# GENERATOR INTERCONNECTION LIMITED OPERATION IMPACT STUDY REPORT

ASGI-2016-005

ASGI-2016-006

ASGI-2016-007

Published February 2017

By SPP Generator Interconnections Dept.

# REVISION HISTORY

| Date | Author | Change Description |
|---|---|---|
| 1/12/2017 | SPP | Limited Operation Impact Study (LOIS) for ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 Report Revision 0 Issued |
| 2/9/2017 | SPP | Limited Operation Impact Study (LOIS) for ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 Report Revision 1 Issued for Table 1,2, and 3 Updates |

# EXECUTIVE SUMMARY

An Affected System Interconnection Customer has requested an Affected System Limited Operation System Impact Study (AS-LOIS) consistent with Southwest Power Pool Open Access Transmission Tariff (OATT) for ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007. ASGI-2016-005 (20MW), ASGI-2016-006 (20MW) and ASGI-2016-007 (20MW) wind generating facilities are to be interconnected into the system of NorthWestern Energy (NWE). The NorthWestern Energy system interconnects to Western Area Power Administration (WAPA) in Aurora and Davison Counties, South Dakota. ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 have requested this Limited Operation Interconnection Study (LOIS) to determine the impacts of interconnecting to the transmission system before all required Network Upgrades identified in the DISIS-2015-002 Impact Study can be placed into service.

This Affected System LOIS addresses the effects of interconnecting the generators to the rest of the transmission system for the system topology and conditions as expected on December 31, 2016 and prior to the completion of the required Network Upgrades listed in Table 2. These required Network Upgrades are not expected to be in service by December 2016. ASGI-2016-005 is requesting the interconnection of eight (8) GE 2.5 MW wind turbines and associated facilities interconnecting to NWE at the Mount Vernon 69kV substation in Aurora County, South Dakota. ASGI-2016-006 is requesting the interconnection of eight (8) GE 2.5 MW wind turbines and associated facilities interconnecting to NWE at Mitchell Northwest 115kV substation in Davison County, South Dakota. ASGI-2016-007 is requesting the interconnection of eight (8) GE 2.5 MW wind turbines and associated facilities interconnecting to NWE at the Mount Vernon 69kV substation in Aurora County, South Dakota. The Affected System LOIS assumes that only the higher queued projects listed within Table 1 of this study might go into service before the completion of all Network Upgrades identified within Table 2 of this report. If additional generation projects, listed within Table 3, with queue priority equal to or higher than the study project request to go into commercial operation before all Network Upgrades identified within Table 2 of this report are completed, this Affected System LOIS may be revised to ensure that adequate interconnection service remains available to accommodate the customer's request.

Power flow and stability analysis from this Affected System LOIS has determined that the ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 requests can interconnect 60.0 MW of generation with Energy Resource Interconnection Service (ERIS) prior to the completion of the required Network Upgrades, listed within **Table 2** of this report provided the Network Upgrades are able to be placed in service prior to December 31, 2020. Should any other projects, other than those listed within Table 1 of this report, come into service an additional study may be required to determine if any limited operation service is available. It should be noted that although this Affected System LOIS analyzed many of the most probable contingencies, it is not an all-inclusive list that can account for every operational situation. Additionally, the generator may not be able to inject any power onto the Transmission System due to constraints that fall below the threshold of mitigation for a Generator Interconnection request. Because of this, it is likely that the Customer(s) may be required to reduce their generation output to **0 MW** under certain system conditions to allow system operators to maintain the reliability of the transmission network.

Transient stability analysis for this LOIS has determined that no issues were observed for the transmission system for the forty-six (46) selected faults for the limited operation interconnection of ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 and the analysis shows that the generators will meet Low Voltage Ride-Through (LVRT) requirements of FERC Order #661A. As discussed above, this amount may be reduced further dependent upon system conditions at the time of the outage. The oscillations for FLT15, FLT16, FLT18 and the prior outage FLT36 at Wessington generation is a pre-existing condition when these outages occur. A separate analysis confirmed the oscillations of the Wessington unit with ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 offline.

Nothing in this study should be construed as a guarantee of delivery or transmission service. If the customer(s) wishes to move power across the facilities of SPP, a separate request for transmission service must be made on Southwest Power Pool's OASIS by the Customer(s).

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# PURPOSE

An Affected System Interconnection Customer has requested an Affected System Limited Operation System Impact Study (AS-LOIS) consistent with the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT) for interconnection requests into the system of NorthWestern Energy.

The purpose of this study is to evaluate the impacts of interconnecting ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 requests. ASGI-2016-005 is requesting the interconnection of eight (8) GE 2.5 MW wind turbines and associated facilities interconnecting to NWE at the Mount Vernon 69kV substation in Aurora County, South Dakota. ASGI-2016-006 is requesting the interconnection of eight (8) GE 2.5 MW wind turbines and associated facilities interconnecting to NWE at Mitchell Northwest 115kV substation in Davison County, South Dakota. ASGI-2016-007 is requesting the interconnection of eight (8) GE 2.5 MW wind turbines and associated facilities interconnecting to NWE at the Mount Vernon 69kV substation in Aurora County, South Dakota. The Affected System Interconnection Customer(s) have requested this amount to be studied with Energy Resource Interconnection Service (ERIS) to commence on or around December, 2016.

The LOIS considers the Base Case as well as all Generating Facilities (and with respect to (b) below, any identified Network Upgrades associated with such higher queued interconnection) that, on the date the LOIS is commenced:

a) are directly interconnected to the Transmission System;
b) are interconnected to Affected Systems and may have an impact on the Interconnection Request;
c) have a pending higher queued Interconnection Request to interconnect to the Transmission System listed in Table 1; or
d) have no Queue Position but have executed an LGIA or requested that an unexecuted LGIA be filed with FERC.

Any changes to these assumptions, for example, one or more of the previously queued requests not included within this study execute an interconnection agreement and commencing commercial operation, may require a re-study of this LOIS at the expense of the Customer(s).

Nothing within this System Impact Study constitutes a request for transmission service or confers upon the Interconnection Customer(s) any right to receive transmission service rights. Should the Customer(s) require transmission service, those rights should be requested through SPP's Open Access Same-Time Information System (OASIS) or that of the applicable transmission provider.

This LOIS study included prior queued generation interconnection requests. Those listed within Table 1 are the generation interconnection requests that are assumed to have rights to either full or partial interconnection service prior to the requested December 2016 in-service for this AS-LOIS. Also listed in Table 1 are both the amount of MW of interconnection service expected at the effective time of this study and the total MW requested of interconnection service, the fuel type, the point of interconnection (POI), and the current status of each particular prior queued request.

*Table 1: Generation Requests Included within LOIS*

| Project | MW | Total MW | Fuel Source | POI | Status |
|---|---|---|---|---|---|
| G176 | 100 | 100 | Wind | Yankee 115kV Substation | IA Fully Executed/Commercial Operation |

*Table 1: Generation Requests Included within LOIS*

| Project | MW | Total MW | Fuel Source | POI | Status |
|---|---|---|---|---|---|
| G255 | 100 | 100 | Wind | Yankee 115kV Substation | IA Fully Executed/Commercial Operation |
| G586 | 30 | 30 | Wind | Xcel New Yankee Substation 34.5kV | IA Fully Executed/Commercial Operation |
| G736 | 200 | 200 | Wind | Big Stone South 230kV Substation | IA Pending |
| H081 | 201 | 201 | Wind | Brookings County – Lyon County 345kV | IA Fully Executed/Commercial Operation |
| J432 | 98 | 98 | Wind | Brookings 345kV Substation | DPP System Impact Study |
| J436 | 150 | 150 | Wind | Big Stone South 345kV Substation | DPP System Impact Study |
| J437 | 150 | 150 | Wind | Big Stone South 345kV Substation | DPP System Impact Study |
| J442 | 200 | 200 | Wind | Big Stone South 230kV Substation | DPP System Impact Study |
| J460 | 200 | 200 | Wind | Brookings – H081 345kV | DPP System Impact Study |
| J488 | 151.8 | 151.8 | Wind | Big Stone South 345kV Substation | DPP System Impact Study |
| J489 | 151.8 | 151.8 | Wind | Big Stone South 345kV Substation | DPP System Impact Study |
| J490 | 60 | 60 | Wind | McIntosh 115kV Substation | DPP System Impact Study |
| J493 | 150 | 150 | Wind | BURR 115kV Substation | DPP System Impact Study |
| J510 | 326.9 | 326.9 | Gas | Big Stone South 345kV Substation | DPP System Impact Study |
| J525 | 50 | 50 | Solar | Lake Wilson – Hadley 69kV | DPP System Impact Study |
| J526 | 300 | 300 | Wind | Big Stone South 345kV Substation | DPP System Impact Study |
| GEN-2002-009IS (GI-0209) | 40.5 | 40.5 | Wind | Hyde 69kV Substation | IA Fully Executed/Commercial Operation |
| GEN-2007-013IS (GI-0713) | 50 | 50 | Wind | Wessington Springs 230kV Substation | IA Fully Executed/Commercial Operation |
| GEN-2007-014IS (GI-0714) | 100 | 100 | Wind | Wessington Springs 230kV Substation | IA Fully Executed/Commercial Operation |
| GEN-2007-023IS (GI-0723) | 50 | 50 | Wind | Formit – Summit 115kV | On Suspension |
| GEN-2009-001IS (GI-0901) | 200 | 200 | Wind | Groton – Watertown 345kV | IA Fully Executed/On Schedule |
| GEN-2009-018IS (GI-0918) | 100 | 100 | Wind | Groton 115kV Substation | IA Fully Executed/Commercial Operation |
| GEN-2010-001IS (GI-1001) | 99 | 99 | Wind | Bismarck – Glenham 230kV | IA Fully Executed/On Schedule |
| GEN-2010-003IS (GI-1003) | 34 | 34 | Wind | Wessington Springs 230kV Substation | IA Fully Executed/Commercial Operation |
| GEN-2012-014IS (GI-1214) | 100.34 | 100.34 | Wind | Groton 115kV Substation | IA Fully Executed/On Schedule |
| GEN-2013-001IS (GI-1301) | 90 | 90 | Wind | Summit – Watertown 115kV | On Suspension |
| GEN-2013-009IS (GI-1309) | 19.5 | 19.5 | Wind | Redfield NW 115kV Substation | IA Fully Executed/Commercial Operation |
| GEN-2014-001IS (GI-1401) | 103.7 | 103.7 | Wind | Newell – Maurine 115kV | IA Fully Executed/On Suspension |
| ASGI-2016-005 | 20 | 20 | Wind | Mount Vernon 69kV | Under Affected System LOIS Study |
| ASGI-2016-006 | 20 | 20 | Wind | Mitchell Northwest 115kV | Under Affected System LOIS Study |
| ASGI-2016-007 | 20 | 20 | Wind | Mount Vernon 69kV | Under Affected System LOIS Study |

This LOIS was required because the Affected System Interconnection Customer(s) are requesting interconnection prior to the completion of higher queued required upgrades listed within the latest iteration of their Definitive Interconnection System Impact Study (DISIS).

Table 2 below lists the higher queued required upgrade projects for which these requests have cost responsibility. DISIS-2015-002-1 Group 15 Impact Restudy was posted August 5, 2016. The cluster has been restudied since the original posting.

DISIS-2015-002 reports can be located at the following Generation Interconnection Study URL: http://sppoasis.spp.org/documents/swpp/transmission/GenStudies.cfm?YearType=2015_Impact_Studies

ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 are included as prior queued to DISIS-2016-001 cluster and will be evaluated for impacts prior to DISIS-2016-001 study.

*Table 2: Upgrade Projects not included but Required for Full Interconnection Service*

| Upgrade Project | Type | Description | Status | Study Assignment |
|---|---|---|---|---|
| Groton - Ordway 115kV Circuit #2 | New Line | Build second circuit from Groton - Ordway | On schedule 2017 | WAPA Project |
| MISO MVP Projects | New Lines | Build Big Stone – Brookings and Build Big Stone South - Ellendale | Please refer to MISO for latest upgrade Information | |

Any changes to these assumptions, for example, one or more of the previously queued requests not included within this study execute an interconnection agreement and commencing commercial operation, may require a re-study of this Affected System LOIS at the expense of the Customer(s).

The higher or equally queued projects that were not included in this study are listed in Table 3. While this list is not all inclusive it is a list of the most probable and affecting prior queued requests that were not included within this LOIS, either because no request for an LOIS has been made or the request is on suspension, etc.

*Table 3: Higher or Equally Queued GI Requests not included within LOIS*

| Project | MW | Total MW | Fuel Source | POI | Status |
|---|---|---|---|---|---|
| Currently, none | | | | | |

Nothing in this System Impact Study constitutes a request for transmission service or grants the Interconnection Customer(s) any rights to transmission service.

# FACILITIES

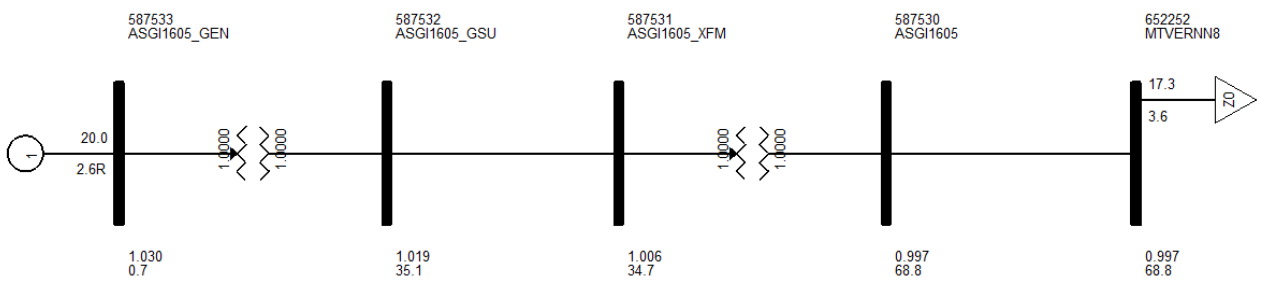
## GENERATING FACILITY

The Affected System Interconnection Customers' request is to interconnect three requests, ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007. ASGI-2016-005 is requesting the interconnection of eight (8) GE 2.5 MW wind turbines and associated facilities interconnecting at NWE Mount Vernon 69kV substation in Aurora County, South Dakota. ASGI-2016-006 is requesting the interconnection of eight (8) GE 2.5 MW wind turbines and associated facilities interconnecting at NWE Mitchell Northwest 115kV substation in Davison County, South Dakota. ASGI-2016-007 is requesting the interconnection of eight (8) GE 2.5 MW wind turbines and associated facilities interconnecting at NWE Mount Vernon 69kV substation in Aurora County, South Dakota.

## INTERCONNECTION FACILITIES

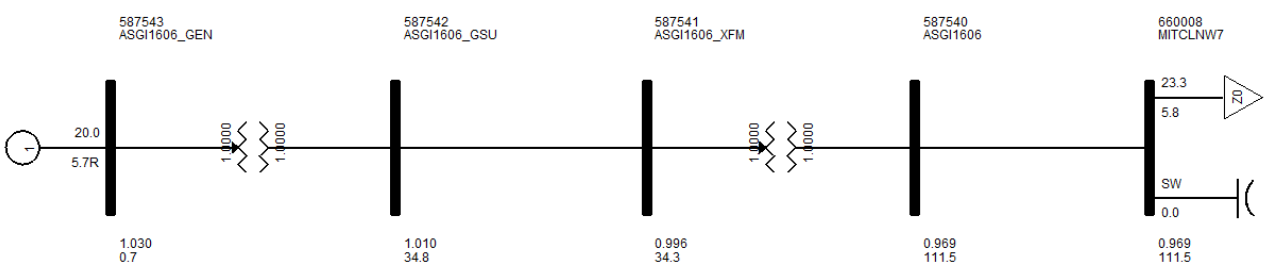
The POI for ASGI-2016-005 Interconnection Customer connects to the Affected System Mount Vernon 69kV substation in Aurora County, South Dakota. Figure 1 depicts the one-line diagram for the POI and the Interconnection Request(s).

*Figure 1: Proposed ASGI-2016-005 Configuration and Request Power Flow Model*



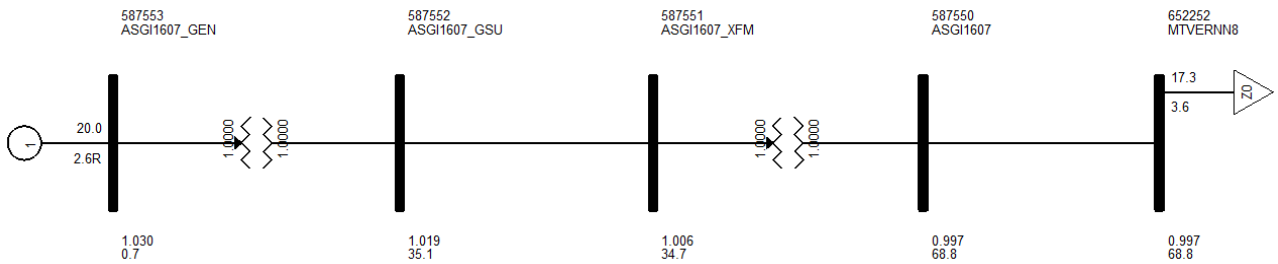

The POI for ASGI-2016-006 Interconnection Customer connects to the Affected System at the Mitchell Northwest 115kV substation in Davison County, South Dakota. Figure 2 depicts the one-line diagram for the POI and the Interconnection Request(s).

*Figure 2: Proposed ASGI-2016-006 Configuration and Request Power Flow Model*




The POI for ASGI-2016-007 Interconnection Customer connects to the Affected System Mount Vernon 69kV substation in Aurora County, South Dakota. Figure 3 depicts the one-line diagram for the POI and the Interconnection Request(s).

*Figure 3: Proposed ASGI-2016-007 Configuration and Request Power Flow Model*




## BASE CASE NETWORK UPGRADES

The Network Upgrades included within the cases used for this Affected System LOIS study are those facilities that are a part of the SPP Transmission Expansion Plan or the Balanced Portfolio projects that have in-service dates prior to the ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 Affected System LOIS. These facilities have an approved Notification to Construct (NTC), or are in construction stages and expected to be in-service at the effective time of this study. No other upgrades were included for this LOIS. If for some reason, construction on these projects is delayed or discontinued, a restudy may be needed to determine the interconnection service availability of the Customer(s).

# POWER FLOW ANALYSIS

Power flow analysis is used to determine if the transmission system can accommodate the injection from the request without violating thermal or voltage transmission planning criteria.

## *MODEL PREPARATION*

Power flow analysis was performed using modified versions of the 2015 series of transmission service request study models including the 2016 Winter Peak (16WP), 2017 Spring (17G), and 2017 Summer Peak (17SP), 2020 Light (20L), 2020 Summer (SP) and Winter (WP) peak and 2025 Summer Peak (25SP) seasonal models. To incorporate the Interconnection Customers' request, a re-dispatch of existing generation within SPP was performed with respect to the amount of the Customers' injection.

For Variable Energy Resources (VER) (solar/wind) in each power flow case, Energy Resource Interconnection Service (ERIS), is evaluated for the generating plants within a geographical area of the interconnection request(s) for the VERs dispatched at 100% nameplate of maximum generation. The VERs in the remote areas is dispatched at 20% nameplate of maximum generation. These projects are dispatched across the SPP footprint using load factor ratios.

Peaking units are not dispatched in the 2017 spring and 2020 light, or in the "High VER" summer and winter peaks. To study peaking units' impacts, the 2016 winter peak, 2017 summer peak, 2020 summer and winter peaks and 2025 summer peak models are developed with peaking units dispatched at 100% of the nameplate rating and VERs dispatched at 20% of the nameplate rating. Each interconnection request is also modeled separately at 100% nameplate for certain analyses.

All generators (VER and peaking) that requested Network Resource Interconnection Service (NRIS) are dispatched in an additional analysis into the interconnecting Transmission Owner's (T.O.) area at 100% nameplate with Energy Resource Interconnection Service (ERIS) only requests at 80% nameplate. This method allows for identification of network constraints that are common between regional groupings to have affecting requests share the mitigating upgrade costs throughout the cluster.

For this LOIS, only the previous queued requests listed in Table 1 were assumed to be in-service at 100% dispatch.

## *STUDY METHODOLOGY AND CRITERIA*

### THERMAL OVERLOADS

Network constraints are found by using PSS/E AC Contingency Calculation (ACCC) analysis with PSS/E MUST First Contingency Incremental Transfer Capability (FCITC) analysis on the entire cluster grouping dispatched at the various levels previously mentioned.

For Energy Resource Interconnection Service (ERIS), thermal overloads are determined for system intact (n-0) (greater than or equal to 100% of Rate A - normal) and for contingency (n-1) (greater than or equal to 100% of Rate B – emergency) conditions.

The overloads are then screened to determine which of generator interconnection requests have at least

- 3% Distribution Factor (DF) for system intact conditions (n-0),
- 20% DF upon outage based conditions (n-1),
- or 3% DF on contingent elements that resulted in a non-converged solution.

Interconnection Requests that requested Network Resource Interconnection Service (NRIS) are also studied in a separate NRIS analysis to determine if any constraint measured greater than or equal to a 3% DF. If so, these constraints are also considered for transmission reinforcement under NRIS.

The contingency set includes all SPP control area branches and ties 69kV and above, first tier Non-SPP control area branches and ties 115 kV and above, any defined contingencies for these control areas, and generation unit outages for the SPP control areas with SPP reserve share program redispatch.

The monitored elements include all SPP control area branches, ties, and buses 69 kV and above, and all first tier Non-SPP control area branches and ties 69 kV and above. NERC Power Transfer Distribution Flowgates for SPP and first tier Non-SPP control area are monitored. Additional NERC Flowgates are monitored in second tier or greater Non-SPP control areas. Voltage monitoring was performed for SPP control area buses 69 kV and above.

## VOLTAGE

For non-converged power flow solutions that are determined to be caused by lack of voltage support, appropriate transmission support will be determined to mitigate the constraint.

After all thermal overload and voltage support mitigations are determined; a full ACCC analysis is then performed to determine voltage constraints. The following voltage performance guidelines are used in accordance with the Transmission Owner local planning criteria.

***SPP Areas (69kV+):***

| Transmission Owner | Voltage Criteria (System Intact) | Voltage Criteria (Contingency) |
|---|---|---|
| AEPW | 0.95 – 1.05 pu | 0.92 – 1.05 pu |
| GRDA | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| SWPA | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| OKGE | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| OMPA | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| WFEC | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| SWPS | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| MIDW | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| SUNC | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| KCPL | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| INDN | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| SPRM | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| NPPD | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| WAPA | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| WERE L-V | 0.95 – 1.05 pu | 0.93 – 1.05 pu |
| WERE H-V | 0.95 – 1.05 pu | 0.95 – 1.05 pu |
| EMDE L-V | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| EMDE H-V | 0.95 – 1.05 pu | 0.92 – 1.05 pu |
| LES | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| OPPD | 0.95 – 1.05 pu | 0.90 – 1.05 pu |

***SPP Buses with more stringent voltage criteria:***

| Bus Name/Number | Voltage Criteria (System Intact) | Voltage Criteria (Contingency) |
|---|---|---|
| TUCO 230kV 525830 | 0.925 – 1.05 pu | 0.925 – 1.05 pu |
| Wolf Creek 345kV 532797 | 0.985 – 1.03 pu | 0.985 – 1.03 pu |
| FCS 646251 | 1.001 – 1.047 pu | 1.001 – 1.047 pu |

***Affected System Areas (115kV+):***

| Transmission Owner | Voltage Criteria (System Intact) | Voltage Criteria (Contingency) |
|---|---|---|
| EES-EAI | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| LAGN | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| EES | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| AMMO | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| CLEC | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| LAFA | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| LEPA | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| XEL | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| MP | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| SMMPA | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| GRE | 0.95 – 1.05 pu | 0.90 – 1.10 pu |
| OTP | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| OTP-H (115kV+) | 0.97 – 1.05 pu | 0.92 – 1.10 pu |
| ALTW | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| MEC | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| MDU | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| SPC | 0.95 – 1.05 pu | 0.95 – 1.05 pu |
| DPC | 0.95 – 1.05 pu | 0.90 – 1.05 pu |
| ALTE | 0.95 – 1.05 pu | 0.90 – 1.05 pu |

The constraints identified through the voltage scan are then screened for the following for each interconnection request. 1) 3% DF on the contingent element and 2) 2% change in pu voltage. In certain conditions, engineering judgement was used to determine whether or not a generator had impacts to voltage constraints.

## RESULTS

The LOIS ACCC analysis indicates that the Affected System Interconnection Customer(s) can interconnect their generation into the NWE transmission system at the available MW listed in the results tables before all required upgrades listed within the DISIS-2015-002 studies or latest iteration can be placed into service. Should any other GI projects, other than those listed within Table 1 of this report, come into service an additional study may be required to determine if any limited operation service is available. ACCC results for the LOIS can be found in Table 4 and Table 5.

Table 4 results are based on the study assumption of system conditions as of 12/31/2016 prior to the DISIS-2016-001 identified and assigned Network Upgrades.

Constraints listed in Table 5 do not require additional transmission reinforcement for Interconnection Service, but could require Interconnection Customer to reduce generation in operational conditions. These transmission constraints occur when this study's generation is dispatched into the SPP footprint for Energy Resource Interconnection Service (ERIS).

## CURTAILMENT AND SYSTEM RELIABILITY

In no way does this study guarantee operation for all periods of time. It should be noted that although this study analyzed many of the most probable contingencies, it is not an all-inclusive list and cannot account for every operational situation. Because of this, it is likely that the Customer(s) may be required to reduce their generation output to **0 MW** under certain system conditions to allow system operators to maintain the reliability of the transmission network.

*Table 4: Interconnection Constraints for Mitigation of LOIS as of 12/31/2016*

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Max MW Available | Contingency |
|---|---|---|---|---|---|---|---|---|---|---|
| 15ALL | n/a | ASGI_16_05 | n/a | n/a | n/a | n/a | n/a | n/a | 20 | n/a |
| 15ALL | n/a | ASGI_16_06 | n/a | n/a | n/a | n/a | n/a | n/a | 20 | n/a |
| 15ALL | n/a | ASGI_16_07 | n/a | n/a | n/a | n/a | n/a | n/a | 20 | n/a |

*Table 5: Constraints that do not require additional Transmission Reinforcements LOIS as of 12/31/2016*

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Contingency |
|---|---|---|---|---|---|---|---|---|---|
| 15ALL | 17SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 97.7 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 102.2349 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 102.3741 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04685 | 95.3 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05076 | 97.3 | P12:115:UMZW:# 537 #: TY IN SD. TY-YJ LINE FAULT |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04685 | 99.6 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 102.351 | P12:115:NPPD:1090:AINSWND7:THEDFRD7:BTB |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 98 | P12:115:NPPD:1090:AINSWND7:THEDFRD7:BTB |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 98.1 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05076 | 97.3 | P12:115:UMZW:# 1901 #: TY IN SD. TY-WSW LINE FAULT |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05076 | 97.3 | P13:115:UMZW:# 1902 #: TY IN SD. LOSS OF TRANSFORMER (KY1A). |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04695 | 99.1 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04695 | 103.5681 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 100.5474 | P12:115:UMZW:# 537 #: TY IN SD. TY-YJ LINE FAULT |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 96.1 | P12:115:UMZW:# 1901 #: TY IN SD. TY-WSW LINE FAULT |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 101.7043 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 100.5474 | P12:115:UMZW:# 1901 #: TY IN SD. TY-WSW LINE FAULT |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 96.1 | P12:115:UMZW:# 537 #: TY IN SD. TY-YJ LINE FAULT |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 96.1 | P13:115:UMZW:# 1902 #: TY IN SD. LOSS OF TRANSFORMER (KY1A). |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 106.1115 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 101.3778 | P12:115:NPPD:1090:AINSWND7:THEDFRD7:BTB |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 105.809 | P12:115:NPPD:1090:AINSWND7:THEDFRD7:BTB |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04697 | 96.3 | BASE CASE |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 100.5474 | P13:115:UMZW:# 1902 #: TY IN SD. LOSS OF TRANSFORMER (KY1A). |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.5 | FT THOMPSON - FTTHOM2-LNX3345.00 345KV CKT Z |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 98.8 | GRPRAR1-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 17SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05154 | 96.6 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04235 | 95.6 | ANTELOPE 3345.00 - HOSKINS 345KV CKT 1 |

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Contingency |
|---|---|---|---|---|---|---|---|---|---|
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 98.8 | GRANDPRAIRIE-HOLT-TLINE-REACTOR-CKT1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04235 | 95.6 | ANTELOPE 3345.00 (ANTELOPE T1) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 105.5956 | MISSION - ST FRANCIS 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.1 | GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04419 | 99.2 | MAXWELL - NORTH PLATTE 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0494 | 97.8 | FT RANDAL - UTICA JCT 230KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 96.5 | AINSWORTH - VALENTINE 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.5 | GRPRAR2-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04101 | 95.1 | STAPLETON - THEDFORD 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.5 | FTTHOM2-LNX3345.00 - GRPRAR2-LNX3345.00 345KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 100.5856 | GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04101 | 96.7 | AINSWORTH - AINSWORTH 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05154 | 97.2 | FT RANDAL - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 101.6786 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 103.9396 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 97.2 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.1 | GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 100.5509 | GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.5 | FTTHOMPSON-GRANDPRAIRIE-TLINE-REACTOR-CKT1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05154 | 101.0692 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 101.0694 | MISSION - ST FRANCIS 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04101 | 102.1286 | MAXWELL - STAPLETON 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 99.4 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.5 | GRANDPRAIRIE-FTTHOMPSON-TLINE-REACTORS-CKT1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04595 | 95.7 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04954 | 95.9 | FT RANDAL - SIOUX CITY 230KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 98.8 | GRPRAR1-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 17SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04101 | 97.6 | MAXWELL - STAPLETON 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 98 | FTTHOM2-LNX3345.00 - GRPRAR2-LNX3345.00 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04686 | 96.5 | GEN640011 2-GERALD GENTLEMAN STATION UNIT 2 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 99.1 | ATKINSON - STUART 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 100.9683 | BASSETT 7115.00 - STUART 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 106.9576 | AINSWORTH - BASSETT 7115.00 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04864 | 96.1 | RASMUSN - UTICA JCT 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04365 | 98.7 | ANTELOPE 3345.00 (ANTELOPE T1) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04686 | 96.3 | GEN640010 1-GERALD GENTLEMAN STATION UNIT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 100.6184 | GRPRAR1-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Contingency |
|---|---|---|---|---|---|---|---|---|---|
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 103.5354 | ATKINSON - STUART 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04752 | 95.8 | GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 102.0053 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 101.0307 | ATKINSON - EMMET 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 98.1 | CALAMUS - THEDFORD 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 105.3458 | BASSETT 7115.00 - STUART 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 98 | FTTHOMPSON-GRANDPRAIRIE-TLINE-REACTOR-CKT1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05247 | 105.9957 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04521 | 95.5 | THEDFRD3 345.00 (THEDFORDT2) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04864 | 95.6 | RASMUSN - SIOUX CITY 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04685 | 95.3 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 104.6511 | MISSION - ST FRANCIS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 100.6226 | GRPRAR1-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 104.9287 | GRPRAR1-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04686 | 95.8 | GEN336821 1-GRAND GULF UNIT |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 105.4669 | AINSWORTH - AINSWORTH 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04686 | 95.6 | GEN635024 4-WALTER SCOTT UNIT 4 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05247 | 101.6804 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 101.029 | AINSWORTH - AINSWORTH 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05042 | 97 | FT RANDAL - UTICA JCT 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 102.2486 | GRPRAR2-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 100.3457 | MISSION - ST FRANCIS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05054 | 100.0547 | FT RANDAL - SIOUX CITY 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05247 | 97.9 | FT RANDAL - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 96.7 | ATKINSON - EMMET 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05076 | 97.7 | FT RANDAL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 97.4 | EMMET - EMMETE.TAP 7115.00 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 102.3487 | AINSWORTH - CALAMUS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04365 | 98.7 | ANTELOPE 3345.00 - HOSKINS 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 104.9285 | GRANDPRAIRIE-HOLT-TLINE-REACTOR-CKT1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 97.7 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05247 | 102.1473 | FT RANDAL - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 104.9245 | GRPRAR1-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04822 | 97.8 | BLOOMFIELD - GAVINS POINT 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 97.9 | GRPRAR2-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 98 | AINSWORTH - CALAMUS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04752 | 95.8 | GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 98 | FT THOMPSON - FTTHOM2-LNX3345.00 345KV CKT Z |

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Contingency |
|---|---|---|---|---|---|---|---|---|---|
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 99.2 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 102.254 | GRANDPRAIRIE-FTTHOMPSON-TLINE-REACTORS-CKT1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 102.4477 | CALAMUS - THEDFORD 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 102.3151 | FTTHOMPSON-GRANDPRAIRIE-TLINE-REACTOR-CKT1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 102.6555 | AINSWORTH - BASSETT 7115.00 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 103.5386 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 98 | GRANDPRAIRIE-FTTHOMPSON-TLINE-REACTORS-CKT1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04685 | 99.6 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04521 | 99.8 | THEDFRD3 345.00 (THEDFORDT2) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05054 | 95.8 | FT RANDAL - SIOUX CITY 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 100.6224 | GRANDPRAIRIE-HOLT-TLINE-REACTOR-CKT1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04822 | 98 | BLOOMFIELD - CREIGHTON 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05007 | 96 | HANLON - STORLA 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05076 | 97.4 | TYNDALL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 102.2567 | FT THOMPSON - FTTHOM2-LNX3345.00 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05042 | 101.285 | FT RANDAL - UTICA JCT 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 102.293 | FTTHOM2-LNX3345.00 - GRPRAR2-LNX3345.00 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 98.4 | AINSWORTH - VALENTINE 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 105.9449 | FTTHOM2-LNX3345.00 - GRPRAR2-LNX3345.00 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 101.8714 | AINSWORTH - VALENTINE 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 105.8067 | AINSWORTH - CALAMUS 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04671 | 98.9 | COLUMBUS - GENOA 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 101.069 | ATKINSON - STUART 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 108.6036 | MISSION - ST FRANCIS 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04763 | 98.9 | GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04373 | 98.5 | ANTELOPE 3345.00 - HOSKINS 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 101.5415 | FTTHOMPSON-GRANDPRAIRIE-TLINE-REACTOR-CKT1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04911 | 98.8 | MISSION - WITTEN 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 100.6041 | TYNDALL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 104.2444 | GRPRAR1-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04695 | 103.5681 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 101.3077 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0526 | 109.1505 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04834 | 96.8 | BLOOMFIELD - GAVINS POINT 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05066 | 98.7 | FT RANDAL - SIOUX CITY 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 108.6802 | GRPRAR1-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 105.9927 | GRPRAR2-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04834 | 101.2057 | BLOOMFIELD - GAVINS POINT 115KV CKT 1 |

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Contingency |
|---|---|---|---|---|---|---|---|---|---|
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04834 | 96.9 | BLOOMFIELD - CREIGHTON 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 101.568 | GRANDPRAIRIE-FTTHOMPSON-TLINE-REACTORS-CKT1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 96.5 | FT RANDAL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 102.7052 | ATKINSON - EMMET 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 103.1097 | BASSETT 7115.00 - STUART 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 107.6182 | BASSETT 7115.00 - STUART 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 108.6811 | GRPRAR1-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05066 | 103.1107 | FT RANDAL - SIOUX CITY 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0526 | 105.2739 | FT RANDAL - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 105.6201 | ATKINSON - STUART 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05054 | 100.1577 | FT RANDAL - UTICA JCT 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04531 | 103.3321 | THEDFRD3 345.00 (THEDFORDT2) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 109.0214 | AINSWORTH - BASSETT 7115.00 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04876 | 99.1 | RASMUSN - UTICA JCT 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 105.9697 | FTTHOMPSON-GRANDPRAIRIE-TLINE-REACTOR-CKT1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04834 | 101.304 | BLOOMFIELD - CREIGHTON 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 101.572 | FT THOMPSON - FTTHOM2-LNX3345.00 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 108.6796 | GRANDPRAIRIE-HOLT-TLINE-REACTOR-CKT1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 96.2 | TYNDALL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 107.3853 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05018 | 99.3 | HANLON - STORLA 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04695 | 99.1 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04531 | 98.9 | THEDFRD3 345.00 (THEDFORDT2) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05054 | 104.5821 | FT RANDAL - UTICA JCT 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0526 | 104.7158 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 101.4744 | CALAMUS - THEDFORD 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04373 | 98.5 | ANTELOPE 3345.00 (ANTELOPE T1) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 101.5169 | FTTHOM2-LNX3345.00 - GRPRAR2-LNX3345.00 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0526 | 100.8463 | FT RANDAL - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 102.951 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04763 | 99 | GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 105.7133 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 104.2436 | GRANDPRAIRIE-HOLT-TLINE-REACTOR-CKT1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 105.996 | GRANDPRAIRIE-FTTHOMPSON-TLINE-REACTORS-CKT1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 98.3 | ATKINSON - EMMET 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 101.3757 | AINSWORTH - CALAMUS 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 104.1632 | MISSION - ST FRANCIS 115KV CKT 1 |

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Contingency |
|---|---|---|---|---|---|---|---|---|---|
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 104.6019 | AINSWORTH - BASSETT 7115.00 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04373 | 102.995 | ANTELOPE 3345.00 - HOSKINS 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 109.2854 | AINSWORTH - AINSWORTH 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 100.911 | FT RANDAL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 101.5644 | GRPRAR2-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 105.9042 | CALAMUS - THEDFORD 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04373 | 102.9407 | ANTELOPE 3345.00 (ANTELOPE T1) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 97.5 | AINSWORTH - VALENTINE 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04697 | 98.8 | GEN635024 4-WALTER SCOTT UNIT 4 |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 106.0007 | FT THOMPSON - FTTHOM2-LNX3345.00 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_05 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04697 | 98.8 | GEN336821 1-GRAND GULF UNIT |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 104.2441 | GRPRAR1-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_05 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 104.6872 | AINSWORTH - AINSWORTH 115KV CKT 1 |
| 15ALL | 20L | ASGI_16_06 | | BROOKING COUNTY - LYON COUNTY 345KV CKT 1 | 2066 | 2066 | 0.06312 | 17.96919 | BASE CASE |
| 15ALL | 17SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 97.7 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 102.2349 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 20L | ASGI_16_07 | | BROOKING COUNTY - LYON COUNTY 345KV CKT 1 | 2066 | 2066 | 0.05525 | 17.96919 | BASE CASE |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 98.1 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 102.351 | P12:115:NPPD:1090:AINSWND7:THEDFRD7:BTB |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04685 | 99.6 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05076 | 97.3 | P13:115:UMZW:# 1902 #: TY IN SD. LOSS OF TRANSFORMER (KY1A). |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05076 | 97.3 | P12:115:UMZW:# 1901 #: TY IN SD. TY-WSW LINE FAULT |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04685 | 95.3 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 102.3741 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05076 | 97.3 | P12:115:UMZW:# 537 #: TY IN SD. TY-YJ LINE FAULT |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 98 | P12:115:NPPD:1090:AINSWND7:THEDFRD7:BTB |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 96.1 | P13:115:UMZW:# 1902 #: TY IN SD. LOSS OF TRANSFORMER (KY1A). |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 105.809 | P12:115:NPPD:1090:AINSWND7:THEDFRD7:BTB |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 96.1 | P12:115:UMZW:# 1901 #: TY IN SD. TY-WSW LINE FAULT |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04695 | 103.5681 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 106.1115 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 100.5474 | P13:115:UMZW:# 1902 #: TY IN SD. LOSS OF TRANSFORMER (KY1A). |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 101.7043 | P12:115:NPPD:1091:VALENTN7:MISSION7:BTB |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 96.1 | P12:115:UMZW:# 537 #: TY IN SD. TY-YJ LINE FAULT |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 100.5474 | P12:115:UMZW:# 537 #: TY IN SD. TY-YJ LINE FAULT |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04695 | 99.1 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04697 | 96.3 | BASE CASE |

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Contingency |
|---|---|---|---|---|---|---|---|---|---|
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 101.3778 | P12:115:NPPD:1090:AINSWND7:THEDFRD7:BTB |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 100.5474 | P12:115:UMZW:# 1901 #: TY IN SD. TY-WSW LINE FAULT |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04235 | 95.6 | ANTELOPE 3345.00 (ANTELOPE T1) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 98.8 | GRANDPRAIRIE-HOLT-TLINE-REACTOR-CKT1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.5 | FTTHOM2-LNX3345.00 - GRPRAR2-LNX3345.00 345KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.1 | GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04954 | 95.9 | FT RANDAL - SIOUX CITY 230KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04101 | 97.6 | MAXWELL - STAPLETON 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 98.8 | GRPRAR1-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 17SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 97.2 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.5 | FTTHOMPSON-GRANDPRAIRIE-TLINE-REACTOR-CKT1 |
| 15ALL | 17SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 101.0694 | MISSION - ST FRANCIS 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 100.5856 | GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04235 | 95.6 | ANTELOPE 3345.00 - HOSKINS 345KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05154 | 96.6 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0494 | 97.8 | FT RANDAL - UTICA JCT 230KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 100.5509 | GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04101 | 96.7 | AINSWORTH - AINSWORTH 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 105.5956 | MISSION - ST FRANCIS 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05154 | 101.0692 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04101 | 95.1 | STAPLETON - THEDFORD 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04595 | 95.7 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04419 | 99.2 | MAXWELL - NORTH PLATTE 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 101.6786 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.5 | GRANDPRAIRIE-FTTHOMPSON-TLINE-REACTORS-CKT1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05154 | 97.2 | FT RANDAL - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 98.8 | GRPRAR1-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 96.5 | AINSWORTH - VALENTINE 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.1 | GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.5 | GRPRAR2-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 17SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 99.4 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05 | 96.5 | FT THOMPSON - FTTHOM2-LNX3345.00 345KV CKT Z |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04101 | 102.1286 | MAXWELL - STAPLETON 115KV CKT 1 |
| 15ALL | 17SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04831 | 103.9396 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 101.0307 | ATKINSON - EMMET 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05247 | 105.9957 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 98 | FT THOMPSON - FTTHOM2-LNX3345.00 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 98.1 | CALAMUS - THEDFORD 115KV CKT 1 |

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Contingency |
|---|---|---|---|---|---|---|---|---|---|
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 98 | FTTHOMPSON-GRANDPRAIRIE-TLINE-REACTOR-CKT1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 103.5386 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 100.9683 | BASSETT 7115.00 - STUART 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 105.4669 | AINSWORTH - AINSWORTH 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04752 | 95.8 | GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05042 | 101.285 | FT RANDAL - UTICA JCT 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 97.7 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05054 | 95.8 | FT RANDAL - SIOUX CITY 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 100.3457 | MISSION - ST FRANCIS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04521 | 99.8 | THEDFRD3 345.00 (THEDFORDT2) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 102.6555 | AINSWORTH - BASSETT 7115.00 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 102.3487 | AINSWORTH - CALAMUS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04752 | 95.8 | GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 106.9576 | AINSWORTH - BASSETT 7115.00 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 102.3151 | FTTHOMPSON-GRANDPRAIRIE-TLINE-REACTOR-CKT1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 98.4 | AINSWORTH - VALENTINE 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 102.4477 | CALAMUS - THEDFORD 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04822 | 97.8 | BLOOMFIELD - GAVINS POINT 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04686 | 96.5 | GEN640011 2-GERALD GENTLEMAN STATION UNIT 2 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 98 | FTTHOM2-LNX3345.00 - GRPRAR2-LNX3345.00 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05247 | 101.6804 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 100.6224 | GRANDPRAIRIE-HOLT-TLINE-REACTOR-CKT1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 102.2567 | FT THOMPSON - FTTHOM2-LNX3345.00 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 99.1 | ATKINSON - STUART 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 104.9287 | GRPRAR1-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04365 | 98.7 | ANTELOPE 3345.00 - HOSKINS 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 97.4 | EMMET - EMMETE.TAP 7115.00 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 105.3458 | BASSETT 7115.00 - STUART 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 103.5354 | ATKINSON - STUART 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 101.029 | AINSWORTH - AINSWORTH 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04686 | 95.6 | GEN635024 4-WALTER SCOTT UNIT 4 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04864 | 95.6 | RASMUSN - SIOUX CITY 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 99.2 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04685 | 95.3 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05076 | 97.7 | FT RANDAL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 104.6511 | MISSION - ST FRANCIS 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05042 | 97 | FT RANDAL - UTICA JCT 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04094 | 98 | AINSWORTH - CALAMUS 115KV CKT 1 |

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Contingency |
|---|---|---|---|---|---|---|---|---|---|
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04864 | 96.1 | RASMUSN - UTICA JCT 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 97.9 | GRPRAR2-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 104.9245 | GRPRAR1-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04028 | 96.7 | ATKINSON - EMMET 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05007 | 96 | HANLON - STORLA 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 100.6226 | GRPRAR1-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 104.9285 | GRANDPRAIRIE-HOLT-TLINE-REACTOR-CKT1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04365 | 98.7 | ANTELOPE 3345.00 (ANTELOPE T1) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 100.6184 | GRPRAR1-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 102.2486 | GRPRAR2-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05076 | 97.4 | TYNDALL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04521 | 95.5 | THEDFRD3 345.00 (THEDFORDT2) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0489 | 102.0053 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04685 | 99.6 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05054 | 100.0547 | FT RANDAL - SIOUX CITY 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04686 | 96.3 | GEN640010 1-GERALD GENTLEMAN STATION UNIT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05247 | 102.1473 | FT RANDAL - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05247 | 97.9 | FT RANDAL - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04686 | 95.8 | GEN336821 1-GRAND GULF UNIT |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04822 | 98 | BLOOMFIELD - CREIGHTON 115KV CKT 1 |
| 15ALL | 20SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 98 | GRANDPRAIRIE-FTTHOMPSON-TLINE-REACTORS-CKT1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 102.254 | GRANDPRAIRIE-FTTHOMPSON-TLINE-REACTORS-CKT1 |
| 15ALL | 20SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05218 | 102.293 | FTTHOM2-LNX3345.00 - GRPRAR2-LNX3345.00 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04373 | 98.5 | ANTELOPE 3345.00 (ANTELOPE T1) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 101.5415 | FTTHOMPSON-GRANDPRAIRIE-TLINE-REACTOR-CKT1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 104.6019 | AINSWORTH - BASSETT 7115.00 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05066 | 98.7 | FT RANDAL - SIOUX CITY 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04834 | 96.9 | BLOOMFIELD - CREIGHTON 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 105.6201 | ATKINSON - STUART 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 103.1097 | BASSETT 7115.00 - STUART 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04763 | 98.9 | GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 101.4744 | CALAMUS - THEDFORD 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 101.572 | FT THOMPSON - FTTHOM2-LNX3345.00 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 108.6811 | GRPRAR1-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 108.6802 | GRPRAR1-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 100.911 | FT RANDAL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 108.6796 | GRANDPRAIRIE-HOLT-TLINE-REACTOR-CKT1 |

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Contingency |
|---|---|---|---|---|---|---|---|---|---|
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05054 | 104.5821 | FT RANDAL - UTICA JCT 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 101.3757 | AINSWORTH - CALAMUS 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 102.951 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 104.6872 | AINSWORTH - AINSWORTH 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0526 | 100.8463 | FT RANDAL - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 101.568 | GRANDPRAIRIE-FTTHOMPSON-TLINE-REACTORS-CKT1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04373 | 102.9407 | ANTELOPE 3345.00 (ANTELOPE T1) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 96.5 | FT RANDAL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04373 | 102.995 | ANTELOPE 3345.00 - HOSKINS 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 104.2441 | GRPRAR1-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 105.7133 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 106.0007 | FT THOMPSON - FTTHOM2-LNX3345.00 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04697 | 98.8 | GEN336821 1-GRAND GULF UNIT |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05054 | 100.1577 | FT RANDAL - UTICA JCT 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04695 | 99.1 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 104.2436 | GRANDPRAIRIE-HOLT-TLINE-REACTOR-CKT1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0526 | 104.7158 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04763 | 99 | GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 102.7052 | ATKINSON - EMMET 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04876 | 99.1 | RASMUSN - UTICA JCT 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.0526 | 109.1505 | KELLY - MEADOWGROVE4230.00 230KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 98.3 | ATKINSON - EMMET 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 108.6036 | MISSION - ST FRANCIS 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 109.2854 | AINSWORTH - AINSWORTH 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 104.2444 | GRPRAR1-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 105.9697 | FTTHOMPSON-GRANDPRAIRIE-TLINE-REACTOR-CKT1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 101.5644 | GRPRAR2-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 100.6041 | TYNDALL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 105.8067 | AINSWORTH - CALAMUS 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04531 | 103.3321 | THEDFRD3 345.00 (THEDFORDT2) 345/115/13.8KV TRANSFORMER CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04041 | 109.0214 | AINSWORTH - BASSETT 7115.00 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 101.3077 | HARMONY - VALENTINE 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04671 | 98.9 | COLUMBUS - GENOA 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04695 | 103.5681 | HOSKINS - RAUN 345KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04834 | 96.8 | BLOOMFIELD - GAVINS POINT 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04697 | 98.8 | GEN635024 4-WALTER SCOTT UNIT 4 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 101.8714 | AINSWORTH - VALENTINE 115KV CKT 1 |

| Dispatch Group | Season | Source | Flow | Monitored Element | RATEA (MVA) | RATEB (MVA) | TDF | TC% LOADING | Contingency |
|---|---|---|---|---|---|---|---|---|---|
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05231 | 105.9927 | GRPRAR2-LNX3345.00 - YANKTON 345KV CKT Z |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 104.1632 | MISSION - ST FRANCIS 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04903 | 107.3853 | HARMONY - ST FRANCIS 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04834 | 101.2057 | BLOOMFIELD - GAVINS POINT 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | TO->FROM | ONEILL - SPENCER 115KV CKT 1 | 120 | 120 | 0.05087 | 96.2 | TYNDALL - WHITE SWAN 115KV CKT 1 |
| 15ALL | 25SP | ASGI_16_07 | FROM->TO | FT RANDAL - SPENCER 115KV CKT 1 | 120 | 120 | 0.04103 | 105.9042 | CALAMUS - THEDFORD 115KV CKT 1 |

# STABILITY ANALYSIS

Transient stability analysis is used to determine if the transmission system can maintain angular stability and ensure bus voltages stay within planning criteria bandwidth during and after a disturbance while considering the addition of a generator interconnection request.

## *MODEL PREPARATION*

Transient stability analysis was performed using modified versions of the 2015 series of Model Development Working Group (MDWG) dynamic study models including the 2016 winter, 2017 and 2025 summer peak dynamic cases. The cases were adapted to resemble the power flow study cases with regards to prior queued generation requests and topology. Finally the prior queued and study generation was dispatched into the SPP footprint. Initial simulations are then carried out for a no-disturbance run of twenty (20) seconds to verify the numerical stability of the model.

## *DISTURBANCES*

The forty-six (46) contingencies were identified for the Limited Operation scenario for use in this study. These faults are listed within Table 6. These contingencies included three-phase faults and single-phase line faults at locations defined by SPP. Single-phase line faults were simulated by applying fault impedance to the positive sequence network at the fault location to represent the effect of the negative and zero sequence networks on the positive sequence network. The fault impedance was computed to give a positive sequence voltage at the specified fault location of approximately 60% of pre-fault voltage. This method is in agreement with SPP current practice.

With the exception of transformers, the typical sequence of events for a three-phase and single-phase fault is as follows:

1. apply fault at particular location
2. continue fault for six (6) cycles, clear the fault by tripping the faulted facility
3. run for an additional twenty (20) cycles

Transformer faults are typically modeled as three-phase faults, unless otherwise noted. The sequence of events for a transformer fault is as follows:

1. apply fault for six (6) cycles
2. clear the fault by tripping the affected transformer facility (unless otherwise noted there will be no re-closing into a transformer fault)

*Table 6: Contingencies Evaluated for Limited Operation*

| Contingency Number and Name | | Description |
|---|---|---|
| 1 | FLT_01_MTVERN7_ARMOUR7_115kV_3PH | 3 phase fault on the Mount Vernon (652518) to Armour (652501) 115kV line, near Mount Vernon.<br>a. Apply fault at the Mount Vernon 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 2 | FLT_02_MTVERN7_STORLA7_115kV_3PH | 3 phase fault on the Mount Vernon (652518) to Storla (659123) 115kV line, near Mount Vernon.<br>a. Apply fault at the Mount Vernon 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 3 | FLT_03_ARMOUR7_FTRANDL7_115kV_3PH | 3 phase fault on the Armour (652501) to Ft. Randall (652510) 115kV line, near Armour.<br>a. Apply fault at the Armour 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |

| Contingency Number and Name | | Description |
|---|---|---|
| 4 | FLT_04_STORLA7_WOONSKT7_115kV_3PH | 3 phase fault on the Storla (659123) to Woonsocket (652528) 115kV line, near Storla.<br>a. Apply fault at the Storla 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 5 | FLT_05_FTRANDL7_SPENCER7_115kV_3PH | 3 phase fault on the Ft. Randall (652510) to Spencer (640349) 115kV line, near Ft. Randall.<br>a. Apply fault at the Ft. Randall 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 6 | FLT_06_FTRANDL7_WHSWAN7_115kV_3PH | 3 phase fault on the Ft. Randall (652510) to WH Swan (652463) 115kV line, near Ft. Randall.<br>a. Apply fault at the Ft. Randall 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 7 | FLT_07_FTRANDL7_BONESTL7_115kV_3PH | 3 phase fault on the Ft. Randall (652510) to Bonesteel (652475) 115kV line, near Ft. Randall.<br>a. Apply fault at the Ft. Randall 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 8 | FLT_08_WOONSKT7_HURON7_115kV_3PH | 3 phase fault on the Woonsocket (652528) to Huron (652515) 115kV line, near Woonsocket.<br>a. Apply fault at the Woonsocket 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 9 | FLT_09_SPENCER7_ONEILL7_115kV_3PH | 3 phase fault on the Spencer (640349) to O'Neill (640305) 115kV line, near Spencer.<br>a. Apply fault at the Spencer 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 10 | FLT_10_WHSWAN7_TYNDALL7_115kV_3PH | 3 phase fault on the WH Swan (652463) to Tyndall (652525) 115kV line, near WH Swan.<br>a. Apply fault at the WH Swan 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 11 | FLT_11_BONESTL7_GREGORY7_115kV_3PH | 3 phase fault on the Bonesteel (652475) to Gregory (652478) 115kV line, near Bonesteel.<br>a. Apply fault at the Bonesteel 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 12 | FLT_12_HURON7_REDFELD7_115kV_3PH | 3 phase fault on the Huron (652515) to Redfield (652535) 115kV line, near Huron.<br>a. Apply fault at the Huron 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 13 | FLT_13_HURON7_HURONWP7_115kV_3PH | 3 phase fault on the Huron (652515) to Huron West Park (660003) 115kV line, near Huron.<br>a. Apply fault at the Huron 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 14 | FLT_14_HURON7_BTAPWP7_115kV_3PH | 3 phase fault on the Huron (652515) to Broadland Tap (660009) 115kV line, near Huron.<br>a. Apply fault at the Huron 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 15 | FLT_15_STORLA4_HANLON4_230kV_3PH | 3 phase fault on the Storla (659122) to Hanlon (652513) 230kV line, near Storla.<br>a. Apply fault at the Storla 230kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 16 | FLT_16_STORLA4_WESSINGTON4_230kV_3PH | 3 phase fault on the Storla (659122) to Wessington (652607) 230kV line, near Storla.<br>a. Apply fault at the Storla 230kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 17 | FLT_17_HANLON4_SIOUXFL4_230kV_3PH | 3 phase fault on the Hanlon (652513) to Sioux Falls (652523) 230kV line, near Hanlon.<br>a. Apply fault at the Hanlon 230kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 18 | FLT_18_WESSINGTON4_FTTHOMP4_230kV_3PH | 3 phase fault on the Wessington (652607) to Ft. Thompson (652507) 230kV line, near Wessington.<br>a. Apply fault at the Wessington 230kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 19 | FLT_19_MITCLNW7_MITCHEL7_115kV_3PH | 3 phase fault on the Mitchell NW (660008) to Mitchell (660004) 115kV line, near Mitchell NW.<br>a. Apply fault at the Mitchell NW 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 20 | FLT_20_MITCLNW7_HURONWP7_115kV_3PH | 3 phase fault on the Mitchell NW (660008) to Huron West Park (660003) 115kV line, near Mitchell NW.<br>a. Apply fault at the Mitchell NW 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |

| Contingency Number and Name | | Description |
|---|---|---|
| 21 | FLT_21_MITCHEL7_GRANT7_115kV_3PH | 3 phase fault on the Mitchell (660004) to Grant (603009) 115kV line, near Mitchell.<br>a. Apply fault at the Mitchell 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 22 | FLT_22_MITCHEL7_LETCHER7_115kV_3PH | 3 phase fault on the Mitchell (660004) to Letcher (652609) 115kV line, near Mitchell.<br>a. Apply fault at the Mitchell 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 23 | FLT_23_MITCHEL7_TRIPP7_115kV_3PH | 3 phase fault on the Mitchell (660004) to Tripp (660005) 115kV line, near Mitchell.<br>a. Apply fault at the Mitchell 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 24 | FLT_24_HURONWP7_BTAPWP7_115kV_3PH | 3 phase fault on the Huron West Park (660003) to Broadland Tap (660009) 115kV line, near Huron West Park.<br>a. Apply fault at the Huron West Park 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 25 | FLT_25_GRANT7_CHERRYC7_115kV_3PH | 3 phase fault on the Grant (603009) to Cherry County (603008) 115kV line, near Grant.<br>a. Apply fault at the Grant 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 26 | FLT_26_TRIPP7_MENNOJT7_115kV_3PH | 3 phase fault on the Tripp (660005) to Menno Junction (660007) 115kV line, near Tripp.<br>a. Apply fault at the Tripp 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 27 | FLT_27_BTAPWP7_REDFLD7_115kV_3PH | 3 phase fault on the Broadland Tap (660009) to Redfield (652535) 115kV line, near Broadland Tap.<br>a. Apply fault at the Broadland Tap 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 28 | FLT_28_CHERRYC7_WSXFLS7_115kV_3PH | 3 phase fault on the Cherry County (603008) to W Sioux Falls (603107) 115kV line, near Cherry County.<br>a. Apply fault at the Cherry County 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 29 | FLT_29_CHERRYC7_LOUISE7_115kV_3PH | 3 phase fault on the Cherry County (603008) to Louise (603231) 115kV line, near Cherry County.<br>a. Apply fault at the Cherry County 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 30 | FLT_30_CHERRYC7_RENNER7_115kV_3PH | 3 phase fault on the Cherry County (603008) to Renner (603274) 115kV line, near Cherry County.<br>a. Apply fault at the Cherry County 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 31 | FLT_31_MENNOJT7_UTICAJC7_115kV_3PH | 3 phase fault on the Menno Junction (660007) to Utica Junction (652626) 115kV line, near Menno Junction.<br>a. Apply fault at the Menno Junction 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted line. |
| 32 | FLT_32_MTVERN7_ARMOUR7SB_115kV_1PH | **Single phase fault with stuck breaker** on the Mount Vernon (652518) to Armour (652501) 115kV line, near Mount Vernon.<br>a. Apply fault at the Mount Vernon 115kV bus.<br>b. Clear fault after 16 cycles by tripping the faulted line. |
| 33 | FLT_33_MTVERN7_STORLA7SB_115kV_1PH | **Single phase fault with stuck breaker** on the Mount Vernon (652518) to Storla (659123) 115kV line, near Mount Vernon.<br>a. Apply fault at the Mount Vernon 115kV bus.<br>b. Clear fault after 16 cycles by tripping the faulted line. |
| 34 | FLT_34_MITCLNW7_MITCHEL7SB_115kV_1PH | **Single phase fault with stuck breaker** on the Mitchell NW (660008) to Mitchell (660004) 115kV line, near Mitchell NW.<br>a. Apply fault at the Mitchell NW 115kV bus.<br>b. Clear fault after 16 cycles by tripping the faulted line. |
| 35 | FLT_35_MITCLNW7_HURONWP7SB_115kV_1PH | **Single phase fault with stuck breaker** on the Mitchell NW (660008) to Huron West Park (660003) 115kV line, near Mitchell NW.<br>a. Apply fault at the Mitchell NW 115kV bus.<br>b. Clear fault after 16 cycles by tripping the faulted line. |
| 36 | FLT_36_STORLA7_WOONSKT7PO_115kV_3PH | **Prior outage** on the Mount Vernon (652518) to Armour (652501) 115kV line:<br>3 phase fault on the Storla (659123) to Woonsocket (652528) 115kV line, near Storla 115kV.<br>a. Prior Outage Mount Vernon to Armour 115kV.<br>b. Apply fault at the Storla 115kV bus.<br>c. Clear fault after 6 cycles by tripping the faulted line. |

| Contingency Number and Name | | Description |
|---|---|---|
| 37 | FLT_38_HURONWP7_BTAPWP7PO_115kV_3PH | **Prior outage** on the Mitchell NW (660008) to Mitchell (660004) 115kV line:<br>3 phase fault on the Huron West Park (660003) to Broadland Tap (660009) 115kV line, near Huron West Park 115kV.<br>a. Prior Outage Mitchell NW to Mitchell 115kV.<br>b. Apply fault at the Huron West Park 115kV bus.<br>c. Clear fault after 6 cycles by tripping the faulted line. |
| 38 | FLT_39_HURONWP7_HURON7PO_115kV_3PH | **Prior outage** on the Mitchell NW (660008) to Mitchell (660004) 115kV line:<br>3 phase fault on the Huron West Park (660003) to Huron (652515) 115kV line, near Huron West Park 115kV.<br>a. Prior Outage Mitchell NW to Mitchell 115kV.<br>b. Apply fault at the Huron West Park 115kV bus.<br>c. Clear fault after 6 cycles by tripping the faulted line. |
| 39 | FLT_40_MITCHEL7_GRANT7PO_115kV_3PH | **Prior outage** on the Mitchell NW (660008) to Huron West Park (660003) 115kV line:<br>3 phase fault on the Mitchell (660004) to Grant (603009) 115kV line, near Mitchell 115kV.<br>a. Prior Outage Mitchell NW to Huron West Park 115kV.<br>b. Apply fault at the Mitchell 115kV bus.<br>c. Clear fault after 6 cycles by tripping the faulted line. |
| 40 | FLT_41_MITCHEL7_LETCHER7PO_115kV_3PH | **Prior outage** on the Mitchell NW (660008) to Huron West Park (660003) 115kV line:<br>3 phase fault on the Mitchell (660004) to Letcher (652609) 115kV line, near Mitchell 115kV.<br>a. Prior Outage Mitchell NW to Huron West Park 115kV.<br>b. Apply fault at the Mitchell 115kV bus.<br>c. Clear fault after 6 cycles by tripping the faulted line. |
| 41 | FLT_42_MITCHEL7_TRIPP7PO_115kV_3PH | **Prior outage** on the Mitchell NW (660008) to Huron West Park (660003) 115kV line:<br>3 phase fault on the Mitchell (660004) to Tripp (660005) 115kV line, near Mitchell 115kV.<br>a. Prior Outage Mitchell NW to Huron West Park 115kV.<br>b. Apply fault at the Mitchell 115kV bus.<br>c. Clear fault after 6 cycles by tripping the faulted line. |
| 42 | FLT_43_STORLA7_STORLA4_115_230kV_3PH | 3 phase fault on the Storla 115kV (659123) / 230kV (659122) / 13.2kV (659119) transformer, near Storla 115kV ckt 1.<br>a. Apply fault at Storla 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer. |
| 43 | FLT_44_FTRANDL7_FTRANDL4_115_230kV_3PH | 3 phase fault on the Ft. Randall 115kV (652510) / 230kV (652509) transformer, near Ft. Randall 115kV ckt 1.<br>a. Apply fault at the Ft. Randall 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer. |
| 44 | FLT_45_HURON7_HURON4_115_230kV_3PH | 3 phase fault on the Huron 115kV (652515) / 230kV (652514) / 13.3kV (652281) transformer, near Huron 115kV ckt 1.<br>a. Apply fault at the Huron 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer. |
| 45 | FLT_46_HURONWP7_HURONWP8_115_69kV_3PH | 3 phase fault on the Huron West Park 115kV (660003) / 69kV (660012) transformer, near Huron West Park 115kV ckt 1.<br>a. Apply fault at the Huron West Park 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer. |
| 46 | FLT_47_LETCHER7_LETCHER4_115_230kV_3PH | 3 phase fault on the Letcher 115kV (652609) / 230kV (652606) / 13.2kV (652608) transformer, near Letcher 115kV ckt 1.<br>a. Apply fault at the Letcher 115kV bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer. |

## *RESULTS*

Results of the stability analysis are summarized in Table 7. These results are valid for ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 interconnecting with a generation amount up to 20 MW each. The analysis identified some oscillations of FLT15, FLT16, FLT18 and the prior outage FLT36 at Wessington generation. A separate analysis with ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 turned off still showed the oscillations of the Wessington unit. This is a pre-existing condition when these outages occur.

*Table 7: Fault Analysis Results for Limited Operation*

| | Contingency Number and Name | 2016WP | 2017SP | 2025SP |
|---|---|---|---|---|
| 1 | FLT_01_MTVERN7_ARMOUR7_115kV_3PH | Stable | Stable | Stable |
| 2 | FLT_02_MTVERN7_STORLA7_115kV_3PH | Stable | Stable | Stable |
| 3 | FLT_03_ARMOUR7_FTRANDL7_115kV_3PH | Stable | Stable | Stable |
| 4 | FLT_04_STORLA7_WOONSKT7_115kV_3PH | Stable | Stable | Stable |
| 5 | FLT_05_FTRANDL7_SPENCER7_115kV_3PH | Stable | Stable | Stable |
| 6 | FLT_06_FTRANDL7_WHSWAN7_115kV_3PH | Stable | Stable | Stable |
| 7 | FLT_07_FTRANDL7_BONESTL7_115kV_3PH | Stable | Stable | Stable |
| 8 | FLT_08_WOONSKT7_HURON7_115kV_3PH | Stable | Stable | Stable |
| 9 | FLT_09_SPENCER7_ONEILL7_115kV_3PH | Stable | Stable | Stable |
| 10 | FLT_10_WHSWAN7_TYNDALL7_115kV_3PH | Stable | Stable | Stable |
| 11 | FLT_11_BONESTL7_GREGORY7_115kV_3PH | Stable | Stable | Stable |
| 12 | FLT_12_HURON7_REDFELD7_115kV_3PH | Stable | Stable | Stable |
| 13 | FLT_13_HURON7_HURONWP7_115kV_3PH | Stable | Stable | Stable |
| 14 | FLT_14_HURON7_BTAPWP7_115kV_3PH | Stable | Stable | Stable |
| 15 | FLT_15_STORLA4_HANLON4_230kV_3PH | Stable | Stable | Stable |
| 16 | FLT_16_STORLA4_WESSINGTON4_230kV_3PH | Stable | Stable | Stable |
| 17 | FLT_17_HANLON4_SIOUXFL4_230kV_3PH | Stable | Stable | Stable |
| 18 | FLT_18_WESSINGTON4_FTTHOMP4_230kV_3PH | Stable | Stable | Stable |
| 19 | FLT_19_MITCLNW7_MITCHEL7_115kV_3PH | Stable | Stable | Stable |
| 20 | FLT_20_MITCLNW7_HURONWP7_115kV_3PH | Stable | Stable | Stable |
| 21 | FLT_21_MITCHEL7_GRANT7_115kV_3PH | Stable | Stable | Stable |
| 22 | FLT_22_MITCHEL7_LETCHER7_115kV_3PH | Stable | Stable | Stable |
| 23 | FLT_23_MITCHEL7_TRIPP7_115kV_3PH | Stable | Stable | Stable |
| 24 | FLT_24_HURONWP7_BTAPWP7_115kV_3PH | Stable | Stable | Stable |
| 25 | FLT_25_GRANT7_CHERRYC7_115kV_3PH | Stable | Stable | Stable |
| 26 | FLT_26_TRIPP7_MENNOJT7_115kV_3PH | Stable | Stable | Stable |
| 27 | FLT_27_BTAPWP7_REDFLD7_115kV_3PH | Stable | Stable | Stable |
| 28 | FLT_28_CHERRYC7_WSXFLS7_115kV_3PH | Stable | Stable | Stable |
| 29 | FLT_29_CHERRYC7_LOUISE7_115kV_3PH | Stable | Stable | Stable |
| 30 | FLT_30_CHERRYC7_RENNER7_115kV_3PH | Stable | Stable | Stable |
| 31 | FLT_31_MENNOJT7_UTICAJC7_115kV_3PH | Stable | Stable | Stable |
| 32 | FLT_32_MTVERN7_ARMOUR7SB_115kV_1PH | Stable | Stable | Stable |
| 33 | FLT_33_MTVERN7_STORLA7SB_115kV_1PH | Stable | Stable | Stable |
| 34 | FLT_34_MITCLNW7_MITCHEL7SB_115kV_1PH | Stable | Stable | Stable |
| 35 | FLT_35_MITCLNW7_HURONWP7SB_115kV_1PH | Stable | Stable | Stable |
| 36 | FLT_36_STORLA7_WOONSKT7PO_115kV_3PH | Stable | Stable | Stable |
| 37 | FLT_38_HURONWP7_BTAPWP7PO_115kV_3PH | Stable | Stable | Stable |
| 38 | FLT_39_HURONWP7_HURON7PO_115kV_3PH | Stable | Stable | Stable |
| 39 | FLT_40_MITCHEL7_GRANT7PO_115kV_3PH | Stable | Stable | Stable |
| 40 | FLT_41_MITCHEL7_LETCHER7PO_115kV_3PH | Stable | Stable | Stable |
| 41 | FLT_42_MITCHEL7_TRIPP7PO_115kV_3PH | Stable | Stable | Stable |
| 42 | FLT_43_STORLA7_STORLA4_115_230kV_3PH | Stable | Stable | Stable |
| 43 | FLT_44_FTRANDL7_FTRANDL4_115_230kV_3PH | Stable | Stable | Stable |
| 44 | FLT_45_HURON7_HURON4_115_230kV_3PH | Stable | Stable | Stable |
| 45 | FLT_46_HURONWP7_HURONWP8_115_69kV_3PH | Stable | Stable | Stable |
| 46 | FLT_47_LETCHER7_LETCHER4_115_230kV_3PH | Stable | Stable | Stable |

## FERC LVRT COMPLIANCE

FERC Order #661A places specific requirements on wind farms through its Low Voltage Ride Through (LVRT) provisions. For Interconnection Agreements signed after December 31, 2006, wind farms shall stay on line for faults at the POI that draw the voltage down at the POI to 0.0 pu.

Fault contingencies were developed to verify that wind farms remain on line when the POI voltage is drawn down to 0.0 pu. These contingencies are shown in Table 8.

*Table 8: LVRT Contingencies*

| | Contingency Number and Name | Description |
|---|---|---|
| 1 | FLT_01_MTVERN7_ARMOUR7_115kV_3PH | 3 phase fault on the Mount Vernon (652518) to Armour (652501) 115kV line, near Mount Vernon |
| 2 | FLT_02_MTVERN7_STORLA7_115kV_3PH | 3 phase fault on the Mount Vernon (652518) to Storla (659123) 115kV line, near Mount Vernon |
| 3 | FLT_19_MITCLNW7_MITCHEL7_115kV_3PH | 3 phase fault on the Mitchell NW (660008) to Mitchell (660004) 115kV line, near Mitchell NW |
| 4 | FLT_20_MITCLNW7_HURONWP7_115kV_3PH | 3 phase fault on the Mitchell NW (660008) to Huron West Park (660003) 115kV line, near Mitchell NW |

The required prior queued project wind farms remained online for the fault contingencies described in this section as well as the fault contingencies described in the Disturbances section of this report. ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 are found to be in compliance with FERC Order #661A.

# SHORT CIRCUIT ANALYSIS

A short circuit analysis was performed on the 2025 Summer Peak power flow case using the PSS/E ASCC program. Since the power flow model does not contain negative and zero sequence data, only three-phase symmetrical fault current levels were calculated at the point of interconnection up to and including five levels away. The results of the short circuit analysis are shown on the next page.

**ASGI-2016-005 and ASGI-2016-007**

PSS®E-32.2.0 ASCC SHORT CIRCUIT CURRENTS WED, JAN 04 2017 14:28
2015 MDWG FINAL WITH 2013 MMWG, UPDATED WITH 2014 SERC & MRO
MDWG 2025S WITH MMWG 2024S, MRO & SERC 2025 SUMMER

OPTIONS USED:
- FLAT CONDITIONS
  - BUS VOLTAGES SET TO 1 PU AT 0 PHASE ANGLE
  - GENERATOR P=0, Q=0
  - TRANSFOMRER TAP RATIOS=1.0 PU and PHASE ANGLES=0.0
  - LINE CHARGING=0.0 IN +/-/0 SEQUENCE
  - LOAD=0.0 IN +/- SEQUENCE, CONSIDERED IN ZERO SEQUENCE
  - LINE/FIXED/SWITCHED SHUNTS=0.0 AND MAGNETIZING ADMITTANCE=0.0 IN +/-/0 SEQUENCE
  - DC LINES AND FACTS DEVICES BLOCKED
  - TRANSFORMER ZERO SEQUENCE IMPEDANCE CORRECTIONS IGNORED

THREE PHASE FAULT
X---------- BUS ----------X /I+/ AN(I+)
652252 [MTVERNN8 69.000] AMP 2896.6 -84.53
587530 [ASGI1605 69.000] AMP 2896.6 -84.53
587550 [ASGI1607 69.000] AMP 2896.6 -84.53
652518 [MTVERN 7 115.00] AMP 4297.9 -77.42
587531 [ASGI1605_XFM34.500] AMP 2439.1 -87.04
587551 [ASGI1607_XFM34.500] AMP 2439.1 -87.04
652251 [MTVERNS8 69.000] AMP 3032.5 -83.24
652501 [ARMOUR 7 115.00] AMP 4170.2 -75.61
659123 [STORLA 7 115.00] AMP 6598.1 -81.77
587532 [ASGI1605_GSU34.500] AMP 2292.3 -84.60
587552 [ASGI1607_GSU34.500] AMP 2292.3 -84.60
652246 [ARMOUR 9 34.500] AMP 2678.7 -85.08
652249 [ARMOUR 8 69.000] AMP 2439.5 -83.83
652510 [FTRANDL7 115.00] AMP 13140.2 -83.36
652528 [WOONSKT7 115.00] AMP 5259.7 -77.63
659119 [STORLA 9 13.200] AMP 16142.2 -85.54
659122 [STORLA 4 230.00] AMP 6025.1 -84.37
640349 [SPENCER7 115.00] AMP 4613.4 -74.01
652463 [WH SWAN7 115.00] AMP 12791.7 -83.03
652475 [BONESTL7 115.00] AMP 3903.6 -75.60
652509 [FTRANDL4 230.00] AMP 10916.1 -83.86
652513 [HANLON 4 230.00] AMP 5975.7 -84.27
652515 [HURON 7 115.00] AMP 15169.3 -83.66
652546 [FTRDL12G 13.800] AMP 44790.9 -86.60
652607 [WESSINGTON 4230.00] AMP 6765.3 -85.04
952509 [G12_009IS 115.00] AMP 6487.2 -83.24
640305 [ONEILL 7 115.00] AMP 3927.0 -71.00
640350 [SPENCER9 34.500] AMP 1394.9 -85.10
640540 [MEADOWGROVE4230.00] AMP 5510.2 -83.04
643140 [SPENCER T1 913.800] AMP 2219.4 -86.06
652278 [HANLON18 69.000] AMP 5239.6 -87.52
652279 [HANLON28 69.000] AMP 5239.6 -87.52

652281 [HURON419 13.328] AMP 34026.0 -88.35
652282 [HURON429 13.328] AMP 34021.7 -88.36
652284 [HURON 8 69.000] AMP 3652.7 -87.71
652478 [GREGORY7 115.00] AMP 2856.9 -75.45
652507 [FTTHOMP4 230.00] AMP 19153.0 -85.33
652514 [HURON 4 230.00] AMP 10781.8 -83.75
652516 [LAKPLAT4 230.00] AMP 5553.4 -82.52
652523 [SIOUXFL4 230.00] AMP 12872.5 -84.76
652525 [TYNDALL7 115.00] AMP 3852.3 -74.66
652526 [UTICAJC4 230.00] AMP 7416.8 -82.60
652535 [REDFELD7 115.00] AMP 4138.7 -75.17
652547 [FTRDL34G 13.800] AMP 42272.7 -87.92
652548 [FTRDL56G 13.800] AMP 42272.7 -87.92
652549 [FTRDL78G 13.800] AMP 42272.7 -87.92
652565 [SIOUXCY4 230.00] AMP 19075.5 -84.62
652591 [HANLON 7 115.00] AMP 5498.6 -84.67
652592 [HANLON 9 13.800] AMP 14546.5 -86.42
659295 [SDPRAIRWND 4230.00] AMP 5595.1 -85.49
660003 [HURONWP7 115.00] AMP 10020.5 -81.49
660009 [BTAP WP7 115.00] AMP 14733.9 -82.98
662100 [WESSINGTON 934.500] AMP 16629.3 -86.83
952510 [G12_009IS_1 34.500] AMP 8668.3 -87.26

**ASGI-2016-006**

PSS®E-32.2.0 ASCC SHORT CIRCUIT CURRENTS WED, JAN 04 2017 14:30
2015 MDWG FINAL WITH 2013 MMWG, UPDATED WITH 2014 SERC & MRO
MDWG 2025S WITH MMWG 2024S, MRO & SERC 2025 SUMMER

OPTIONS USED:
- FLAT CONDITIONS
  - BUS VOLTAGES SET TO 1 PU AT 0 PHASE ANGLE
  - GENERATOR P=0, Q=0
  - TRANSFOMRER TAP RATIOS=1.0 PU and PHASE ANGLES=0.0
  - LINE CHARGING=0.0 IN +/-/0 SEQUENCE
  - LOAD=0.0 IN +/- SEQUENCE, CONSIDERED IN ZERO SEQUENCE
  - LINE/FIXED/SWITCHED SHUNTS=0.0 AND MAGNETIZING ADMITTANCE=0.0 IN +/-/0 SEQUENCE
  - DC LINES AND FACTS DEVICES BLOCKED
  - TRANSFORMER ZERO SEQUENCE IMPEDANCE CORRECTIONS IGNORED

THREE PHASE FAULT
X---------- BUS ----------X /I+/ AN(I+)
660008 [MITCLNW7 115.00] AMP 5470.2 -79.18
587540 [ASGI1606 115.00] AMP 5470.2 -79.18
660003 [HURONWP7 115.00] AMP 10020.5 -81.49
660004 [MITCHEL7 115.00] AMP 5844.9 -79.27
587541 [ASGI1606_XFM34.500] AMP 3126.5 -87.01
603009 [GRANT 7 115.00] AMP 3941.5 -76.11
652515 [HURON 7 115.00] AMP 15169.3 -83.66
652609 [LETCHER7 115.00] AMP 6016.8 -83.26
660005 [TRIPP 7 115.00] AMP 4128.6 -78.49
660009 [BTAP WP7 115.00] AMP 14733.9 -82.98
660012 [HURON WP 869.000] AMP 5989.1 -87.46
587542 [ASGI1606_GSU34.500] AMP 2860.1 -83.53
603008 [CHERRYC7 115.00] AMP 13380.8 -80.89
605011 [GRANT 69.000] AMP 4357.0 -80.57
652281 [HURON419 13.328] AMP 34026.0 -88.35
652282 [HURON429 13.328] AMP 34021.7 -88.36
652284 [HURON 8 69.000] AMP 3652.7 -87.71
652514 [HURON 4 230.00] AMP 10781.8 -83.75
652528 [WOONSKT7 115.00] AMP 5259.7 -77.63
652535 [REDFELD7 115.00] AMP 4138.7 -75.17
652606 [LETCHER4 230.00] AMP 4702.0 -83.78
652608 [LETCHER9 13.200] AMP 16257.3 -87.01
659198 [LETCHR PS227115.00] AMP 2599.7 -78.66
660002 [REDFLD 7 115.00] AMP 3919.6 -78.97
660007 [MENNOJT7 115.00] AMP 6572.3 -80.32
660011 [TITAN WIND 934.500] AMP 5225.6 -89.53
660018 [B_H WIND 7115.00] AMP 3450.5 -79.40
603017 [WSX FLS7 115.00] AMP 14582.3 -81.45
603231 [LOUISE 7 115.00] AMP 10069.1 -81.21
603274 [RENNER 7 115.00] AMP 11453.9 -81.47
605008 [CANISTO8 69.000] AMP 2991.2 -68.75
605010 [CANISTJ8 69.000] AMP 4172.9 -78.89

652291 [REDFELD8 69.000] AMP 2851.6 -83.78
652507 [FTTHOMP4 230.00] AMP 19153.0 -85.33
652512 [GROTON 7 115.00] AMP 18620.4 -85.01
652523 [SIOUXFL4 230.00] AMP 12872.5 -84.76
652530 [WATERTN4 230.00] AMP 14311.9 -84.82
652614 [CARPENTER 4 230.00] AMP 6826.3 -83.44
652626 [UTICAJC7 115.00] AMP 8828.6 -82.32
659123 [STORLA 7 115.00] AMP 6598.1 -81.77
659199 [LETCHR PS2294.2000] AMP 16640.1 -84.78
659205 [BRDLAND4 230.00] AMP 9776.1 -84.11
660001 [ABDNSBT7 115.00] AMP 7537.2 -82.73
660017 [B_H WIND 934.500] AMP 7531.3 -85.52
660020 [REDFIELD 9 34.500] AMP 3799.9 -86.81
585320 [GEN-2015-097115.00] AMP 5281.5 -82.09
602004 [SPLT RK4 230.00] AMP 12454.6 -84.77
603014 [LINCNCO7 115.00] AMP 10487.2 -81.47
603016 [SPLT RK7 115.00] AMP 35689.2 -84.94
603225 [FALLS 7 115.00] AMP 15222.7 -81.79
605009 [SALEM 69.000] AMP 1617.2 -63.37
605207 [WSX FLS8 69.000] AMP 8893.5 -81.96
652232 [SIOUXF19 13.200] AMP 27530.2 -88.84
652233 [SIOUXF29 13.200] AMP 27530.2 -88.84
652237 [WATERT19 13.800] AMP 38020.2 -86.81
652239 [WATERT29 13.200] AMP 21827.8 -88.30
652240 [WATERT39 13.200] AMP 21819.8 -88.26
652250 [GROTON18 69.000] AMP 4136.2 -87.24
652253 [GROTON28 69.000] AMP 1858.3 -87.42
652273 [FTTHMP19 13.800] AMP 25897.9 -87.60
652274 [FTTHMP29 13.800] AMP 25898.2 -87.63
652276 [FTTHOMP8 69.000] AMP 4339.0 -85.59
652398 [VFODNES4 230.00] AMP 6910.8 -83.52
652503 [BLAIR 4 230.00] AMP 9783.8 -83.80
652506 [FTTHOMP3 345.00] AMP 8425.3 -86.53
652509 [FTRANDL4 230.00] AMP 10916.1 -83.86
652513 [HANLON 4 230.00] AMP 5975.7 -84.27
652516 [LAKPLAT4 230.00] AMP 5553.4 -82.52
652518 [MTVERN 7 115.00] AMP 4297.9 -77.42
652519 [OAHE 4 230.00] AMP 13617.9 -85.34
652524 [SIOUXFL7 115.00] AMP 25546.0 -83.93
652526 [UTICAJC4 230.00] AMP 7416.8 -82.60
652529 [WATERTN3 345.00] AMP 10083.2 -85.61
652531 [WATERTN7 115.00] AMP 13622.8 -85.41
652533 [BRISTOL7 115.00] AMP 4756.9 -75.25
652534 [ORDWAY 7 115.00] AMP 7921.0 -76.37
652539 [WATERSVC 20.000] AMP 23085.1 -87.95
652540 [BIGBND14 230.00] AMP 11618.4 -85.31
652578 [PAHOJA 4 230.00] AMP 7253.3 -82.50
652582 [APPLEDORN 4 230.00] AMP 7068.4 -82.36
652607 [WESSINGTON 4230.00] AMP 6765.3 -85.04
652627 [UTICAJC9 13.200] AMP 18135.5 -87.16
652630 [WATERTNCAP 4230.00] AMP 14311.9 -84.82
659028 [G12_014IS_1 115.00] AMP 5545.8 -78.72

659119 [STORLA 9 13.200] AMP 16142.2 -85.54
659120 [BRDLAND3 345.00] AMP 3993.7 -86.63
659122 [STORLA 4 230.00] AMP 6025.1 -84.37
659160 [GROTON 3 345.00] AMP 6212.2 -86.06
659161 [GROTON 9 13.800] AMP 24290.8 -87.89
659196 [CARPENTER 8 69.000] AMP 3169.1 -87.93
659204 [BROADLAND 913.800] AMP 22968.9 -87.54
659275 [GROTONB7 115.00] AMP 18077.5 -85.03
659278 [NBCS101G 12.500] AMP 5988.8 -88.43
659287 [DAYCNTYTAP 7115.00] AMP 6897.5 -80.09
659292 [KEYSTN PS237115.00] AMP 2565.6 -77.25
659312 [LOWERBRULE 4230.00] AMP 10787.4 -85.01
660000 [ABDNJCT7 115.00] AMP 5537.4 -80.35
660015 [REDFIELD 8 69.000] AMP 798.2 -88.66
660026 [NAPA JCT7 115.00] AMP 8543.7 -78.87

# CONCLUSION

An Affected System Interconnection Customer has requested an Affected System Limited Operation System Impact Study (AS-LOIS) under the Southwest Power Pool Open Access Transmission Tariff (OATT) for ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007. ASGI-2016-005 (20MW), ASGI-2016-006 (20MW) and ASGI-2016-007 (20MW) wind generating facilities are to be interconnected into the system of NorthWestern Energy (NWE). The NorthWestern Energy system interconnects to Western Area Power Administration (WAPA) in Aurora and Davison Counties, South Dakota. ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 have requested this Limited Operation Interconnection Study (LOIS) to determine the impacts of interconnecting to the transmission system before all required Network Upgrades identified in the DISIS-2015-002 Impact Study can be placed into service.

Power flow analysis from this Affected System LOIS has determined that the ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 requests can interconnect 60.0 MW of generation with Energy Resource Interconnection Service (ERIS) prior to the completion of the required Network Upgrades, listed within *Table 2*Table 2 of this report, provided the Network Upgrades are able to be placed in service prior to December 31, 2020. Should any other projects, other than those listed within Table 1 of this report, come into service an additional study may be required to determine if any limited operation service is available. It should be noted that although this Affected System LOIS analyzed many of the most probable contingencies, it is not an all-inclusive list that can account for every operational situation. Additionally, the generator may not be able to inject any power onto the Transmission System due to constraints that fall below the threshold of mitigation for a Generator Interconnection request. Because of this, it is likely that the Customer(s) may be required to reduce their generation output to **0 MW** under certain system conditions to allow system operators to maintain the reliability of the transmission network.

Transient stability analysis for this LOIS has determined that no issues were observed for the transmission system for the forty-six (46) selected faults for the limited operation interconnection of ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007. The oscillations for FLT15, FLT16, FLT18 and the prior outage FLT36 at Wessington generation is a pre-existing condition when these outages occur. A separate analysis with ASGI-2016-005, ASGI-2016-006 and ASGI-2016-007 turned off still showed the oscillations of the Wessington unit.

Any changes to these assumptions, for example, one or more of the previously queued requests not included within this study execute an interconnection agreement and commencing commercial operation, may require a re-study of this LOIS at the expense of the Customer.

Nothing in this System Impact Study constitutes a request for transmission service or confers upon the Interconnection Customer any right to receive transmission service.