battery	Christian	MO	Ozark South 161 kV	74.99	74.99	74.99
GEN-2022-104	Solar	Bryan	OK	Brown-South Coleman Jct 138 kV	113.078	0	113.078
GEN-2022-105	Solar	Tillman	OK	Oklaunion-Lawton Eastside 345 kV	300	0 0	150 150
GEN-2022-106	Solar	Tillman	OK	Oklaunion-Lawton Eastside 345 kV	300	0	150 150
GEN-2022-107	Solar	Tillman	OK	Oklaunion-Lawton Eastside 345 kV	400	0	200 200
GEN-2022-108	Solar	DeSoto Parish	LA	SW Shreveport-Dolet Hills 345 kV	100	0	100
GEN-2022-110	Battery	Coal	OK	Lehigh 138 kV	150	150	150
GEN-2022-111	Hybrid (Solar / BESS)	Marion	TX	Wilkes 345 kV	150	0 155	155 0
GEN-2022-114	Wind	Tillman	OK	Lawton-Oklaunion 345 kV	250	123.6 126.4	19.28 19.72
GEN-2022-129	Battery	Osage	OK	Webb City Tap-Shidler 138 kV	200	200	200
GEN-2022-130	Battery	Sebastian	AR	Battlefield BESS 161 kV	200	200	200
GEN-2022-132	Battery	Caddo	OK	Anadarko 138 kV	300	150 150	150 150
GEN-2022-136	Battery	Bryan	OK	Colbert 138 kV	200	200	200
GEN-2022-137	Battery	Cleveland	OK	Canadian Switchyard 138 kV	200	200	200
GEN-2022-138	Battery	Roger	OK	Tulsa North-Northeast Station 345 kV	300	150 150	150 150
GEN-2022-139	Battery	Harrison	TX	Pirkey 345 kV	300	150 150	150 150
GEN-2022-143	Battery	Marshall	OK	Caney Creek 138 kV	200	200	200

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Project #	Fuel type	Town / County	State	Point of Interconnection	MW request	SH (MW)	SPK (MW)
GEN-2022-145	Battery	Cluster	OK	Weatherford Jct.-Hinton 138 kV	195	195	195
GEN-2022-147	CT	Hale	TX	Tuco 345 kV	203	0	203
GEN-2022-154	Battery	Cleveland	OK	Canadian Switch 138 kV	100	100	100
GEN-2022-155	Battery	Oklahoma	OK	Horseshoe Lake 138 kV	200	200	200
GEN-2022-156	Battery	Creek	OK	Silver City 138 kV	100	100	100
GEN-2022-159	Wind	Chaves, Lea	NM	Crossroads-Hobbs 345 kV	280	138.4 141.6	21.59 22.09
GEN-2022-160	Wind	Chaves, Lea	NM	Crossroads-Hobbs 345 kV	280	138.4 141.6	21.59 22.09
GEN-2022-163	Battery	Canadian	OK	Cimarron 345 kV	200	200	200
GEN-2022-167	Solar	Tulsa	OK	Tulsa North-Northeastern 345 kV	250	0	250
GEN-2022-171	Wind	Curry	NM	Pleasant Hill 230 kV	200	200	31.2
GEN-2022-176	Wind	Nowata	OK	Northeastern-Delaware 345 kV	215	215	33.54
GEN-2022-196	Wind	Pittsburg	OK	Pittsburg 345 kV	215	215	33.54
GEN-2022-231	Solar	Logan	OK	Crescent-Cottonwood Creek 138 kV	166	0	166
GEN-2022-234	Solar	Rogers	OK	Alluwe Tap-Chelsea 138 kV	200	0	200
GEN-2022-235	Battery	Canadian	OK	El Reno SW 138 kV	150	150	150
GEN-2022-237	Solar	Pottawatomie	OK	Maud 138 kV	150	0	150
GEN-2022-238	Battery	Pottawatomie	OK	Maud 138 kV	150	150	150
GEN-2022-239	Solar	Hempstead	AR	John W Turk Jr Power Plant 345 kV	350	0	165.1 184.9
GEN-2022-240	Battery	Hempstead	AR	John W Turk Jr Power Plant 345 kV	200	200	200
GEN-2022-241	Battery	Hempstead	AR	John W Turk Jr Power Plant 345 kV	200	200	200

1.1.2 Phase 2 Study Projects in MISO West

The DISIS 2022-001 Phase 2 Study Projects in MISO West region (Study Projects in MISO West) have 43 generation projects with combined energy of 10305 MW, which are listed in Table ES-2.

Table ES-2: DISIS 2022-001 Phase 2 Study Projects in MISO West

Project #	Fuel type	Town / County	State	Point of Interconnection	MW request	SH (MW)	SPK (MW)
GEN-2022-004	Solar	Sedgwick	KS	Murray Gill 138 kV	33	0	33
GEN-2022-005	Solar	Labette	KS	Northeast Parsons 138 kV	200	0	200
GEN-2022-006	Solar	Labette	KS	Neosho-N345 161 kV	200	0	200
GEN-2022-007	Solar	Lyon	KS	Lang-Reading 115 kV	135	0	135
GEN-2022-009	CT	Williams	ND	Judson 345 kV	125	0 0	62.5 62.5
GEN-2022-010	CT	Williams	ND	Judson 345 kV	250	0	250
GEN-2022-083	CT	Williams	ND	Judson 345 kV	250	0	250
GEN-2022-013	Solar	Bourbon	KS	Neosho-LaCygne 345 kV	300	0	150 150
GEN-2022-024	Battery	Bourbon	KS	Neosho-LaCygne 345 kV	200	200	200
GEN-2022-015	Solar	Decatur	KS	Mingo-Red Willow 345 kV	270	0	135 135
GEN-2022-025	Solar	Decatur	KS	Mingo-Red Willow 345 kV	200	0	200
GEN-2022-026	Solar	Decatur	KS	Mingo-Red Willow 345 kV	200	0	200
GEN-2022-054	Solar	Bourbon	KS	Wolf Creek-Blackberry 345 kV	200	0	200
GEN-2022-062	Solar	Bourbon	KS	Wolf Creek-Blackberry 345 kV	200	0	200
GEN-2022-058	Solar	Benton	AR	Sibley 161 kV	180	0	180
GEN-2022-065	Solar	Edwards	KS	Arthur Mullergreen-Spearville 230 kV	145	0	145
GEN-2022-068	Wind	Hyde	SD	Chappelle Creek 345 kV	250	125 125	19.5 19.5
GEN-2022-073	Battery	Kay	MO	Nashua 161 kV	300	150 150	150 150
GEN-2022-075	Solar	Ellis	KS	Spearville-Post Rock 345 kV	175	0	175
GEN-2022-076	Solar	Stevens	KS	Carpenter 345 kV	500	0	500
GEN-2022-077	Solar	Chase	NE	Enders 115 kV	255	0	127.5 127.5
GEN-2022-079	Solar	Cedar	MO	Dadeville East-Bolivar South 161 kV	192	0	192

Project #	Fuel type	Town / County	State	Point of Interconnection	MW request	SH (MW)	SPK (MW)
GEN-2022-080	Battery	Cedar	MO	Dadeville East-Bolivar South 161 kV	96	96	96
GEN-2022-081	Battery	Washington	KS	Clifton 115 kV	218	218	218
GEN-2022-094	Wind	Osborne	KS	Postrock-Axtell 345 kV	250	250	39
GEN-2022-100	Hybrid (Solar / BESS)	Cooper	MO	Overton-Sedalia East 161 kV	80	0 40	80 0
GEN-2022-102	Battery	Clay	MO	Liberty West 161 kV	100	100	100
GEN-2022-113	Solar	Newton	MO	Tipton Station 161 kV	200	0	200
GEN-2022-131	Battery	Johnson	MO	Warrensburg East-Odessa 161 kV	200	200	200
GEN-2022-142	Battery	Clay	MO	Shoal Creek 161 kV	200	200	200
GEN-2022-144	Battery	Jackson	MO	Blue Mills BESS 161 kV	200	200	200
GEN-2022-152	Battery	Richardson	NE	Humboldt 161 kV	80	80	80
GEN-2022-161	Wind	Butler	KS	Burns 345 kV	400	173.13 226.87	27.01 35.39
GEN-2022-162	Wind	Saline	NE	Friend 115 kV	118	118	18.41
GEN-2022-168	Solar	Henry	MO	Silwell-Clinton 161 kV	380	0	190 190
GEN-2022-186	Solar	Coffey	KS	Wolf Creek-Benton 345 kV	684	0	228 228 228
GEN-2022-204	Wind	Edwards, Hodgeman	KS	Post Rock-Spearville 345 kV	250	125 125	19.5 19.5
GEN-2022-205	Wind	Edwards, Hodgeman	KS	Post Rock-Spearville 345 kV	250	125 125	19.5 19.5
GEN-2022-206	Wind	Edwards, Hodgeman	KS	Post Rock-Spearville 345 kV	250	125 125	19.5 19.5
GEN-2022-208	Wind	Andrew, Gentry, Dekalb	MO	Mullen Creek-Ketchum 345 kV	400	135.54 132.23 132.23	21.14 20.63 20.63
GEN-2022-209	Hybrid (Solar / BESS)	Andrew, Gentry, Dekalb	MO	Mullen Creek-Ketchum 345 kV	600	0 0 0 106.4 106.4	136.8 136.8 136.8 106.4 106.4
GEN-2022-214	Solar	Sumner	KS	Gill-Viola 138 kV	239	0	119.5 119.5

Project #	Fuel type	Town / County	State	Point of Interconnection	MW request	SH (MW)	SPK (MW)
GEN-2022-219	Solar	Dawson	MT	Belfield 230 kV	350	0	175 175

1.2 MISO AFSIS Study Summary

1.2.1 Study Summary for Study Projects in MISO South

Summer peak and summer shoulder steady state models and stability packages used for MISO AFSIS on SPP DISIS 2022-001 Study Projects in MISO South were developed from the MISO DPP 2021 South Phase 2 models and stability packages.

Steady state thermal and voltage analysis was performed to identify any thermal and voltage violations in the MISO South region. MISO AFSIS Thermal Network Upgrades identified in steady state analysis are listed in Table ES-3. No MISO AFSIS voltage Network Upgrades were identified.

Table ES-3: AFSIS Thermal Network Upgrades Identified for SPP Study Projects in MISO South

Constraint	Owner	Mitigation	Cost ($)
Couch-McNeil 115 kV	EES-EAI	Terminal Equipment Upgrade at Couch 115 kV	$2,500,000
Couch-Lewisville 115 kV	EES-EAI	DISIS-2021-001 AFS NUs ~9.07 miles of Single ACSR 666.6 FLAMINGO at 115 kV and 175.92 MVA, $10,983,745	$0
Murfreesboro-Snashvl 138 kV	EES-EAI AEPW	Line should be rated at 134 MVA	$0
Amity-Murfreesboro E. 138 kV	EES-EAI	Rebuild	$17,700,000
Lewisville-Patmos 115 kV	EES-EAI AECC	DISIS-2021-001 AFS NUs EES: ~10.38 miles of Single ACSR 954 CARDINAL at 115 kV and 220.64 MVA+Bus at Lweisville, $12,802,852 AECC: Bus upgrade at Patmos - $500,000 (~400MVA post-mitigation rating)	$0
Patmos-Fulton 115 kV	EES-EAI AEPW AECC	DISIS-2021-001 AFS NUs Entergy: reconductor for the 4.22 miles of the line that belongs to Entergy. $5,093,561 AEPW: Rebuild the 7.1 mile AEP owned section of the 115 kV line from Patmos to Fulton. $10.4M AECC: Bus upgrade at Patmos, station upgrades at Fulton, rebuild the 3.61 mile AECC owned section of the 115kV line from Patmos to Fulton - $11.5M total for all upgrades (~400MVA post-mitigation rating for all AECC facilities).	$0

Transient stability analysis was performed to identify any transient stability violations caused by the SPP Study Projects in MISO South. No transient stability constraints were identified in the 2026 summer peak and summer shoulder scenarios. No MISO AFSIS stability NUs were identified in the transient stability analysis.

A short circuit screening analysis was conducted by comparing three phase fault currents in the benchmark and study cases for the SPP Study Projects in MISO South. Based on the screening results, MISO Transmission Owners do not plan to conduct additional studies.

Contingent facilities were identified. Details are in Section 4.2.

It should be noted that a restudy may be required if significant changes to the study assumptions occur, including but not limited to, interconnection request withdrawals and/or changes to higher-queued Network Upgrades included in the Base Case.

For the study projects that are required to mitigate thermal violations, the projects should not be allowed to come into service before the required Network Upgrades are in service, unless a MISO restudy removes the mitigation requirement from the project, or an interim limit is provided to the project through MISO Annual ERIS process. For projects that are required to mitigate voltage violations, no injection is allowed until the allocated upgrades and contingent facilities are in service.

1.2.2 Study Summary for Study Projects in MISO West

Summer peak and summer shoulder steady state models and stability packages used for MISO AFSIS on SPP DISIS 2022-001 Study Projects in MISO West were developed from the MISO DPP 2021 West Phase 2 models and stability packages.

Steady state thermal and voltage analysis was performed to identify any thermal and voltage violations in MISO West region. MISO AFSIS Thermal and voltage Network Upgrades identified in the summer shoulder scenario for steady state analysis are listed in Table ES-4 and Table ES-5.

No MISO AFSIS thermal or voltage Network Upgrades (NUs) were identified in the summer peak scenario.

Table ES-4: AFSIS Thermal Network Upgrades Identified in the Summer Shoulder Scenario for SPP Study Projects in MISO West

Constraint	Owner	Mitigation	Cost ($)
J976 POI-Enon Tap 345 kV	Ameren	upgraded by internal projects: SN/SE: 1836 / 2091MVA	$0
J976 POI-Montgomery 345 kV	Ameren	DPP19 Central Upgrade: Upgrade 0.02 mi 345 kV line conductor from MTGY to Str 326 on MTGY-BELU-6 to be 3000 A, upgrade the Mongomery line position to be 3000A, $600,000. No Cost to DISIS-2022-001	$0
Apache Tap-California 161 kV	Ameren	GI-83: Reconductor 1.06 mi 161 kV conductor for 1600 A SE; cost is $1.2M in GI-83 study	$0

Constraint	Owner	Mitigation	Cost ($)
Sheyenne-Lake Park 230 kV	XEL OTP	XEL:the Xcel portion of the Sheyenne – Lake Park 230kV line and sub is rated to 460.54/506.6 MVA, no upgrade needed. $0 OTP:DPP-2021 West Phase 2 Upgrade: Reconductor/rebuild to 796.7/876.4MVA rating, $35M	$0
Audubon-Lake Park 230 kV	OTP	OTP:DPP-2021 West Phase 2 Upgrade: Reconductor/rebuild to 796.7/876.4MVA rating $10M	$0
Jamestown-Center 345 kV	OTP MPC	MPC: MPC mitigation is not required in MISO study OTP: Adjust CT, $5,000, priror queue upgrade assigned to MPC-2021-1 group	$0
Glenham-Campbell 230 kV	MDU WAPA	WAPA: Rebuild the existing CAMPBELL 4 to GLENHAM4 230 kV line (14 miles) to a standard rating of 796 MVA, $12,369,126, assigned to DPP-2021 West Phase 2 MDU: Current terminal equipment at Glenham is rated above the worst loading, $0	$0

Table ES-5: AFSIS Voltage Network Upgrades Identified in Summer Shoulder Scenario for SPP Study Projects in MISO West

Network Upgrades	Owner	Cost ($)[1]
LRTP-02: Big Stone South – Alexandria – Big Oaks (Cassie’s Crossing), $573,500,000	MRES OTP XEL	$0

Note 1: LRTP project’s cost is not assigned to DISIS-2022-001 projects

Transient stability analysis was performed to identify any transient stability violations caused by the SPP Study Projects in MISO West. Stability package representing 2026 summer peak (SPK) and summer shoulder (SH) scenarios with SPP DISIS 2022-001 Study Projects in MISO West was created from the MISO DPP 2021 West Phase 2 stability packages. Power flow models are the same as steady state power flow models

Based on the MISO West 2026 summer peak transient stability analysis, no MISO Affected System stability constraints were identified in the summer peak scenario. No MISO AFSIS stability NUs are required in summer peak stability study.

Based on the MISO West 2026 summer shoulder transient stability analysis, transient stability violations were identified in the summer shoulder scenario. All these identified stability violations can be mitigated by prior queued Network Upgrades listed in Table ES-6. Study projects in DISIS-2022-001 west group are not responsible for costs of these Network Upgrades.

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Table ES-6. Prior Queued Network Upgrades Required for Stability Constraints in Summer Shoulder Scenario

Network Upgrades	Cost ($)[1]	Comments
LRTP-2 project "Big Stone South - Alexandria - Cassie's Crossing"	$0	NU required for MPC-2021-1 group and DPP 2021 West Ph2 cycle
New 50-mile line from MPC04300 to a new substation on Jamestown-Buffalo	$0	NU required for MPC04300 project
LRTP-1 project "Jamestown – Ellendale"	$0	NU required for MPC-2021-1 group and DPP 2021 West Ph2 cycle
Install a 2×40 MVar cap bank at Drayton 230 kV (657752)	$0	NU required for MPC04300 project and DPP 2021 West Ph2 cycle
Install a 4×75 MVar cap bank at Jamestwon 345 kV (620369)	$0	NU required for MPC04300 project and DPP 2021 West Ph2 cycle
Install additional 2×75 MVar cap bank at Alexandria 345 kV (658047, total capacitor bank will be 4×75 MVar)	$0	NU required for DPP 2021 West Ph2 cycle

Note 1: Network Upgrades' costs are not assigned to DISIS-2022-001 projects

A short circuit screening analysis was conducted by comparing three phase fault currents in the benchmark and study cases for the SPP Study Projects in MISO West. Based on the screening results, MISO Transmission Owners do not plan to conduct additional studies.

No contingent MTEP facilities were identified for the SPP Study Projects in MISO West.

It should be noted that a restudy may be required if significant changes to the study assumptions occur, including but not limited to, interconnection request withdrawals and/or changes to higher-queued Network Upgrades included in the Base Case.

For the study projects that are required to mitigate thermal violations, the projects should not be allowed to come into service before the required Network Upgrades are in service, unless a MISO restudy removes the mitigation requirement from the project, or an interim limit is provided to the project through MISO Annual ERIS process. For projects that are required to mitigate voltage violations, no injection is allowed until the allocated upgrades and contingent facilities are in service.

1.3 Total MISO AFSIS Network Upgrades

1.3.1 Total MISO AFSIS Network Upgrades for Study Projects in MISO South

The total cost of MISO AFSIS Network Upgrades required for the Study Projects in MISO South is listed in Table ES-6. The costs for Network Upgrades are planning level estimates and subject to be revised in the facility studies.

Table ES-7: Total Cost of MISO AFSIS Network Upgrades for SPP DISIS 2022-001 Study Projects in MISO South

Project Num	Network Upgrades ($)			Total Network Upgrade Cost ($)
	MISO Thermal & Voltage	Transient Stability	Short Circuit	
GEN-2022-001	$0	$0	$0	$0
GEN-2022-011	$0	$0	$0	$0
GEN-2022-016	$0	$0	$0	$0
GEN-2022-019	$0	$0	$0	$0
GEN-2022-021	$0	$0	$0	$0
GEN-2022-038	$0	$0	$0	$0
GEN-2022-042	$0	$0	$0	$0
GEN-2022-048	$0	$0	$0	$0
GEN-2022-055	$0	$0	$0	$0
GEN-2022-071	$0	$0	$0	$0
GEN-2022-072	$0	$0	$0	$0
GEN-2022-074	$0	$0	$0	$0
GEN-2022-082	$0	$0	$0	$0
GEN-2022-085	$0	$0	$0	$0
GEN-2022-088	$2,252,864	$0	$0	$2,252,864
GEN-2022-089	$2,252,864	$0	$0	$2,252,864
GEN-2022-090	$0	$0	$0	$0
GEN-2022-091	$0	$0	$0	$0
GEN-2022-092	$0	$0	$0	$0
GEN-2022-093	$1,617,618	$0	$0	$1,617,618
GEN-2022-098	$0	$0	$0	$0
GEN-2022-103	$0	$0	$0	$0
GEN-2022-104	$0	$0	$0	$0
GEN-2022-105	$0	$0	$0	$0
GEN-2022-106	$0	$0	$0	$0
GEN-2022-107	$0	$0	$0	$0
GEN-2022-108	$0	$0	$0	$0
GEN-2022-110	$0	$0	$0	$0
GEN-2022-111	$0	$0	$0	$0

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Project Num	Network Upgrades ($)			Total Network Upgrade Cost ($)
	MISO Thermal & Voltage	Transient Stability	Short Circuit	
GEN-2022-114	$0	$0	$0	$0
GEN-2022-129	$0	$0	$0	$0
GEN-2022-130	$0	$0	$0	$0
GEN-2022-132	$0	$0	$0	$0
GEN-2022-136	$0	$0	$0	$0
GEN-2022-137	$0	$0	$0	$0
GEN-2022-138	$0	$0	$0	$0
GEN-2022-139	$0	$0	$0	$0
GEN-2022-143	$0	$0	$0	$0
GEN-2022-145	$0	$0	$0	$0
GEN-2022-147	$0	$0	$0	$0
GEN-2022-154	$0	$0	$0	$0
GEN-2022-155	$0	$0	$0	$0
GEN-2022-156	$0	$0	$0	$0
GEN-2022-159	$0	$0	$0	$0
GEN-2022-160	$0	$0	$0	$0
GEN-2022-163	$0	$0	$0	$0
GEN-2022-167	$0	$0	$0	$0
GEN-2022-171	$0	$0	$0	$0
GEN-2022-176	$0	$0	$0	$0
GEN-2022-196	$0	$0	$0	$0
GEN-2022-231	$0	$0	$0	$0
GEN-2022-234	$0	$0	$0	$0
GEN-2022-235	$0	$0	$0	$0
GEN-2022-237	$0	$0	$0	$0
GEN-2022-238	$0	$0	$0	$0
GEN-2022-239	$6,569,105	$0	$0	$6,569,105
GEN-2022-240	$3,753,774	$0	$0	$3,753,774
GEN-2022-241	$3,753,774	$0	$0	$3,753,774
Total ($)	**$20,200,000**	**$0**	**$0**	**$20,200,000**

1.3.2 Total MISO AFSIS Network Upgrades for Study Projects in MISO West

The total cost of MISO AFSIS Network Upgrades required for the Study Projects in MISO West is listed in Table ES-7. The costs for Network Upgrades are planning level estimates and subject to be revised in the facility studies.

Table ES-8: Total Cost of MISO AFSIS Network Upgrades for SPP Study Projects in MISO West

Project Num	Network Upgrades ($)			Total Network Upgrade Cost ($)
	MISO Thermal & Voltage	Transient Stability	Short Circuit	
GEN-2022-004	$0	$0	$0	$0
GEN-2022-005	$0	$0	$0	$0
GEN-2022-006	$0	$0	$0	$0
GEN-2022-007	$0	$0	$0	$0
GEN-2022-009	$0	$0	$0	$0
GEN-2022-010	$0	$0	$0	$0
GEN-2022-013	$0	$0	$0	$0
GEN-2022-015	$0	$0	$0	$0
GEN-2022-024	$0	$0	$0	$0
GEN-2022-025	$0	$0	$0	$0
GEN-2022-026	$0	$0	$0	$0
GEN-2022-054	$0	$0	$0	$0
GEN-2022-058	$0	$0	$0	$0
GEN-2022-062	$0	$0	$0	$0
GEN-2022-065	$0	$0	$0	$0
GEN-2022-068	$0	$0	$0	$0
GEN-2022-073	$0	$0	$0	$0
GEN-2022-075	$0	$0	$0	$0
GEN-2022-076	$0	$0	$0	$0
GEN-2022-077	$0	$0	$0	$0
GEN-2022-079	$0	$0	$0	$0
GEN-2022-080	$0	$0	$0	$0
GEN-2022-081	$0	$0	$0	$0
GEN-2022-083	$0	$0	$0	$0
GEN-2022-094	$0	$0	$0	$0

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Project Num	Network Upgrades ($)			Total Network Upgrade Cost ($)
	MISO Thermal & Voltage	Transient Stability	Short Circuit	
GEN-2022-100	$0	$0	$0	$0
GEN-2022-102	$0	$0	$0	$0
GEN-2022-113	$0	$0	$0	$0
GEN-2022-131	$0	$0	$0	$0
GEN-2022-142	$0	$0	$0	$0
GEN-2022-144	$0	$0	$0	$0
GEN-2022-152	$0	$0	$0	$0
GEN-2022-161	$0	$0	$0	$0
GEN-2022-162	$0	$0	$0	$0
GEN-2022-168	$0	$0	$0	$0
GEN-2022-186	$0	$0	$0	$0
GEN-2022-204	$0	$0	$0	$0
GEN-2022-205	$0	$0	$0	$0
GEN-2022-206	$0	$0	$0	$0
GEN-2022-208	$0	$0	$0	$0
GEN-2022-209	$0	$0	$0	$0
GEN-2022-214	$0	$0	$0	$0
GEN-2022-219	$0	$0	$0	$0
Total ($)	**$0**	**$0**	**$0**	**$0**

1.4 Per Project Summary

This section provides estimated cost of MISO AFSIS Network Upgrades on a per project basis for the Study Projects in SPP DISIS 2022-001 cycle.

It should be noted that a restudy may be required should significant changes to the study assumptions occur, including but not limited to, interconnection request withdrawals and/or changes to higher-queued Network Upgrades included in the Base Case.

1.4.1 Per Project Summary for Study Projects in MISO South

The following projects in MISO South do not have MISO AFSIS Network Upgrade cost allocated to the projects:

- GEN-2022-001, GEN-2022-011, GEN-2022-016, GEN-2022-019, GEN-2022-021, GEN-2022-038, GEN-2022-042, GEN-2022-048, GEN-2022-055, GEN-2022-071, GEN-2022-072, GEN-2022-074, GEN-2022-082, GEN-2022-085, GEN-2022-090,

GEN-2022-091, GEN-2022-092, GEN-2022-098, GEN-2022-103, GEN-2022-104, GEN-2022-105, GEN-2022-106, GEN-2022-107, GEN-2022-108, GEN-2022-110, GEN-2022-111, GEN-2022-114, GEN-2022-129, GEN-2022-130, GEN-2022-132, GEN-2022-136, GEN-2022-137, GEN-2022-138, GEN-2022-139, GEN-2022-143, GEN-2022-145, GEN-2022-147, GEN-2022-154, GEN-2022-155, GEN-2022-156, GEN-2022-159, GEN-2022-160, GEN-2022-163, GEN-2022-167, GEN-2022-171, GEN-2022-176, GEN-2022-196, GEN-2022-231, GEN-2022-234, GEN-2022-235, GEN-2022-237, GEN-2022-238.

MISO AFSIS Network Upgrade costs are allocated to the below projects in MISO South:

1.4.1.1 GEN-2022-088 Summary

Network Upgrade	Owner	Cost	GEN-2022-088	NUs Type
Amity-Murfreesboro E. 138 kV	EES-EAI	$17,700,000	$2,252,864	SPK
Total Cost Per Project			**$2,252,864**	

1.4.1.2 GEN-2022-089 Summary

Network Upgrade	Owner	Cost	GEN-2022-089	NUs Type
Amity-Murfreesboro E. 138 kV	EES-EAI	$17,700,000	$2,252,864	SPK
Total Cost Per Project			**$2,252,864**	

1.4.1.3 GEN-2022-093 Summary

Network Upgrade	Owner	Cost	GEN-2022-093	NUs Type
Couch-McNeil 115 kV	EES-EAI	$2,500,000	$350,536	SPK
Amity-Murfreesboro E. 138 kV	EES-EAI	$17,700,000	$1,267,082	SPK
Total Cost Per Project			**$1,617,618**	

1.4.1.4 GEN-2022-239 Summary

Network Upgrade	Owner	Cost	GEN-2022-239	NUs Type
Couch-McNeil 115 kV	EES-EAI	$2,500,000	$1,003,083	SPK
Amity-Murfreesboro E. 138 kV	EES-EAI	$17,700,000	$5,566,022	SPK
Total Cost Per Project			**$6,569,105**	

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1.4.1.5 GEN-2022-240 Summary

Network Upgrade	Owner	Cost	GEN-2022-240	NUs Type
Couch-McNeil 115 kV	EES-EAI	$2,500,000	$573,190	SPK
Amity-Murfreesboro E. 138 kV	EES-EAI	$17,700,000	$3,180,584	SPK
Total Cost Per Project			**$3,753,774**	

1.4.1.6 GEN-2022-241 Summary

Network Upgrade	Owner	Cost	GEN-2022-241	NUs Type
Couch-McNeil 115 kV	EES-EAI	$2,500,000	$573,190	SPK
Amity-Murfreesboro E. 138 kV	EES-EAI	$17,700,000	$3,180,584	SPK
Total Cost Per Project			**$3,753,774**	

1.4.2 Per Project Summary for Study Projects in MISO West

All DISIS 2022-001 generation projects in MISO West (Table ES-2) do not have MISO AFSIS Network Upgrade cost allocated to the projects:

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Section

1

Model Development and Study Criteria

1.1 MISO South Model Development and Study Criteria

1.1.1 MISO South Region AFSIS Model Development

Summer peak and summer shoulder steady state models and stability packages used for MISO AFSIS on SPP DISIS 2022-001 Study Projects in MISO South were developed from the MISO DPP 2021 South Phase 2 models and stability packages.

The starting models used for developing MISO South AFSIS models on DISIS 2022-001 Study are listed below:

- 2026 summer peak model: DPP21-Phase2-2026SUM-Dischrg-Final_240419.sav
- 2026 summer shoulder model: DPP21-Phase2-2026SSH-Dischrg-Final_240419.sav

1.1.1.1 MISO South AFSIS Benchmark Cases

The benchmark cases for the MISO South AFSIS study were created as follows:

- Removed recently withdrawn MISO South prior queued generation projects (Table A-1). Power mismatch was balanced by scaling generation in the MISO South (Table A-10).
- Removed recently withdrawn MISO Classic prior queued generation projects (Table A-2). Power mismatch was balanced by scaling generation in the MISO North (Table A-9).
- Removed recently withdrawn MPC prior queued generation projects (Table A-3). Power mismatch was balanced by scaling generation in the MISO North (Table A-9).
- Removed recently withdrawn SPP prior queued generation projects (Table A-4). Corrected generation dispatch for several SPP prior queued projects. Power mismatch was balanced by scaling generation in SPP market (Table A-11) based on the load-ratio share of the Transmission Owner (TO) power flow modeling areas.
- SPP prior queued generation projects (Table A-5) were modeled.
- Removed several SPP Network Upgrades associated with SPP prior queued withdrawn projects. Added SPP R PLAN "BUILD GENTLEMAN - CHERRY COUNTY - HOLT 345kV". Power mismatch was balanced by scaling generation in SPP market (Table A-11) based on the load-ratio share of the TO power flow modeling areas.
- Removed withdrawn AECI prior queued generation project GIA-84. AECI prior queued generation projects (Table A-6) were modeled. Power mismatch was balanced by scaling generation in AECI (Table A-12).
- Removed recently retired MISO generation in MISO South area. These recently retired MISO South generation are listed in Table A-7. Power mismatch was balanced by scaling generation in the MISO South (Table A-10).

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- Removed recently retired MISO generation in MISO Central area. These recently retired generation projects in MISO Central are listed in Table A-8. Power mismatch was balanced by scaling generation in the MISO North (Table A-9).
- Turned off MISO generation projects in DPP 2021 Central area due to their lower queue positions. Power mismatch was balanced by scaling generation in the MISO North (Table A-9).
- Added the SPP Study Projects with offline status in DISIS 2022-001 cycles close to MISO South. The SPP Study Projects in MISO South are listed in Table ES-1.

1.1.1.2 MISO South AFSIS Study Cases

Summer peak (SPK) study case was created by dispatching the Study Projects in MISO South at the specified summer peak level from the benchmark case.

Summer shoulder (SH) study case was created by dispatching the Study Projects in MISO South at the specified summer shoulder level from the benchmark case.

Generation in the SPP market was used for power balance, where SPP generation was scaled based on the load-ratio share of the TO power flow modeling areas.

Both study and benchmark power flow cases were solved with transformer tap adjustment enabled, area interchange disabled, phase shifter adjustment enabled and switched shunt adjustment enabled.

1.1.2 MISO South Region AFSIS Contingency Criteria

The following contingencies were considered in the MISO South AFSIS analysis:

- NERC Category P0 (system intact - no contingencies)
- NERC Category P1 contingencies
    - Single element outages, at buses with a nominal voltage of 60 kV and above.
    - Multiple-element NERC Category P1 contingencies.
    - NERC Category P2, P4, P5, P7 contingencies.

The detailed list of contingency files is in Appendix A.9

For all contingency and post-disturbance analyses, cases were solved with transformer tap adjustment enabled, area interchange adjustment disabled, phase shifter adjustment disabled (fixed) and switched shunt adjustment enabled.

1.1.3 MISO South Region AFSIS Monitored Elements

The MISO South AFSIS study area is defined in Table 1-1. Facilities in the study area were monitored for system intact and contingency conditions. Under NERC category P0 conditions (system intact), branches were monitored for loading above the normal (PSS®E rate A) rating. Under NERC category P1-P7 conditions, branches were monitored for loading as shown in the column labeled "Post-Disturbance Thermal Limits".

Table 1-1: MISO South AFSIS Monitored Elements

Owner / Area	Thermal Limits [1]		Voltage Limits [2]	
	Pre-Disturbance	Post-Disturbance	Pre-Disturbance	Post-Disturbance
EES	100% of Rate A	100% of Rate B	1.05/0.975/0.95	1.05/0.95/0.92/0.90
CLECO	100% of Rate A	100% of Rate B	1.05/0.95	1.10/0.90
SMEPA	100% of Rate A	100% of Rate B	1.05/0.95	1.05/0.90
LAFA	100% of Rate A	100% of Rate B	1.05/0.95	1.05/0.90
LAGN	100% of Rate A	100% of Rate B	1.05/0.975/0.95	1.05/0.95/0.92
LEPA	100% of Rate A	100% of Rate B	1.05/0.975/0.95	1.05/0.95/0.92

Notes

1: PSS®E Rate A, Rate B or Rate C

2: Limits dependent on nominal bus voltage

1.2 MISO West Model Development and Study Criteria

1.2.1 MISO West Region AFSIS Model Development

Summer peak and summer shoulder steady state models and stability packages used for MISO AFSIS on SPP DISIS 2022-001 Study Projects in MISO West were developed from the MISO DPP 2021 West Phase 2 models and stability packages.

The starting models used for developing MISO West AFSIS models on DISIS 2022-001 Study are listed below:

- 2026 summer peak model: DPP21-Ph2-2026SUM-Study-Discharge_Final_01222024_V2.sav
- 2026 summer shoulder model: DPP21-Ph2-2026SHHW-Study-Discharge_Final_01222024_V2.sav

1.2.1.1 MISO West AFSIS Benchmark Cases

The benchmark cases for the MISO West AFSIS study were created as follows:

- Removed recently withdrawn MISO West and Central and CIPCO prior queued generation projects (Table B-1). Power mismatch was balanced by scaling generation in the MISO North (Table A-9).
- Removed recently withdrawn SPP prior queued generation projects (Table B-2). Removed duplicated projects GEN-2017-060, GEN-2017-082. Corrected generation dispatch for several SPP prior queued projects. Power mismatch was balanced by scaling generation in SPP market (Table A-11) based on the load-ratio share of the TO power flow modeling areas.
- SPP prior queued generation projects (Table B-3) were modeled
- Removed several SPP Network Upgrades associated with SPP prior queued withdrawn projects. Added SPP R PLAN "BUILD GENTLEMAN - CHERRY

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COUNTY - HOLT 345kV". Power mismatch was balanced by scaling generation in SPP market (Table A-11) based on the load-ratio share of the TO power flow modeling areas

- Network Upgrades for prior queued projects and MTEP Appendix A projects were added into the models. They are listed in Table B-4.
- MPC prior queued generation projects (Table B-5) were modeled. Power mismatch was balanced by scaling generation in the MISO North (Table A-9) except generation in Dakotas.
- Removed withdrawn AECI prior queued generation project GIA-84. AECI prior queued generation projects (Table B-6) were modeled. Power mismatch was balanced by scaling generation in AECI (Table A-12).
- Removed recently retired MISO generation in MISO West and Central areas. These recently retired MISO West and Central generation are listed in Table B-7. Power mismatch was balanced by scaling generation in the MISO North (Table A-9).
- Turned off MISO generation projects in DPP 2021 Central area due to their lower queue positions. Power mismatch was balanced by scaling generation in the MISO North (Table A-9).
- Added the SPP Study Projects with offline status in DISIS 2022-001 cycles close to MISO West. The SPP Study Projects in MISO West are listed in Table ES-2.

1.2.1.2 MISO West AFSIS Study Cases

Summer peak (SPK) study case was created by dispatching the Study Projects in MISO West at the specified summer peak level from the benchmark case.

Summer shoulder (SH) study case was created by dispatching the Study Projects in MISO West at the specified summer shoulder level from the benchmark case.

Generation in the SPP market was used for power balance, where SPP generation was scaled based on the load-ratio share of the TO power flow modeling areas.

Due to potential voltage collapse in SPP system, several fictitious SVCs were added to the models. Several 345 kV line reactors were also switched off. These changes are listed in Table B-8.

Both study and benchmark power flow cases were solved with transformer tap adjustment enabled, area interchange disabled, phase shifter adjustment enabled and switched shunt adjustment enabled.

1.2.2 MISO West Region AFSIS Contingency Criteria

The following contingencies were considered in the MISO West AFSIS analysis:

- NERC Category P0 (system intact - no contingencies)
- NERC Category P1 contingencies
    - Single element outages, at buses with a nominal voltage of 60 kV and above.
    - Multiple-element NERC Category P1 contingencies.
    - NERC Category P2, P4, P5, P7 contingencies.

The detailed list of contingency files is in Appendix B.8.

For all contingency and post-disturbance analyses, cases were solved with transformer tap adjustment enabled, area interchange adjustment disabled, phase shifter adjustment disabled (fixed) and switched shunt adjustment enabled.

1.2.3 MISO West Region AFSIS Monitored Elements

The MISO West AFSIS study area is defined in Table 1-2. Facilities in the study area were monitored for system intact and contingency conditions. Under NERC category P0 conditions (system intact), branches were monitored for loading above the normal (PSS®E rate A) rating. Under NERC category P1-P7 conditions, branches were monitored for loading as shown in the column labeled "Post-Disturbance Thermal Limits".

Table 1-2: MISO West AFSIS Monitored Elements

Owner / Area	Thermal Limits [1]		Voltage Limits [2]	
	Pre-Disturbance	Post-Disturbance	Pre-Disturbance	Post-Disturbance
AMIL	100% of Rate A	100% of Rate B	1.05/0.95	1.075/0.90
AMMO	100% of Rate A	100% of Rate B	1.05/0.95	1.075/0.90
BEPC-MISO	100% of Rate A	100% of Rate B	1.05/0.95	1.10/0.90
CMMPA	100% of Rate A	100% of Rate B	1.05/0.95	1.07/0.90
CWLD	100% of Rate A	100% of Rate B	1.05/0.95	1.10/0.90
CWLP	100% of Rate A	100% of Rate B	1.05/0.95	1.075/0.90
DPC	100% of Rate A	100% of Rate B	1.05/0.95	1.10/0.90
GLH	100% of Rate A	100% of Rate B	1.05/0.95	1.05/0.90
GRE	100% of Rate A	100% of Rate B	1.05/0.95	1.10/0.92/0.90
ITCM	100% of Rate A	100% of Rate B	1.07/1.05/0.95	1.10/0.93
MDU	100% of Rate A	100% of Rate B	1.05/0.95	1.10/0.90
MEC	100% of Rate A	100% of Rate B	1.05/0.96/0.95	1.05/0.96/0.95/0.94/0.93[3]
MMPA	100% of Rate A	100% of Rate B	1.05/0.95	1.10/0.90
MP	100% of Rate A	100% of Rate B	1.05/1.00	1.10/0.95
MPW	100% of Rate A	100% of Rate B	1.05/0.95	1.05/0.95
MRES	100% of Rate A	100% of Rate B	1.05/0.97	1.05/0.92
OTP	100% of Rate A	100% of Rate B	1.07/1.05/0.97	1.10/0.92
PPI	100% of Rate A	100% of Rate B	1.05/0.95	1.05/0.95
RPU	100% of Rate A	100% of Rate B	1.05/0.95	1.10/0.92
SIPC	100% of Rate A	100% of Rate B	1.07/0.95	1.09/0.91
SMMPA	100% of Rate A	100% of Rate B	1.05/0.95	1.10/0.90

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Owner / Area	Thermal Limits [1]		Voltage Limits [2]	
	Pre-Disturbance	Post-Disturbance	Pre-Disturbance	Post-Disturbance
WPPI	100% of Rate A	100% of Rate B	1.05/0.95	1.10/0.90
XEL	100% of Rate A	100% of Rate B	1.05/0.95	1.05/0.92

Notes

1: PSS®E Rate A, Rate B or Rate C

2: Limits dependent on nominal bus voltage

3: For facilities in Cedar Falls Utilities or Ames Municipal Utilities, post-contingency voltage limits are 1.05/0.94 for >200 kV, and 1.05/0.93 for others.

1.3 MISO Steady State Performance Criteria

A branch is considered as a thermal injection constraint if the branch is loaded above its applicable normal or emergency rating for the post-change case, and any of the following conditions are met:

1) the generator (NR/ER) has a larger than 20% DF on the overloaded facility under post contingent condition or 5% DF under system intact condition, or
2) the megawatt impact due to the generator is greater than or equal to 20% of the applicable rating (normal or emergency) of the overloaded facility, or
3) the overloaded facility or the overload-causing contingency is at generator's outlet, or
4) for any other constrained facility, where none of the study generators meet one of the above criteria in 1), 2), or 3), however, the cumulative megawatt impact of the group of study generators (NR/ER) is greater than 20% of the applicable rating, then only those study generators whose individual MW impact is greater than 5% of the applicable rating and has DF greater than 5% (OTDF or PTDF) will be responsible for mitigating the cumulative MW impact constraint.

A bus is considered a voltage constraint if both of the following conditions are met. All voltage constraints must be resolved before a project can receive interconnection service.

1) the bus voltage is outside of applicable normal or emergency limits for the post-change case, and
2) the change in bus voltage is greater than 0.01 per unit.

All Study Projects must mitigate thermal injection constraints and voltage constraints in order to obtain unconditional Interconnection Service.

Section

2

MISO South Affected System Study

Steady state thermal and voltage analysis and transient stability analysis were performed in the MISO South AFSIS study.

2.1 MISO South AFSIS Thermal and Voltage Analysis

Nonlinear (AC) contingency analysis was performed on the benchmark and study cases, and the incremental impact of the SPP DISIS 2022-001 Study Projects in MISO South were evaluated by comparing the steady-state performance of the transmission system in the benchmark and study cases. Network upgrades were identified to mitigate any steady state thermal and voltage constraints.

Steady-state analysis was performed in summer peak and summer shoulder discharging scenarios. PSS®E version 34.9.3 and PSS®MUST version 12.4.0 were used in the study.

2.1.1 MISO Contingency Analysis for 2026 Summer Peak Condition

Steady state AC contingency analysis was performed on the MISO South AFSIS summer peak (SPK) study and benchmark cases developed in Section 1.1.1. The 2026 summer peak MISO thermal and voltage results are in Appendix C.1.

2.1.1.1 Summer Peak System Intact Conditions

For NERC category P0 (system intact) conditions, thermal constraints are listed in Table C-1. No voltage constraints were identified (Table C-2).

2.1.1.2 Summer Peak Post Contingency Conditions

The results in this Section are for analysis of conditions following NERC category P1-P7 contingencies.

For P1 contingencies, thermal constraints are listed in Table C-3. No voltage constraints were identified (Table C-4).

For P2-P7 contingencies, thermal constraints are listed in Table C-5. No voltage constraints were identified (Table C-6).

2.1.1.3 Summary of Summer Peak Results

In summer peak scenario, MISO South AFSIS worst thermal constraints are listed in Table 2-1. No voltage constraints were identified.

Table 2-1: Summer Peak MISO South AFSIS Thermal Constraints, Maximum Screened Loading

Generator	Constraint	Rating	Owner	Worst Loading		Contingency	Cont Type
				(MVA)	(%)		
GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Couch-McNeil 115 kV	239	EES-EAI	273.3	114.3	CEII Redacted	P1
GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Couch-McNeil 115 kV	239	EES-EAI	259.8	108.7	CEII Redacted	P2-P7
GEN-2022-088, GEN-2022-089, GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Couch-Lewisville 115 kV	159	EES-EAI	216.4	136.1	CEII Redacted	P0
GEN-2022-090, GEN-2022-091, GEN-2022-093, GEN-2022-111, GEN-2022-239, GEN-2022-240, GEN-2022-241	Couch-Lewisville 115 kV	159	EES-EAI	291.2	183.1	CEII Redacted	P1
GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Couch-Lewisville 115 kV	159	EES-EAI	294.3	185.1	CEII Redacted	P2-P7
GEN-2022-088, GEN-2022-089	Murfreesboro-Snashvl 138 kV	114	EES-EAI AEPW	119.1	104.5	CEII Redacted	P0
GEN-2022-088, GEN-2022-089, GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Murfreesboro-Snashvl 138 kV	114	EES-EAI AEPW	129.8	113.8	CEII Redacted	P1
GEN-2022-088, GEN-2022-089	Amity-Murfreesboro E. 138 kV	98	EES-EAI	110.5	112.7	CEII Redacted	P0
GEN-2022-088, GEN-2022-089, GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Amity-Murfreesboro E. 138 kV	98	EES-EAI	120.8	123.2	CEII Redacted	P1

Generator	Constraint	Rating	Owner	Worst Loading		Contingency	Cont Type
				(MVA)	(%)		
GEN-2022-088, GEN-2022-089, GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Lewisville-Patmos 115 kV	159	EES-EAI AECC	241.6	152.0	CEII Redacted	P0
GEN-2022-093, GEN-2022-111, GEN-2022-239, GEN-2022-240, GEN-2022-241	Lewisville-Patmos 115 kV	159	EES-EAI AECC	316.9	199.3	CEII Redacted	P1
GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Lewisville-Patmos 115 kV	159	EES-EAI AECC	320.1	201.3	CEII Redacted	P2-P7
GEN-2022-088, GEN-2022-089, GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Patmos-Fulton 115 kV	159	EES-EAI AEPW AECC	245.0	154.1	CEII Redacted	P0
GEN-2022-090, GEN-2022-091, GEN-2022-093, GEN-2022-111, GEN-2022-239, GEN-2022-240, GEN-2022-241	Patmos-Fulton 115 kV	159	EES-EAI AEPW AECC	320.4	201.5	CEII Redacted	P1
GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Patmos-Fulton 115 kV	159	EES-EAI AEPW AECC	323.6	203.5	CEII Redacted	P2-P7

2.1.2 MISO Contingency Analysis for 2026 Summer Shoulder Condition

Steady state AC contingency analysis was performed on the MISO South AFSIS summer shoulder (SH) study and benchmark cases developed in Section 1.1.1. The 2026 summer shoulder MISO thermal and voltage results are in Appendix C.2.

2.1.2.1 Summer Shoulder System Intact Conditions

For NERC category P0 (system intact) conditions, thermal constraints are listed in Table C-7. No voltage constraints were identified (Table C-8).

2.1.2.2 Summer Shoulder Post Contingency Conditions

The results in this Section are for analysis of conditions following NERC category P1-P7 contingencies.

For P1 contingencies, thermal constraints are listed in Table C-9. No voltage constraints were identified (Table C-10).

For P2-P7 contingencies, thermal constraints are listed in Table C-11. No voltage constraints were identified (Table C-12).

2.1.2.3 Summary of Summer Shoulder Results

In summer shoulder scenario, MISO South AFSIS worst thermal constraints are listed in Table 2-1. No voltage constraints were identified.

Table 2-2: Summer Shoulder MISO South AFSIS Thermal Constraints, Maximum Screened Loading

Generator	Constraint	Rating	Owner	Worst Loading		Contingency	Cont Type
				(MVA)	(%)		
GEN-2022-240, GEN-2022-241	Couch-Lewisville 115 kV	159	EES-EAI	170.5	107.2	CEII Redacted	P1
GEN-2022-240, GEN-2022-241	Couch-Lewisville 115 kV	159	EES-EAI	172.9	108.7	CEII Redacted	P2-P7
GEN-2022-240, GEN-2022-241	Lewisville-Patmos 115 kV	159	EES-EAI AECC	192.7	121.2	CEII Redacted	P1
GEN-2022-240, GEN-2022-241	Lewisville-Patmos 115 kV	159	EES-EAI AECC	194.9	122.6	CEII Redacted	P2-P7
GEN-2022-089, GEN-2022-240, GEN-2022-241	Patmos-Fulton 115 kV	159	EES-EAI AEPW AECC	160.2	100.8	CEII Redacted	P0
GEN-2022-240, GEN-2022-241	Patmos-Fulton 115 kV	159	EES-EAI AEPW AECC	195.6	123.0	CEII Redacted	P1
GEN-2022-240, GEN-2022-241	Patmos-Fulton 115 kV	159	EES-EAI AEPW AECC	197.8	124.4	CEII Redacted	P2-P7

2.1.3 Summary of MISO South AFSIS Steady State Analysis

MISO South steady state analyses were performed on the MISO 2026 summer peak and summer shoulder scenarios. The steady state thermal constraints and required Network Upgrades are listed in Table 2-3. No voltage constraints were identified.

Table 2-3: MISO South AFSIS Combined Thermal Constraints and Network Upgrades

Generator	Constraint	Owner	Mitigation	Cost ($)
GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Couch-McNeil 115 kV	EES-EAI	Terminal Equipment Upgrade at Couch 115 kV	$2,500,000
GEN-2022-088, GEN-2022-089, GEN-2022-090, GEN-2022-091, GEN-2022-093, GEN-2022-111, GEN-2022-239, GEN-2022-240, GEN-2022-241	Couch-Lewisville 115 kV	EES-EAI	DISIS-2021-001 AFS NUs ~9.07 miles of Single ACSR 666.6 FLAMINGO at 115 kV and 175.92 MVA, $10,983,745	$0
GEN-2022-088, GEN-2022-089, GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Murfreesboro-Snashvl 138 kV	EES-EAI AEPW	Line should be rated at 134 MVA	$0
GEN-2022-088, GEN-2022-089, GEN-2022-093, GEN-2022-239, GEN-2022-240, GEN-2022-241	Amity-Murfreesboro E. 138 kV	EES-EAI	Rebuild	$17,700,000
GEN-2022-088, GEN-2022-089, GEN-2022-093, GEN-2022-111, GEN-2022-239, GEN-2022-240, GEN-2022-241	Lewisville-Patmos 115 kV	EES-EAI AECC	DISIS-2021-001 AFS NUs EES: ~10.38 miles of Single ACSR 954 CARDINAL at 115 kV and 220.64 MVA+Bus at Leweisville, $12,802,852 AECC: Bus upgrade at Patmos - $500,000 (~400MVA post-mitigation rating)	$0
GEN-2022-088, GEN-2022-089, GEN-2022-090, GEN-2022-091, GEN-2022-093, GEN-2022-111, GEN-2022-239, GEN-2022-240, GEN-2022-241	Patmos-Fulton 115 kV	EES-EAI AEPW AECC	DISIS-2021-001 AFS NUs Entergy: reconductor for the 4.22 miles of the line that belongs to Entergy. $5,093,561 AEPW: Rebuild the 7.1 mile AEP owned section of the 115 kV line from Patmos to Fulton. $10.4M AECC: Bus upgrade at Patmos, station upgrades at Fulton, rebuild the 3.61 mile AECC owned section of the 115kV line from Patmos to Fulton - $11.5M total for all upgrades (~400MVA post-mitigation rating for all AECC facilities).	$0

2.2 MISO South AFSIS Transient Stability Analysis

Stability analysis was performed to evaluate transient stability and impact on the MISO South region of the SPP Study Projects in MISO South.

2.2.1 Procedure

2.2.1.1 Computer Programs

Stability analysis was performed using TSAT revision 23.0.

2.2.1.2 Methodology

Stability package representing 2026 summer peak (SPK) and summer shoulder (SH) scenarios with SPP DISIS 2022-001 Study Projects in MISO South was created from the MISO DPP 2021 South Phase 2 stability packages. Power flow models are the same as steady state power flow models, which were developed in Section 1.1.1.

Disturbances were simulated to evaluate the transient stability and impact on the region of the SPP Study Projects in MISO South. MISO transient stability criteria and local TOs' planning criteria specified in MTEP21 were adopted for checking stability violations.

2.2.2 Model Development

Summer peak and summer shoulder stability power flow models are the same as the correspondent steady state models, which were developed as specified in Section 1.1.1.

2.2.3 Disturbance Criteria

The stability simulations performed as part of this study considered all the regional and local contingencies listed in Table 2-4. Regional contingencies with pre-defined switching sequences were selected from the MISO MTEP21 study; switching sequences for local contingencies were developed based on the generic clearing times shown in Table 2-5. The admittance for local single line-to-ground (SLG) faults were estimated by assuming that the Thevenin impedance of the positive, negative and zero sequence networks at the fault point are equal.

Table 2-4: MISO South AFSIS Regional and Local Disturbance Descriptions

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Table 2-5: Generic Clearing Time Assumption

Voltage Level (kV)	Primary Clearing Time (cycle)	Backup Clearing Time (cycle)
345 kV	4	11
230 kV	5	13
161/138 kV	6	18
115 kV	6	20
69 kV	8	24

2.2.4 Performance Criteria

MISO transient stability criteria and local TOs' planning criteria specified in MTEP21 were adopted. The Study Projects must mitigate the stability constraints to obtain any type of Interconnection Service.

2.2.5 Summer Peak Stability Results

The contingencies listed in Table 2-4 were simulated using the summer peak stability model.

Appendix D.1.2 contains plots of generator rotor angles, generator power output, and bus voltages for each simulation. Simulations were performed with a 0.5 seconds steady-state run followed by the appropriate disturbance. Simulations were run for a 10-second duration.

MISO South AFSIS summer peak stability study results summary is in Appendix D.1.1, Table D-1.

The following stability related issues were identified in the summer peak stability study.

2.2.5.1 Generator Tripping Due to Low Voltage Relay

Under several faults, some generators were tripped by their low voltage relays (Table 2-6). Duration of the faults is longer than low voltage relay tripping time. Therefore, no mitigation is required for these generators tripping.

Table 2-6: Generator Tripping Due to Low Voltage Relay

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2.2.5.2 Stability Network Upgrades Identified in Summer Peak

In summary, no MISO Affected System stability constraints were identified in the summer peak scenario. No MISO AFSIS stability NUs are required in summer peak stability study.

2.2.6 Summer Shoulder Stability Results

The contingencies listed in Table 2-4 were simulated using the summer shoulder stability model.

Appendix D.2.2 contains plots of generator rotor angles, generator power output, and bus voltages for each simulation. Simulations were performed with a 0.5 seconds steady-state run followed by the appropriate disturbance. Simulations were run for a 10-second duration.

MISO South AFSIS summer shoulder stability study results summary is in Appendix D.2.1, Table D-2.

The following stability related issues were identified in the summer shoulder stability study.

2.2.6.1 Generator Tripping Due to Low Voltage Relay

Under several faults, some generators were tripped by their low voltage relays (Table 2-7). Duration of the faults is longer than low voltage relay tripping time. Therefore, no mitigation is required for these generators tripping.

Table 2-7: Generator Tripping Due to Low Voltage Relay

CEII Redacted

2.2.6.2 Stability Network Upgrades Identified in Summer Shoulder

In summary, no MISO Affected System stability constraints were identified in the summer shoulder scenario. No MISO AFSIS stability NUs are required in summer shoulder stability study.

2.2.7 Summary of MISO South AFSIS Transient Stability Analysis

Based on the MISO South 2026 summer peak and summer shoulder transient stability analysis, no MISO South AFSIS stability NUs are required for the SPP Study Projects in MISO South.

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Section

3

MISO West Affected System Study

Steady state thermal and voltage analysis and transient stability analysis were performed in the MISO West AFSIS study.

3.1 MISO West AFSIS Thermal and Voltage Analysis

Nonlinear (AC) contingency analysis was performed on the benchmark and study cases, and the incremental impact of the SPP DISIS 2022-001 Study Projects in MISO West were evaluated by comparing the steady-state performance of the transmission system in the benchmark and study cases. Network upgrades were identified to mitigate any steady state thermal and voltage constraints.

Steady-state analysis was performed in summer peak and summer shoulder discharging scenarios. PSS®E version 34.9.3 and PSS®MUST version 12.4.0 were used in the study.

3.1.1 MISO Contingency Analysis for 2026 Summer Peak Condition

Steady state AC contingency analysis was performed on the MISO West AFSIS summer peak (SPK) study and benchmark cases developed in Section 1.2.1. The 2026 summer peak MISO thermal and voltage results are in Appendix E.1.

3.1.1.1 Summer Peak System Intact Conditions

For NERC category P0 (system intact) conditions, no thermal constraints (Table E-1) or voltage constraints (Table E-2) were identified.

3.1.1.2 Summer Peak Post Contingency Conditions

The results in this Section are for analysis of conditions following NERC category P1-P7 contingencies. All NERC Category P1 contingencies were converged.

For P1 contingencies, no thermal constraints (Table E-3) or voltage constraints (Table E-4) were identified.

For P2-P7 contingencies, no thermal constraints (Table E-5) or voltage constraints (Table E-6) were identified.

3.1.1.3 Summary of Summer Peak Results

In summer peak scenario, no thermal or voltage constraints were identified in the MISO West steady state analysis for the SPP Study Projects.

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3.1.2 MISO Contingency Analysis for 2026 Summer Shoulder Condition

Steady state AC contingency analysis was performed on the MISO West AFSIS summer shoulder (SH) study and benchmark cases developed in Section 1.2.1. The 2026 summer shoulder MISO thermal and voltage results are in Appendix E.2.

3.1.2.1 Summer Shoulder System Intact Conditions

For NERC category P0 (system intact) conditions, thermal constraints are listed in Table E-7. No voltage constraints were identified (Table E-8).

3.1.2.2 Summer Shoulder Post Contingency Conditions

The results in this Section are for analysis of conditions following NERC category P1-P7 contingencies.

For P1 contingencies, thermal constraints are listed in Table E-9. No voltage constraints were identified (Table E-10).

Five category P1-P7 contingencies (Table E-13) were not converged in both the benchmark and study cases. No mitigation plan is required for the SPP Study Projects for this non-converged contingency.

For the non-converged contingencies in Table E-13, DC contingency analysis was performed to get the dc thermal results. The dc thermal results for non-converged contingencies are listed in Table E-14.

For P2-P7 contingencies, no thermal constraints were identified (Table E-11). Voltage constraints are listed in Table E-12.

3.1.2.3 Summer Shoulder Worst Constraints

In the 2026 summer shoulder scenario, MISO West AFSIS worst thermal constraints are listed in Table 3-1, and MISO West AFSIS worst voltage constraints are listed in Table E-15.

Table 3-1: 2026 Summer Shoulder MISO West AFSIS Thermal Constraints, Maximum Screened Loading

Generator	Constraint	Rating	Owner	Worst Loading		Contingency	Cont Type
				(MVA)	(%)		
GEN-2022-100	J976 POI-Enon Tap 345 kV	956.0	Ameren	1102.4	115.3	CEII Redacted	P0
GEN-2022-100	J976 POI-Montgomery 345 kV	956.0	Ameren	1102.4	115.3	CEII Redacted	P0
GEN-2022-100, GEN-2022-131	J976 POI-Montgomery 345 kV	956.0	Ameren	1103.4	115.4	CEII Redacted	P1
GEN-2022-100	Apache Tap-California 161 kV	204.0	Ameren	223.6	109.6	CEII Redacted	P0
GEN-2022-068	Sheyenne-Lake Park 230 kV	300.8	XEL OTP	380.4	126.5	CEII Redacted	P1
GEN-2022-068	Audubon-Lake Park 230 kV	293.6	OTP	372.4	126.8	CEII Redacted	P1
GEN-2022-068	Jamestown-Center 345 kV	704.0	OTP MPC	774.1	110.0	CEII Redacted	P1
GEN-2022-068	Glenham-Campbell 230 kV	210.0	MDU WAPA	291.4	138.8	CEII Redacted	P1

3.1.2.4 Mitigation Test for Voltage Constraints

Under P7 contingency of “P71:345:XEL-GRE:CMT-HNA 1:CMT-HNA 2”, multiple voltage constraints were identified in areas of Blue Lake, Paynesville, Panther, and McLeod. It was tested that the following switched capacitor banks (Table 3-2) can resolve all these voltage constraints:

Table 3-2: Switched Capacitor Banks for Mitigating Voltage Constraints

Switched Capacitor Banks	Cost
Add 1×50 MVar switched cap at Panther 230 kV (615529)	$5.0M
Add additional 2×50 MVar switched cap at McLeod 230 kV (658276)	$3.0M
Add 1×50 MVar switched cap at Willmar 230 kV (658259)	$1.5M
Add 1×50 MVar switched cap at Paynesville 230 kV (602036)	$7.2M

In the summer shoulder stability study (Section 3.2.9), voltage collapses were identified at Alexandria 345 kV bus in the summer shoulder benchmark case. It was validated that MISO LRTP-2 project “Big Stone South - Alexandria - Cassie's Crossing” can resolve all the identified voltage collapses and transient voltage violations in the summer shoulder benchmark case. Therefore, the LRTP-2 project, which is contingent facilities for prior queued projects (projects in MPC-2021-1 group, projects in DPP 2021 West Phase 2 cycle), is also required Network Upgrade prior to SPP DISIS-2022-001 cluster.

With the LRTP-2 project added to the summer shoulder study case, it was tested that all the identified steady-state voltage constraints were mitigated. Therefore, the switched capacitor banks in Table 3-2 are no longer required.

3.1.2.5 Summary of Summer Shoulder Results

In the summer shoulder scenario, Table 3-3 lists MISO West AFSIS thermal constraints and Network Upgrades, and Table 3-4 lists MISO West AFSIS voltage constraints and Network Upgrades.

Table 3-3: MISO West AFSIS Thermal Constraints and Network Upgrades in Summer Shoulder Scenario

Generator	Constraint	Owner	Mitigation	Cost ($)
GEN-2022-100	J976 POI-Enon Tap 345 kV	Ameren	upgraded by internal projects: SN/SE: 1836 / 2091MVA	$0
GEN-2022-100, GEN-2022-131	J976 POI-Montgomery 345 kV	Ameren	DPP19 Central Upgrade: Upgrade 0.02 mi 345 kV line conductor from MTGY to Str 326 on MTGY-BELU-6 to be 3000 A, upgrade the Mongomery line position to be 3000A, $600,000. No Cost to DISIS-2022-001	$0
GEN-2022-100	Apache Tap-California 161 kV	Ameren	GI-83: Reconductor 1.06 mi 161 kV conductor for 1600 A SE; cost is $1.2M in GI-83 study	$0
GEN-2022-068	Sheyenne-Lake Park 230 kV	XEL OTP	XEL:the Xcel portion of the Sheyenne – Lake Park 230kV line and sub is rated to 460.54/506.6 MVA, no upgrade needed. $0 OTP:DPP-2021 West Phase 2 Upgrade: Reconductor/rebuild to 796.7/876.4MVA rating, $35M	$0
GEN-2022-068	Audubon-Lake Park 230 kV	OTP	OTP:DPP-2021 West Phase 2 Upgrade: Reconductor/rebuild to 796.7/876.4MVA rating $10M	$0
GEN-2022-068	Jamestown-Center 345 kV	OTP MPC	MPC: MPC mitigation is not required in MISO study OTP: Adjust CT, $5,000, priror queue upgrade assigned to MPC-2021-1 group	$0
GEN-2022-068	Glenham-Campbell 230 kV	MDU WAPA	WAPA: Rebuild the existing CAMPBELL 4 to GLENHAM4 230 kV line (14 miles) to a standard rating of 796 MVA, $12,369,126, assigned to DPP-2021 West Phase 2 MDU: Current terminal equipment at Glenham is rated above the worst loading, $0	$0

Table 3-4: MISO West AFSIS Voltage Constraints and Network Upgrades in Summer Shoulder Scenario

Constraint	Network Upgrades	Owner	Cost ($)[1]
Low voltages in areas of Blue Lake, Paynesville, Panther, and McLeod	LRTP-02: Big Stone South – Alexandria – Big Oaks (Cassie's Crossing), $573,500,000	MRES OTP XEL	$0

Note 1: LRTP project' cost is not assigned to DISIS-2022-001 projects

3.1.3 Summary of MISO West AFSIS Steady State Analysis

MISO West steady state analyses were performed on the MISO 2026 summer peak and summer shoulder scenarios. No thermal or voltage constraints were identified in the summer peak scenario. In the summer shoulder scenario, steady state thermal constraints and required Network Upgrades are listed in Table 3-3, and voltage constraints and required Network Upgrades are listed in Table 3-4.

3.2 MISO West AFSIS Transient Stability Analysis

Stability analysis was performed to evaluate transient stability and impact on the MISO West region of the SPP Study Projects in MISO West.

3.2.1 Procedure

3.2.1.1 Computer Programs

Stability analysis was performed using TSAT revision 24.0.

3.2.1.2 Methodology

Stability package representing 2026 summer peak (SPK) and summer shoulder (SH) scenarios with SPP DISIS 2022-001 Study Projects in MISO West was created from the MISO DPP 2021 West Phase 2 stability packages. Power flow models are the same as steady state power flow models, which were developed in Section 1.2.1.

Disturbances were simulated to evaluate the transient stability and impact on the region of the SPP Study Projects in MISO West. MISO transient stability criteria and local TOs' planning criteria specified in MTEP21 were adopted for checking stability violations.

3.2.2 Model Development

Summer peak and summer shoulder stability power flow models are the same as the correspondent steady state models, which were developed as specified in Section 1.2.1.

3.2.3 Disturbance Criteria

The stability simulations performed as part of this study considered all the regional and local contingencies listed in Table 3-5. Regional contingencies with pre-defined switching sequences were selected from the MISO MTEP21 study; switching sequences for local contingencies were developed based on the generic clearing times shown in Table 2-5. The admittance for local single line-to-ground (SLG) faults were estimated by assuming that the Thevenin impedance of the positive, negative and zero sequence networks at the fault point are equal.

Table 3-5: MISO West AFSIS Regional and Local Disturbance Descriptions

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3.2.4 Performance Criteria

MISO transient stability criteria and local TOs' planning criteria specified in MTEP21 were adopted. The Study Projects must mitigate the stability constraints to obtain any type of Interconnection Service.

3.2.5 Summer Peak Stability Results

The contingencies listed in Table 3-5 were simulated using the summer peak stability model. The summer peak stability model was developed from the summer peak steady state model.

As mentioned in Section 1.2.1.2, several fictitious SVCs were added and several 345 kV line reactors were also switched off (Table B-8) due to potential voltage collapse in SPP system.

Appendix F.1.2 contains plots of generator rotor angles, generator power output, and bus voltages for each simulation. Simulations were performed with a 0.5 seconds steady-state run followed by the appropriate disturbance. Simulations were run for a 10-second duration.

MISO West AFSIS summer peak stability study results summary is in Appendix F.1.1, Table F-1.

The following stability related issues were identified in the summer peak stability study.

3.2.5.1 Local Voltage Collapse at POI of GEN-2021-050 and GEN-2021-051

Under two contingencies listed in Table 3-6, stability simulation was crashed due to local voltage collapse at POI of GEN-2021-050 and GEN-2021-051. After the fault was cleared, there was only one remaining 161 kV outlet for projects GEN-2017-108, GEN-2021-050, and GEN-2021-051 with loading around 880 MW. The simulation crash issue was related to insufficient outlet of GEN-2017-108, GEN-2021-050, and GEN-2021-051. No MISO AFSIS NU is required.

Table 3-6: Simulation Crash

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3.2.5.2 Transient Low Voltage Recovery

Under one contingency of “G17-108-TAP_SLG_POI_STILWEL5” (Table 3-7), voltage at 161 kV POI of GEN-2021-050 and GEN-2021-051 was around 0.82 p.u., and voltage at Clinton 161 kV bus was around 0.88 p.u. after the fault was cleared. After the fault was cleared, there was only one remaining 161 kV outlet for projects GEN-2017-108, GEN-2021-050, and GEN-2021-051 with loading around 880 MW. The post-fault low voltage recovery issue is related to insufficient outlet of GEN-2017-108, GEN-2021-050, and GEN-2021-051. No MISO AFSIS NU is required.

Table 3-7: Transient Low Voltage Recovery

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3.2.5.3 Transient High Voltage Violation

Under one contingency of “2139_W_MDU_P12” (Table 3-8), transient voltage at J1989 345 kV POI bus (in MDU area) was above 1.2 pu for up to 0.05 second. This transient high voltage violation was caused by J1989 and J1990 projects which are in DPP 2021 Phase 2 cycle. The violation was not related to any projects in DISIS 2022-001 cluster. No MISO AFSIS NU is required.

Table 3-8: Transient High Voltage Violation

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3.2.6 Stability Network Upgrades Identified in Summer Peak

In summary, no MISO Affected System stability constraints were identified in the summer peak scenario. No MISO AFSIS stability NUs are required in summer peak stability study.

3.2.7 Summer Shoulder Stability Analysis

The contingencies listed in Table 3-5 were simulated using the summer shoulder stability model. The summer shoulder stability model was developed from the summer shoulder steady state model. As mentioned in Section 1.2.1.2, several fictitious SVCs were added and several 345 kV line reactors were also switched off (Table B-8) due to potential voltage collapse in SPP system.

3.2.8 Stability Results in Summer Shoulder Benchmark Case

The following stability related issues were identified in the stability study for summer shoulder benchmark case.

3.2.8.1 Voltage Collapse in Benchmark Case

Under four contingencies listed in Table 3-9, voltage collapse was identified at Alexandria 345 kV bus in the summer shoulder benchmark case. The identified voltage collapse can be resolved by LRTP-2 project “Big Stone South - Alexandria - Cassie's Crossing”, which was required Network Upgrade for projects in MPC-2021-1 group and projects in MISO DPP 2021 West Phase 2 cycle.

Therefore, the LRTP-2 project is pre-required Network Upgrade and will be included in stability study for summer shoulder study case.

Table 3-9: Voltage Collapse in Benchmark Case

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3.2.8.2 Tripping of MPC-04300 Project in Benchmark Case

Under two contingencies listed in Table 3-10, MPC-04300 project was tripped in the summer shoulder benchmark case. The identified project tripping can be resolved by the Network Upgrade “New 50-mile line from MPC04300 to a new substation on Jamestown-Buffalo”, which was required Network Upgrade for MPC-04300 project.

Therefore, the Network Upgrade “New 50-mile line from MPC04300 to a new substation on Jamestown-Buffalo” is pre-required Network Upgrade and will be included in stability study for summer shoulder study case.

Table 3-10: Tripping of MPC-04300 Project in Benchmark Case

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3.2.8.3 Summary of Stability Study Results in Summer Shoulder Benchmark Case

In summary, Network Upgrades in Table 3-11 are pre-required Network Upgrades for stability constraints identified in summer shoulder benchmark case.

Table 3-11: Pre-Required Network Upgrade for Stability Constraints in Summer Shoulder Benchmark Case

Constraint	Network Upgrades	Scenario	Comments
Voltage Collapse in shoulder benchmark case	LRTP-2 project “Big Stone South - Alexandria - Cassie's Crossing”	ST in SH benchmark	NU required for MPC-2021-1 group and DPP 2021 West Ph2 cycle
Tripping of MPC-04300 project in benchmark case	New 50-mile line from MPC04300 to a new substation on Jamestown-Buffalo	ST in SH benchmark	NU required for MPC04300 project

3.2.9 Stability Results in Summer Shoulder Study Case

Appendix F.2.2 contains plots of generator rotor angles, generator power output, and bus voltages for each simulation. Simulations were performed with a 0.5 seconds steady-state run followed by the appropriate disturbance. Simulations were run for a 10-second duration.

MISO West AFSIS summer shoulder stability study results summary is in Appendix F.2.1, Table F-2.

The following stability related issues were identified in the summer shoulder stability study.

3.2.9.1 Voltage Collapse and Severe Voltage Violations Resolved by LRTP-2 Project

Under multiple contingencies listed in Table 3-12, voltage collapse and severe voltage violations were identified in the summer shoulder study case. All the identified voltage collapse and severe voltage violations can be resolved by the LRTP-2 project “Big Stone South - Alexandria - Cassie's Crossing”.

Table 3-12: Voltage Collapse and Severe Voltage Constraints in SH Study Case

CEII Redacted

3.2.9.2 Generation Tripping and Poorly Damped Oscillation

Under multiple contingencies listed in Table 3-13, generation tripping of MPC03800, MPC03900, and MPC04300 projects and poorly damped oscillation were identified in the summer shoulder study case. All these identified generation tripping and poorly damped oscillation can be resolved by the Network Upgrade “New 50-mile line from MPC04300 to a new substation on Jamestown-Buffalo”.

Table 3-13: Generation Tripping and Poorly Damped Oscillation

CEII Redacted

3.2.9.3 Additional Poorly Damped Oscillation

Under two contingencies listed in Table 3-14, additional poorly damped oscillations were identified in the summer shoulder study case. The identified poorly damped oscillation can be resolved by the LRTP-1 project “Jamestown – Ellendale”, which was required Network Upgrade for projects in MPC-2021-1 group and projects in MISO DPP 2021 West Phase 2 cycle.

Table 3-14: Additional Poorly Damped Oscillation

CEII Redacted

3.2.9.4 Transient Low Voltage Violation in Area of Drayton

Under three contingencies listed in Table 3-15, transient low voltage violations were identified in area of Drayton. The transient low voltage violations in Drayton area can be resolved by adding a 2×40 MVar switched capacitor bank at Drayton 230 kV (657752), which was required Network Upgrade for MPC04300 project and projects in MISO DPP 2021 West Phase 2 cycle.

Table 3-15: Transient Low Voltage Violation in Drayton

CEII Redacted

3.2.9.5 Transient Low Voltage Violations at Jamestown and Bison

Under one contingency listed in Table 3-16, transient low voltage violations were identified at Jamestown and Bison. The transient low voltage violation at Jamestown can be resolved by adding a 4×75 MVar switched capacitor bank at Jamestown 345 kV (620369), which was required Network Upgrade for MPC04300 project and projects in MISO DPP 2021 West Phase 2 cycle. The transient low voltage violation at Bison can be resolved by adding additional 2×75 MVar switched capacitor bank at Alexandria 345 kV (total capacitor bank will be 4×75 MVar).

Table 3-16: Transient Low Voltage Violations at Jamestown and Bison

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3.2.9.6 Transient High Voltage Violations in OTP, MDU

Under multiple contingencies listed in Table 3-17, transient high voltage violations (>1,2 p.u.) were observed at OTP and MDU buses. These transient high voltage violations were caused by J1989 and J1990 projects in DPP 2021 West Phase 2 cycle. Network Upgrade is not required for the SPP Study Projects in MISO West.

Table 3-17: Transient High Voltage Violations in OTP, MDU

CEII Redacted

3.2.9.7 Summary of Stability Study Results in Summer Shoulder Study Case

In summary, Network Upgrades in Table 3-18 are additional Network Upgrades for stability constraints identified in summer shoulder study case. All these Network Upgrades are prior queued Network Upgrades. Study projects in DISIS-2022-001 West group are not responsible for costs of these Network Upgrades.

Table 3-18: Additional Network Upgrades for Stability Constraints in Summer Shoulder Study Case

Constraint	Network Upgrades	Comments
Poorly damped oscillation in study case	LRTP-1 project "Jamestown – Ellendale"	NU required for MPC-2021-1 group and DPP 2021 West Ph2 cycle
Transient low voltage violations in Drayton area	Install a 2×40 MVar cap bank at Drayton 230 kV (657752)	NU required for MPC04300 project and DPP 2021 West Ph2 cycle
Transient low voltage violation at Jamestown	Install a 4×75 MVar cap bank at Jamestwon 345 kV (620369)	NU required for MPC04300 project and DPP 2021 West Ph2 cycle
Transient low voltage violation at Alexandria	Install additional 2×75 MVar cap bank at Alexandria 345 kV (658047, total capacitor bank will be 4×75 MVar)	NU required for DPP 2021 West Ph2 cycle

3.2.10 Summary of MISO West AFSIS Transient Stability Analysis

Based on the MISO West 2026 summer peak transient stability analysis, no MISO Affected System stability constraints were identified in the summer peak scenario. No MISO AFSIS stability NUs are required in summer peak stability study.

Based on the MISO West 2026 summer shoulder transient stability analysis, transient stability violations were identified in the summer shoulder scenario. All these identified stability violations can be mitigated by prior queued Network Upgrades listed in Table 3-19. Study projects in DISIS-2022-001 West group are not responsible for costs of these Network Upgrades.

Table 3-19: Prior Queued Network Upgrades Required for Stability Constraints in Summer Shoulder Scenario

Constraint	Network Upgrades	Comments
Voltage Collapse in shoulder benchmark case	LRTP-2 project "Big Stone South - Alexandria - Cassie's Crossing"	NU required for MPC-2021-1 group and DPP 2021 West Ph2 cycle
Tripping of MPC-04300 project in benchmark case	New 50-mile line from MPC04300 to a new substation on Jamestown-Buffalo	NU required for MPC04300 project
Poorly damped oscillation in study case	LRTP-1 project "Jamestown – Ellendale"	NU required for MPC-2021-1 group and DPP 2021 West Ph2 cycle
Transient low voltage violations in Drayton area	Install a 2×40 MVar cap bank at Drayton 230 kV (657752)	NU required for MPC04300 project and DPP 2021 West Ph2 cycle
Transient low voltage violation at Jamestown	Install a 4×75 MVar cap bank at Jamestwon 345 kV (620369)	NU required for MPC04300 project and DPP 2021 West Ph2 cycle
Transient low voltage violation at Alexandria	Install additional 2×75 MVar cap bank at Alexandria 345 kV (658047, total capacitor bank will be 4×75 MVar)	NU required for DPP 2021 West Ph2 cycle

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Section

4

Contingent Facilities

4.1 Contingent Facilities in MISO South

Table 4-1 describes transmission assumptions modeled in the studies that were deemed necessary to mitigate the thermal and voltage violations identified in the study.

For the study projects that are required to mitigate thermal violations, the projects should not be allowed to come into service before the required Network Upgrades are in service, unless a MISO restudy removes the mitigation requirement from the project, or an interim limit was provided to the project through MISO Annual ERIS process.

Table 4-1: Contingent Facility and Conditional Projects in MISO South

MTEP ID	MTEP Cycle	Facility Name	Description	Expected ISD	Status	Conditional Projects
20163	MTEP22	Many Area Transmission Expansion	Many Area Transmission Expansion, contingency facility ID: 25882, 25883, 25884	6/252025	M2 - Appendix A Approved	GEN-2022-108

4.2 Contingent Facilities in MISO West

No contingent MTEP facilities were identified for the SPP Study Projects in MISO West.

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Section
5

Network Upgrades and Cost Allocation

5.1 Cost Assumptions for Network Upgrades

The cost estimate for each network upgrade was provided by the corresponding transmission owning company.

5.2 Cost Allocation Methodology

Costs of AFSIS Network Upgrades are allocated based on MISO Network Upgrade cost allocation methodology, which is detailed in the MISO Generation Interconnection Business Practices Manual BPM-015.

5.3 MISO South AFSIS Network Upgrades Required for the SPP Study Projects in MISO South

5.3.1 MISO South AFSIS Network Upgrades

Based on the MISO South 2026 summer peak and summer shoulder steady state analysis, thermal constraints were identified in MISO system for the SPP Study Projects in MISO South; No voltage constraints were identified in MISO South. MISO South AFSIS thermal NUs are required for the SPP Study Projects in MISO South.

Based on the MISO South 2026 summer peak and summer shoulder transient stability analysis, no transient stability constraints were identified for the SPP Study Projects in MISO South; No MISO South AFSIS stability NUs are required for the SPP Study Projects in MISO South.

A short circuit screening analysis was conducted by comparing three phase fault currents in the benchmark and study cases for the SPP Study Projects in MISO South. Based on the screening results, MISO Transmission Owners do not plan to conduct additional studies.

Contingent MTEP facilities and Network Upgrades were identified for the SPP Study Projects in MISO South, as listed in Section 4.2.

The total costs of MISO South AFSIS Network Upgrades for SPP Study Projects in MISO South are summarized in Table 5-1.

It should be noted that a restudy may be required if significant changes to the study assumptions occur, including but not limited to, interconnection request withdrawals and/or changes to higher-queued Network Upgrades included in the Base Case.

For the study projects that are required to mitigate thermal violations, the projects should not be allowed to come into service before the required Network Upgrades are in service, unless

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a MISO restudy removes the mitigation requirement from the project, or an interim limit is provided to the project through MISO Annual ERIS process. For projects that are required to mitigate voltage violations, no injection is allowed until the allocated upgrades and contingent facilities are in service.

Table 5-1: Summary of MISO South AFSIS Network Upgrades

Category of Network Upgrades	Cost ($)
Thermal Network Upgrades Identified in MISO Steady-State Analysis	$20,200,000
Voltage Network Upgrades Identified in MISO Steady-State Analysis	$0
Network Upgrades Identified in Stability Analysis	$0
Network Upgrades Identified in Short Circuit Analysis	$0
Total	**$20,200,000**

MISO South AFSIS Network Upgrades for SPP Study Projects in MISO South are listed below.

Table 5-2: MISO South Thermal NUs and Cost

Constraint	Owner	Mitigation	Cost ($)
Couch-McNeil 115 kV	EES-EAI	Terminal Equipment Upgrade at Couch 115 kV	$2,500,000
Couch-Lewisville 115 kV	EES-EAI	DISIS-2021-001 AFS NUs ~9.07 miles of Single ACSR 666.6 FLAMINGO at 115 kV and 175.92 MVA, $10,983,745	$0
Murfreesboro-Snashvl 138 kV	EES-EAI AEPW	Line should be rated at 134 MVA	$0
Amity-Murfreesboro E. 138 kV	EES-EAI	Rebuild	$17,700,000
Lewisville-Patmos 115 kV	EES-EAI AECC	DISIS-2021-001 AFS NUs EES: ~10.38 miles of Single ACSR 954 CARDINAL at 115 kV and 220.64 MVA+Bus at Lweisville, $12,802,852 AECC: Bus upgrade at Patmos - $500,000 (~400MVA post-mitigation rating)	$0
Patmos-Fulton 115 kV	EES-EAI AEPW AECC	DISIS-2021-001 AFS NUs Entergy: reconductor for the 4.22 miles of the line that belongs to Entergy. $5,093,561 AEPW: Rebuild the 7.1 mile AEP owned section of the 115 kV line from Patmos to Fulton. $10.4M AECC: Bus upgrade at Patmos, station upgrades at Fulton, rebuild the 3.61 mile AECC owned section of the 115kV line from Patmos to Fulton - $11.5M total for all upgrades (~400MVA post-mitigation rating for all AECC facilities).	$0

Table 5-3: MISO South Steady-State Voltage NUs and Cost

Network Upgrades	Owner	Study Cycle	Cost ($)
No voltage NUs			$0

Table 5-4: MISO South Transient Stability NUs and Cost

Network Upgrades	Owner	Cost ($)
No MISO AFS stability NUs		$0

Table 5-5: MISO South Short Circuit Network Upgrades

NUs	Cost ($)
No short circuit NUs	$0

5.3.2 MISO South AFSIS NU Cost Allocation

The calculated Distribution Factor (DF) results and MW contribution on each MISO South Affected System constraint are in Appendix G.1.1. The cost allocation for each NU is calculated based on the contribution of each generating facility, as detailed in Appendix G.1.2.

Assuming all generation projects in the SPP Study Projects in MISO South advance, a summary of the costs for total MISO South AFSIS NUs allocated to each generation project is listed in Table 5-6.

Table 5-6: Summary of MISO South AFSIS NU Costs Allocated to the SPP South Study Projects

Project Num	Network Upgrades ($)			Total Network Upgrade Cost ($)
	MISO Thermal & Voltage	Transient Stability	Short Circuit	
GEN-2022-001	$0	$0	$0	$0
GEN-2022-011	$0	$0	$0	$0
GEN-2022-016	$0	$0	$0	$0
GEN-2022-019	$0	$0	$0	$0
GEN-2022-021	$0	$0	$0	$0
GEN-2022-038	$0	$0	$0	$0
GEN-2022-042	$0	$0	$0	$0
GEN-2022-048	$0	$0	$0	$0
GEN-2022-055	$0	$0	$0	$0

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Project Num	Network Upgrades ($)			Total Network Upgrade Cost ($)
	MISO Thermal & Voltage	Transient Stability	Short Circuit	
GEN-2022-071	$0	$0	$0	$0
GEN-2022-072	$0	$0	$0	$0
GEN-2022-074	$0	$0	$0	$0
GEN-2022-082	$0	$0	$0	$0
GEN-2022-085	$0	$0	$0	$0
GEN-2022-088	$2,252,864	$0	$0	$2,252,864
GEN-2022-089	$2,252,864	$0	$0	$2,252,864
GEN-2022-090	$0	$0	$0	$0
GEN-2022-091	$0	$0	$0	$0
GEN-2022-092	$0	$0	$0	$0
GEN-2022-093	$1,617,618	$0	$0	$1,617,618
GEN-2022-098	$0	$0	$0	$0
GEN-2022-103	$0	$0	$0	$0
GEN-2022-104	$0	$0	$0	$0
GEN-2022-105	$0	$0	$0	$0
GEN-2022-106	$0	$0	$0	$0
GEN-2022-107	$0	$0	$0	$0
GEN-2022-108	$0	$0	$0	$0
GEN-2022-110	$0	$0	$0	$0
GEN-2022-111	$0	$0	$0	$0
GEN-2022-114	$0	$0	$0	$0
GEN-2022-129	$0	$0	$0	$0
GEN-2022-130	$0	$0	$0	$0
GEN-2022-132	$0	$0	$0	$0
GEN-2022-136	$0	$0	$0	$0
GEN-2022-137	$0	$0	$0	$0
GEN-2022-138	$0	$0	$0	$0
GEN-2022-139	$0	$0	$0	$0
GEN-2022-143	$0	$0	$0	$0
GEN-2022-145	$0	$0	$0	$0
GEN-2022-147	$0	$0	$0	$0

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Project Num	Network Upgrades ($)			Total Network Upgrade Cost ($)
	MISO Thermal & Voltage	Transient Stability	Short Circuit	
GEN-2022-154	$0	$0	$0	$0
GEN-2022-155	$0	$0	$0	$0
GEN-2022-156	$0	$0	$0	$0
GEN-2022-159	$0	$0	$0	$0
GEN-2022-160	$0	$0	$0	$0
GEN-2022-163	$0	$0	$0	$0
GEN-2022-167	$0	$0	$0	$0
GEN-2022-171	$0	$0	$0	$0
GEN-2022-176	$0	$0	$0	$0
GEN-2022-196	$0	$0	$0	$0
GEN-2022-231	$0	$0	$0	$0
GEN-2022-234	$0	$0	$0	$0
GEN-2022-235	$0	$0	$0	$0
GEN-2022-237	$0	$0	$0	$0
GEN-2022-238	$0	$0	$0	$0
GEN-2022-239	$6,569,105	$0	$0	$6,569,105
GEN-2022-240	$3,753,774	$0	$0	$3,753,774
GEN-2022-241	$3,753,774	$0	$0	$3,753,774
Total ($)	**$20,200,000**	**$0**	**$0**	**$20,200,000**

5.4 MISO West AFSIS Network Upgrades Required for the SPP Study Projects in MISO West

5.4.1 MISO West AFSIS Network Upgrades

Based on the MISO West 2026 summer peak and summer shoulder steady state analysis, thermal and voltage constraints were identified in MISO system for the SPP Study Projects in MISO West. These thermal and voltage constraints can be mitigated by Network Upgrades required for prior queued projects. No MISO West AFSIS steady state Network Upgrades are required for the SPP Study Projects in MISO West.

Based on the MISO West 2026 summer peak and summer shoulder transient stability analysis, stability violations were identified in the summer shoulder scenario. All these identified stability violations can be mitigated by Network Upgrades required for prior queued

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projects. SPP Study Projects in MISO West are not responsible for costs of these Network Upgrades.

A short circuit screening analysis was conducted by comparing three phase fault currents in the benchmark and study cases for the SPP Study Projects in MISO West. Based on the screening results, MISO Transmission Owners do not plan to conduct additional studies.

No contingent MTEP facilities were identified for the SPP Study Projects in MISO West.

The total costs of MISO West AFSIS Network Upgrades for SPP Study Projects in MISO West are summarized in Table 5-7.

Table 5-7: Summary of MISO West AFSIS Network Upgrades

Category of Network Upgrades	Cost ($)
Thermal Network Upgrades Identified in MISO Steady-State Analysis	$0
Voltage Network Upgrades Identified in MISO Steady-State Analysis	$0
Network Upgrades Identified in Stability Analysis	$0
Network Upgrades Identified in Short Circuit Analysis	$0
Total	**$0**

MISO West AFSIS Network Upgrades for SPP Study Projects in MISO West are listed below.

It should be noted that a restudy may be required if significant changes to the study assumptions occur, including but not limited to, interconnection request withdrawals and/or changes to higher-queued Network Upgrades included in the Base Case.

For the study projects that are required to mitigate thermal violations, the projects should not be allowed to come into service before the required Network Upgrades are in service, unless a MISO restudy removes the mitigation requirement from the project, or an interim limit is provided to the project through MISO Annual ERIS process. For projects that are required to mitigate voltage violations, no injection is allowed until the allocated upgrades and contingent facilities are in service.

Table 5-8: MISO West Thermal NUs and Cost

Constraint	Owner	Mitigation	Cost ($)
J976 POI-Enon Tap 345 kV	Ameren	upgraded by internal projects: SN/SE: 1836 / 2091MVA	$0
J976 POI-Montgomery 345 kV	Ameren	DPP19 Central Upgrade: Upgrade 0.02 mi 345 kV line conductor from MTGY to Str 326 on MTGY-BELU-6 to be 3000 A, upgrade the Mongomery line position to be 3000A, $600,000. No Cost to DISIS-2022-001	$0
Apache Tap-California 161 kV	Ameren	GI-83: Reconductor 1.06 mi 161 kV conductor for 1600 A SE; cost is $1.2M in GI-83 study	$0

Constraint	Owner	Mitigation	Cost ($)
Sheyenne-Lake Park 230 kV	XEL OTP	XEL:the Xcel portion of the Sheyenne – Lake Park 230kV line and sub is rated to 460.54/506.6 MVA, no upgrade needed. $0 OTP:DPP-2021 West Phase 2 Upgrade: Reconductor/rebuild to 796.7/876.4MVA rating, $35M	$0
Audubon-Lake Park 230 kV	OTP	OTP:DPP-2021 West Phase 2 Upgrade: Reconductor/rebuild to 796.7/876.4MVA rating $10M	$0
Jamestown-Center 345 kV	OTP MPC	MPC: MPC mitigation is not required in MISO study OTP: Adjust CT, $5,000, priror queue upgrade assigned to MPC-2021-1 group	$0
Glenham-Campbell 230 kV	MDU WAPA	WAPA: Rebuild the existing CAMPBELL 4 to GLENHAM4 230 kV line (14 miles) to a standard rating of 796 MVA, $12,369,126, assigned to DPP-2021 West Phase 2 MDU: Current terminal equipment at Glenham is rated above the worst loading, $0	$0

Table 5-9: MISO West Steady-State Voltage NUs and Cost

Network Upgrades	Owner	Cost ($)[1]
LRTP-02: Big Stone South – Alexandria – Big Oaks (Cassie's Crossing), $573,500,000	MRES OTP XEL	$0

Note 1: LRTP project's cost is not assigned to DISIS-2022-001 projects

Table 5-10: MISO West Transient Stability NUs and Cost

Network Upgrades	Cost ($)[1]	Comments
LRTP-2 project "Big Stone South - Alexandria - Cassie's Crossing"	$0	NU required for MPC-2021-1 group and DPP 2021 West Ph2 cycle
New 50-mile line from MPC04300 to a new substation on Jamestown-Buffalo	$0	NU required for MPC04300 project
LRTP-1 project "Jamestown – Ellendale"	$0	NU required for MPC-2021-1 group and DPP 2021 West Ph2 cycle
Install a 2×40 MVar cap bank at Drayton 230 kV (657752)	$0	NU required for MPC04300 project and DPP 2021 West Ph2 cycle
Install a 4×75 MVar cap bank at Jamestwon 345 kV (620369)	$0	NU required for MPC04300 project and DPP 2021 West Ph2 cycle
Install additional 2×75 MVar cap bank at Alexandria 345 kV (658047, total capacitor bank will be 4×75 MVar)	$0	NU required for DPP 2021 West Ph2 cycle

Note 1: Network Upgrades' costs are not assigned to DISIS-2022-001 projects

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Table 5-11: MISO West Short Circuit Network Upgrades

NUs	Cost ($)
No short circuit NUs	$0

5.4.2 MISO West AFSIS NU Cost Allocation

The calculated Distribution Factor (DF) results, voltage impact, and MW contribution on each MISO West Affected System constraint are in Appendix G.2.1. The cost allocation for each NU is calculated based on the contribution of each generating facility, as detailed in Appendix G.2.2.

Assuming all generation projects in the SPP Study Projects in MISO West advance, a summary of the costs for total MISO West AFSIS NUs allocated to each generation project is listed in Table 5-12.

Table 5-12: Summary of MISO West AFSIS NU Costs Allocated to the SPP West Study Projects

Project Num	Network Upgrades ($)			Total Network Upgrade Cost ($)
	MISO Thermal & Voltage	Transient Stability	Short Circuit	
GEN-2022-004	$0	$0	$0	$0
GEN-2022-005	$0	$0	$0	$0
GEN-2022-006	$0	$0	$0	$0
GEN-2022-007	$0	$0	$0	$0
GEN-2022-009	$0	$0	$0	$0
GEN-2022-010	$0	$0	$0	$0
GEN-2022-013	$0	$0	$0	$0
GEN-2022-015	$0	$0	$0	$0
GEN-2022-024	$0	$0	$0	$0
GEN-2022-025	$0	$0	$0	$0
GEN-2022-026	$0	$0	$0	$0
GEN-2022-054	$0	$0	$0	$0
GEN-2022-058	$0	$0	$0	$0
GEN-2022-062	$0	$0	$0	$0
GEN-2022-065	$0	$0	$0	$0
GEN-2022-068	$0	$0	$0	$0
GEN-2022-073	$0	$0	$0	$0
GEN-2022-075	$0	$0	$0	$0

Project Num	Network Upgrades ($)			Total Network Upgrade Cost ($)
	MISO Thermal & Voltage	Transient Stability	Short Circuit	
GEN-2022-076	$0	$0	$0	$0
GEN-2022-077	$0	$0	$0	$0
GEN-2022-079	$0	$0	$0	$0
GEN-2022-080	$0	$0	$0	$0
GEN-2022-081	$0	$0	$0	$0
GEN-2022-083	$0	$0	$0	$0
GEN-2022-094	$0	$0	$0	$0
GEN-2022-100	$0	$0	$0	$0
GEN-2022-102	$0	$0	$0	$0
GEN-2022-113	$0	$0	$0	$0
GEN-2022-131	$0	$0	$0	$0
GEN-2022-142	$0	$0	$0	$0
GEN-2022-144	$0	$0	$0	$0
GEN-2022-152	$0	$0	$0	$0
GEN-2022-161	$0	$0	$0	$0
GEN-2022-162	$0	$0	$0	$0
GEN-2022-168	$0	$0	$0	$0
GEN-2022-186	$0	$0	$0	$0
GEN-2022-204	$0	$0	$0	$0
GEN-2022-205	$0	$0	$0	$0
GEN-2022-206	$0	$0	$0	$0
GEN-2022-208	$0	$0	$0	$0
GEN-2022-209	$0	$0	$0	$0
GEN-2022-214	$0	$0	$0	$0
GEN-2022-219	$0	$0	$0	$0
Total ($)	**$0**	**$0**	**$0**	**$0**

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Appendix A

MISO South AFSIS Model Development for Steady-State Analysis

A.1 Recently Withdrawn Prior Queued Projects

Table A-1: Recently Withdrawn MISO South Prior Queued Project

Prj #	Bus Number	Bus Name	Id	Status
J1463	44630	J1463 GEN 0.8000	1	Withdrawn
J1790	47900	J1790 GEN 0.6000	1	Withdrawn

Table A-2: Recently Withdrawn MISO Classic Prior Queued Project

Prj #	Bus Number	Bus Name	Id	Status
J1204	42040	J1204 GEN 0.6000	1	Withdrawn
J1332	43320	J1332 GEN 0.6000	1	Withdrawn
J1447	44470	J1447 GEN 0.6300	1	Withdrawn
J1474	44740	J1474 GEN 0.6300	1	Withdrawn
J1491	44910	J1491 GEN 0.6900	1	Withdrawn
J1510	45100	J1510 GEN 0.6300	PV	Withdrawn
J1526	45260	J1526 GEN 0.6300	1	Withdrawn
J1527	45270	J1527 GEN 0.6300	1	Withdrawn
J1563	45630	J1563 GEN 0.6300	1	Withdrawn
J1579	45790	J1579 GEN 0.6300	1	Withdrawn
J1591	45910	J1591 GEN 0.6900	1	Withdrawn
J1591	45911	J1591 GEN1 0.6900	1	Withdrawn
J1593	45930	J1593 GEN 0.6300	1	Withdrawn
J1593	45931	J1593 GEN1 0.6300	1	Withdrawn
J1624	46240	J1624 GEN 0.6300	1	Withdrawn
J1625	46250	J1625 GEN 0.6300	1	Withdrawn

Prj #	Bus Number	Bus Name	Id	Status
J1636	46360	J1636 GEN 0.6900	1	Withdrawn
J1637	46370	J1637 GEN 0.6900	1	Withdrawn
J1637	46371	J1637 GEN1 0.6900	1	Withdrawn
J1655	46550	J1655 GEN 0.6000	1	Withdrawn
J1676	46760	J1676 GEN 0.6300	1	Withdrawn
J1676	46761	J1676 GEN1 0.6300	1	Withdrawn
J1678	46780	J1678 GEN 0.6300	1	Withdrawn
J1678	47431	J1678 GEN1 0.6300	1	Withdrawn
J1680	46800	J1680 GEN 0.6600	1	Withdrawn
J1687	46870	J1687 GEN 0.6450	1	Withdrawn
J1695	46950	J1695 GEN 0.6300	1	Withdrawn
J1697	46970	J1697 GEN 0.6300	1	Withdrawn
J1713	47130	J1713 GEN 1.0000	1	Withdrawn
J1726	47260	J1726 GEN 0.6300	1	Withdrawn
J1770	47700	J1770 GEN 0.6900	1	Withdrawn
J1815	48150	J1815 GEN 0.6000	1	Withdrawn
J1830	48300	J1830 GEN 0.6900	1	Withdrawn
J1830	48301	J1830 GEN1 0.6900	1	Withdrawn
J1835	48350	J1835 GEN 0.7000	1	Withdrawn
J897	88977	J897 G1 0.6900	W	Withdrawn
J897	88978	J897 G2 0.6900	W	Withdrawn

Table A-3: Recently Withdrawn MPC Prior Queued Project

Prj #	Size (MW)	Status
MPC04100	300	Withdrawn
MPC04200	153.6	Withdrawn

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Table A-4: Recently Withdrawn SPP Prior Queued Project

Prj #	Status	Bus Number	Bus Name	Id
GEN-2016-063	TERMINATED	587433	G16-063-GEN10.6900	1
GEN-2017-013	WITHDRAWN	588583	G17-013-GEN10.6900	1
GEN-2017-032	WITHDRAWN	588753	G17-032-GEN10.6900	1
GEN-2017-090	WITHDRAWN	589283	G17-090-GEN10.6900	1
GEN-2017-090	WITHDRAWN	589287	G17-090-GEN20.6900	1
GEN-2017-125	TERMINATED	761904	G17-125GEN1 0.6900	1
GEN-2017-132	TERMINATED	760035	G17-132-GEN10.6900	1
GEN-2017-132	TERMINATED	760038	G17-132-GEN20.6900	1
GEN-2017-152	TERMINATED	761128	G17-152GEN1 0.6900	1
GEN-2017-154	TERMINATED	760854	G17-154GEN1 0.6900	1
GEN-2017-166	WITHDRAWN	761862	G17-166GEN1 0.6900	1
GEN-2018-030	WITHDRAWN	762661	G18-030GEN1 0.6600	1
GEN-2020-015	WITHDRAWN	764271	G20-015-GEN10.6300	1
GEN-2020-016	WITHDRAWN	764496	G20-016-GEN10.6900	1
GEN-2020-023	WITHDRAWN	764526	G20-023-GEN10.6300	1
GEN-2020-052	WITHDRAWN	765101	G20-052-GEN10.6900	1
GEN-2020-052	WITHDRAWN	765104	G20-052-GEN20.6900	1
GEN-2020-071	WITHDRAWN	765131	G20-071-GEN10.7200	1
GEN-2020-076	WITHDRAWN	765146	G20-076-GEN10.5200	1
GEN-2020-086	WITHDRAWN	765161	G20-086-GEN10.6900	1
GEN-2020-086	WITHDRAWN	765164	G20-086-GEN20.6900	1
GEN-2021-004	WITHDRAWN	765332	G21-004-GEN10.6900	1
GEN-2021-004	WITHDRAWN	765335	G21-004-GEN20.6600	1
GEN-2021-086	WITHDRAWN	766092	G21-086-GEN10.6000	1
GEN-2021-086	WITHDRAWN	766092	G21-086-GEN10.6000	2
GEN-2021-086	WITHDRAWN	766095	G21-086-GEN20.6000	1
GEN-2021-086	WITHDRAWN	766095	G21-086-GEN20.6000	2
GEN-2021-104	WITHDRAWN	766212	G21-104-GEN10.6600	1
GEN-2021-104	WITHDRAWN	766215	G21-104-GEN20.6900	1
GEN-2016-063	TERMINATED	587433	G16-063-GEN10.6900	1
GEN-2017-013	WITHDRAWN	588583	G17-013-GEN10.6900	1

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Prj #	Status	Bus Number	Bus Name	Id
GEN-2017-032	WITHDRAWN	588753	G17-032-GEN10.6900	1
GEN-2017-090	WITHDRAWN	589283	G17-090-GEN10.6900	1
GEN-2017-090	WITHDRAWN	589287	G17-090-GEN20.6900	1
GEN-2017-125	TERMINATED	761904	G17-125GEN1 0.6900	1
GEN-2017-132	TERMINATED	760035	G17-132-GEN10.6900	1
GEN-2017-132	TERMINATED	760038	G17-132-GEN20.6900	1
GEN-2017-152	TERMINATED	761128	G17-152GEN1 0.6900	1
GEN-2017-154	TERMINATED	760854	G17-154GEN1 0.6900	1
GEN-2017-166	WITHDRAWN	761862	G17-166GEN1 0.6900	1
GEN-2018-030	WITHDRAWN	762661	G18-030GEN1 0.6600	1
GEN-2020-015	WITHDRAWN	764271	G20-015-GEN10.6300	1
GEN-2020-016	WITHDRAWN	764496	G20-016-GEN10.6900	1
GEN-2020-023	WITHDRAWN	764526	G20-023-GEN10.6300	1
GEN-2020-052	WITHDRAWN	765101	G20-052-GEN10.6900	1
GEN-2020-052	WITHDRAWN	765104	G20-052-GEN20.6900	1
GEN-2020-071	WITHDRAWN	765131	G20-071-GEN10.7200	1
GEN-2020-076	WITHDRAWN	765146	G20-076-GEN10.5200	1
GEN-2020-086	WITHDRAWN	765161	G20-086-GEN10.6900	1
GEN-2020-086	WITHDRAWN	765164	G20-086-GEN20.6900	1
GEN-2021-004	WITHDRAWN	765332	G21-004-GEN10.6900	1
GEN-2021-004	WITHDRAWN	765335	G21-004-GEN20.6600	1
GEN-2021-086	WITHDRAWN	766092	G21-086-GEN10.6000	1

A.2 SPP Prior Queued Generation Projects

Table A-5: SPP Prior Queued Generation Projects

Projects	Cluster	MW	Generation Type	Town or County	State	Substation or Line	TO at POI
GEN-2016-037	DISIS-2017-001	300	Wind	Washita County	OK	Chisholm-Gracemont 345kV	AEP
GEN-2017-023	DISIS-2017-001	85	Solar	Choctaw County	OK	Hugo Power Plant 138 kV Sub	WFEC
GEN-2017-027	DISIS-2017-001	140	Wind	Carter County	OK	Pooleville-Ratliff (Carter County) 138kV	OGE
GEN-2017-040	DISIS-2017-001	200.1	Solar	Ochiltree County	TX	Canadian River-Muskogee and Muskogee-Seminole 345kV	OGE
GEN-2017-057	DISIS-2017-001	72.5	Solar	Caddo Parish	LA	Hosston 69kV	AEP
GEN-2017-061	DISIS-2017-001	101.5	Solar	Mayes County	OK	GRDA1 to CLARMR 5 161kV line	GRDA
GEN-2017-071	DISIS-2017-001	124.7	Solar	Payne County	OK	Greenwood 138kV sub	OGE
GEN-2017-075	DISIS-2017-001	200	Solar	Johnston County	OK	Hugo-Sunnyside 345 kV	OGE
GEN-2017-077	DISIS-2017-001	124.7	Solar	Mayes County	OK	Explorer Claremore Tap EXCLART4	AEP
GEN-2017-092	DISIS-2017-001	200	Solar	Muskogee County	OK	Canadian River-Muskogee and Muskogee-Seminole 345kV	OGE
GEN-2017-133	DISIS-2017-002	200	Wind	Oklahoma	OK	Arcadia 345kV	OGE
GEN-2017-134	DISIS-2017-002	250	Wind	Oklahoma	OK	Arcadia 345kV	OGE
GEN-2017-137	DISIS-2017-002	295	Wind	Oklahoma	OK	Arcadia 345kV	OGE
GEN-2017-140	DISIS-2017-002	160	Solar	Wagoner	OK	Clarksville 345kV Switching Station	AEP
GEN-2017-141	DISIS-2017-002	241.7	Solar	Wagoner	OK	Clarksville 345kV Switching Station	AEP
GEN-2017-149	DISIS-2017-002	258	Wind	Johnston	OK	Johnson County 345kV Substation	OGE
GEN-2017-150	DISIS-2017-002	250	Solar	Grady	OK	Minco 345kV	OGE
GEN-2017-151	DISIS-2017-002	300	Wind	Crosby	TX	TUCO-Oklaunion 345kV	SPS
GEN-2017-164	DISIS-2017-002	250	Solar	Garfield	OK	Woodring 345kV Substation	OGE
GEN-2017-171	DISIS-2017-002	150	Solar	Stephen	OK	Lawton Eastside - Terry Road 345kV	AEP
GEN-2017-231	DISIS-2017-002	72.5	Solar	Franklin County	AR	Branch 161kV Substation	OGE
GEN-2017-233	DISIS-2017-002	215	Wind	Grady	OK	Minco 345kV	OGE
GEN-2018-003	DISIS-2018-001	150	Solar	Bowie	TX	North Boston-Bann 138kV Line	AEP
GEN-2018-011	DISIS-2018-001	74.1	Battery	Kingfisher	OK	Dover 138 kV Switching Station	WFEC
GEN-2018-015	DISIS-2018-001	252	Solar	Paducah	TX	Tuco-Oklaunion 345kV Line	SPS
GEN-2018-021	DISIS-2018-001	74.1	Solar	Washita	OK	Chisholm-Gracemont 345kV Line	AEP

Projects	Cluster	MW	Generation Type	Town or County	State	Substation or Line	TO at POI
GEN-2018-024	DISIS-2018-001	100	Battery	Muskogee	OK	Canadian River-Muskogee and Muskogee-Seminole 345kV	OGE
GEN-2018-026	DISIS-2018-001	100	Battery	Canadian	OK	Mustang 138kV Substation	OGE
GEN-2018-027	DISIS-2018-001	100	Battery	Tulsa	OK	Tulsa Power Station 138kV Substation	AEP
GEN-2018-028	DISIS-2018-001	200	Battery	Tulsa	OK	Tulsa North 138kV Substation	AEP
GEN-2018-029	DISIS-2018-001	100	Battery	Oklahoma	OK	Horseshoe Lake 138kV Substation	OGE
GEN-2018-048	DISIS-2018-001	300	Solar	Caddo	OK	Pecan Creek 345kV Substation	OGE
GEN-2018-050	DISIS-2018-001	200	Solar	Caddo	LA	Longwood 345kV Substation	AEP
GEN-2018-055	DISIS-2018-001	252	Solar	Grady	OK	Terry Road 345kV station (shared with Rush Springs Windfarm on a common gentie)	AEP
GEN-2018-064	DISIS-2018-002	80	Solar	Benton	AR	Tonnece Substation 69kV	GRDA
GEN-2018-071	DISIS-2018-002	151	Battery	Kay	OK	Interconnecting into OG&E's Ranch Road 345kV substation by tapping a 0.1 gen tie line into the existing Frontier II gen-tie line	OGE
GEN-2018-072	DISIS-2018-002	151	Battery	Kay	OK	Interconnecting into OG&E's Ranch Road 345kV substation by tapping a 0.1 gen tie line into the existing Frontier II gen-tie line	OGE
GEN-2018-079	DISIS-2018-002	148	Solar	Craig / Novata	OK	Farmland-Delaware 138kV line	AEP
GEN-2018-082	DISIS-2018-002	215	Wind	Pittsburg	OK	Pittsburg 345kV Substation	AEP
GEN-2018-088	DISIS-2018-002	130	Solar	Bowie	TX	Lydia 345kV substation	AEP
GEN-2018-106	DISIS-2018-002	165	Solar	Caddo	LA	Longwood 345kV substation	AEP
GEN-2018-115	DISIS-2018-002	250	Hybrid	Lawton	OK	Lawton East Side 345kV/138kv	AEP
GEN-2019-002	DISIS-2019-001	100	Battery	Mayes	OK	Maid 161kV substation	GRDA
GEN-2019-013	DISIS-2019-001	50	Battery	Roger Mills	OK	Dempsey 230kV sub/Sweetwater 230kV	AEP
GEN-2019-035	DISIS-2019-001	80	Solar	Barry	MO	Reeds Spring-Aurora 161kV Line	EDE
GEN-2019-065	DISIS-2019-001	180	Battery	Smith	TX	Overton-Northwest Henderson 138kV	AEP
GEN-2020-009	DISIS-2020-001	300	Hybrid	Cotton	OK	Lawton East Side to Oklaunion 345kV	AEP
GEN-2020-010	DISIS-2020-001	140	Hybrid	Mutual	OK	Seiling-Taloga Substations 138kV	WFEC
GEN-2020-012	DISIS-2020-001	113	Hybrid	Headrick	OK	Snyder â€“ Altus Jct. 138kV	AEP
GEN-2020-020	DISIS-2020-001	201.6	Hybrid	McCurtain	OK	Tap the 345 kV Northwest Texarkana - Valliant line	AEP
GEN-2020-054	DISIS-2020-001	298	Solar	Bowie	TX	Lydia 345 kV Station	AEP
GEN-2020-059	DISIS-2020-001	250	Hybrid	Lovington	NM	Tuco-Yoakum-Hobbs 345 kV	SPS
GEN-2020-060	DISIS-2020-001	200	Battery	Lubbock	TX	Lubbock East Substation 230 kV	SPS

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Projects	Cluster	MW	Generation Type	Town or County	State	Substation or Line	TO at POI
GEN-2020-062	DISIS-2020-001	256	Solar	Curry	NM	OASIS 230kV Substation	SPS
GEN-2020-065	DISIS-2020-001	1003	Thermal	Gaines	NM	Hobbs-Andrews 345 kV Line	SPS
GEN-2020-067	DISIS-2020-001	352.5	Wind	Terry & Hockley	TX	Tuco to Yoakum 345kV line	SPS
GEN-2020-068	DISIS-2020-001	400	Solar	Terry & Hockley	TX	Tuco to Yoakum 345kV line	SPS
GEN-2020-074	DISIS-2020-001	200	Battery	Carter	OK	Lawton to Sunnyside 345 kV Substation	AEP
GEN-2020-075	DISIS-2020-001	200	Battery	Comanche	OK	Cimmarron to Lawton 345 kV Line	AEP
GEN-2020-081	DISIS-2020-001	200	Battery	Rusk	TX	Tenaska Switching Substation 345kV	AEP
GEN-2020-085	DISIS-2020-001	500	Solar	Carter	OK	Lawton to Sunnyside 345 kV Line	AEP
GEN-2020-087	DISIS-2020-001	500	Solar	Comanche	OK	Cimmarron to Lawton 345 kV Line	AEP
GEN-2020-092	DISIS-2020-001	100	Solar	Mayes	OK	Pryor Junction - Midwest Carbide 138kV	AEP
GEN-2021-001	DISIS-2021-001	100	Battery	Bryan	OK	138kV Brown Substation	OGE
GEN-2021-016	DISIS-2021-001	250	Wind	Johnston and Murray	OK	Sunnyside-Johnston 345 kV	AEP
GEN-2021-018	DISIS-2021-001	231	Solar	Noble	OK	Sooner 345 kV	OGE
GEN-2021-033	DISIS-2021-001	204.12	Solar	Franklin	AR	Grand Prairie 161kV Substation	OGE
GEN-2021-036	DISIS-2021-001	204.12	Solar	Little River	AR	Craig to Patterson 138 kV	AEP
GEN-2021-038	DISIS-2021-001	200	Battery	Titus	TX	Welsh 345kV Substation	AEP
GEN-2021-041	DISIS-2021-001	100	Battery	Canadian	OK	Mustang 138kV Substation	OGE
GEN-2021-047	DISIS-2021-001	250	Solar	Mayes	OK	Tulsa (Bus #509852) - Igloo (Bus #513596) 345kV line	GRDA
GEN-2021-052	DISIS-2021-001	75	Battery	Muskogee	OK	Pecan Creek 345kV substation	OGE
GEN-2021-053	DISIS-2021-001	300	Solar	Muskogee	OK	Pecan Creek 345 kV Substation	OGE
GEN-2021-063	DISIS-2021-001	155	Hybrid	McCurtain	OK	Craig JCT 138kV	AEP
GEN-2021-064	DISIS-2021-001	100	Hybrid	Caddo	OK	Carnegie South 138kV	AEP
GEN-2021-075	DISIS-2021-001	300	Hybrid	Camp	TX	CAMPCOR4 138kV Substation	AEP
GEN-2021-088	DISIS-2021-001	100	Battery	Cleveland	OK	Cedar Lane - Canadian 138 kV	OGE
GEN-2021-090	DISIS-2021-001	400	Hybrid	Yoakum	TX	Yoakum 345kV Substation	SPS

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A.3 AECI Prior Queued Generation Projects

Table A-6: AECI Prior Queued Generation Projects

Projects	MW	Generation Type	State	Substation or Line
GIA-61	230	Wind	MO	Maryville 161 kV
GIA-83	1018	Wind	MO	McCredie 345 kV
GIA-86	100	Solar	MO	Thomas Hill 69 kV
GIA-90	100	Solar	MO	Montgomery City 161 kV
GIA-91	96	Solar	MO	Sedalia 69 kV
GIA-93	100	Solar	MO	Palmyra 161 kV
GIA-95	247	Wind	MO	Jasper-Morgan 345 kV
GIA-96	97.5	Wind	OK	Stroud 138kV
GIA-099	470	CT Gas	MO	Gobbler Knob 345 kV
GIA-100	40	CT Gas	MO	Gobbler Knob 345 kV
GIA-101	460	CT Gas	MO	Rockies Express 161 kV
GIA-102	75	CT Gas	MO	Rockies Express 161 kV
GIA-103	460	Gas, CT	OK	Bristow 138 kV
GIA-104	460	Gas, CT	OK	Stillwater 138 kV
GIA-105	460	Gas, CT	OK	Cleveland 138 kV

A.4 Removed Recently Retired MISO Generation

Table A-7: Removed Recently Retired MISO Generation in MISO South Area

Unit(s) Description	State	Power Flow Area	Bus Name	Bus Number	Unit ID	Derate To MW	Requested Change of Status
Teche Unit 3	LA	CLEC	G3TECHE	501823	1	0	Retirement
Baxter Wilson Unit 1	MS	EES	1B.WLSN U1	336801	18	0	Retirement
Waterford Unit 1	LA	EES	1WAT U1	336151	1	0	Retirement
Dolet Hills	LA	CLEC	G1DOLHIL	501801	1	330	Retirement
Sterlington 1-4 & 6-10	LA	LAGN	1KOCH U1	303010	1	0	Retirement
Sterlington 1-4 & 6-10	LA	LAGN	1KOCH U1	303010	2	0	Retirement
Sterlington 1-4 & 6-10	LA	LAGN	1KOCH U2	303011	1	0	Retirement
Sterlington 1-4 & 6-10	LA	LAGN	1KOCH U2	303011	2	0	Retirement
Sterlington 1-4 & 6-10	LA	LAGN	1KOCH U3	303012	1	0	Retirement
Sterlington 1-4 & 6-10	LA	LAGN	1KOCH U3	303012	2	0	Retirement
Sterlington 1-4 & 6-10	LA	LAGN	1KOCH U4	303013	1	0	Retirement
Sterlington 1-4 & 6-10	LA	LAGN	1KOCH U4	303013	2	0	Retirement
Sterlington 1-4 & 6-10	LA	LAGN	1KOCH U1	303010	1A	0	Retirement
Sabine Cogen	TX	EES	1BAYORU1	334740	1	0	Retirement
Sabine Cogen	TX	EES	1BAYORU2	334738	1	0	Retirement
Sabine Cogen	TX	EES	1BAYORU3	334739	1	0	Retirement
Nelson 4	LA	EES	1NELSON_G4!	335204	1	0	Retirement
Sterlington Unit 7C	LA	EES	1STERL_7C	337419	1	0	Retirement
Woodville Renewable Power Project	TX	EES	1WOODVILLE	334313	1	0	Retirement
Rex Brown 4 & 5	MS	EES-EMI	1REX BRWN U4	336944	1	0	Retirement
Rex Brown 4 & 5	MS	EES-EMI	1REX BRN U5	336941	1	0	Retirement
Dow GT300	LA	EES	1DOW_AEP_5!	335545	1	0	Retirement
Henderson Station	MS	EES-EMI	3GREENWOOD!	337054	1	0	Retirement
Henderson Station	MS	EES-EMI	3GREENWOOD!	337054	2	0	Retirement
Henderson Station	MS	EES-EMI	3GREENWOOD!	337054	3	0	Retirement
Henderson Station	MS	EES-EMI	3GREENWOOD!	337054	4	0	Retirement
Baxter Wilson 2	MS	EES-EMI	1B.WLSN U2	336831	1	0	Retirement
Rex Brown Plant Unit 3	MS	EES-EMI	1REX BRWN U3	336943	1	0	Retirement

Unit(s) Description	State	Power Flow Area	Bus Name	Bus Number	Unit ID	Derate To MW	Requested Change of Status
Morrow Units 1 and 2	MS	SMEPA	MOR GEN 1	318600	1	0	Retirement
Morrow Units 1 and 2	MS	SMEPA	MOR GEN 2	318601	1	0	Retirement

Table A-8: Removed Recently Retired MISO Generation in MISO Central Area

Unit(s) Description	State	Power Flow Area	Bus Name	Bus Number	Unit ID	Derate To MW	Requested Change of Status
Grand Tower Units 1-4	IL	AMIL	1GRTW 1	347170	1	0	Retirement
Grand Tower Units 1-4	IL	AMIL	1GRTW 2	347171	2	0	Retirement
Grand Tower Units 1-4	IL	AMIL	1GRTW 3	347168	3	0	Retirement
Grand Tower Units 1-4	IL	AMIL	1GRTW 4	347169	4	0	Retirement
Meramec CTG 2	MO	AMMO	1MER 6	345172	6	0	Retirement
Dallman Units 31 & 32	IL	CWLP	1DALMAN 31	343549	1	0	Retirement
Dallman Units 31 & 32	IL	CWLP	1DALMAN 32	343550	2	0	Retirement
Meramec CTG 1	MO	AMMO	1MER 5	345164	5	0	Retirement
Bailly Unit 10	IN	NIPS	17BAILLY-10	255246	10	0	Retirement
Coffeen Units 1 and 2	IL	AMIL	1COFFEN 1	346896	1	0	Retirement
Coffeen Units 1 and 2	IL	AMIL	1COFFEN 2	346897	2	0	Retirement
Hennepin Units 1 and 2	IL	AMIL	1HENNEPIN G1	349106	1	0	Retirement
Hennepin Units 1 and 2	IL	AMIL	1HENNEPIN G2	349107	H	0	Retirement
Hennepin Units 1 and 2	IL	AMIL	1HENNEPIN G2	349107	L	0	Retirement
Havana Unit 6	IL	AMIL	1HAVANA G6	349121	6	0	Retirement
Duck Creek Unit 1	IL	AMIL	1DCK GEN1	349633	1	0	Retirement
Baldwin 3	IL	AMIL	1BALDWIN G3	349128	3	0	Retirement
Reid Unit1	KY	BREC	1REID1	340574	5	0	Retirement
Plant D7	MO	CWLD	2PLANT2	343051	7	0	Retirement
Northeast - NET Units 1 & 2	IN	SIGE	10NE_GT	253512	1	0	Retirement
Henderson Municipal Power & Light Units 1&2	KY	BREC	HMP&L1	340577	3	0	Retirement
Henderson Municipal Power & Light Units 1&2	KY	BREC	HMP&L2	340578	4	0	Retirement
Bailly 7 & 8	IN	NIPS	17BAILLY-7	255234	7	0	Retirement
Bailly 7 & 8	IN	NIPS	17BAILLY-8	255235	8	0	Retirement

Unit(s) Description	State	Power Flow Area	Bus Name	Bus Number	Unit ID	Derate To MW	Requested Change of Status
Coleman 1,2,3	KY	BREC	COLEMAN1	340579	1	0	Retirement
Coleman 1,2,3	KY	BREC	COLEMAN2	340580	2	0	Retirement
Coleman 1,2,3	KY	BREC	COLEMAN3	340581	3	0	Retirement

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A.5 MISO North for Power Balance

Table A-9. MISO North for Power Balance

Area #	Area Name	Area #	Area Name
207	HE	600	Xcel
208	DEI	608	MP
210	SIGE	613	SMMPA
216	IPL	615	GRE
217	NIPS	620	OTP
218	METC	627	ALTW
219	ITC	633	MPW
295	WEC	635	MEC
296	MIUP	661	MDU
314	BREC	663	BEPC-MISO
315	HMPL	680	DPC
333	CWLD	694	ALTE
356	AMMO	696	WPS
357	AMIL	697	MGE
360	CWLP	698	UPPC
361	SIPC	701	Classic Prior
362	GLH		

A.6 MISO South for Power Balance

Table A-10. MISO South for Power Balance

Area #	Area Name
326	EES-EMI
327	EES-EAI
332	LAGN
349	SMEPA
351	EES

Area #	Area Name
502	CLEC
503	LAFA
504	LEPA
700	South Prior

** DRAFT **

A.7 SPP Market for Power Balance

Table A-11. SPP Market for Power Balance

Area #	Area Name	Area #	Area Name
515	SWPA	542	KACY
520	AEPW	544	EMDE
523	GRDA	545	INDN
524	OKGE	546	SPRM
525	WFEC	640	NPPD
526	SPS	641	HAST
527	OMPA	642	KACY
531	MIDW	645	OPPD
534	SUNC	650	LES
536	WERE	652	WAPA
541	KCPL	659	BEPC-SPP

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A.8 AECI for Power Balance

Table A-12. AECI for Power Balance

Area #	Area Name
330	AECI

** DRAFT **

A.9 Contingency Files used in MISO South AFSIS Analysis

Table A-13: List of Contingencies used in the MISO South AFSIS Analysis

Contingency File Name	Description
Automatic single element contingencies	Single element outages at buses 60 kV and above in the study region
MISO21_2026_SUM_TA_South_P1_P2_P4_P5_P7 240206.con	Specified category P1, P2, P4, P5, P7 contingencies in MISO South
MISO21_2026_SUM_TA_Central_P1_P2_P4_P5_P7 240110.con	Specified category P1, P2, P4, P5, P7 contingencies in MISO Central
City of Jonesboro.con	Specified category P2 contingencies
Lakeover.con	Specified category P5 contingencies
Pickens.con	Specified contingencies
AECI_Neighboring_Impacts_2020.con	Specified contingencies in AECI
External_P1s.con	Specified category P1 external contingencies
External_P1-P7.con	Specified category P1-P7 external contingencies
SPP_Filtered_Cons.con	Specified contingencies in SPP
TVA_P1_P2_E2_renamed.con	Specified category P1, P2 contingencies in TVA

Appendix

B

MISO West AFSIS Model Development for Steady-State and Stability Analysis

B.1 Recently Withdrawn Prior Queued Projects

Table B-1: Recently Withdrawn MISO West & Central and CIPCO Prior Queued Project

Prj #	Bus Number	Bus Name	Id	Status
J1092	40920	J1092 GEN 0.3800	1	Withdrawn
J1204	42040	J1204 GEN 0.6000	1	Withdrawn
J1231	42310	J1231 GEN 0.6450	1	Withdrawn
J1253	42530	J1253 GEN 0.6450	PV	Withdrawn
J1332	43320	J1332 GEN 0.6000	1	Withdrawn
J1447	44470	J1447 GEN 0.6300	1	Withdrawn
J1474	44740	J1474 GEN 0.6300	1	Withdrawn
J1491	44910	J1491 GEN 0.6900	1	Withdrawn
J1510	45100	J1510 GEN 0.6300	PV	Withdrawn
J1563	45630	J1563 GEN 0.6300	1	Withdrawn
J1579	45790	J1579 GEN 0.6300	1	Withdrawn
J1591	45910	J1591 GEN 0.6900	1	Withdrawn
J1591	45911	J1591 GEN1 0.6900	1	Withdrawn
J1593	45930	J1593 GEN 0.6300	1	Withdrawn
J1593	45931	J1593 GEN1 0.6300	1	Withdrawn
J1624	46240	J1624 GEN 0.6300	1	Withdrawn
J1625	46250	J1625 GEN 0.6300	1	Withdrawn
J1636	46360	J1636 GEN 0.6900	1	Withdrawn
J1637	46370	J1637 GEN 0.6900	1	Withdrawn
J1637	46371	J1637 GEN1 0.6900	1	Withdrawn
J1655	46550	J1655 GEN 0.6000	1	Withdrawn
J1676	46760	J1676 GEN 0.6300	1	Withdrawn

Prj #	Bus Number	Bus Name	Id	Status
J1676	46761	J1676 GEN1 0.6300	1	Withdrawn
J1678	46780	J1678 GEN 0.6300	1	Withdrawn
J1680	46800	J1680 GEN 0.6600	1	Withdrawn
J1687	46870	J1687 GEN 0.6450	1	Withdrawn
J1695	46950	J1695 GEN 0.6300	1	Withdrawn
J1697	46970	J1697 GEN 0.6300	1	Withdrawn
J1707	47070	J1707 GEN 0.6300	1	Withdrawn
J1713	47130	J1713 GEN 1.0000	1	Withdrawn
J1716	47160	J1716 GEN 0.6450	PV	Withdrawn
J1726	47260	J1726 GEN 0.6300	1	Withdrawn
J1678	47431	J1678 GEN 0.6300	1	Withdrawn
J1770	47700	J1770 GEN 0.6900	1	Withdrawn
J1815	48150	J1815 GEN 0.6000	1	Withdrawn
J1830	48300	J1830 GEN 0.6900	1	Withdrawn
J1830	48301	J1830 GEN1 0.6900	1	Withdrawn
J1835	48350	J1835 GEN 0.7000	1	Withdrawn
J1877	48770	J1877 GEN 0.6900	B1	Withdrawn
J1884	48840	J1884 GEN 0.6300	ES	Withdrawn
J1938	49380	J1938 GEN 0.6300	PV	Withdrawn
J1945	49450	J1945 GEN 0.6300	PV	Withdrawn
J1960	49600	J1960 GEN 0.6300	S1	Withdrawn
J1964	49640	J1964 GEN 0.6300	ES	Withdrawn
J1976	49760	J1976 GEN 0.6300	B1	Withdrawn
J1983	49830	J1983 GEN 0.6300	ES	Withdrawn
J1994	49940	J1994 GEN 0.6300	PV	Withdrawn
J1996	49960	J1996 GEN1 0.6300	PV	Withdrawn
J1996	49961	J1996 GEN2 0.6300	ES	Withdrawn
J2000	50000	J2000 GEN 0.6300	S1	Withdrawn
J2016	50160	J2016 GEN 0.6300	B1	Withdrawn
J2039	50390	J2039 GEN1 0.7200	W1	Withdrawn
J2039	50391	J2039 GEN2 0.6900	B1	Withdrawn
J2046	50460	J2046 GEN 0.6300	S1	Withdrawn

Prj #	Bus Number	Bus Name	Id	Status
J2074	50740	J2074 GEN 0.6600	ES	Withdrawn
J2121	51210	J2121 GEN 0.6300	S1	Withdrawn
J2130	51300	J2130 GEN 0.6600	S1	Withdrawn
J2147	51470	J2147 GEN 0.6300	S1	Withdrawn
J2150	51500	J2150 GEN 0.6600	S1	Withdrawn
J2188	51880	J2188 GEN 0.6300	PV	Withdrawn
J2218	52180	J2218 GEN 0.6600	ES	Withdrawn
J2221	52210	J2221 GEN 0.6300	S1	Withdrawn
J2229	52290	J2229 GEN 0.6300	B1	Withdrawn
J2236	52360	J2236 GEN 0.6300	B1	Withdrawn
J2239	52390	J2239 GEN 0.6300	S1	Withdrawn
J2251	52510	J2251 GEN 0.6300	S1	Withdrawn
J2255	52550	J2255 GEN 0.6300	B1	Withdrawn
J2259	52590	J2259 GEN 0.6600	S1	Withdrawn
J2263	52630	J2263 GEN 0.4340	B1	Withdrawn
J2269	52690	J2269 GEN 0.6600	S1	Withdrawn
J2271	52710	J2271 GEN 0.6450	PV	Withdrawn
J2278	52780	J2278 GEN 0.6000	S1	Withdrawn
J2282	52820	J2282 GEN1 0.6300	S1	Withdrawn
J2282	52821	J2282 GEN2 0.6300	B1	Withdrawn
J2293	52930	J2293 GEN 0.6000	PE	Withdrawn
J2318	53180	J2318 GEN1 0.6300	S1	Withdrawn
J2318	53181	J2318 GEN2 0.6300	B1	Withdrawn
IR37	800160	IR37 GEN 0.6300	1	Withdrawn

Table B-2: Recently Withdrawn SPP Prior Queued Project

Prj #	Status	Bus Number	Bus Name	Id
ASGI-2017-014	Withdrawn	761546	AS17-014GEN10.5500	1
GEN-2016-063	TERMINATED	587433	G16-063-GEN10.6900	1
GEN-2017-013	WITHDRAWN	588583	G17-013-GEN10.6900	1
GEN-2017-032	WITHDRAWN	588753	G17-032-GEN10.6900	1
GEN-2017-090	WITHDRAWN	589283	G17-090-GEN10.6900	1
GEN-2017-090	WITHDRAWN	589287	G17-090-GEN20.6900	1
GEN-2017-125	TERMINATED	761904	G17-125GEN1 0.6900	1
GEN-2017-202	WITHDRAWN	761421	G17-202GEN1 0.6900	1
GEN-2017-209	TERMINATED	760917	G17-209GEN1 0.6900	1
GEN-2017-209	TERMINATED	760917	G17-209GEN1 0.6900	2
GEN-2017-209	TERMINATED	760920	G17-209GEN2 0.6300	1
GEN-2017-209	TERMINATED	760920	G17-209GEN2 0.6300	2
GEN-2018-008	WITHDRAWN	762540	G18-008-GEN10.6900	1
GEN-2018-008	WITHDRAWN	762543	G18-008-GEN20.6900	1
GEN-2018-012	WITHDRAWN	762507	G18-012-GEN10.6900	1
GEN-2018-022	WITHDRAWN	762584	G18-022GEN1 0.6000	1
GEN-2018-022	WITHDRAWN	762587	G18-022GEN2 0.6000	1
GEN-2018-022	WITHDRAWN	762588	G18-022GEN3 0.6300	1
GEN-2018-030	WITHDRAWN	762661	G18-030GEN1 0.6600	1
GEN-2018-039	WITHDRAWN	762738	G18-039GEN1 0.6600	1
GEN-2018-056	WITHDRAWN	762914	G18-056-GEN10.6600	1
GEN-2018-062	WITHDRAWN	762979	G18-062-GEN10.6900	1
GEN-2019-048	WITHDRAWN	763805	G19-048-GEN10.6500	1
GEN-2020-001	WITHDRAWN	764256	G20-001-GEN10.6300	1
GEN-2020-006	WITHDRAWN	764166	G20-006-GEN10.6300	1
GEN-2020-027	WITHDRAWN	764616	G20-027-GEN10.6300	1
GEN-2020-027	WITHDRAWN	764619	G20-027-GEN20.8000	1
GEN-2020-030	WITHDRAWN	764646	G20-030-GEN10.6300	1
GEN-2020-030	WITHDRAWN	764649	G20-030-GEN20.8000	1
GEN-2020-033	WITHDRAWN	764676	G20-033-GEN10.6300	1
GEN-2020-033	WITHDRAWN	764679	G20-033-GEN20.8000	1
GEN-2020-036	WITHDRAWN	764691	G20-036-GEN10.6300	1

Prj #	Status	Bus Number	Bus Name	Id
GEN-2020-036	WITHDRAWN	764694	G20-036-GEN20.8000	1
GEN-2020-070	WITHDRAWN	765026	G20-070-GEN10.7200	1
GEN-2020-071	WITHDRAWN	765131	G20-071-GEN10.7200	1
GEN-2020-076	WITHDRAWN	765146	G20-076-GEN10.5200	1
GEN-2020-077	WITHDRAWN	764481	G20-077-GEN10.7200	1
GEN-2020-086	WITHDRAWN	765161	G20-086-GEN10.6900	1
GEN-2020-086	WITHDRAWN	765164	G20-086-GEN20.6900	1
GEN-2020-089	WITHDRAWN	765176	G20-089-GEN10.6300	1
GEN-2021-007	WITHDRAWN	765362	G21-007-GEN10.6900	1
GEN-2021-007	WITHDRAWN	765365	G21-007-GEN20.6900	1
GEN-2021-007	WITHDRAWN	765368	G21-007-GEN30.6900	1
GEN-2021-024	WITHDRAWN	765522	G21-024-GEN10.6900	1
GEN-2021-037	WITHDRAWN	765652	G21-037-GEN10.6900	1
GEN-2021-072	WITHDRAWN	765952	G21-072-GEN10.6600	1
GEN-2021-072	WITHDRAWN	765955	G21-072-GEN20.6600	1
GEN-2021-072	WITHDRAWN	765958	G21-072-GEN30.6600	1
GEN-2021-072	WITHDRAWN	765961	G21-072-GEN40.6600	1
GEN-2021-073	WITHDRAWN	765972	G21-073-GEN10.6300	1
GEN-2021-073	WITHDRAWN	765975	G21-073-GEN20.6300	1
GEN-2021-106	WITHDRAWN	766232	G21-106-GEN10.6300	1

B.2 SPP Prior Queued Generation Projects

Table B-3: SPP Prior Queued Generation Projects

Projects	Cluster	MW	Generation Type	Nearest Town or County	State	Substation or Line	TO at POI
GEN-2016-036	DISIS-2016-002-1	44.6	Wind	Chippewa	MN	Granite Falls 115kV substation	WAPA
GEN-2016-074	DISIS-2016-002-1	200	Wind	Custer	NE	Sweetwater 345kV	NPPD
GEN-2016-087	DISIS-2016-002-1	98.9	Wind	Campbell	SD	Bismark-Glenham 230 kV line	WAPA
GEN-2016-094	DISIS-2016-002-1	200	Wind	Hyde	SD	Tap Ft Thompson - Oahe 230kV	WAPA
GEN-2016-115	DISIS-2016-002-1	300	Wind	Atchison	MO	Nebraska City-Mullen Creek (Holt County MO) 345kV	GMO
GEN-2016-130	DISIS-2016-002-1	202	Wind	Mercer	ND	Leland Olds 345 kV	BEPC
GEN-2016-147	DISIS-2016-002-1	40	Solar	Cheyenne	NE	Sidney 115 kV Sub	Tri-State
GEN-2016-151	DISIS-2016-002-1	202	Wind	Burke	ND	Tande 345kV	BEPC
GEN-2017-004	DISIS-2017-001	201.6	Wind	Cloud	KS	Elm Creek - Summit 345 kV	ITCGP
GEN-2017-005	DISIS-2017-001	190	Wind	Bourbon & Crawford	OK	Marmaton - Litchfield 161 kV	WERE
GEN-2017-009	DISIS-2017-001	302	Wind	Neoshoe	KS	Neosho - Caney River 345 kV	WERE
GEN-2017-010	DISIS-2017-001	200.1	Wind	Bowman	ND	Rhame 230 kV Sub	BEPC
GEN-2017-014	DISIS-2017-001	300	Wind	Haakon	SD	Philip Tap 230 kV	WAPA
GEN-2017-048	DISIS-2017-001	300	Wind	Williams	ND	Neset 230 kV Substation	BEPC
GEN-2017-060	DISIS-2017-001	149.4	Wind	Barton	MO	LaRussell Energy Center 161kV	EDE
GEN-2017-082	DISIS-2017-001	149.4	Wind	Barton / Jasper	MO	Asbury Plant 161 kV	EDE
GEN-2017-094	DISIS-2017-001	200	Wind	Wessington / Hand	SD	Fort Thompson-Huron 230 kV	WAPA
GEN-2017-097	DISIS-2017-001	128	Solar	Pennington	SD	Underwood 115 kV Sub	WAPA
GEN-2017-105	DISIS-2017-002	75	Wind	Burt	NE	Tekamah - Raun 161 kV Line	OPPD
GEN-2017-108	DISIS-2017-002	400	Solar	Henry	MO	Stillwell - Clinton 161kV Line	KCPL
GEN-2017-115	DISIS-2017-002	244	Wind	Atchinson / Nodaway	MO	Holt County 345 kV	KCPL
GEN-2017-119	DISIS-2017-002	180	Wind	Cloud / Mitchell	KS	Elm Creek 345kV	SUNC
GEN-2017-120	DISIS-2017-002	260	Wind	Dickinson / Marion	KS	Abilene Energy Center-Northview 115kV	WERE
GEN-2017-144	DISIS-2017-002	200	Wind	Holt, Antelope, Wheeler	NE	Holt County 345kV	NPPD
GEN-2017-175	DISIS-2017-002	300	Wind	Turner	SD	Vfodnes-Utica Jct. 230kV	WAPA
GEN-2017-181	DISIS-2017-002	300	Wind	Lancaster	NE	Tobias 345kV Substation	NPPD

Projects	Cluster	MW	Generation Type	Nearest Town or County	State	Substation or Line	TO at POI
GEN-2017-182	DISIS-2017-002	128	Wind	Lancaster	NE	Tobias 345kV	NPPD
GEN-2017-183	DISIS-2017-002	400	Wind	Hodgeman / Ford	KS	Nashua-St. Joe 345kV	KCPL
GEN-2017-184	DISIS-2017-002	400	Solar	Hodgeman / Ford	KS	Nashua-St. Joe 345kV	KCPL
GEN-2017-188	DISIS-2017-002	130	Solar	Barry	MO	Asbury 161 kV	EDE
GEN-2017-195	DISIS-2017-002	500.4	Solar	Johnson	KS	West Gardner 345kV	KCPL
GEN-2017-196	DISIS-2017-002	128	Battery	Johnson	KS	West Gardner 345kV	KCPL
GEN-2017-201	DISIS-2017-002	250	Wind	Wayne	NE	Hoskins 345kV	NPPD
GEN-2017-210	DISIS-2017-002	310	Hybrid	Cedar	NE	McCool 345kV Substation	NPPD
GEN-2017-214	DISIS-2017-002	100	Wind	Ward	ND	Logan 230kV Substation	BEPC
GEN-2017-215	DISIS-2017-002	100	Wind	Ward	ND	Logan 230kV Substation	BEPC
GEN-2017-222	DISIS-2017-002	180	Wind	Denison	IA	Denison 230kV Substation	WAPA
GEN-2017-234	DISIS-2017-002	115	Wind	Greeley	NE	Spalding to North Loup 115kV	NPPD
ASGI-2017-013	DISIS-2018-001	40	Wind	#N/A	#N/A	655239	WAPA
ASGI-2018-003	DISIS-2018-001	20	Solar	#N/A	#N/A	541306	KCPL
ASGI-2018-006	DISIS-2018-001	20	Solar	#N/A	#N/A	541309	KCPL
ASGI-2018-007	DISIS-2018-001	20	Solar	#N/A	#N/A	543062	KCPL
ASGI-2018-010	DISIS-2018-001	35	Solar	#N/A	#N/A	543077	KCPL
ASGI-2018-011	DISIS-2018-001	35	Solar	#N/A	#N/A	543066	KCPL
GEN-2018-010	DISIS-2018-001	74.1	Battery	Montrail	ND	Neset 230kV Substation	BEPC
GEN-2018-013	DISIS-2018-001	74.1	Wind	Dickinson	KS	Abilene Energy Center-Northview 115kV	WERE
GEN-2018-025	DISIS-2018-001	200	Battery	Washington	NE	Fort Calhoun 345kV	OPPD
GEN-2018-031	DISIS-2018-001	50	Battery	Jackson	MO	Blue Valley 161kV	INDN
GEN-2018-032	DISIS-2018-001	310	Wind	McPhearson	KS	Neosho 345kV Substation	WERE
GEN-2018-033	DISIS-2018-001	200	Battery	Cass	NE	Cass County 345kV	OPPD
GEN-2018-037	DISIS-2018-001	100	Battery	Douglas	NE	Looping in OPPD (S1211) (S1220) (S1211) (S1299) 161kV	OPPD
GEN-2018-043	DISIS-2018-001	500	Solar	Burt	NE	Ft. Calhoun - Raun 345 kV	OPPD
GEN-2018-057	DISIS-2018-001	203.4	Solar	Sedgwick	KS	Gordon Evans 138kV	WERE
GEN-2018-060	DISIS-2018-001	50	Wind	Webster	NE	Axtell-Post Rock 345 kV	NPPD

Projects	Cluster	MW	Generation Type	Nearest Town or County	State	Substation or Line	TO at POI
GEN-2018-063	DISIS-2018-002	57	Solar	Greene	MO	Sedalia Marshfield Springfield Nichols Street 69kV	EDE
GEN-2018-065	DISIS-2018-002	19.8	Wind	Madison	NE	Antelope - Hoskins 345 kV	NPPD
GEN-2018-067	DISIS-2018-002	255	Wind	Williams	ND	115kV Strandahl sub	MWEC
GEN-2018-068	DISIS-2018-002	302.4	Wind	Madison	NE	Antelope - Hoskins 345 kV	NPPD
GEN-2018-069	DISIS-2018-002	125	Wind	Wibaux	MT	WAPA-UGP Mingusville 230kV	WAPA
GEN-2018-074	DISIS-2018-002	72	Wind	Crawford & Carrol	IA	Denison 230kV	WAPA
GEN-2018-083	DISIS-2018-002	250	Wind	Madison	NE	Shell Creek-Hoskins 345kv	NPPD
GEN-2018-125	DISIS-2018-002	231	Wind	Lincoln	NE	Gentleman to Sweetwater 345kV	NPPD
GEN-2018-131	DISIS-2018-002	221.4	Solar	Pierce	NE	Antelope - Hoskins 345 kV	NPPD
GEN-2018-132	DISIS-2018-002	201.6	Solar	Pierce	NE	Antelope - Hoskins 345 kV	NPPD
GEN-2019-009	DISIS-2019-001	100	Solar	Nemaha	NE	S1263 Brock 161kV	OPPD
GEN-2019-016	DISIS-2019-001	200	Solar	Polk & Dade	MO	Dadeville 161kV	EDE
GEN-2019-019	DISIS-2019-001	15.15	Thermal	Sioux	IA	Siouxland 69kV	NIPCO
GEN-2019-023	DISIS-2019-001	110	Hybrid	Wibaux	MT	WAPA-UGP Mingusville 230kV	WAPA
GEN-2019-037	DISIS-2019-001	150	Solar	Mercer	ND	Leland Olds 345kV	BEPC
GEN-2019-039	DISIS-2019-001	174.5	Solar	Butler	NE	Columbus Southeast-Rising City 115kV	NPPD
GEN-2019-041	DISIS-2019-001	78	Solar	Lancaster	NE	115kV Monolith Substation	NPPD
GEN-2019-069	DISIS-2019-001	100	Solar	Madison	NE	Shell Creek-Hoskins 345kV	NPPD
GEN-2019-070	DISIS-2019-001	50	Solar	Madison	NE	Shell Creek-Hoskins 345kv	NPPD
GEN-2019-073	DISIS-2019-001	100	Solar	Madison	NE	Shell Creek-Hoskins 345kv	NPPD
ASGI-2020-001	DISIS-2020-001	35	Hybrid	#N/A	#N/A	543094	KCPL
ASGI-2020-003	DISIS-2020-001	35	Hybrid	#N/A	#N/A	543060	KCPL
GEN-2020-002	DISIS-2020-001	81	Solar	Yutan	NE	6846 Substation 69 kV	OPPD
GEN-2020-007	DISIS-2020-001	650	Hybrid	Linn & Bates	KS	Evergy La Cygne to Wolf Creek 345kV	KCPL
GEN-2020-008	DISIS-2020-001	250	Hybrid	Stevens	KS	Corporation Carpenter 345kV	SPS
GEN-2020-011	DISIS-2020-001	320	Hybrid	Funk	NE	Axtell-Sweetwater 345kV	NPPD
GEN-2020-013	DISIS-2020-001	215	Hybrid	Orleans	NE	Orleans-Holdrege 115kV	NPPD
GEN-2020-014	DISIS-2020-001	45	Thermal	Alexander	ND	Lonesome Creek 115kV	BEPC
GEN-2020-021	DISIS-2020-001	235	Wind	Sioux	ND	LeLand Olds-Chapelle Creek 345kV	BEPC
GEN-2020-025	DISIS-2020-001	255	Thermal	Sarpy	NE	Substation 1363; 161kV	OPPD

Projects	Cluster	MW	Generation Type	Nearest Town or County	State	Substation or Line	TO at POI
GEN-2020-028	DISIS-2020-001	255	Thermal	Sarpy	NE	Substation 1363; 161kV	OPPD
GEN-2020-031	DISIS-2020-001	272.7	Thermal	Sarpy	NE	Substation 1363; 161kV	OPPD
GEN-2020-038	DISIS-2020-001	272.7	Thermal	Plattsmouth	NE	Substation 3740; 345kV	OPPD
GEN-2020-043	DISIS-2020-001	56.52	Thermal	Douglas	NE	Between Substation 1209 and 1252; 161kV	OPPD
GEN-2020-044	DISIS-2020-001	56.52	Thermal	Douglas	NE	1209 and 1252; 161kV	OPPD
GEN-2020-045	DISIS-2020-001	56.52	Thermal	Douglas	NE	1209 and 1252; 161kV	OPPD
GEN-2020-056	DISIS-2020-001	20	Solar	Russell	KS	Russell 115 kV	SUNC
GEN-2020-057	DISIS-2020-001	424.5	Battery	Garner	KS	Atlantic 345 kV	WERE
GEN-2020-058	DISIS-2020-001	424.5	Solar	Garner	KS	Atlantic 345 kV	WERE
GEN-2020-061	DISIS-2020-001	29	Thermal	Pleasant Hill	MO	Pleasant Hill 345/161/69 kV	GMO
GEN-2020-064	DISIS-2020-001	64	Thermal	Joplin	MO	4544 Stateline CC 161kV	EDE
GEN-2020-069	DISIS-2020-001	52.85	Wind	Cherry	NE	Cody to Valentine 115kV	NPPD
GEN-2020-072	DISIS-2020-001	150	Hybrid	Windsor	MO	Windsor to AEC Sedalia 161 kV	GMO
GEN-2020-073	DISIS-2020-001	150	Hybrid	Franklin	KS	SE Ottawa to Pleasant Valley 161kV	KCPL
GEN-2020-078	DISIS-2020-001	100	Solar	Washington	NE	Substation 1226 to Substation 1237, 161kV Tap	OPPD
GEN-2020-079	DISIS-2020-001	225	Hybrid	Cherokee	KS	Riverton-Neosho 161kV	EDE
GEN-2020-083	DISIS-2020-001	74.5	Hybrid	Fairview	MT	Fairview 115kV	WAPA
GEN-2020-084	DISIS-2020-001	350	Solar	Burt	NE	Raun - Fort Calhoun 345 kV	OPPD
GEN-2020-088	DISIS-2020-001	150	Solar	Jasper	MO	La Russell 161 kV	EDE
GEN-2020-090	DISIS-2020-001	204.3	Battery	Bourbon	KS	Wolf Creek - Blackberry 345 kV	WERE
GEN-2020-091	DISIS-2020-001	150	Solar	McKenzie	ND	Patent Gate Substation 345 kV	BEPC
GEN-2020-094	DISIS-2020-001	250	Solar	Syracuse	NE	Neb. City - 103rd & Rokeby 345 kV	OPPD
GEN-2021-005	DISIS-2021-001	350	Battery	Saline	KS	Summit 345 kV	WERE
GEN-2021-006	DISIS-2021-001	300	Battery	Labette	KS	Neosho 345kV	WERE
GEN-2021-008	DISIS-2021-001	200	Solar	McKenzie	ND	345kV Bus at BEPC Patent Gate	BEPC
GEN-2021-017	DISIS-2021-001	37.5	Wind	Cloud & Mitchell	KS	Elm Creek 345 kV	ITCGP
GEN-2021-023	DISIS-2021-001	306.18	Solar	Grant	KS	Wild Plains 345kV	WERE
GEN-2021-024	DISIS-2021-001	203.04	Wind	LaMoure	ND	WAPA 230kV Jamestown	WAPA
GEN-2021-027	DISIS-2021-001	102.06	Solar	Lancaster	NE	Olive Creek 115 kV	NPPD

Projects	Cluster	MW	Generation Type	Nearest Town or County	State	Substation or Line	TO at POI
GEN-2021-029	DISIS-2021-001	253.8	Battery/Storage	Linn / Bates	KS	Evergy Tap the La Cygne to Stillwel 345 kV	KCPL
GEN-2021-030	DISIS-2021-001	510.3	Solar	Linn / Bates	KS	Evergy Tap the La Cygne to Stillwel 345 Kv	KCPL
GEN-2021-034	DISIS-2021-001	113	Solar	Lancaster	NE	Rokeby 115 kV	LES
GEN-2021-039	DISIS-2021-001	100	Battery	Douglas	NE	New 161kV substation looping in OPPD 161kV lines S1211 to S1220 and S1211 to S1299	OPPD
GEN-2021-040	DISIS-2021-001	200	Battery	Cass	NE	OPPD District, Cass County Power Plant Substation, 345kV Bus	OPPD
GEN-2021-042	DISIS-2021-001	50	Battery	Jackson	MO	Independence Power & Light, Blue Valley Substation, 161kV Bus	INDN
GEN-2021-043	DISIS-2021-001	250	Battery	Lancaster	NE	8000 SW 12th (Rokeby) Station, 115kV Bus	LES
GEN-2021-048	DISIS-2021-001	75	Battery	Lancaster	NE	Wagener 115kV	LES
GEN-2021-049	DISIS-2021-001	250	Solar	Lancaster	NE	Wagener 115kV	LES
GEN-2021-050	DISIS-2021-001	200	Solar	Henry	MO	161kV Stilwell-Clinton	KCPL
GEN-2021-051	DISIS-2021-001	75	Battery	Henry	MO	161kV Stilwell-Clinton	KCPL
GEN-2021-056	DISIS-2021-001	300	Wind	Harper & Kingman	KS	Viola 345kV	WERE
GEN-2021-057	DISIS-2021-001	300	Wind	Antelope	NE	Antelope 345kV	NPPD
GEN-2021-068	DISIS-2021-001	249.6	Wind	Hodgeman / Ford	KS	SUNC Spearville - Holcomb 345kV	SUNC
GEN-2021-069	DISIS-2021-001	249.6	Wind	Hodgeman / Ford	KS	SUNC Spearville - Holcomb 345kV	SUNC
GEN-2021-070	DISIS-2021-001	504	Wind	Hodgeman and Ford	KS	SUNC Spearville - Holcomb 345kV	SUNC
GEN-2021-076	DISIS-2021-001	113	Solar	Ellis	KS	ITC Post Rock 345 kV	ITCGP
GEN-2021-077	DISIS-2021-001	95	Hybrid	Pettis	MO	Windsor to AEC Sedalia 161 kV	GMO
GEN-2021-096	DISIS-2021-001	500	Solar	Coffey	KS	Wolf Creek - Benton 345 kV	WERE
GEN-2021-101	DISIS-2021-001	159	Solar	Douglas	KS	Evergy's Midland Substation 115kV	WERE
GEN-2021-103	DISIS-2021-001	150	Battery	Johnson	KS	Evergy's Atlantic Substation115kV	WERE
GEN-2021-107	DISIS-2021-001	201.6	Solar	Pottawatomie	KS	Evergy 345kV Jeffrey Energy Center	WERE
GEN-2021-108	DISIS-2021-001	182.25	Solar	Cass	NE	OPPD 345KV Cass County	OPPD

B.3 Modeled Network Upgrades

Table B-4: Modeled Network Upgrades

Network Upgrades	Owner	Study Cycle
Build Brookings Co-Lyon Co 2nd 345 kV line; Build Helena-Hampton Corner 345 kV line	XEL	MTEP Appendix A
Capacitor at Bagley 115: 1x20 Mvar	SPTI	DISIS-2016-002
100 MVAR Capacitor Bank at Montezuma 345 (MEC)	SPTI	DISIS-2017-001
100 MVAR switched cap at Blackhawk 345 kV (MEC)	SPTI	DISIS-2017-001
40 MVar switched cap at Wahpeton 230 kV (620329)	SPTI	DISIS-2017-001
60 MVar switched cap at Buffalo 345 kV (620358)	SPTI	DISIS-2017-001
Add breaker to the Bison shunt reactor	SPTI	MISO AFS on MPC Grp 2021
1x75 MVAr MSC at Alexandria 345 kV (658047)	SPTI	MISO AFS on MPC Grp 2021

B.4 MPC Prior Queued Generation Projects

Table B-5: MPC Prior Queued Generation Projects

Projects	Cluster	MW	Generation Type	Town or County	State	Substation or Line
MPC03600	MPC Group 2020	167.2	Solar	Richland	ND	Frontier-Wahpeton 230 kV
MPC03700	MPC Group 2020	127.9	Solar	Richland	ND	Frontier-Wahpeton 230 kV
MPC03800	MPC Group 2021	230	Wind	Eddy; Wells	ND	Center-Prairie 345 kV
MPC03900	MPC Group 2021	140	Wind	Eddy; Wells	ND	Center-Prairie 345 kV
MPC04000	MPC Group 2021	284	Wind	Oliver; Morton	ND	Square Butte 230 kV
MPC04300	NA	400	Wind	Steele	ND	Center-Prairie 345 kV

B.5 AECI Prior Queued Generation Projects

Table B-6: AECI Prior Queued Generation Projects

Projects	MW	Generation Type	Town or County	State	Substation or Line
GIA-61	230	Wind	Nodaway	MO	Maryville 161 kV
GIA-83	1018	Wind	Randolph	MO	McCredie 345 kV
GIA-86	100	Solar	Clifton Hill	MO	Thomas Hill 69 kV
GIA-90	100	Solar	Randolph	MO	Montgomery City 161 kV
GIA-91	96	Solar	Carroll	MO	Sedalia 69 kV
GIA-93	100	Solar	Macon		Palmyra 161 kV
GIA-95	247	Wind	Dade	MO	Jasper-Morgan 345 kV
GIA-96	97.5	Wind	Lincoln	OK	Stroud 138kV
GIA-101	460	CT Gas	Clinton	MO	Rockies Express 161 kV
GIA-102	75	CT Gas	Clinton	MO	Rockies Express 161 kV
GIA-103	460	CT Gas	Creek	OK	Bristow 138 kV
GIA-104	460	CT Gas	Payne	OK	Stillwater 138 kV

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B.6 Removed Recently Retired MISO Generation

Table B-7: Removed Recently Retired MISO Generation in MISO West & Central Area

Unit(s) Description	State	Power Flow Area	Bus Name	Bus Number	Unit ID	Derate To MW	Requested Change of Status
Genoa Unit 3	WI	DPC	GENOA53G	681522	3	0	Retirement
Grand Tower Units 1-4	IL	AMIL	1GRTW 1	347170	1	0	Retirement
Grand Tower Units 1-4	IL	AMIL	1GRTW 2	347171	2	0	Retirement
Grand Tower Units 1-4	IL	AMIL	1GRTW 3	347168	3	0	Retirement
Grand Tower Units 1-4	IL	AMIL	1GRTW 4	347169	4	0	Retirement
Moulton and Champepadan Wind	MN	GRE	GRE-CHANWNDW	615108	W	0	Retirement
Meramec CTG 2	MO	AMMO	1MER 6	345172	6	0	Retirement
Elk River Station	MN	GRE	GRE-ELK RIV869	615020	1	0	Retirement
Elk River Station	MN	GRE	GRE-ELK RIV869	615020	2	0	Retirement
Elk River Station	MN	GRE	GRE-ELK RIV869	615020	3	0	Retirement
Boswell Units 1 and 2	MN	MP	BOSWE71G	608776	1	0	Retirement
Boswell Units 1 and 2	MN	MP	BOSWE72G	608777	2	0	Retirement
Schahfer Unit 14 & 15	IN	NIPS	17SCHAFER-14	255238	14	0	Retirement
Schahfer Unit 14 & 15	IN	NIPS	17SCHAFER-15	255237	15	0	Retirement
Dallman Units 31 & 32	IL	CWLP	1DALMAN 31	343549	1	0	Retirement
Dallman Units 31 & 32	IL	CWLP	1DALMAN 32	343550	2	0	Retirement
Petersburg Unit 1	IN	IPL	PETERSBURG 1	254811	1	0	Retirement
Bailly Unit 10	IN	NIPS	17BAILLY-10	255246	10	0	Retirement
Community Wind North (G586)	MN	XEL	G586 - CWN 1	600130	W	13.2	Retirement
Community Wind North (G586)	MN	XEL	G586 - CWN 2	600131	W	13.2	Retirement
Jeffers Wind (G442)	MN	XEL	G442 JEFFERW	600124	W	44	Retirement
Granite City Units 1,2,3,4	MN	XEL	GRNT CTY 1G	600126	1	0	Retirement
Granite City Units 1,2,3,4	MN	XEL	GRNT CTY 1G	600126	2	0	Retirement
Granite City Units 1,2,3,4	MN	XEL	GRNT CTY 2G	600127	3	0	Retirement
Granite City Units 1,2,3,4	MN	XEL	GRNT CTY 2G	600127	4	0	Retirement
Bailly 7 & 8	IN	NIPS	17BAILLY-7	255234	7	0	Retirement
Bailly 7 & 8	IN	NIPS	17BAILLY-8	255235	8	0	Retirement
Stoneman 1 & 2	WI	DPC	STONE	186860	1	0	Retirement

B.7 Fictitious SVCs and Switched-Off Line Reactors

Table B-8: Fictitious SVCs and Switched-Off Line Reactors

SVCs or Line Reactors	SPK Benchmark Study Model	SPK Study Model	SH Benchmark Model	SH Study Model
Spearville (531469)	NA	±250 MVAR	NA	±300 MVAR
CARPENTER 7 (523823)	NA	±300 MVAR	±150 MVAR	±300 MVAR
HITCHLAND 7 (523097)	NA	±600 MVAR	NA	±200 MVAR
TUCO_INT 7 (525832)	NA	±250 MVAR	NA	NA
BORDER 7 (515458)	NA	±250 MVAR	NA	NA
THISTLE7 (539801)	NA	NA	±250 MVAR	±600 MVAR
Line reactor (523823 - 523097)	Turn off	Turn off	Turn off	Turn off
Line reactor (523823 - 523853)	Turn off	Turn off	Turn off	Turn off
Line reactor (525832 - 511456)	NA	Turn off	NA	Turn off
Line reactor (525832 - 515458)	NA	Turn off	NA	Turn off
Line reactor (525832 - 526936)	NA	Turn off	NA	Turn off

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B.8 Contingency Files used in MISO West AFSIS Analysis

Table B-9: List of Contingencies used in the MISO West AFSIS Analysis

Contingency File Name	Description
Automatic single element contingencies	Single element outages at buses 60 kV and above in the study region
DPP2021 Ph2 LRTP Tranche 1 Projects 7 8 MEC CONs.con	MEC category P2 and P7 Contingency Updates for LRTP Tranche 1 Project 7 and 8
LRTP 6_P1.con	Specified category P1 contingency for LRTP Tranche 1 Project 6
LRTP 6_P1_P2.con	Specified category P1, P2 contingencies for LRTP Tranche 1 Project 6
MDU DPP 2021 Phase 2 Cat P1 2023.11.03.con	Specified category P1 contingencies in MDU
MDU DPP 2021 Phase 2 Cat P1_P2_P4 2023.11.03.con	Specified category P1, P2, P4 contingencies in MDU
MEC DPP 2021 Phase 2 Cat P1 2023.11.03.con	Specified category P1 contingencies in MEC
MEC DPP 2021 Phase 2 Cat P2 2023.11.03.con	Specified category P2 contingencies in MEC
MEC DPP 2021_P1.con	Specified category P1 contingencies in MEC
MEC DPP 2021_P2.con	Specified category P2 contingencies in MEC
MEC_P1.con	Specified category P1 contingencies in MEC
MEC DPP 2021 Phase 2 Cat P5 2023.11.03.con	Specified category P5 contingencies in MEC
MEC DPP 2021 Phase 2 Cat P7 2023.11.03.con	Specified category P7 contingencies in MEC
MEC DPP 2021_P5.con	Specified category P5 contingencies in MEC
MEC DPP 2021_P7.con	Specified category P7 contingencies in MEC
MISO21_2026_SUM_TA_Central_P1.con	Specified category P1 contingencies in MISO Central
MISO21_2026_SUM_TA_Central_P1_P2_P4_P5_P7.con	Specified category P1, P2, P4, P5, P7 contingencies in MISO Central
MISO21_2026_SUM_TA_IOWA_P1.con	Specified category P1 contingencies in Iowa
MISO21_2026_SUM_TA_IOWA_P1_P2_P4_P5_P7.con	Specified category P1, P2, P4, P5, P7 contingencies in Iowa
MISO21_2026_SUM_TA_MINN-DAKS_P1.con	Specified category P1 contingencies in MN, Dakotas
MISO21_2026_SUM_TA_MINN-DAKS_P1_P2_P4_P5_P7.con	Specified category P1, P2, P4, P5, P7 contingencies in MN, Dakotas
XEL_LRTP_P1.con	Specified category P1 contingencies in Xcel
MISO_DPP_2021_PRELIM_MH.con	Specified contingencies in MH
AECI-AMMO.CON	Specified category P1, P2 contingencies in AECI-AMMO
AECI-EES.con	Specified category P2, P3, P6 contingencies in AECI-EES
160303-KACY_P1.con	Specified category P1 contingencies in KACY

Contingency File Name	Description
160303-KACY_P2.con	Specified category P2 contingencies in KACY
KCPL_P1.con	Specified category P1 contingencies in KCPL
KCPL_P2.con	Specified category P2 contingencies in KCPL
KCPL_P4.con	Specified category P4 contingencies in KCPL
KCPL_P5.con	Specified category P5 contingencies in KCPL
KCPL_P7.con	Specified category P7 contingencies in KCPL

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Appendix

C

MISO South AFSIS Thermal and Voltage Analysis Results

C.1 2026 Summer Peak (SPK) MISO South AFSIS Constraints

Table C-1. 2026 SPK System Intact MISO South Thermal Constraints

Table C-2. 2026 SPK System Intact MISO South Voltage Constraints

Table C-3. 2026 SPK Category P1 MISO South Thermal Constraints

Table C-4. 2026 SPK Category P1 MISO South Voltage Constraints

Table C-5. 2026 SPK Category P2-P7 MISO South Thermal Constraints

Table C-6. 2026 SPK Category P2-P7 MISO South Voltage Constraints

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C.2 2026 Summer Shoulder (SH) MISO South AFSIS Constraints

Table C-7. 2026 SH System Intact MISO South Thermal Constraints

Table C-8. 2026 SH System Intact MISO South Voltage Constraints

Table C-9. 2026 SH Category P1 MISO South Thermal Constraints

Table C-10. 2026 SH Category P1 MISO South Voltage Constraints

Table C-11. 2026 SH Category P2-P7 MISO South Thermal Constraints

Table C-12. 2026 SH Category P2-P7 MISO South Voltage Constraints

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Appendix

D

MISO South AFSIS Stability Analysis Results

D.1 2026 Summer Peak (SPK) MISO South AFSIS Stability Results

Stability simulation was performed in the 2026 summer peak (SPK) stability model.

D.1.1 2026 SPK MISO South AFSIS Stability Summary

MISO South AFSIS summer peak stability study results are summarized in Table D-1.

Table D-1: 2026 Summer Peak MISO South AFSIS Stability Analysis Results Summary

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D.1.2 2026 SPK MISO South AFSIS Stability Plots

Plots of stability simulations for 2026 summer peak study case are in separate files which are listed below:

AppendixD1-2_2026SPK_SPP South_Study_Plots.zip

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D.2 2026 Summer Shoulder MISO South AFSIS Stability Results

Stability simulation was performed in the 2026 summer shoulder (SH) stability model.

D.2.1 2026 SH MISO South AFSIS Stability Summary

MISO South AFSIS summer shoulder stability study results are summarized in Table D-2.

Table D-2: 2026 Summer Shoulder MISO South AFSIS Stability Analysis Results Summary

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D.2.2 2026 SH MISO South AFSIS Stability Plots

Plots of stability simulations for 2026 summer shoulder study case are in separate files which are listed below:

AppendixD2-2_2026SH_SPP South_Study_Plots.zip

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Appendix

E

MISO West AFSIS Thermal and Voltage Analysis Results

E.1 2026 Summer Peak (SPK) MISO West AFSIS Constraints

Table E-1. 2026 SPK System Intact MISO West Thermal Constraints

Table E-2. 2026 SPK System Intact MISO West Voltage Constraints

Table E-3. 2026 SPK Category P1 MISO West Thermal Constraints

Table E-4. 2026 SPK Category P1 MISO West Voltage Constraints

Table E-5. 2026 SPK Category P2-P7 MISO West Thermal Constraints

Table E-6. 2026 SPK Category P2-P7 MISO West Voltage Constraints

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E.2 2026 Summer Shoulder (SH) MISO West AFSIS Constraints

Table E-7. 2026 SH System Intact MISO West Thermal Constraints

Table E-8. 2026 SH System Intact MISO West Voltage Constraints

Table E-9. 2026 SH Category P1 MISO West Thermal Constraints

Table E-10. 2026 SH Category P1 MISO West Voltage Constraints

Table E-11. 2026 SH Category P2-P7 MISO West Thermal Constraints

Table E-12. 2026 SH Category P2-P7 MISO West Voltage Constraints

Table E-13. 2026 SH MISO West Non-Converged Contingencies

Table E-14. 2026 SH MISO West Non-Converged Contingencies DCCC Results

Table E-15. 2026 SH MISO West Worst Voltage Constraints

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Appendix

F

MISO West AFSIS Stability Analysis Results

F.1 2026 Summer Peak (SPK) MISO West AFSIS Stability Results

Stability simulation was performed in the 2026 summer peak (SPK) stability model.

F.1.1 2026 SPK MISO West AFSIS Stability Summary

MISO West AFSIS summer peak stability study results are summarized in Table F-1.

Table F-1: 2026 Summer Peak MISO West AFSIS Stability Analysis Results Summary

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F.1.2 2026 SPK MISO West AFSIS Stability Plots

Plots of stability simulations for 2026 summer peak study case are in separate files which are listed below:

AppendixF1-2_2026SPK_SPP West_Study_Plots.zip

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F.2 2026 Summer Shoulder MISO West AFSIS Stability Results

Stability simulation was performed in the 2026 summer shoulder (SH) stability model.

F.2.1 2026 SH MISO West AFSIS Stability Summary

MISO West AFSIS summer shoulder stability study results are summarized in Table F-2.

Table F-2: 2026 Summer Shoulder MISO West AFSIS Stability Analysis Results Summary

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F.2.2 2026 SH MISO West AFSIS Stability Plots

Plots of stability simulations for 2026 summer shoulder study case are in separate files which are listed below:

AppendixF2-2_2026SH_SPP West_Study_Plots.zip

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Appendix

G

2026 Cost Allocation Results

G.1 MISO South AFSIS Network Upgrade Cost Allocation

G.1.1 Distribution Factor (DF) and MW Contribution Results for MISO South AFSIS Cost Allocation

Table G-1: Distribution Factor and MW Contribution on Constraints for MISO South Affected System Thermal NU Cost Allocation

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G.1.2 MISO South AFSIS Network Upgrade Cost Allocation Details

Table G-2: MISO South Affected System Network Upgrades Cost Allocation

Table G-2: MISO South Affected System Network Upgrades Cost Allocation

Monitored Element	English Name	Owner	Cost	GEN-2022-001	GEN-2022-011	GEN-2022-016	GEN-2022-019	GEN-2022-021	GEN-2022-038	GEN-2022-042	GEN-2022-048	GEN-2022-055	GEN-2022-071	GEN-2022-072	GEN-2022-074
337502 3COUCH% 115 337516 3MCNEIL! 115 1	Couch-McNeil 115 kV	EES-EAI	$2,500,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
337502 3COUCH% 115 338874 3LEWISVILLE# 115 1	Couch-Lewisville 115 kV	EES-EAI	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
337672 4MURFBORO 138 507434 SNASHVL4 138 1	Murfreesboro-Snashvl 138 kV	EES-EAI AEPW	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
337674 3AMITY% 115 338849 3MURFBORO.E# 115 1	Amity-Murfreesboro E. 138 kV	EES-EAI	$17,700,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
338874 3LEWISVILLE# 115 338875 3PATMOS.W# 115 1	Lewisville-Patmos 115 kV	EES-EAI AECC	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
338875 3PATMOS.W# 115 503912 FULTON 3 115 1	Patmos-Fulton 115 kV	EES-EAI AEPW AECC	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Cost Per Project for each Project	**Total Cost Per Project**		**$20,200,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Monitored Element	GEN-2022-082	GEN-2022-085	GEN-2022-088	GEN-2022-089	GEN-2022-090	GEN-2022-091	GEN-2022-092	GEN-2022-093	GEN-2022-098	GEN-2022-103	GEN-2022-104	GEN-2022-105	GEN-2022-106	GEN-2022-107	GEN-2022-108	GEN-2022-110	GEN-2022-111	GEN-2022-114
337502 3COUCH% 115 337516 3MCNEIL! 115 1	$0	$0	$0	$0	$0	$0	$0	$350,536	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
337502 3COUCH% 115 338874 3LEWISVILLE# 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
337672 4MURFBORO 138 507434 SNASHVL4 138 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
337674 3AMITY% 115 338849 3MURFBORO.E# 115 1	$0	$0	$2,252,864	$2,252,864	$0	$0	$0	$1,267,082	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
338874 3LEWISVILLE# 115 338875 3PATMOS.W# 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
338875 3PATMOS.W# 115 503912 FULTON 3 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Cost Per Project for each Project	**$0**	**$0**	**$2,252,864**	**$2,252,864**	**$0**	**$0**	**$0**	**$1,617,618**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Monitored Element	GEN-2022-129	GEN-2022-130	GEN-2022-132	GEN-2022-136	GEN-2022-137	GEN-2022-138	GEN-2022-139	GEN-2022-143	GEN-2022-145	GEN-2022-147	GEN-2022-154	GEN-2022-155	GEN-2022-156	GEN-2022-159	GEN-2022-160	GEN-2022-163	GEN-2022-167
337502 3COUCH% 115 337516 3MCNEIL! 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
337502 3COUCH% 115 338874 3LEWISVILLE# 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
337672 4MURFBORO 138 507434 SNASHVL4 138 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
337674 3AMITY% 115 338849 3MURFBORO.E# 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
338874 3LEWISVILLE# 115 338875 3PATMOS.W# 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
338875 3PATMOS.W# 115 503912 FULTON 3 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Cost Per Project for each Project	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Monitored Element	GEN-2022-171	GEN-2022-176	GEN-2022-196	GEN-2022-231	GEN-2022-234	GEN-2022-235	GEN-2022-237	GEN-2022-238	GEN-2022-239	GEN-2022-240	GEN-2022-241	NUs Type	Comments
337502 3COUCH% 115 337516 3MCNEIL! 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$1,003,083	$573,190	$573,190	SPK	$2,500,000
337502 3COUCH% 115 338874 3LEWISVILLE# 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SPK, SH	$0
337672 4MURFBORO 138 507434 SNASHVL4 138 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SPK	$0
337674 3AMITY% 115 338849 3MURFBORO.E# 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$5,566,022	$3,180,584	$3,180,584	SPK	$17,700,000
338874 3LEWISVILLE# 115 338875 3PATMOS.W# 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SPK, SH	$0
338875 3PATMOS.W# 115 503912 FULTON 3 115 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SPK, SH	$0
Total Cost Per Project for each Project	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$6,569,105**	**$3,753,774**	**$3,753,774**		$20,200,000

G.2 MISO West AFSIS Network Upgrade Cost Allocation

G.2.1 Distribution Factor (DF), Voltage Impact, and MW Contribution Results for MISO West AFSIS Cost Allocation

Table G-3: Distribution Factor and MW Contribution on Constraints for MISO West Affected System Thermal NU Cost Allocation

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G.2.2 MISO West AFSIS Network Upgrade Cost Allocation Details

Table G-4: MISO West Affected System Network Upgrades Cost Allocation

Table G-4: MISO West Affected System Network Upgrades Cost Allocation

Monitored Element	English Name	Owner	Cost	GEN-2022-004	GEN-2022-005	GEN-2022-006	GEN-2022-007	GEN-2022-009	GEN-2022-010	GEN-2022-013	GEN-2022-015	GEN-2022-024	GEN-2022-025	GEN-2022-026	GEN-2022-054	GEN-2022-058	GEN-2022-062	GEN-2022-065	GEN-2022-068	GEN-2022-073	GEN-2022-075	GEN-2022-076	GEN-2022-077	GEN-2022-079	GEN-2022-080	GEN-2022-081	GEN-2022-083	GEN-2022-094	GEN-2022-100	GEN-2022-102	GEN-2022-113	GEN-2022-131	GEN-2022-142	GEN-2022-144	GEN-2022-152	GEN-2022-161	GEN-2022-162	GEN-2022-168	GEN-2022-186	GEN-2022-204	GEN-2022-205	GEN-2022-206	GEN-2022-208	GEN-2022-209	GEN-2022-214	GEN-2022-219	NUs Type
40400 J976 POI 345 344536 7ENON_TP 345 1	J976 POI-Enon Tap 345 kV	Ameren	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SH
40400 J976 POI 345 345230 7MONTGMRY 345 1	J976 POI-Montgomery 345 kV	Ameren	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SH
344026 5APCH TP 161 344234 5CALIF UE 2 161 1	Apache Tap-California 161 kV	Ameren	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SH
602006 SHEYNNE4 230 620337 LAKE PARK T4 230 1	Sheyenne-Lake Park 230 kV	XEL OTP	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SH
620336 AUDUBON4 230 620337 LAKE PARK T4 230 1	Audubon-Lake Park 230 kV	OTP	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SH
620369 JAMESTN3 345 657791 CENTER 3 345 1	Jamestown-Center 345 kV	OTP MPC	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SH
661038 GLENHAM4 230 652499 CAMPBELL 4 230 1	Glenham-Campbell 230 kV	MDU WAPA	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SH
Total Cost Per Project for each Project	**Total Cost Per Project**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	

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