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MISO Affected System Restudy for SPP DISIS-2018-001 West Cluster

Prepared for

MISO

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Revision History

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Contents

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Executive Summary

This report presents restudy results of an Affected System Impact Study (AFSIS) on MISO transmission system performed for generator interconnection requests in the Southwest Power Pool (SPP) queue 2018-001 West cluster (Study Projects). The AFSIS restudy results are summarized below.

1.1 Study Projects List

The generation projects (Study Projects) in SPP DISIS 2018-001 West cluster are listed in Table ES-1.

Table ES-1: SPP DISIS 2018-001 West Study Projects

Project #	Area	State	Point of Interconnection	Gen Type	MW request	SH (MW)	SPK (MW)
ASGI-2017-013	WAPA	ND	Wolsey 69 kV	Wind	40	40	6.24
ASGI-2018-003	KCPL	KS	Appleton 69 kV	Solar	20	0	20
ASGI-2018-006	KCPL	KS	Metz 69 kV	Solar	20	0	20
ASGI-2018-007	KCPL	KS	Salisbury 161 kV	Solar	20	0	20
ASGI-2018-010	KCPL	KS	Pleasant Valley 161 kV	Solar	35	0	35
ASGI-2018-011	KCPL	KS	South Ottawa 161 kV	Solar	35	0	35
GEN-2018-010	WAPA	ND	Neset 230 kV	BESS	74.1	74.1	74.1
GEN-2018-013	WERE	KS	Abilene Energy Center-Northview 115 kV	Wind	74.1	74.1	11.56
GEN-2018-025	OPPD	NE	Fort Calhoun 345 kV	BESS	200	200	200
GEN-2018-031	KCPL	MO	Blue Valley 161 kV	BESS	50	50	50
GEN-2018-032	WERE	KS	Neosho 345 kV	Wind	310	155 155	24.18 24.18
GEN-2018-033	OPPD	NE	Cass County 345 kV	BESS	200	200	200
GEN-2018-037	OPPD	NE	Looping in OPPD (S1211) (S1220) (S1211) (S1299) 161 kV	BESS	100	100	100
GEN-2018-043	OPPD	NE	Ft. Calhoun-Raun 345 kV	Solar	500	0	167 167 166
GEN-2018-057	WERE	KS	Gordon Evans 138 kV	Solar	203.4	0	203.4
GEN-2018-060	NPPD	NE	Axtell-Post Rock 345 kV	Wind	50	50	7.8

1.2 MISO AFSIS Restudy Summary

MISO AFSIS restudy steady state models were developed from the final study models used in MISO AFSIS study for DISIS-2018-001 West Phase 3 cycle. MISO AFSIS restudy stability package was developed from the final stability package used in MISO AFSIS study for DISIS-2018-001 West Phase 3 cycle.

For this MISO AFSIS restudy, steady state analysis and stability analysis were performed in both summer peak and summer shoulder scenarios.

Steady state thermal and voltage analysis was performed to identify any thermal and voltage violations in the MISO system. No steady state thermal constraints or voltage constraints were identified. No MISO AFSIS Network Upgrades are required.

Transient stability analysis was performed to identify any transient stability violations caused by the SPP DISIS-2018-001 West Study Projects.

Based on the MISO 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 summer shoulder transient stability analysis, 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.

A short circuit screening analysis was conducted by comparing three phase fault currents in the benchmark and study cases for the SPP DISIS-2018-001 West Study Projects. Based on the screening results, MISO Transmission Owners do not plan to conduct additional studies.

No contingent facilities or MTEP facilities were identified for the SPP DISIS-2018-001 West Study Projects.

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, and changes to the Contingent Network Upgrade.

For the study projects that are required to mitigate thermal and/or voltage violations, the projects should not be allowed to come into service before all 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 or Quarterly Operating Limit process.

1.3 Total MISO AFSIS Network Upgrades

The total cost of MISO AFSIS Network Upgrades (NU) required for the Study Projects in DISIS-2018-001 West Cluster is listed in Table ES-2. The costs for Network Upgrades are planning level estimates and subject to be revised in the facility studies.

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Table ES-2: Total Cost of MISO AFSIS Network Upgrades for DISIS-2018-001 Study Projects

Project Num	Network Upgrades ($)			Total Network Upgrade Cost ($)
	MISO Thermal & Voltage	Transient Stability	Short Circuit	
ASGI-2017-013	$0	$0	$0	$0
ASGI-2018-003	$0	$0	$0	$0
ASGI-2018-006	$0	$0	$0	$0
ASGI-2018-007	$0	$0	$0	$0
ASGI-2018-010	$0	$0	$0	$0
ASGI-2018-011	$0	$0	$0	$0
GEN-2018-010	$0	$0	$0	$0
GEN-2018-013	$0	$0	$0	$0
GEN-2018-025	$0	$0	$0	$0
GEN-2018-031	$0	$0	$0	$0
GEN-2018-032	$0	$0	$0	$0
GEN-2018-033	$0	$0	$0	$0
GEN-2018-037	$0	$0	$0	$0
GEN-2018-043	$0	$0	$0	$0
GEN-2018-057	$0	$0	$0	$0
GEN-2018-060	$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-2018-001 West cluster.

All DISIS 2018-001 West Study Projects (Table ES-1) 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 Model Development

Summer peak and summer shoulder steady state models and stability package used in this AFSIS restudy were developed from the final study models and stability package used in MISO AFSIS study for DISIS-2018-001 West Phase 3 cycle.

The original MISO AFSIS final study models for DISIS-2018-001 West Phase 3 cycle are listed below:

- Summer peak study model: West_SP_TC_case_V12_Phase3.sav
- Summer shoulder study model: West_SH_TC_V12_Phase3.sav

Stability power flow models used in this AFSIS restudy are the same as steady state power flow models.

1.1.1 MISO AFSIS Study Models

The steady state study models and stability power flow models for the AFSIS restudy were created as follows:

- Removed recently withdrawn SPP prior queued generation projects (Table A-1). Power mismatch was balanced by scaling generation in SPP market (Table A-8) based on the load-ratio share of the Transmission Owner (TO) power flow modeling areas.
- Add missing project ASGI-2018-011 in summer shoulder model. Trued up generation dispatch in DISIS-2018-001 West cluster. Removed SPP Network Upgrades no longer assigned to prior queued projects (Table A-2). Power mismatch was balanced by scaling generation in SPP market (Table A-8) based on the load-ratio share of the Transmission Owner (TO) power flow modeling areas.
- Removed recently withdrawn MISO prior queued generation projects (Table A-3). Removed withdrawn MPC04200 generation project. Updated modeling and trued up generation dispatch based on latest modeling information on MPC prior queued generation projects (Table A-4). Power mismatch was balanced by scaling generation in the MISO North (Table A-7).
- Turned off MISO generating facilities in DPP 2020 Central area due to their lower queue positions. Power mismatch was balanced by scaling generation in the MISO North (Table A-7).
- Removed extra generator at bus 999815 and withdrawn generation project AECI GI-94. Trued up generation dispatch on AECI prior queued generation projects (Table A-5). Power mismatch was balanced by scaling generation in AECI (Table A-9).
- Removed MISO Network Upgrades no longer assigned to prior queued projects. Added recently approved MTEP Appendix A projects. Corrected modeling errors.

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These changes are in Table A-6. Power mismatch was balanced by scaling generation in the MISO North (Table A-7).

- Updated bus voltage limits based on MTEP25.

1.1.2 MISO AFSIS Benchmark Model

Summer peak (SPK) and summer shoulder (SH) benchmark models were created by turning off the DISIS-2018-001 West Study Projects (Table ES-1) from the study cases. Power mismatch was balanced by scaling generation in SPP market (Table A-8) 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.

1.2 Contingency Criteria

The following contingencies were considered in the steady-state analysis:

- NERC Category P0 (system intact - no contingencies)
- NERC Category P1 contingencies
  - Single element outages, at buses with a nominal voltage of 57 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.10

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.

1.3 Monitored Elements

The 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, and bus voltages were monitored based on normal voltage limits associated with each bus in power flow case. Under NERC category P1-P7 conditions, branches were monitored for loading as shown in the column labeled "Post-Disturbance Thermal Limits", and bus voltages were monitored based on emergency voltage limits associated with each bus in power flow case.

Table 1-1: Monitored Elements

Owner / Area	Thermal Limits [1]	
	Pre-Disturbance	Post-Disturbance
AMIL	100% of Rate A	100% of Rate B
AMMO	100% of Rate A	100% of Rate B
CWLD	100% of Rate A	100% of Rate B

Owner / Area	Thermal Limits [1]	
	Pre-Disturbance	Post-Disturbance
CWLP	100% of Rate A	100% of Rate B
SIPC	100% of Rate A	100% of Rate B
GLH	100% of Rate A	100% of Rate B
XEL	100% of Rate A	100% of Rate B
GRE	100% of Rate A	100% of Rate B
OTP	100% of Rate A	100% of Rate B
ITCM	100% of Rate A	100% of Rate B
MEC	100% of Rate A	100% of Rate B
MDU	100% of Rate A	100% of Rate B

Notes

1. PSS®E Rate A, Rate B or Rate C

1.4 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.

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Section
2

MISO Steady-State Thermal and Voltage Analysis

Nonlinear (AC) contingency analysis was performed on the benchmark and study cases, and the incremental impact of the DISIS-2018-001 West Study Projects was 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 shoulder scenario. PSS®E version 34.9.5 and TARA were used in the study.

2.1 MISO Contingency Analysis for Summer Peak Condition

Steady state AC contingency analysis was performed on the MISO AFSIS summer peak (SPK) study and benchmark cases developed in Section 1.1. The summer peak MISO AFSIS thermal and voltage results are in Appendix B.1.

2.1.1 Summer Peak System Intact Conditions

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

2.1.2 Summer Peak Post Contingency Conditions

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

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

One category P2-P7 contingency (Table B-7) was not converged in both the benchmark and study cases. No mitigation plan is required for the DISIS-2018-001 Study Projects for this non-converged contingency.

For the non-converged contingencies, DC contingency analysis was performed to get the dc thermal results. The dc thermal results for non-converged contingencies are listed in Table B-8.

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

2.1.3 Summary of Summer Peak Results

In the summer peak scenario, no thermal constraints or voltage constraints were identified in the MISO steady state analysis for the DISIS-2018-001 Study Projects.

2.2 MISO Contingency Analysis for Summer Shoulder Condition

Steady state AC contingency analysis was performed on the MISO AFSIS summer shoulder (SH) study and benchmark cases developed in Section 1.1. The summer shoulder MISO AFSIS thermal and voltage results are in Appendix B.2.

2.2.1 Summer Shoulder System Intact Conditions

For NERC category P0 (system intact) conditions, no thermal constraints (Table B-9) or voltage constraints (Table B-10) were identified.

2.2.2 Summer Shoulder Post Contingency Conditions

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

For P1 contingencies, no thermal constraints (Table B-11) or voltage constraints (Table B-12) were identified.

One category P2-P7 contingency (Table B-15) was not converged in both the benchmark and study cases. No mitigation plan is required for the DISIS-2018-001 Study Projects for this non-converged contingency.

For the non-converged contingencies in Table B-15, DC contingency analysis was performed to get the dc thermal results. The dc thermal results for non-converged contingencies are listed in Table B-16.

For P2-P7 converged contingencies, no thermal constraints (Table B-13) or voltage constraints (Table B-14) were identified.

2.2.3 Summary of Summer Shoulder Results

In the summer shoulder scenario, no thermal constraints or voltage constraints were identified in the MISO steady state analysis for the DISIS-2018-001 Study Projects.

2.3 Summary of MISO AFSIS Steady State Analysis

MISO AFSIS steady state analyses were performed on the MISO summer peak and summer shoulder scenarios. No steady state thermal constraints or voltage constraints were identified. No MISO AFSIS Network Upgrades are required.

Section

3

Stability Analysis

Stability analysis was performed to evaluate transient stability and impact on the region of the DISIS-2018-001 West Study Projects.

3.1 Procedure

3.1.1 Computer Programs

Stability analysis was performed using TSAT revision 23.0.

3.1.2 Methodology

Stability package representing summer peak (SPK) and summer shoulder (SH) scenarios with DISIS-2018-001 West Study Projects were created from the final stability package used in MISO AFSIS study for DISIS-2018-001 West Phase 3 cycle. The stability power flow models are the same as steady state power flow models, which were developed in Section 1.1.

Disturbances were simulated to evaluate the transient stability and impact on the region of the DISIS-2018-001 West Study Projects. MISO transient stability criteria and local TOs' planning criteria were adopted for checking stability violations.

3.2 Model Development

Summer peak and summer shoulder stability power flow models are the same as the corresponding steady state models, which were developed as specified in Section 1.1.

3.3 Disturbance Criteria

The stability simulations performed as part of this study considered all the regional and local contingencies listed in Table 3-1. Regional contingencies with pre-defined switching sequences were selected from the MISO MTEP20 study; switching sequences for local contingencies were developed based on the generic clearing times shown in Table 3-2. 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.

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Table 3-1: Regional and Local Disturbance Descriptions

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Table 3-2: 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

3.4 Performance Criteria

MISO transient stability criteria and local TOs' planning criteria specified in MTEP20 were adopted. The Study Projects must mitigate the stability constraints to obtain any type of Interconnection Service.

3.5 Summer Peak Stability Results

The contingencies listed in Table 3-1 were simulated using the summer peak stability study case as developed in Section 1.1.

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

Under all the simulated faults, all simulations are transiently stable, transient period voltage criteria are met, oscillations are damped. No stability constraints were identified.

3.5.1 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.

3.6 Summer Shoulder Stability Results

The contingencies listed in Table 3-1 were simulated using the summer shoulder stability study case as developed in Section 1.1.

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

Under all the simulated faults, all simulations are transiently stable, transient period voltage criteria are met, oscillations are damped. No stability constraints were identified.

3.6.1 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.

3.7 Summary of Transient Stability Analysis

Based on the MISO summer peak and summer shoulder transient stability analysis, no MISO AFSIS stability Network Upgrades are required for the DISIS-2018-001 West Study Projects.

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Section

4

Network Upgrades and Cost Allocation

4.1 Cost Assumptions for Network Upgrades

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

4.2 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.

4.3 AFSIS Network Upgrades Required for the DISIS-2018-001 Study Projects

Based on the MISO summer peak and summer shoulder steady state analysis, no MISO Affected System steady state thermal constraints or voltage constraints were identified. No MISO AFSIS Network Upgrades are required.

Based on the MISO summer peak and summer shoulder transient stability analysis, no MISO Affected System transient stability constraints were identified for the DISIS-2018-001 West Study Projects; No MISO AFSIS stability NUs are required for the DISIS-2018-001 Study 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 South. Based on the screening results, MISO Transmission Owners do not plan to conduct additional studies.

No contingent facilities or MTEP facilities were identified for the SPP DISIS-2018-001 West Study Projects.

The total costs of MISO AFSIS Network Upgrades for DISIS-2018-001 Study Projects are summarized in Table 4-1.

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 a MISO restudy removes the mitigation requirement from the project, or an interim limit is provided to the project through MISO Annual ERIS process.

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For projects that are required to mitigate voltage 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.

Table 4-1: Summary of MISO 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 AFSIS Network Upgrades for DISIS-2018-001 West Study Projects are listed below:

Table 4-2: MISO Thermal Network Upgrades and Cost

Constraint	Owner	Mitigation	Cost ($)
No thermal constraints			$0

Table 4-3: MISO Steady-State Voltage Network Upgrades and Cost

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

Table 4-4: MISO Transient Stability Network Upgrades and Cost

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

Table 4-5: MISO Short Circuit Network Upgrades

NUs	Cost ($)
No short circuit NUs	$0

4.4 MISO AFSIS Cost Allocation

Assuming all generation projects in the DISIS-2018-001 West cluster advance, a summary of the costs for total MISO AFSIS NUs allocated to each generation project is listed in Table 4-6.

Table 4-6: Summary of MISO AFSIS NU Costs Allocated to the DISIS-2018-001 West Study Projects

Project Num	Network Upgrades ($)			Total Network Upgrade Cost ($)
	MISO Thermal & Voltage	Transient Stability	Short Circuit	
ASGI-2017-013	$0	$0	$0	$0
ASGI-2018-003	$0	$0	$0	$0
ASGI-2018-006	$0	$0	$0	$0
ASGI-2018-007	$0	$0	$0	$0
ASGI-2018-010	$0	$0	$0	$0
ASGI-2018-011	$0	$0	$0	$0
GEN-2018-010	$0	$0	$0	$0
GEN-2018-013	$0	$0	$0	$0
GEN-2018-025	$0	$0	$0	$0
GEN-2018-031	$0	$0	$0	$0
GEN-2018-032	$0	$0	$0	$0
GEN-2018-033	$0	$0	$0	$0
GEN-2018-037	$0	$0	$0	$0
GEN-2018-043	$0	$0	$0	$0
GEN-2018-057	$0	$0	$0	$0
GEN-2018-060	$0	$0	$0	$0
Total ($)	**$0**	**$0**	**$0**	**$0**

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Appendix

A

Model Development for Steady-State and Stability Analysis

A.1 Withdrawn SPP Prior Queued Projects

Table A-1: Withdrawn SPP Prior Queued Project

Prj #	Bus Number	Bus Name	Id	Status
ASGI-2017-014	761546	AS17-014GEN10.5500	1	Withdrawn
GEN-2010-041	560326	G10-41 0.6900	1	TERMINATED
GEN-2014-039	562547	G14_039_3 0.6900	1	WITHDRAWN
GEN-2015-076	563113	G15076_4 0.6500	1	WITHDRAWN
GEN-2015-076	563114	G15076_5 0.6500	1	WITHDRAWN
GEN-2016-007	587053	G16-007-GEN10.6500	1	TERMINATED
GEN-2016-063	587433	G16-063-GEN10.6900	1	TERMINATED
GEN-2016-088	587733	G16-088-GEN10.6900	1	TERMINATED
GEN-2016-092	587753	G16-092-GEN10.6900	1	WITHDRAWN
GEN-2016-096	587783	G16-096-GEN10.6900	1	WITHDRAWN
GEN-2016-096	587787	G16-096-GEN20.6900	1	WITHDRAWN
GEN-2016-103	587833	G16-103-GEN10.6900	1	WITHDRAWN
GEN-2016-106	587853	G16-106-GEN10.6900	1	WITHDRAWN
GEN-2016-109	589453	G16-109-GEN112.000	1	WITHDRAWN
GEN-2016-110	587873	G16-110-GEN10.6900	1	WITHDRAWN
GEN-2016-127	588033	G16-127-GEN10.6900	1	WITHDRAWN
GEN-2016-127	588036	G16-127-GEN20.6900	1	WITHDRAWN
GEN-2016-159	588383	G16-159-GEN10.6900	1	WITHDRAWN
GEN-2016-159	588386	G16-159-GEN20.6900	1	WITHDRAWN
GEN-2017-001	588373	G17-001-GEN10.6900	1	WITHDRAWN
GEN-2017-006	588513	G17-006-GEN10.6900	1	WITHDRAWN
GEN-2017-008	588533	G17-008-GEN10.6900	1	WITHDRAWN
GEN-2017-008	588537	G17-008-GEN20.6900	1	WITHDRAWN

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Prj #	Bus Number	Bus Name	Id	Status
GEN-2017-013	588583	G17-013-GEN10.6900	1	WITHDRAWN
GEN-2017-024	588683	G17-024-GEN10.6000	1	WITHDRAWN
GEN-2017-030	588733	G17-030-GEN10.6900	1	WITHDRAWN
GEN-2017-031	588743	G17-031-GEN10.6900	1	WITHDRAWN
GEN-2017-032	588753	G17-032-GEN10.6900	1	WITHDRAWN
GEN-2017-038	588793	G17-038-GEN10.6900	1	WITHDRAWN
GEN-2017-041	588823	G17-041-GEN10.6900	1	WITHDRAWN
GEN-2017-055	588943	G17-055-GEN10.5500	1	WITHDRAWN
GEN-2017-064	589023	G17-064-GEN10.5500	1	WITHDRAWN
GEN-2017-064	589027	G17-064-GEN20.5500	1	WITHDRAWN
GEN-2017-067	589053	G17-067-GEN10.5500	1	WITHDRAWN
GEN-2017-067	589057	G17-067-GEN20.5500	1	WITHDRAWN
GEN-2017-090	589283	G17-090-GEN10.6900	1	WITHDRAWN
GEN-2017-090	589287	G17-090-GEN20.6900	1	WITHDRAWN
GEN-2017-095	589333	G17-095-GEN10.6900	1	WITHDRAWN
GEN-2017-111	762009	G17-111-GEN10.6300	1	WITHDRAWN
GEN-2017-125	761904	G17-125GEN1 0.6900	1	TERMINATED
GEN-2017-128	761925	G17-128GEN1 0.6900	1	WITHDRAWN
GEN-2017-148	760896	G17-148GEN1 0.6900	1	WITHDRAWN
GEN-2017-191	761946	G17-191GEN1 0.6900	1	WITHDRAWN
GEN-2017-199	760686	G17-199GEN1 0.6900	1	WITHDRAWN
GEN-2017-200	760706	G17-200GEN1 0.6900	1	WITHDRAWN
GEN-2017-202	761421	G17-202GEN1 0.6900	1	WITHDRAWN
GEN-2017-209	760917	G17-209GEN1 0.6900	1	TERMINATED
GEN-2017-209	760917	G17-209GEN1 0.6900	2	TERMINATED
GEN-2017-209	760920	G17-209GEN2 0.6300	1	TERMINATED
GEN-2017-209	760920	G17-209GEN2 0.6300	2	TERMINATED
GEN-2017-216	761043	G17-216GEN1 0.6900	1	WITHDRAWN
GEN-2017-225	760454	G17-225-GEN10.5500	1	WITHDRAWN
GEN-2017-229	761757	G17-229GEN1 0.6900	1	WITHDRAWN
GEN-2017-235	761064	G17-235GEN1 0.6900	1	WITHDRAWN
GEN-2017-236	761085	G17-236GEN1 0.6900	1	WITHDRAWN
GEN-2018-007	762452	G18-007-GEN10.6600	1	WITHDRAWN

Prj #	Bus Number	Bus Name	Id	Status
GEN-2018-008	762540	G18-008-GEN10.6900	1	WITHDRAWN
GEN-2018-008	762543	G18-008-GEN20.6900	1	WITHDRAWN
GEN-2018-012	762507	G18-012-GEN10.6900	1	WITHDRAWN
GEN-2018-014	762528	G18-014-GEN10.7200	1	WITHDRAWN
GEN-2018-022	762584	G18-022GEN1 0.6000	1	WITHDRAWN
GEN-2018-022	762587	G18-022GEN2 0.6000	1	WITHDRAWN
GEN-2018-022	762588	G18-022GEN3 0.6300	1	WITHDRAWN
GEN-2018-030	762661	G18-030GEN1 0.6600	1	WITHDRAWN
GEN-2018-039	762738	G18-039GEN1 0.6600	1	WITHDRAWN
GEN-2018-044	762793	G18-044-GEN10.6600	1	WITHDRAWN
GEN-2018-044	762796	G18-044-GEN20.6600	1	WITHDRAWN
GEN-2018-044	762799	G18-044-GEN30.6600	1	WITHDRAWN
GEN-2018-053	762881	G18-053-GEN10.6900	1	WITHDRAWN
GEN-2018-054	762892	G18-054-GEN10.6600	1	WITHDRAWN
GEN-2018-056	762914	G18-056-GEN10.6600	1	WITHDRAWN
GEN-2018-058	762936	G18-058-GEN10.6600	1	WITHDRAWN
GEN-2018-059	762946	G18-059-GEN10.6600	1	WITHDRAWN
GEN-2018-061	762968	G18-061-GEN10.6900	1	WITHDRAWN
GEN-2018-062	762979	G18-062-GEN10.6900	1	WITHDRAWN

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A.2 SPP Model Updates

Table A-2: SPP Model Updates

Company	Python/ Idev File Name	Shoulder	Peak
SPTI	SPP Topology.py	×	×

A.3 Withdrawn MISO Prior Queued Projects

Table A-3: Withdrawn MISO Prior Queued Project

Prj #	Bus Number	Bus Name	Id	Status
IR37	800160	IR37 GEN 0.6300	1	Withdrawn
J1042	40420	J1042 GEN 0.6300	PV	Withdrawn
J1043	40430	J1043 GEN 0.6500	1	Withdrawn
J1074	40740	J1074 GEN 0.6000	1	Withdrawn
J1152	41520	J1152 GEN 0.5500	1	Withdrawn
J1178	41780	J1178 GEN 0.6300	1	Withdrawn
J1191	41910	J1191 GEN 0.6000	1	Withdrawn
J1192	41920	J1192 GEN 0.6000	1	Withdrawn
J1197	41970	J1197 GEN 0.6600	1	Withdrawn
J1204	42040	J1204 GEN 0.6000	1	Withdrawn
J1207	42070	J1207 GEN 13.800	1	Withdrawn
J1222	42220	J1222 GEN 0.6300	1	Withdrawn
J1222	42221	J1222 GEN1 0.6300	1	Withdrawn
J1225	42250	J1225 GEN 0.6300	1	Withdrawn
J1227	42270	J1227 GEN 0.6300	1	Withdrawn
J1231	42310	J1231 GEN 0.6450	1	Withdrawn
J1233	43931	J1233 GEN1 0.6300	1	Withdrawn
J1242	42420	J1242 GEN 0.6450	1	Withdrawn
J1243	42430	J1243 GEN 0.6450	1	Withdrawn
J1244	42440	J1244 GEN 0.6900	W	Withdrawn
J1244	42441	J1244 GEN1 0.6900	W	Withdrawn
J1252	42521	J1252 GEN 0.6300	BT	Withdrawn
J1253	42530	J1253 GEN 0.6450	PV	Withdrawn
J1254	42540	J1254 GEN 0.6300	1	Withdrawn
J1265	42650	J1265 GEN 0.6300	1	Withdrawn
J1271	42710	J1271 GEN 0.6450	1	Withdrawn
J1274	42740	J1274 GEN 0.6450	1	Withdrawn
J1275	42750	J1275 GEN 0.6300	1	Withdrawn
J1276	42741	J1276 GEN1 0.6450	1	Withdrawn
J1288	42880	J1288 GEN 22.000	1	Withdrawn

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Prj #	Bus Number	Bus Name	Id	Status
J1296	42960	J1296 GEN 0.6000	1	Withdrawn
J1298	42980	J1298 GEN 0.6000	1	Withdrawn
J1301	43010	J1301 GEN 0.6000	1	Withdrawn
J1307	43070	J1307 GEN 0.6000	1	Withdrawn
J1315	43150	J1315 GEN 0.6900	1	Withdrawn
J1315	43151	J1315 GEN1 0.6900	1	Withdrawn
J1315	43152	J1315 GEN2 0.6900	1	Withdrawn
J1315	43153	J1315 GEN3 0.6900	1	Withdrawn
J1315	43154	J1315 GEN4 0.6900	1	Withdrawn
J1315	43155	J1315 GEN5 0.6900	1	Withdrawn
J1318	43180	J1318 GEN 0.6000	1	Withdrawn
J1321	43210	J1321 GEN 0.6300	1	Withdrawn
J1324	43240	J1324 GEN 0.6000	1	Withdrawn
J1328	43280	J1328 GEN 0.6000	1	Withdrawn
J1330	43300	J1330 GEN 0.6000	1	Withdrawn
J1332	43320	J1332 GEN 0.6000	1	Withdrawn
J1338	43380	J1338 GEN 0.7200	1	Withdrawn
J1342	43420	J1342 GEN 0.3850	1	Withdrawn
J1345	43450	J1345 GEN 0.6900	BT	Withdrawn
J1349	43490	J1349 GEN 0.6000	1	Withdrawn
J1349	43491	J1349 GEN1 0.6900	1	Withdrawn
J1349	43492	J1349 GEN2 0.6900	1	Withdrawn
J1350	43500	J1350 GEN 0.6000	1	Withdrawn
J1353	43530	J1353 GEN 0.3850	1	Withdrawn
J1356	43560	J1356 GEN 0.3850	1	Withdrawn
J1363	43381	J1363 GEN1 0.6900	1	Withdrawn
J1370	43700	J1370 GEN 0.4800	1	Withdrawn
J1371	43710	J1371 GEN 0.7200	1	Withdrawn
J1376	43760	J1376 GEN 0.7200	1	Withdrawn
J1385	43850	J1385 GEN 0.6300	1	Withdrawn
J1395	43950	J1395 GEN 0.6600	1	Withdrawn
J1395	43951	J1395 GEN1 0.6600	1	Withdrawn
J1398	43980	J1398 GEN 0.6000	1	Withdrawn

Prj #	Bus Number	Bus Name	Id	Status
J1403	44030	J1403 GEN 0.6600	1	Withdrawn
J1403	44031	J1403 GEN1 0.6600	1	Withdrawn
J1405	44050	J1405 GEN 0.6450	1	Withdrawn
J1408	44080	J1408 GEN 0.7200	1	Withdrawn
J1408	44081	J1408 GEN1 0.4800	1	Withdrawn
J1408	44082	J1408 GEN2 0.6600	1	Withdrawn
J1409	42751	J1409 GEN1 0.6300	1	Withdrawn
J1413	44130	J1413 GEN 0.6300	1	Withdrawn
J1413	44131	J1413 GEN1 0.6300	1	Withdrawn
J1416	44160	J1416 GEN 0.6300	1	Withdrawn
J1417	44170	J1417 GEN 0.6300	1	Withdrawn
J1418	44180	J1418 GEN 0.6300	1	Withdrawn
J1419	44190	J1419 GEN 0.6450	1	Withdrawn
J1438	44380	J1438 GEN 0.6300	1	Withdrawn
J1446	44460	J1446 GEN 0.6900	1	Withdrawn
J1447	44470	J1447 GEN 0.6300	1	Withdrawn
J1448	44480	J1448 GEN 0.6300	1	Withdrawn
J1456	44560	J1456 GEN 0.6900	1	Withdrawn
J1456	44561	J1456 GEN1 0.6900	1	Withdrawn
J1456	44562	J1456 GEN2 0.6900	1	Withdrawn
J1457	44570	J1457 GEN 0.6900	1	Withdrawn
J1457	44571	J1457 GEN1 0.6900	1	Withdrawn
J1468	44680	J1468 GEN 0.6900	1	Withdrawn
J1471	44710	J1471 GEN 0.6300	1	Withdrawn
J1474	44740	J1474 GEN 0.6300	1	Withdrawn
J1478	44780	J1478 GEN 0.6900	1	Withdrawn
J1479	44790	J1479 GEN 0.6900	1	Withdrawn
J1487	44870	J1487 GEN 0.6900	1	Withdrawn
J1492	44920	J1492 GEN 0.6450	1	Withdrawn
J1494	44940	J1494 GEN 0.6450	1	Withdrawn
J1495	44950	J1495 GEN 0.6450	1	Withdrawn
J1497	44970	J1497 GEN 0.6300	1	Withdrawn

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Prj #	Bus Number	Bus Name	Id	Status
J1498	44980	J1498 GEN 0.6000	1	Withdrawn
J1510	45100	J1510 GEN 0.6300	1	Withdrawn
J1515	45150	J1515 GEN 0.6300	1	Withdrawn
J1516	45160	J1516 GEN 0.6300	1	Withdrawn
J1517	45170	J1517 GEN 0.5200	1	Withdrawn
J1526	45260	J1526 GEN 0.6300	1	Withdrawn
J1527	45270	J1527 GEN 0.6300	1	Withdrawn
J1537	45370	J1537 GEN 0.6300	1	Withdrawn
J1552	45520	J1552 GEN 0.6300	1	Withdrawn
J1563	45630	J1563 GEN 0.6300	1	Withdrawn
J1565	45650	J1565 GEN 0.6300	1	Withdrawn
J1567	45670	J1567 GEN 0.6300	1	Withdrawn
J1578	45780	J1578 GEN 0.6300	1	Withdrawn
J1579	45790	J1579 GEN 0.6300	1	Withdrawn
J1582	45820	J1582 GEN 0.6300	1	Withdrawn
J1585	45850	J1585 GEN 0.6300	1	Withdrawn
J1589	45890	J1589 GEN 0.6600	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
J1596	45960	J1596 GEN 0.6300	1	Withdrawn
J1600	46000	J1600 GEN 0.6300	PV	Withdrawn
J1609	46090	J1609 GEN 0.6900	1	Withdrawn
J1609	46091	J1609 GEN1 0.6900	1	Withdrawn
J1622	36220	J1622 GEN 0.6300	1	Withdrawn
J1624	46240	J1624 GEN 0.6300	1	Withdrawn
J1625	46250	J1625 GEN 0.6300	1	Withdrawn
J1632	46320	J1632 GEN 0.6900	1	Withdrawn
J1632	46321	J1632 GEN1 0.6900	1	Withdrawn
J1637	46370	J1637 GEN 0.6900	1	Withdrawn
J1637	46371	J1637 GEN1 0.6900	1	Withdrawn
J1639	46390	J1639 GEN 0.3850	1	Withdrawn

Prj #	Bus Number	Bus Name	Id	Status
J1652	46520	J1652 GEN 0.6450	1	Withdrawn
J1654	46540	J1654 GEN 0.6300	1	Withdrawn
J1655	46550	J1655 GEN 0.6000	1	Withdrawn
J1656	46560	J1656 GEN 0.7200	1	Withdrawn
J1656	46561	J1656 GEN1 0.7200	1	Withdrawn
J1656	46562	J1656 GEN2 0.6600	1	Withdrawn
J1656	46563	J1656 GEN3 0.6600	1	Withdrawn
J1660	46600	J1660 GEN 0.6300	1	Withdrawn
J1665	46650	J1665 GEN 0.6300	1	Withdrawn
J1666	46660	J1666 GEN 0.7200	1	Withdrawn
J1666	46661	J1666 GEN1 0.7200	1	Withdrawn
J1667	46670	J1667 GEN 0.7200	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 GEN 0.6300	1	Withdrawn
J1680	46800	J1680 GEN 0.6600	1	Withdrawn
J1681	46810	J1681 GEN 0.6300	1	Withdrawn
J1681	46811	J1681 GEN1 0.6300	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
J1699	46990	J1699 GEN 0.6300	1	Withdrawn
J1703	47030	J1703 GEN 0.6900	1	Withdrawn
J1704	47040	J1704 GEN 0.6300	1	Withdrawn
J1707	47070	J1707 GEN 0.6300	1	Withdrawn
J1708	47080	J1708 GEN 0.6300	1	Withdrawn
J1713	47130	J1713 GEN 1.0000	1	Withdrawn
J1716	47160	J1716 GEN 0.6450	1	Withdrawn
J1726	47260	J1726 GEN 0.6300	1	Withdrawn
J1727	631152	J1727 34.500	1	Withdrawn
J1728	631153	J1728 34.500	1	Withdrawn

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Prj #	Bus Number	Bus Name	Id	Status
J1729	629987	J1729 34.500	1	Withdrawn
J1729	629987	J1729 34.500	2	Withdrawn
J1735	47350	J1735 GEN 0.6300	1	Withdrawn
J1737	47370	J1737 GEN 0.6300	1	Withdrawn
J1754	47540	J1754 GEN 0.6900	1	Withdrawn
J1756	47560	J1756 GEN 0.6000	1	Withdrawn
J1756	47561	J1756 GEN1 0.5200	1	Withdrawn
J1758	657985	J1758 0.5750	W1	Withdrawn
J1758	657985	J1758 0.5750	W2	Withdrawn
J1761	615124	J1761 0.5750	W	Withdrawn
J1761	657964	J1761 0.5750	W1	Withdrawn
J1761	657964	J1761 0.5750	W2	Withdrawn
J1763	620412	J1763 0.5750	W1	Withdrawn
J1763	620413	J1763 0.5750	W1	Withdrawn
J1763	657600	J1763 0.5750	W1	Withdrawn
J1765	47650	J1765 GEN 0.6300	1	Withdrawn
J1767	629084	J1767 25.000	1	Withdrawn
J1770	47700	J1770 GEN 0.6900	1	Withdrawn
J1776	629147	J1776 34.500	1	Withdrawn
J1776	629147	J1776 34.500	2	Withdrawn
J1784	47840	J1784 GEN 0.6300	1	Withdrawn
J1800	600058	J1800 0.5750	W	Withdrawn
J1804	48041	J1804 GEN 0.6300	1	Withdrawn
J1806	48060	J1806 GEN 0.6300	1	Withdrawn
J1810	48100	J1810 GEN 0.6300	1	Withdrawn
J1815	48150	J1815 GEN 0.6000	1	Withdrawn
J1817	48170	J1817 GEN 0.6900	1	Withdrawn
J1817	48171	J1817 GEN1 0.6900	1	Withdrawn
J1829	48290	J1829 GEN 0.6300	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
J803	88035	J803 0.6000	PV	Withdrawn

Prj #	Bus Number	Bus Name	Id	Status
J832	256790	J832 G 0.5500	1	Withdrawn
J833	265675	J833 G 0.5500	PV	Withdrawn
J897	88977	J897 G1 0.6900	W	Withdrawn
J897	88978	J897 G2 0.6900	W	Withdrawn
J974	89740	J974 GEN 0.6900	1	Withdrawn
J974	89741	J974 GEN1 0.6900	1	Withdrawn
J979	89790	J979 GEN 0.6900	1	Withdrawn
J979	89791	J979 GEN1 0.6900	1	Withdrawn

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A.4 MPC Prior Queued Generation Projects

Table A-4: 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

A.5 AECI Prior Queued Generation Projects

Table A-5: 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

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A.6 MISO Model Updates

Table A-6: MISO Model Updates

MISO Model Updates	Change File
Remove the new Astoria-Brookings 345kV CKT2 (620483-601031 2)	RMV Astoria-Brookings 345kV.py
Correct Astoria-Brookings 345kV CKT1 rating to 1792 MVA SN/SE	Correct Astoria-Brks Rating.py
Remove the new Hazel Creek-Scott Co 345kV CKT1 (601054-601055 1)	RMV Hazel Crk-Scott Co.py
Revert the Hankinson-Wahpeton 230kV line rating and parameters to 479/527 MVA SN/SE	Correct Hankinson-Wahpeton.py
Add spot load of 155MW at Big Stone South. MTEP ID#50603	OTP_EXPEDITED_50603_Big_Stone_South_Load_Addtion-155MW.idv
Add spot load of 55MW at Jamestown 7(620269) and 45MW at Jamestown9 (620169),	Jamestown Load.idv
Add spot load of 225MW at Ellendale 230kV (661026). MTEP ID#50037	MDU-50037-EPR-EllendaleDataCenter2.idv
Add spot load of 125MW at Ellendale Data bus 230kV (661088) and associated upgrades. MTEP ID#50037	MDU-50152-EPR-EllendaleDataCenter3.idv
Remove shunts at Winger 230 kV (657758)	RMV Winger Caps.py
Remove 100 MVAR Capacitor Bank at Montezuma 345 (635730)	RMV Montezuma Cap.py
Capacitor at Bagley 115: 1x20 Mvar (620239)	Add OTP_Bagley_115cap.py
100 MVAR switched cap at Blackhawk 345 kV (636199)	Add 100 MVAR Blkhawk.py
40 MVar switched cap at Wahpeton 230 kV (620329)	Add 40 MVAR Wahpeton.py
60 MVar switched cap at Buffalo 345 kV (620358)	Add 60 MVAR Buffalo.py
Add breaker to the Bison shunt reactor	Bison Reactor_Switch.py

A.7 MISO North for Power Balance

Table A-7. 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		

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A.8 SPP Market for Power Balance

Table A-8. SPP Market for Power Balance

Area #	Area Name
506	MJMEUC
515	SWPA
520	AEPW
523	GRDA
524	OKGE
525	WFEC
526	SPS
527	OMPA
531	MIDW
534	SUNC
536	WERE
541	KCPL

Area #	Area Name
542	KACY
544	EMDE
545	INDN
546	SPRM
640	NPPD
641	HAST
642	GRIS
645	OPPD
650	LES
652	WAPA
659	BEPC-SPP

A.9 SPP Market for Power Balance

Table A-9. AECI for Power Balance

Area #	Area Name
330	AECI

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A.10 Contingency Files used in Steady-State Analysis

Table A-10: List of Contingencies used in the Steady-State Analysis

Contingency File Name	Description
Automatic single element contingencies	Single element outages at buses 57 kV and above in the study region
MISO20_2025_SUM__TA_P1_AMRN.con	Specified category P1 contingencies in Ameren
MISO20_2025_SUM__TA_P1_IOWA.con	Specified category P1 contingencies in Iowa
MISO20_2025_SUM__TA_P1_IOWA_ITCM_MPW.con	Specified category P1 contingencies in ITCM, MPW
MISO20_2025_SUM__TA_P1_IOWA_MEC.con	Specified category P1 contingencies in MEC
MISO20_2025_SUM__TA_P1_MINN-DAKS.con	Specified category P2 contingencies in Minnesota, Dakotas
MISO20_2025_SUM__TA_P1_P2_P4_P5_NoLoadLoss.con	Specified category P1, P2, P4, P5 no load loss contingencies in MISO
MISO20_2025_SUM__TA_P2_P4_P5_P6_P7_LoadLoss.con	Specified category P2, P4, P5, P6, P7 load loss contingencies in MISO
MISO20_2025_SUM__TA_P2_P7_MEC.con	Specified category P2, P7 contingencies in MEC
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
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

Appendix

B

MISO Steady State Thermal and Voltage Analysis Results

B.1 Summer Peak (SPK) MISO AFSIS Constraints

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B.2 Summer Shoulder (SH) MISO AFSIS Constraints

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Appendix

C

Stability Analysis Results

C.1 Summer Peak Stability Results

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

C.1.1 SPK MISO AFSIS Stability Summary

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

Table C-1: Summer Peak MISO AFSIS Stability Analysis Results Summary

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C.1.2 SPK MISO AFSIS Stability Plots

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

AppendixC1-2_SPK_DISIS-2018-001_Study_Plots.zip

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C.2 Summer Shoulder Stability Results

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

C.2.1 SH MISO AFSIS Stability Summary

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

Table C-2: Summer Shoulder MISO AFSIS Stability Analysis Results Summary

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C.2.2 SH MISO AFSIS Stability Plots

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

AppendixC2-2_SH_DISIS-2018-001_Study_Plots.zip

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