Definitive Interconnection System Impact Study for Generation Interconnection Requests

(DISIS-2010-002)

January 2011

Tariff Studies – Generation Interconnection

Southwest Power Pool

Revision History

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1/31/2010	Southwest Power Pool	N/A	Report Issued

Executive Summary

Generation Interconnection customers have requested a Definitive Interconnection System Impact Study (DISIS) under the Generation Interconnection Procedures (GIP) in the Southwest Power Pool Open Access Transmission Tariff (OATT). The Interconnection Customers' requests have been clustered together for the following Feasibility Cluster Study. This Impact Study analyzes the interconnecting of multiple generation interconnection requests associated with new generation totaling approximately 3,358.5 MW of new generation which would be located within the transmission systems of Mid-Kansas Electric Power LLC (MKEC), Missouri Public Service (MIPU), Nebraska Public Power District (NPPD), Midwest Energy Inc. (MIDW), Oklahoma Gas and Electric (OKGE), Omaha Public Power District (OPPD), Southwestern Public Service (SPS), Sunflower Electric Power Corporation (SUNC), Westar Energy (WERE) and Western Farmers Electric Cooperative (WFEC). The various generation interconnection requests have differing proposed in-service dates[1]. The generation interconnection requests included in this Feasibility Cluster Study are listed in Appendix A by their queue number, amount, requested interconnection service, area, requested interconnection point, proposed interconnection point, and the requested in-service date.

Power flow analysis has indicated that for the powerflow cases studied, 3,358.5 MW of nameplate generation may be interconnected with transmission system reinforcements within the SPP transmission system. Dynamic Stability and power factor analysis has determined the need for reactive compensation in accordance with Order No. 661-A for wind farm interconnection requests and those requirements are listed for each interconnection request within the contents of this report.

Dynamic Stability Analysis has determined that the transmission system will remain stable with the assigned Network Upgrades and necessary reactive compensation requirements.

The total estimated minimum cost for interconnecting the DISIS-2010-002 interconnection customers is $629,000,000. These costs are shown in Appendix E and F. Interconnection Service to DISIS-2010-002 interconnection customers is also contingent upon higher queued customers paying for certain required network upgrades. The in service date for the DISIS customers will be deferred until the construction of these network upgrades can be completed.

These costs do not include the Interconnection Customer Interconnection Facilities as defined by the SPP Open Access Transmission Tariff (OATT). This cost does not include additional network constraints in the SPP transmission system that were identified as shown in Appendix H.

Network Constraints listed in Appendix H are in the local area of the new generation when this generation is injected throughout the SPP footprint for the Energy Resource (ER) Interconnection Request. Certain Interconnection Requests were studied for Network Resource Interconnection Service (NR). Those constraints are listed in Appendix H. Additional Network constraints will have to be verified with a Transmission Service Request (TSR) and associated studies. With a defined source and sink in a TSR, this list of Network Constraints will be refined and expanded to account for all Network Upgrade requirements.

[1] The generation interconnection requests in-service dates will need to be deferred based on the required lead time for the Network Upgrades necessary. The Interconnection Customer's that proceed to the Facility Study will be provided a new in-service date based on the competition of the Facility Study.

The required interconnection costs listed in Appendix E and F do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request through SPP's Open Access Same Time Information System (OASIS) as required by Attachment Z1 of the SPP OATT.

Based on the SPP Tariff Attachment O, transmission facilities that are part of the SPP Transmission Expansion Plan (STEP) including Sponsored Economic Upgrades or the Balanced Portfolio that are approved by the SPP Board of Directors will receive notifications to construct. These projects will then be considered construction pending projects and would not be assignable to the Impact Cluster Study Generation Interconnection Requests.

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Introduction

Pursuant to the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT), SPP has conducted this Definitive Interconnection System Impact Study (DISIS) for certain generation interconnection requests in the SPP Generation Interconnection Queue. These interconnection requests have been clustered together for the following Impact Study. The customers will be referred to in this study as the DISIS-2010-001 Interconnection Customers. This Impact Study analyzes the interconnecting of multiple generation interconnection requests associated with new generation totaling 3,358.5 MW of new generation which would be located within the transmission systems of Mid-Kansas Electric Power LLC (MKEC), Missouri Public Service (MIPU), Nebraska Public Power District (NPPD), Midwest Energy Inc. (MIDW), Oklahoma Gas and Electric (OKGE), Omaha Public Power District (OPPD), Southwestern Public Service (SPS), Sunflower Electric Power Corporation (SUNC), Westar Energy (WERE) and Western Farmers Electric Cooperative (WFEC). The various generation interconnection requests have differing proposed in-service dates[2]. The generation interconnection requests included in this Impact Study are listed in Appendix A by their queue number, amount, requested interconnection service, area, requested interconnection point, proposed interconnection point, and the requested in-service date.

The primary objective of this Definitive Interconnection System Impact Study is to identify the system constraints associated with connecting the generation to the area transmission system. The Impact and other subsequent Interconnection Studies are designed to identify attachment facilities, Network Upgrades and other Direct Assignment Facilities needed to accept power into the grid at each specific interconnection receipt point.

Model Development

Interconnection Requests Included in the Cluster

SPP has included all interconnection requests that submitted a Definitive Interconnection System Impact Study request no later than September 30, 2010 and were subsequently accepted by Southwest Power Pool under the terms of the Generator Interconnection Procedures (GIP) that became effective March 30, 2010.

Affected System Interconnection Requests - Also included in this Definitive Impact Study are two Affected System Studies, both of the requests are on the Lea County Electric Cooperative system in Lea County, New Mexico. The Affected System Studies have been given the designation ASGI-2010-020 (Tatum – Crossroads 69kV) and ASGI-2010-021 (Saunders – Anderson 69kV) respectively.

The interconnection requests that are included in this study are listed in Appendix A.

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[2] The generation interconnection requests in-service dates will need to be deferred based on the required lead time for the Network Upgrades necessary. The Interconnection Customer's that proceed to the Facility Study will be provided a new in-service date based on the competition of the Facility Study.

Previous Queued Projects

The previous queued projects included in this study are listed in Appendix B. In addition to the Base Case Upgrades, the previous queued projects and associated upgrades were assumed to be in-service and added to the Base Case models. These projects were dispatched as Energy Resources with equal distribution across the SPP footprint.

Development of Base Cases

Powerflow - The 2010 series Transmission Service Request (TSR) Models 2011 spring and 2014 summer and winter, and 2016 summer and winter scenario 0 peak cases were used for this study. After the cases were developed, each of the control areas' resources were then re-dispatched using current dispatch orders.

Stability – The 2010 series SPP Model Development Working Group (MDWG) Models 2011 winter and 2011 summer were used for this study.

Base Case Upgrades

The following facilities are part of the SPP Transmission Expansion Plan or the Balanced Portfolio or recently approved Priority Projects. These facilities have been approved or are in construction stages and were assumed to be in-service at the time of dispatch and added to the base case models. The DISIS-2010-002 Customers have not been assigned cost for the below listed projects. <u>The DISIS-2010-002 Customers Generation Facilities in service dates may need to be delayed until the completion of the following upgrades.</u> If for some reason, construction on these projects is discontinued, additional restudies will be needed to determine the interconnection needs of the DISIS customers.

- Hitchland 345/230/115kV upgrades to be built by SPS for 2010/2011 in-service[3].
  - Hitchland – Moore County 230kV line
  - Hitchland – Perryton 230kV line
  - Hitchland – Texas County 115kV line
  - Hitchland – Hansford County 115kV line
  - Hitchland – Sherman County Tap 115kV line
- Valliant – Hugo – Sunnyside 345kV – assigned to Aggregate Study AG3-2006 Customers
- Wichita – Reno County – Summit 345kV to be built by WERE[4].
- Rose Hill – Sooner 345kV to be built by WERE/OKGE.
- Knob Hill – Steele City 115kV to be built by NPPD/WERE.
- Balanced Portfolio Projects[5]:
  - Gracemont 345/138/13.2kV Autotransformer
  - Woodward– Tuco 345kV line
  - Iatan– Nashua 345kV line
  - Muskogee– Seminole 345kV line
  - Post Rock– Axtell 345kV line
  - Spearville– Post Rock 345kV line

[3] Approved 230kV upgrades are based on SPP 2007 STEP. Upgrades may need to be re-evaluated in the system impact study.
[4] Approved based on an order of the Kansas Corporation Commission issued in Docket no. 07-WSEE-715-MIS
[5] Notice to Construct (NTC) issued June, 2009

- Tap Stillwell – Swissvale 345kV line at West Gardner
- Priority Projects[6]:
  - Hitchland - Woodward double circuit 345kV
  - Woodward – Medicine Lodge double circuit 345kV
  - Spearville – Comanche (Clark) double circuit 345kV
  - Comanche (Clark) – Medicine Lodge double circuit 345kV
  - Medicine Lodge – Wichita double circuit 345kV
  - Medicine Lodge 345/138kV autotransformer

Contingent Upgrades

The following facilities do not yet have approval. These facilities have been assigned to higher queued interconnection customers. These facilities have been included in the models for the DISIS-2010-002 study and are assumed to be in service. The DISIS-2010-002 Customers at this time do not have responsibility for these facilities but may later be assigned the cost of these facilities if higher queued customers terminate their GIA or withdraw from the interconnection queue. The DISIS-2010-002 Customer Generation Facilities in service dates may need to be delayed until the completion of the following upgrades.

- Finney – Holcomb 345kV ckt #2 line assigned to GEN-2006-044 interconnection customer. This customer is currently in suspension[7].
- Central Plains – Setab 115kV transmission line assigned to GEN-2007-013 interconnection customer.
- Spearville 345/230kV autotransformer #2 assigned to 1st Cluster Interconnection Customers (100% to GEN-2006-006)
- Grassland 230/115kV autotransformer #2 assigned to 1st Cluster Interconnection Customers (100% to GEN-2008-016)
- Spearville 230/115kV autotransformer #2 assigned to DISIS-2009-001-1 Interconnection Customers (100% to GEN-2008-079)
- Petersburg – Madison 115kV assigned to DISIS-2009-001-1 Interconnection Customers
- Judson Large – North Judson Large – Spearville Ckt #2 assigned to DISIS-2009-001-1 Interconnection Customers (100% to GEN-2008-079)
- GEN-2008-038 Tap – Barnsdall 138kV assigned to DISIS-2009-001-1 Interconnection Customers (100% to GEN-2008-038)
- Belden – Bloomfield 115kV assigned to DISIS-2009-001-1 Interconnection Customers
- Hitchland – Wheeler (Border) double circuit 345kV assigned to DISIS-2010-001 Interconnection Customers
- Madison County 230/115kV autotransformer #1 assigned to DISIS-2010-001 Interconnection Customer
- Norfolk – Madison County Tap 115kV Ckt #1 assigned to DISIS-2010-001 Interconnection Customers

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[6] Notice to Construct (NTC) issued June, 2010. NTC for double circuit lines indicated that NTC may be revised at a later time to be built at a higher voltage.
[7] Based on Facility Study Posting November 2008

- Washita – Gracemont 138kV Ckt #2 assigned to DISIS-2010-001 Interconnection Customers
- Post Rock 345/230kV autotransformer #2 assigned to DISIS-2010-001 Interconnection Customers
- Washita – Weatherford 138kV Ckt #1 assigned to DISIS-2010-001 Interconnection Customers
- GEN-2008-079 Tap – Spearville 115kV Ckt #1 assigned to DISIS-2010-001 Interconnection Customers
- Spearville 345/230kV autotransformer #3 assigned to DISIS-2010-001 Interconnection Customers

Potential Upgrades Not in the Base Case

Any potential upgrades that do not have a Notification to Construct (NTC) have not been included in the base case. These upgrades include any identified in the SPP Extra-High Voltage (EHV) overlay plan, or any other SPP planning study other than the upgrades listed above in the previous section.

Regional Groupings

The interconnection requests listed in Appendix A were grouped together in ten different regional groups based on geographical and electrical impacts. These groupings are shown in Appendix C.

To determine interconnection impacts, ten different dispatch variations of the spring base case models were developed to accommodate the regional groupings.

Powerflow - For each group, the various wind generating plants were modeled at 80% nameplate of maximum generation. The wind generating plants in the other areas were modeled at 20% nameplate of maximum generation. This process created ten different scenarios with each group being studied at 80% nameplate rating. These projects were dispatched as Energy Resources with equal distribution across the SPP footprint. Certain projects that requested Network Resource Interconnection Service were dispatched in an additional analysis into the balancing authority of the interconnecting transmission owner. This method allowed for the identification of network constraints that were common to the regional groupings that could then in turn have the mitigating upgrade cost allocated throughout the entire cluster. Each interconnection request was also modeled separately at 100% nameplate for certain analyses.

Peaking units were not dispatched in the 2010 spring model. To study peaking units' impacts, the 2014 summer peak model was chosen and peaking units were modeled at 100% of the nameplate rating and wind generating facilities were modeled at 10% of the nameplate rating. Each interconnection request was also modeled separately at 100% nameplate for certain analyses.

Identification of Network Constraints

The initial set of network constraints were found by using PTI MUST First Contingency Incremental Transfer Capability (FCITC) analysis on the entire cluster grouping dispatched at the various levels mentioned above. These constraints were then screened to determine if any of the generation interconnection requests had at least a 20% Distribution Factor (DF) upon the constraint. Constraints that measured at least a 20% DF from at least one interconnection request were considered for mitigation. Interconnection Requests that were being studied for Network Resource Interconnection Service were studied in the additional NRIS analysis to determine if any constraint had at least a 3% DF. If so, these constraints were considered for mitigation.

Determination of Cost Allocated Network Upgrades

Cost Allocated Network Upgrades of wind generation interconnection requests were determined using the 2011 spring model. Cost Allocated Network Upgrades of peaking units was determined using the 2016 summer peak model. Once a determination of the required Network Upgrades was made, a powerflow model of the 2011 spring case was developed with all cost allocated Network Upgrades in-service. A MUST FCITC analysis was performed to determine the Power Transfer Distribution Factors (PTDF), a distribution factor with no contingency that each generation interconnection request had on each new upgrade. The impact each generation interconnection request had on each upgrade project was weighted by the size of each request. Finally the costs due by each request for a particular project were then determined by allocating the portion of each request's impact over the impact of all affecting requests.

For example, assume that there are three Generation Interconnection requests, X, Y, and Z that are responsible for the costs of Upgrade Project '1'. Given that their respective PTDF for the project have been determined, the cost allocation for Generation Interconnection request 'X' for Upgrade Project 1 is found by the following set of steps and formulas:

- Determine an Impact Factor on a given project for all responsible GI requests:

$$\text{Request X Impact Factor on Upgrade Project 1} = \text{PTDF}(\%)(\text{X}) * \text{MW}(\text{X}) = \text{X1}$$

$$\text{Request Y Impact Factor on Upgrade Project 1} = \text{PTDF}(\%)(\text{Y}) * \text{MW}(\text{Y}) = \text{Y1}$$

$$\text{Request Z Impact Factor on Upgrade Project 1} = \text{PTDF}(\%)(\text{Z}) * \text{MW}(\text{Z}) = \text{Z1}$$

- Determine each request's Allocation of Cost for that particular project:

$$\text{Request X's Project 1 Cost Allocation } (\$) = \frac{\text{Network Upgrade Project 1 Cost}(\$) * \text{X1}}{\text{X1} + \text{Y1} + \text{Z1}}$$

- Repeat previous for each responsible GI request for each Project

The cost allocation of each needed Network Upgrade is determined by the size of each request and its impact on the given project. This allows for the most efficient and reasonable mechanism for sharing the costs of upgrades.

Credits for Amounts Advanced for Network Upgrades - Interconnection Customer shall be entitled to credits in accordance with Attachment Z1 of the SPP Tariff for any Network Upgrades including any tax gross-up or any other tax-related payments associated with the Network Upgrades, and not refunded to the Interconnection Customer.

Interconnection Facilities

The requirement to interconnect the 3,358.5 MW of generation into the existing and proposed transmission systems in the affected areas of the SPP transmission footprint consist of the necessary cost allocated shared facilities listed in Appendix F by upgrade. The interconnection requirements for the cluster total $629,000,000. Interconnection Facilities specific to each generation interconnection request are listed in Appendix E.

A list of constraints with greater than or equal to a 20% OTDF that were identified and used for mitigation are listed in Appendix G. Other Network Constraints in the MKEC, MIPU, NPPD, MIDW, OKGE, OPPD, SPS, SUNC, WERE and WFEC transmission systems that were identified are shown in Appendix H. With a defined source and sink in a TSR, this list of Network Constraints will be refined and expanded to account for all Network Upgrade requirements.

A preliminary one-line drawing for each generation interconnection request are listed in Appendix D. Figure 1 depicts the major transmission line Network Upgrades needed to support the interconnection of the generation amounts requested in this study.

Powerflow

Powerflow Analysis Methodology

The Southwest Power Pool (SPP) Criteria states that:

> "The transmission system of the SPP region shall be planned and constructed so that the contingencies as set forth in the Criteria will meet the applicable *NERC Reliability Standards* for transmission planning. All MDWG power flow models shall be tested to verify compliance with the System Performance Standards from NERC Table 1 – Category A."

The ACCC function of PSS/E was used to simulate single contingencies in portions or all of the modeled control areas of Mid-Kansas Electric Power LLC (MKEC), Missouri Public Service (MIPU), Nebraska Public Power District (NPPD), Midwest Energy Inc. (MIDW), Oklahoma Gas and Electric (OKGE), Omaha Public Power District (OPPD), Southwestern Public Service (SPS), Sunflower Electric Power Corporation (SUNC), Westar Energy (WERE) and Western Farmers Electric Cooperative (WFEC) and other control areas were applied and the resulting scenarios analyzed. This satisfies the "more probable" contingency testing criteria mandated by NERC and the SPP criteria.

Powerflow Analysis

A powerflow analysis was conducted for each Interconnection Customer's facility using modified versions of the 2011 (spring, summer, and winter) peak and the 2016 (summer and winter) peak models. The output of the Interconnection Customer's facility was offset in each model by a reduction in output of existing online SPP generation. This method allows the request to be studied as an Energy Resource (ER) Interconnection Request. The available seasonal models used were through the 2016 Winter Peak. Certain requests that requested Network Resource Interconnection

Service (NRIS) had an additional analysis conducted for sinking the energy in the interconnecting Transmission Owner's balancing authority.

This analysis was conducted assuming that previous queued requests in the immediate area of these interconnect requests were in-service. The analysis of the each Customer's project indicates that additional criteria violations will occur on the MKEC, MIPU, NPPD, MIDW, OKGE, OPPD, SPS, SUNC, WERE and WFEC transmission systems under steady state and contingency conditions in the peak seasons.

Cluster Group 1 (Woodward Area)

The Woodward group had 320 MW of interconnection requests in addition to the 3,344.2 MW of previously queued generation in the area. The GEN-2010-043 interconnection request was studied for Network Resource Interconnection Service (NRIS). As a result, the GEN-2010-043 will have an impact and overload the Mooreland – Glass Mountain 138kV line. To mitigate this constraint, the section from Mooreland – Glass Mountain must be rebuilt. In addition, the Dover SW – Okeene 138kV line and the El Reno – Roman Nose 138kV line will need to be rebuilt due to overloads caused by GEN-2010-043.

Cluster Group 2 (Hitchland Area)

The Hitchland group had 300 MW of interconnection requests in addition to the 3,361.9 MW of previously queued generation in the area. Possible voltage collapse was observed for the outage of Finney-Stevens 345kV line. As a result, the tapped station will need to include terminals to tie both Hitchland-Woodward 345kV lines into the substation. Also, a 345kV line from Comanche to the GEN-2008-047 interconnection tap point was modeled and was used for Group 3 as well.

Cluster Group 3 (Spearville Area)

The Spearville group had 1,648.5 MW of interconnection requests in addition to the 3,112.7 MW of previously queued generation in the area. Significant outlet constraints were identified in the area due to the amount of generation being studied. A double circuit 345kV circuit from Spearville-Mullergren-Circle was added to be able to initialize the models to begin analysis. A 345kV line from Comanche-GEN-2008-047 tap point was also necessary. The St. John (MKEC) – St. John (MIDW) 138kV line will need to be rebuilt due to overloads caused by the GEN-2010-049 interconnection request.

Cluster Group 4 (Mingo/NW Kansas Group)

The Mingo/NW Kansas group had 0 MW of interconnection requests in addition to the 924.2 MW of previously queued generation in the area. No new constraints were found in this area.

Cluster Group 5 (Amarillo Area)

The Amarillo group had 0 MW of interconnection requests in addition to the 2,218.1 MW of previously queued generation in the area. No new constraints were found in this area.

Cluster Group 6 (South Panhandle/New Mexico)

The South Panhandle/New Mexico group had 142.6 MW of interconnection requests in addition to the 2,227 MW of previously queued generation in the area. The entire section from Lovington – Reed – McDonald – Tatum – ASGI-2010-020 will need to be rebuilt due to overloads caused by the ASGI-2010-020 affected system interconnection request.

Cluster Group 7 (Southwestern Oklahoma)

The Southwestern Oklahoma group had 125 MW of interconnection requests in addition to the 2,075.8 MW of previously queued generation in the area. The Clinton Junction – Elk City 138kV line will need to be rebuilt due to overloads caused by the GEN-2010-012 interconnection request.

Cluster Group 8 (South Central Kansas/North Oklahoma)

The South Central Kansas/North Oklahoma group had 0 MW of interconnection requests in addition to the 3,551.9 MW of previously queued generation in the area. No new constraints were found in this area.

Cluster Group 9 (Northeast Nebraska)

The Northeast Nebraska group had 200 MW of interconnection requests in addition to the 798.5 MW of previously queued generation in the area. No new constraints were found in this area. No new constraints were found in this area.

Cluster Group 10 (North Nebraska)

The North Nebraska group had 74.9 MW of interconnection requests in addition to the 281.2 MW of previously queued generation in the area. The GEN-2010-038 request will have a significant impact and overload the Broken Bow – Loup City 115kV line. To mitigate this constraint, a new line from Broken Bow – Ord will be constructed and the section of line from Ord to Loup City will be rebuilt.

Cluster Group 11 (North Kansas)

The North Kansas group had 70 MW of interconnection requests in addition to the 1,297.9 MW of previously queued generation in the area. The Clifton – Green Leaf 115kV line will need to be rebuilt due to overloads caused by the GEN-2010-048 interconnection request.

Cluster Group 12 (Northwest Arkansas)

The Northwest Arkansas group had 0 MW of interconnection requests in addition to the 0 MW of previously queued generation in the area. No new constraints were found in this area.

Cluster Group 13 (Northwest Missouri)

The North Missouri group had 237.5 MW of interconnection requests in addition to the 2,436.5 MW of previously queued generation in the area. The GEN-2010-047 – Harbine 115kV line will need to be rebuilt due to overloads caused by the GEN-2010-047 interconnection request. The Humboldt transformer also shows up as overloaded for GEN-2010-041.

Cluster Group 14 (South Central Oklahoma)

The South Central Oklahoma group had 300 MW of interconnection requests in addition to the 956.4 MW of previously queued generation in the area. The Northwest 345/138/13.8kV transformer will need to be rerated or replaced due to the overload caused by GEN-2010-040.

Cluster Group 15 (Southwest Nebraska)

The Southwest Nebraska group had 0 MW of interconnection requests in addition to the 89.7 MW of previously queued generation in the area. No new constraints were found in this area.

Stability Analysis

A stability analysis was conducted for each Interconnection Customer's facility using modified versions of the 2011 summer and 2011 winter peak models. The stability analysis was conducted with all upgrades in service that were identified in the powerflow analysis. For each group, the interconnection requests were studied at 100% nameplate output while the other groups were dispatched at 20% output for wind requests and 100% output for fossil requests. The output of the Interconnection Customer's facility was offset in each model by a reduction in output of existing online SPP generation. The following synopsis is included for each group. The entire stability study for each group can be found in the Appendices.

Cluster Group 1 (Woodward Area)

The Group 1 stability study was conducted by Excel Engineering (Excel). The addition of the GEN-2010-043 plant increased overloads and low voltage conditions on the 138kV system between Woodward and Northwest. As such, some prior queued wind generators may experience oscillations for outage of the Northwest-Tatonga 345kV line if certain contingent upgrades are not constructed. Low Voltage Ride Through (LVRT) was not analyzed in Group 1 due to the interconnection request being a gas request as opposed to a wind request.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Final PF Requirement at POI		Estimated Capacitor Requirement (Mvar)
				Lagging (supplying)	Leading (absorbing)	
GEN-2010-043	320	GENROU	Mooreland 138kV	N/A	N/A	0

Cluster Group 2 (Hitchland Area)

The Group 2 stability study was conducted by S&C Engineering (S&C). With the power factor requirements and all network upgrades in service, all interconnection request in Group 2 will meet FERC Order #661A low voltage ride through (LVRT) requirements.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Final PF Requirement at POI		Estimated Capacitor Requirement (Mvar)
				Lagging (supplying)	Leading (absorbing)	
GEN-2010-001	300	Suzlon S88 2.1MW	Hitchland 345kV	0.950	0.999	0

Cluster Group 3 (Spearville Area)

The Group 3 stability study was conducted by Excel Engineering (Excel). The analysis for Group 3 showed that a reactive power deficiency was present at Finney 345kV substation and Comanche 345kV substation. The GEN-2010-052 and GEN-2010-053 interconnection requests will need to provide 95% lagging power factor at both Finney 345kV and Comanche 345kV. In order to provide the additional Mvar requirements, additional capacitor banks will be required. These reactive deficiencies also caused voltage stability issues for the Spearville area. In addition to the Spearville-Mullergren-Reno dbl circuit 345kV line, an additional 345kV line from Comanche to a tap on the Hitchland-Woodward 345kV line is necessary. Without this line, a possible outage of the double Comanche-Medicine Lodge 345kV line may cause voltage collapse in the Spearville area. With the power factor requirements and all network upgrades in service, all interconnection request in Group 3 will meet FERC Order #661A low voltage ride through (LVRT) requirements.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Final PF Requirement at POI		Estimated Capacitor Requirement (Mvar)
				Lagging (supplying)	Leading (absorbing)	
GEN-2010-027	900	GE 2.5MW	Spearville 345kV	0.95	1.0	0
GEN-2010-045	197.8	Siemens SWT 2.3MW	Tap Holcomb – Spearville 345kV	0.971	1.0	0
GEN-2010-049	49.6	GE 1.6MW	Pratt 115kV	1.0	0.95	0
GEN-2010-052	301.3	Siemens SWT 2.3MW	Finney 345kV	0.95	0.995	6
GEN-2010-053	199.8	Vestas V90 1.8MW	Comanche 345kV	0.95	1.0	85

Cluster Group 4 (Mingo Area)

There was no stability analysis conducted in the Mingo area due to no requests in the area.

Cluster Group 5 (Amarillo Area)

There was no stability analysis conducted in the Amarillo area due to no requests in the area.

Cluster Group 6 (South Panhandle Area)

The Group 6 stability analysis was conducted by AMEC Environmental. Low Voltage Ride Through (LVRT) was not analyzed in Group 6 due to the interconnection request being a gas request as opposed to a wind request.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Final PF Requirement at POI		Estimated Capacitor Requirement (Mvar)
				Lagging (supplying)	Leading (absorbing)	
GEN-2010-046	56	GENSAL	Tuco 230kV	N/A	N/A	0

The stability analysis for ASGI-2010-020 and ASGI-2010-021 was performed by Southwest Power Pool and the study shows no new problems with the dynamic response of study generation in the region of interest for the faults and clearing times studied. With the power factor requirements and all network upgrades in service, all interconnection request in Group 6 will meet FERC Order #661A low voltage ride through (LVRT) requirements and the transmission system will remain stable. Plots are available on request.

Request	Size (MW)	Generator Model	Point of Interconnection
ASGI-2010-020	50	Nordex N100	Tap LE-Tatum – LE-Crossroads 69kV
ASGI-2010-021	36.6	Vestas V90 1.8MW/ Mitsubishi MPS-1000A	Tap LE-Saundrtp – LE-Anderson 69kV

SPP included the following faults in the stability analysis for these specific requests (ASGI-2010-020 and ASGI-2010-021) on top of the contingency list used by AMEC (Appendix K):

Cont. No.	Cont. Name	Description
1	FLT01-3PH	3 phase fault on the ASGI-2010-020 Tap (580084) to LE-Crossroads (528695) 69kV line, near the ASGI-2010-020 Tap bus. a. Apply fault at the ASGI-2010-020 bus. b. Clear fault after 5 cycles by tripping the faulted line.
2	FLT02-3PH	3 phase fault on the LE-Tatum (528691) to LE-Broncotp (528731) 69kV line, near the LE-Tatum bus. a. Apply fault at the LE-Tatum bus. b. Clear fault after 5 cycles by tripping the faulted line.
3	FLT03-3PH	3 phase fault on the LE-McDonald (528683) to LE-Prairivw (528687) 69kV line, near the LE-McDonald bus. a. Apply fault at the LE-McDonald bus. b. Clear fault after 5 cycles by tripping the faulted line.
4	FLT04-3PH	3 phase fault on the ASGI-2010-021 (580090) to LE-Anderson (528646) 69kV line, near the ASGI-2010-021 bus. a. Apply fault at the ASGI-2010-021 bus. b. Clear fault after 5 cycles by tripping the faulted line.
5	FLT05-3PH	3 phase fault on the LE-Saundrtp (528638) to LE-Lovington (528618) 69kV line, near the LE-Saundrtp bus. a. Apply fault at the LE-Saundertp bus. b. Clear fault after 5 cycles by tripping the faulted line.
6	FLT06-3PH	3 phase fault on the LE-Saundrtp (528638) to LE-Buckeye (528630) 69kV line, near the LE-Saundrtp bus. a. Apply fault at the LE-Saundertp bus. b. Clear fault after 5 cycles by tripping the faulted line.

Cluster Group 7 (Southwest Oklahoma Area)

The Group 7 stability analysis was conducted by ABB Consulting Inc. (ABB). With the power factor requirements and all network upgrades in service, all interconnection request in Group 7 will meet FERC Order #661A low voltage ride through (LVRT) requirements and the transmission system will remain stable.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Final PF Requirement at POI		Estimated Capacitor Requirement (Mvar)
				Lagging (supplying)	Leading (absorbing)	
GEN-2010-012	65	Clipper C93 2.5MW	Brantley 138kV	1.0	1.0	0

Cluster Group 8 (South Central Kansas Area)

There was no stability analysis conducted in the South Central Kansas area due to no requests in the area.

Cluster Group 9 (Northeast Nebraska Area)

The Group 9 stability analysis was conducted by AMEC Environmental. With the power factor requirements and all network upgrades in service, all interconnection request in Group 9 will meet FERC Order #661A low voltage ride through (LVRT) requirements and the transmission system will remain stable.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Final PF Requirement at POI		Estimated Capacitor Requirement (Mvar)
				Lagging (supplying)	Leading (absorbing)	
GEN-2010-051	200	GE 1.6MW	Tap Twin Church – Hoskins 230kV	0.970	0.997	0

Cluster Group 10 (North Nebraska Area)

The Group 10 stability analysis was conducted by Excel Engineering (Excel). With the power factor requirements and all network upgrades in service, all interconnection request in Group 10 will meet FERC Order #661A low voltage ride through (LVRT) requirements and the transmission system will remain stable.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Final PF Requirement at POI		Estimated Capacitor Requirement (Mvar)
				Lagging (supplying)	Leading (absorbing)	
GEN-2010-038	74.9	GE 1.5MW	Broken Bow 115kV	1.0	0.982	0

Cluster Group 11 (North Kansas Area)

The Group 11 stability analysis was conducted by ABB Consulting Inc. (ABB). With the power factor requirements and all network upgrades in service, all interconnection request in Group 11 will meet FERC Order #661A low voltage ride through (LVRT) requirements and the transmission system will remain stable.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Final PF Requirement at POI		Estimated Capacitor Requirement (Mvar)
				Lagging (supplying)	Leading (absorbing)	
GEN-2010-048	70	Nordex 2.5MW	Tap Beach Station – Redline 115kV	0.957	0.957	0

Cluster Group 12 (Northwest Arkansas Area)

There was no stability analysis conducted in the Northwest Arkansas area due to no requests in the area.

Cluster Group 13 (Northwest Missouri Area)

The Group 13 stability analysis was conducted by Black & Veatch. With the power factor requirements and all network upgrades in service, all interconnection request in Group 13 will meet FERC Order #661A low voltage ride through (LVRT) requirements and the transmission system will remain stable

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Final PF Requirement at POI		Estimated Capacitor Requirement (Mvar)
				Lagging (supplying)	Leading (absorbing)	
GEN-2010-036	4.6	GENROU	6th Street 115kV	N/A	N/A	0
GEN-2010-041	10.5	GE 1.5MW	S 1399 161kV	0.965	0.965	0
GEN-2010-047	72	GE 1.6MW	Tap Beatrice – Harbine 115kV	0.980	0.980	0
GEN-2010-050	150.4	GE 1.6MW	Tap Centerville – Marmaton 161kV	0.998	0.998	0

Cluster Group 14 (South Central Oklahoma)

The Group 14 stability analysis was conducted by Pterra Consulting (Pterra). The South Central Oklahoma stability analysis revealed no stability issues with the study requests.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Final PF Requirement at POI		Estimated Capacitor Requirement (Mvar)
				Lagging (supplying)	Leading (absorbing)	
GEN-2010-040	300	Suzlon 2.1MW	Cimarron 345kV	0.95	0.95	Yes

Cluster Group 15 (Southwest Nebraska Area)

There was no stability analysis conducted in the Southwest Nebraska area due to no requests in the area.

Conclusion

The minimum cost of interconnecting all of the interconnection requests included in the Feasibility Cluster Study is estimated at $629,000,000 for the Allocated Network Upgrades and Transmission Owner Interconnection Facilities are listed in Appendix E and F. These costs do not include the cost of upgrades of other transmission facilities listed in Appendix I which are Network Constraints.

These interconnection costs do not include any cost of Network Upgrades determined to be required by short circuit analysis. These studies will be performed if the Interconnection Customer executes the appropriate Interconnection System Impact Study Agreement and provides the required data along with demonstration of Site Control and the appropriate deposit. At the time of the System Impact Cluster Study, a better determination of the interconnection facilities may be available.

The required interconnection costs listed in Appendices E, and F, and other upgrades associated with Network Constraints do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request (TSR) through SPP's Open Access Same Time Information System (OASIS) as required by Attachment Z1 of the SPP Open Access Transmission Tariff (OATT).

Appendix

A: Generation Interconnection Requests Considered for Impact Study

Request	Amount	Service	Area	Requested Point of Interconnection	Proposed Point of Interconnection	Requested In-Service Date
GEN-2010-001	300	ER	OKGE	HITCHLAND-WOODWARD 345KV	TAP HITCHLAND-WOODWARD 345KV	01/01/2012
GEN-2010-012	65	ER	WFEC	BRANTLEY 138kV	BRANTLEY 138kV	03/31/2012
GEN-2010-027	900	ER	SUNC	SPEARVILLE 345kV	COMANCHE 345kV	12/31/2012
GEN-2010-036	4.6	ER	WERE	6th STREET 115kV	6th STREET 115kV	08/01/2012
GEN-2010-038	74.9	ER	NPPD	BROKEN BOW 115kV	BROKEN BOW 115kV	12/01/2012
GEN-2010-040	300	NR	OKGE	CIMARRON 345kV	CIMARRON 345kV	11/30/2011
GEN-2010-041	10.5	NR	OPPD	S 1399 161kV	S 1399 161kV	12/31/2011
GEN-2010-043	320	ER/NR	WFEC	MOORELAND 138kV	MOORELAND 138kV	05/01/2017
GEN-2010-045	197.8	ER/NR	SUNC	TAP HOLCOMB – SPEARVILLE 345kV	TAP HOLCOMB – SPEARVILLE 345kV	12/31/2012
GEN-2010-046	56	ER	SPS	TUCO 230kV	TUCO 230kV	05/01/2013
GEN-2010-047	72	ER/NR	NPPD	TAP BEATRICE – HARBINE 115kV	TAP BEATRICE – HARBINE 115kV	12/01/2012
GEN-2010-048	70	ER/NR	MIDW	TAP BEACH STATION – REDLINE 115kV	TAP BEACH STATION – REDLINE 115kV	12/31/2011
GEN-2010-049	49.6	NR	MKEC	PRATT 115kV	PRATT 115kV	09/01/2012
GEN-2010-050	150.4	ER	MIPU	TAP CENTERVILLE – MARMATON 161kV	TAP CENTERVILLE – MARMATON 161kV	12/15/2012
GEN-2010-051	200	ER	NPPD	TAP TWIN CHURCH – HOSKINS 230kV	TAP TWIN CHURCH – HOSKINS 230kV	12/15/2012
GEN-2010-052	301.3	ER	SPS	FINNEY 345kV	FINNEY 345kV	12/15/2013
GEN-2010-053	199.8	ER/NR	SUNC	COMANCHE 345kV	COMANCHE 345kV	12/31/2014
ASGI-2010-020	50	ER	SPS	TAP (LE) TATUM – (LE) CROSSROADS 69kV	TAP (LE) TATUM – (LE) CROSSROADS 69kV	
ASGI-2010-021	36.6	ER	SPS	TAP (LE) SAUNDERS TAP – (LE) ANDERSON 69kV	TAP (LE) SAUNDERS TAP – (LE) ANDERSON 69kV	
GROUPED TOTAL	**3,358.5**					

***** Planned Facility
^ Proposed Facility
******* Electrically Remote Interconnection Requests

B: Prior Queued Interconnection Requests

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2001-014	96	WFEC	Fort Supply 138kV	On-Line
GEN-2001-026	74	WFEC	Washita 138kV	On-Line
GEN-2001-033	180	SPS	San Juan Mesa Tap 230kV	On-Line
GEN-2001-036	80	SPS	Caprock Tap 115kV	On-Line
GEN-2001-037	100	OKGE	Windfarm Switching 138kV	On-Line
GEN-2001-039A	105	MKEC	Tap Greensburg - Judson-Large 115kV	On Schedule for 2011
GEN-2001-039M	100	SUNC	Central Plains Tap 115kV	On-Line
GEN-2002-004	200	WERE	Latham 345kV	On-Line at 150MW
GEN-2002-005	120	WFEC	Red Hills Tap 138kV	On-Line
GEN-2002-006	150	SPS	Texas County 115kV	IA Executed/On Schedule 12/31/2010
GEN-2002-008	240	SPS	*Hitchland 345kV	On-Line at 120MW
GEN-2002-009	80	SPS	Hansford County 115kV	On-Line
GEN-2002-022	240	SPS	Bushland 230kV	On-Line at 160MW
GEN-2002-025A	150	MKEC	Spearville 230kV	On-Line at 100.5MW
GEN-2003-005	100	WFEC	Anadarko - Paradise 138kV	On Line
GEN-2003-006A	200	MKEC	Elm Creek 230kV	On-Line
GEN-2003-013**	198	SPS	*Hitchland - Finney 345kV	On Schedule for 2012
GEN-2003-019	250	MIDW	Smoky Hills Tap 230kV	On-Line
GEN-2003-020	160	SPS	Martin 115kV	On-Line at 80MW
GEN-2003-022	120	AEPW	Washita 138kV	On-Line
GEN-2004-014	154.5	MKEC	Spearville 230kV	On Schedule for 2010
GEN-2004-020	27	AEPW	Washita 138kV	On-Line
GEN-2005-005	18	OKGE	Windfarm Tap 138kV	IA Pending
GEN-2005-008	120	OKGE	Woodward 138kV	On-Line
GEN-2005-012	250	SUNC	Spearville 345kV	On Suspension
GEN-2005-013	201	WERE	Tap Latham - Neosho	On Schedule for 2012
GEN-2005-015	150	SPS	Tuco - Oklaunion 345kV	On Suspension
GEN-2005-017	340	SPS	Tap *Hitchland - Potter County 345kV	On Suspension
GEN-2005-021	85.5	SPS	Kirby 115kV	On Suspension
GEN-2006-002	101	AEPW	Grapevine - Elk City 230kV	On-Line
GEN-2006-006	205.5	SUNC	Spearville 230kV	IA Pending
GEN-2006-014	300	MIPU	Tap Maryville – Clarinda and tie Midway (WFARMS) 161kV	On Suspension
GEN-2006-017	300	MIPU	Tap Maryville – Clarinda and tie Midway (WFARMS) 161kV	On Suspension
GEN-2006-018	170	SPS	Tuco 230kV	On Schedule for 2011
GEN-2006-020S	18.9	SPS	DWS Frisco Tap	IA Executed/On Schedule 12/31/2011
GEN-2006-020N	42	NPPD	Bloomfield 115kV	1/1/2009
GEN-2006-021	101	MKEC	Flat Ridge Tap 138kV	On-Line
GEN-2006-022	150	MKEC	Ninnescah Tap 115kV	On Suspension
GEN-2006-024S	19.8	WFEC	South Buffalo Tap 69kV	On-Line
GEN-2006-026	502	SPS	Hobbs 230kV	On-Line
GEN-2006-031	75	MIDW	Knoll 115kV	On-Line
GEN-2006-032	200	MIDW	South Hays 230kV	On Suspension
GEN-2006-034	81	SUNC	Tap Kanarado - Sharon Springs 115kV	On Suspension
GEN-2006-035	225	AEPW	Tap Grapevine - Elk City 230kV	On Schedule for 2010
GEN-2006-037N1	75	NPPD	Broken Bow 115kV	IA Pending
GEN-2006-038N019	80	NPPD	Petersburg 115kV	5/1/2011

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2006-038	750	WFEC	Hugo 345kV	On Suspension
GEN-2006-039	400	SPS	Tap and Tie both Potter County - Plant X 230kV and Bushland - Deaf Smith 230kV	On Suspension
GEN-2006-040	108	SUNC	Mingo 115kV	On Schedule for 2010
GEN-2006-043	99	AEPW	Grapevine - Elk City 230kV	On Line
GEN-2006-044	370	SPS	*Hitchland 345kV	On Schedule for 12/2011
GEN-2006-044N	40.5	NPPD	Tap Neligh – Petersburg 115kV	On Schedule for 12/2011
GEN-2006-044N02	100.5	NPPD	GEN-2008-086N02 230kV	Under Study (DISIS-2010-001)
GEN-2006-045	240	SPS	Tap and Tie both Potter County - Plant X 230kV and Bushland - Deaf Smith 230kV	On Suspension
GEN-2006-046	131	OKGE	Dewey 138kV	On Schedule for 2011
GEN-2006-047	240	SPS	Tap and Tie both Potter County - Plant X 230kV and Bushland - Deaf Smith 230kV	On Schedule for 2013
GEN-2006-049	400	SPS	*Hitchland - Finney 345kV	On Schedule for 2014
GEN-2007-002	160	SPS	Grapevine 115kV	On Suspension
GEN-2007-006	160	OKGE	Roman Nose 138kV	On Suspension
GEN-2007-011	135	SUNC	Syracuse 115kV	On Schedule
GEN-2007-011N06	75	NPPD	Tap Neligh – Petersburg 115kV	IA Pending
GEN-2007-011N08	81	NPPD	Bloomfield 115kV	On-Line
GEN-2007-011N09	75	NPPD	Bloomfield 115kV	IA Pending
GEN-2007-013	99	SUNC	Selkirk 115kV	On Suspension
GEN-2007-015	135	WERE	Tap Humboldt – Kelly 161kV	On Suspension
GEN-2007-017	100.5	MIPU	Tap Maryville – Clarinda and tie Midway (WFARMS) 161kV	On Suspension
GEN-2007-021	201	OKGE	*Tatonga 345kV	On Schedule for 2014
GEN-2007-025	300	WERE	Tap Woodring – Wichita 345kV	On Suspension
GEN-2007-032	150	WFEC	Tap Clinton Junction – Clinton 138kV	IA Pending
GEN-2007-038	200	SUNC	Spearville 345kV	IA Pending
GEN-2007-040	200.1	SUNC	Tap Holcomb – Spearville 345kV	IA Pending
GEN-2007-043	200	OKGE	Tap Lawton Eastside – Cimarron 345kV	On-Line (100MW)
GEN-2007-044	300	OKGE	*Tatonga 345kV	On Schedule for 2014
GEN-2007-046	199.5	SPS	Tap & Tie Texas County – Hitchland & DWS Frisco Tap – Hitchland 115kV	On Schedule for 2014
GEN-2007-048	400	SPS	Tap Amarillo South – Swisher 230kV	On Schedule for 2014
GEN-2007-050	170	OKGE	*Woodward 138kV	On-Line
GEN-2007-051	200	WFEC	Mooreland 138kV	On Schedule for 2014
GEN-2007-052	150	WFEC	Anadarko 138kV	On-Line
GEN-2007-053	110	MIPU	Tap Maryville – Clarinda and tie Midway (WFARMS) 161kV	On Schedule for 2013
GEN-2007-057	34.5	SPS	Moore County East 115kV	On Schedule for 2014
GEN-2007-062**	765	OKGE	*Woodward 345kV	On Schedule for 2014
GEN-2008-003	101	OKGE	*Woodward EHV 138kV	On-Line
GEN-2008-008	60	SPS	Graham 115kV	On Schedule for 2014
GEN-2008-009	60	SPS	San Juan Mesa Tap 230kV	On Schedule for 2014
GEN-2008-013	300	OKGE	Tap Woodring – Wichita 345kV	On Schedule for 2013
GEN-2008-014	150	SPS	Tap Tuco – Oklaunion 345kV	On Schedule for 2014
GEN-2008-016	248	SPS	Grassland 230kV	IA Pending
GEN-2008-017	300	SUNC	Setab 345kV	IA Pending)
GEN-2008-018	405	SPS	Finney 345kV	IA Pending
GEN-2008-019**	300	OKGE	*Tatonga 345kV	On Schedule for 2015
GEN-2008-021	42	WERE	Wolf Creek 345kV	IA Pending
GEN-2008-022	300	SPS	Tap Eddy – Tolk 345kV	Under Study (DISIS-2010-001)
GEN-2008-023	150	AEPW	Hobart Junction 138kV	On Schedule for 2012
GEN-2008-025	101.2	SUNC	Ruleton 115kV	IA Pending

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2008-029	250.5	OKGE	Woodward EHV 138kV	IA Pending
GEN-2008-037	101	WFEC	Tap Washita – Blue Canyon 138kV	Under Study (DISIS-2010-001)
GEN-2008-038	150	AEPW	Tap Shidler – West Pawhuska 138kV	Under Study (DISIS-2009-001)
GEN-2008-044	197.8	OKGE	Tatonga 345kV	Under Study (DISIS-2010-001)
GEN-2008-046	200	OKGE	Sunnyside 345kV	Under Study (DISIS-2010-001)
GEN-2008-047	300	SPS	Tap Hitchland - Woodward 345kV	Under Study (DISIS-2010-001)
GEN-2008-051	322	SPS	Potter 345kV	IA Pending
GEN-2008-071	76.8	OKGE	Newkirk 138kV	Under Study (DISIS-2010-001)
GEN-2008-079	100.5	MKEC	Tap Judson Large – Cudahy 115kV	IA Pending
GEN-2008-086N02	200	NPPD	Tap Ft. Randall – Columbus 230kV	IA Pending
GEN-2008-088	50.6	SPS	Vega 69kV	Under Study (DISIS-2010-001)
GEN-2008-092	201	MIDW	Knoll 115kV	Under Study (DISIS-2009-001)
GEN-2008-098	100.8	WERE	Tap Wolf Creek – LaCygne 345kV	Under Study (DISIS-2010-001)
GEN-2008-110	299.2	SPS	Hitchland 345kV	Under Study (DISIS-2010-001)
GEN-2008-119O	60	OPPD	Tap Humboldt – Kelly 161kV	On-Line
GEN-2008-123N	89.7	NPPD	Tap Guide - Pauline 115kV	Under Study (DISIS-2010-001)
GEN-2008-124	200.1	SUNC	Spearville 230kV	IA Pending
GEN-2008-127	200.1	WERE	Tap Sooner – Rose Hill 345kV	IA Pending
GEN-2008-129	80	MIPU	Pleasant Hill 161kV	On-Line
GEN-2009-008	199.5	SUNC	South Hays 230kV	Under Study (DISIS-2010-001)
GEN-2009-011	50	MKEC	Tap Plainville – Phillipsburg 115kV	IA Pending
GEN-2009-016	141	AEPW	Falcon Road 138kV	IA Pending
GEN-2009-017**	60	SPS	Tap Pembrook – Stiles 138kV	Under Study (DISIS-2009-001)
GEN-2009-020	48.6	MIDW	Tap Bazine – Nekoma 69kV	Under Study (DISIS-2010-001)
GEN-2009-025	60	OKGE	Tap Deer Creek – Sinclair 69kV	IA Pending
GEN-2009-030	100.8	WFEC	Weatherford 138kV	Under Study (DISIS-2010-001)
GEN-2009-032S	6.4	OKGE	Foster 138kV	Under Study (DISIS-2010-001)
GEN-2009-040	73.8	WERE	Tap Smittyville - Knob Hill 115kV	Under Study (DISIS-2010-001)
GEN-2009-059	100.5	MKEC	Tap GEN-2008-079 - Cudahy 115kV	Under Study (DISIS-2010-001)
GEN-2009-060	84	WFEC	Gotebo 69kV	Under Study (DISIS-2010-001)
GEN-2009-062	115	SUNC	Hugoton 115kV	Under Study (DISIS-2010-001)
GEN-2009-067S	20	SPS	7 Rivers 69kV	Under Study (DISIS-2010-001)
GEN-2010-003	100.8	WERE	GEN-2008-098 345kV	Under Study (DISIS-2010-001)
GEN-2010-005	300	WERE	GEN-2007-025 345kV	Under Study (DISIS-2010-001)
GEN-2010-006	205	SPS	Jones 230kV	Under Study (DISIS-2010-001)
GEN-2010-007	73.8	SPS	Tap Pringle - Riverview 115kV	Under Study (DISIS-2010-001)
GEN-2010-008	64.4	WFEC	Fargo 69kV	Under Study (DISIS-2010-001)
GEN-2010-009	165.6	SUNC	Gray County 345kV	Under Study (DISIS-2010-001)

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2010-010	100.5	NPPD	Emerick 69kV	Under Study (DISIS-2010-001)
GEN-2010-011	29.7	OKGE	GEN-2008-044 345kV	Under Study (DISIS-2010-001)
GEN-2010-013	50.4	WERE	GEN-2005-013 345kV	Under Study (DISIS-2010-001)
GEN-2010-014	360	SPS	Hitchland 345kV	Under Study (DISIS-2010-001)
GEN-2010-015	200.1	SUNC	Spearville 345kV	Under Study (DISIS-2010-001)
GEN-2010-016	199.8	SUNC	Tap Spearville - Knoll 345kV	Under Study (DISIS-2010-001)
Broken Bow	8.3	NPPD	Genoa 115kV	On-Line
Ord	10.8	NPPD	Bloomfield 115kV	On-Line
Stuart	2.1	NPPD	Petersburg 115kV	On-Line
Ainsworth	75	NPPD	Ainsworth Wind Tap 115kV	On-Line
Rosebud Wind Project	30	NPPD	St. Francis 115kV	On-Line
Broken Bow	80	NPPD	Broken Bow 115kV	On-Line
Wolf Creek	1170	WERE	Wolf Creek 345kV	On-Line
Genoa	4	NPPD	Genoa 115kV	On-Line
ASGI-2010-001	400	AECI	Tap Cooper – Fairport 345kV	AECI queue Affected Study
ASGI-2010-002	201	AECI	Lathrop 161kV	AECI queue Affected Study
ASGI-2010-003	300	AECI	Maryville 161kV	AECI queue Affected Study
ASGI-2010-004	50	AECI	Tap Queen City – Lancaster 69kV	AECI queue Affected Study
ASGI-2010-005	99	AECI	Lathrop 161kV	AECI queue Affected Study
ASGI-2010-006	150	AECI	Tap Fairfax – Fairfax Tap 138kV	AECI queue Affected Study
ASGI-2010-007	150	AECI	Tap Fairfax – Fairfax Tap 138kV	AECI queue Affected Study
ASGI-2010-008	100	AECI	Maryville 161kV	AECI queue Affected Study
ASGI-2010-009	201	AECI	Osborn 161kV	AECI queue Affected Study
ASGI-2010-010	42	SPS	Lovington 115kV	AECI queue Affected Study
ASGI-2010-011	48	SPS	Texas County 69kV	AECI queue Affected Study
Llanoest	80	SPS	Llano Wind Farm Tap 115kV	On-Line
			Dumas_19ST 115kV	On-Line
			Etter 115kV	On-Line
			Sherman 115kV	On-Line
			Spearman 115kV	On-Line
SPSDISTR	90	SPS	Texas County 115kV	On-Line
			Washita 138kV (GEN-2003-004)	On-Line
			Washita 138kV (GEN-2004-023)	On-Line
BLUCAN2	153	WFEC	Washita 138kV (GEN-2005-003)	On-Line
Montezuma	110	MKEC	Haggard 115kV	On-Line
GROUPED TOTAL	**26,576**			

** Interconnection on Caprock Electric tested for impacts on SPP

***** Planned Facility

^ Proposed Facility

C: Study Groupings

Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	GEN-2001-014	96	WFEC	Fort Supply 138kV
	GEN-2001-037	100	OKGE	Windfarm Switching 138kV
	GEN-2002-005	120	WFEC	Red Hills Tap 138kV
	GEN-2005-005	18	OKGE	Windfarm Tap 138kV
	GEN-2005-008	120	OKGE	Woodward 138kV
	GEN-2006-024S	19.8	WFEC	South Buffalo Tap 69kV
	GEN-2006-046	131	OKGE	Dewey 138kV
	GEN-2007-006	160	OKGE	Roman Nose 138kV
	GEN-2007-021	201	OKGE	*Tatonga 345kV
	GEN-2007-044	300	OKGE	*Tatonga 345kV
	GEN-2007-050	170	OKGE	*Woodward 138kV
	GEN-2007-051	200	WFEC	Mooreland 138kV
	GEN-2007-062	765	OKGE	*Woodward 345kV
	GEN-2008-003	101	OKGE	*Woodward EHV 138kV
	GEN-2008-019	300	OKGE	*Tatonga 345kV
	GEN-2008-029	250.5	OKGE	WOODWARD EHV 138kV
	GEN-2008-044	197.8	OKGE	Tatonga 345kV
	GEN-2010-008	64.4	WFEC	Fargo 69kV
	GEN-2010-011	29.7	OKGE	GEN-2008-044 345kV
	PRIOR QUEUED SUBTOTAL	**3,344.2**		
Cluster	**Request**	**Amount**	**Area**	**Proposed Point of Interconnection**
Woodward	GEN-2010-043	320	WFEC	Mooreland 138kV
	WOODWARD SUBTOTAL	**320**		
	AREA SUBTOTAL	**3,664.2**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	SPS Distribution	90	SPS	Various
	ASGI-2010-011	48	SPS	Texas County 69kV
	GEN-2002-006	150	SPS	Texas County 115kV
	GEN-2002-008	240	SPS	*Hitchland 345kV
	GEN-2002-009	80	SPS	Hansford County 115kV
	GEN-2003-013	198	SPS	*Tap Hitchland - Finney 345kV
	GEN-2003-020	160	SPS	Martin 115kV
	GEN-2005-017	340	SPS	*Tap Hitchland - Potter County 345kV
	GEN-2006-020S	18.9	SPS	DWS Frisco Tap
	GEN-2006-044	370	SPS	*Hitchland 345kV
	GEN-2006-049	400	SPS	*Tap Hitchland - Finney 345kV
	GEN-2007-046	199.5	SPS	Tap & Tie Texas County – Hitchland & DWS Frisco Tap – Hitchland 115kV
	GEN-2007-057	34.5	SPS	Moore County East 115kV
	GEN-2008-047	300	SPS	TAP HITCHLAND - WOODWARD 345kV
	GEN-2008-110	299.2	SPS	Hitchland 345kV
	GEN-2010-007	73.8	SPS	Tap Pringle – Riverview 115kV
	GEN-2010-014	360	SPS	Hitchland 345kV
	PRIOR QUEUED SUBTOTAL	**3,361.9**		
Cluster	**Request**	**Amount**	**Area**	**Proposed Point of Interconnection**
Hitchland	GEN-2010-001	300	SPS	GEN-2008-047 345kV
	HITCHLAND SUBTOTAL	**300**		
	AREA SUBTOTAL	**3,661.9**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	Montezuma	110	MKEC	Haggard 115kV
	GEN-2001-039A	105	MKEC	Tap Greensburg - Judson-Large 115kV
	GEN-2002-025A	150	MKEC	Spearville 230kV
	GEN-2004-014	154.5	MKEC	Spearville 230kV
	GEN-2005-012	250	SUNC	Spearville 345kV
	GEN-2006-006	205.5	SUNC	Spearville 230kV
	GEN-2006-021	101	MKEC	Flat Ridge Tap 138kV
	GEN-2006-022	150	MKEC	Ninnescah Tap 115kV
	GEN-2007-038	200	SUNC	Spearville 345kV
	GEN-2007-040	200.1	SUNC	Tap Holcomb – Spearville 345kV
	GEN-2008-018	405	SPS	Finney 345kV
	GEN-2008-079	100.5	MKEC	Tap Judson Large – Cudahy 115kV
	GEN-2008-124	200.1	SUNC	Spearville 230kV
	GEN-2009-059	100.5	MKEC	Tap GEN-2008-079 – Cudahy 115kV
	GEN-2009-062	115	SUNC	Hugoton 115kV
	GEN-2010-009	165.6	SUNC	Gray County 345kV
	GEN-2010-015	200.1	SUNC	Spearville 345kV
	GEN-2010-016	199.8	SUNC	Tap Spearville – Knoll 345kV
PRIOR QUEUED SUBTOTAL		**3,112.7**		
Cluster	**Request**	**Amount**	**Area**	**Proposed Point of Interconnection**
Spearville	GEN-2010-027	900	SUNC	Comanche 345kV
	GEN-2010-045	197.8	SUNC	Tap Holcomb – Spearville 345kV
	GEN-2010-049	49.6	MKEC	Pratt 115kV
	GEN-2010-052	301.3	SPS	Finney 345kV
	GEN-2010-053	199.8	SUNC	Comanche 345kV
SPEARVILLE SUBTOTAL		**1,648.5**		
AREA SUBTOTAL		**4,761.3**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	GEN-2001-039M	100	SUNC	Central Plains Tap 115kV
	GEN-2006-034	81	SUNC	Tap Kanarado - Sharon Springs 115kV
	GEN-2006-040	108	SUNC	Mingo 115kV
	GEN-2007-011	135	SUNC	Syracuse 115kV
	GEN-2007-013	99	SUNC	Selkirk 115kV
	GEN-2008-017	300	SUNC	Setab 345kV
	GEN-2008-025	101.2	SUNC	Ruleton 115kV
PRIOR QUEUED SUBTOTAL		**924.2**		
MINGO/NW KANSAS SUBTOTAL		**924.2**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	Llano Estacado	80	SPS	Llano Estacado Tap 115kV
	GEN-2002-022	240	SPS	Bushland 230kV
	GEN-2005-021	85.5	SPS	Kirby 115kV
	GEN-2006-039	400	SPS	Tap and Tie both Potter County - Plant X 230kV and Bushland - Deaf Smith 230kV
	GEN-2006-045	240	SPS	Tap and Tie both Potter County - Plant X 230kV and Bushland - Deaf Smith 230kV
	GEN-2006-047	240	SPS	Tap and Tie both Potter County - Plant X 230kV and Bushland - Deaf Smith 230kV
	GEN-2007-002	160	SPS	Grapevine 115kV
	GEN-2007-048	400	SPS	Tap Amarillo South – Swisher 230kV
	GEN-2008-051	322	SPS	Potter 345kV
	GEN-2008-088	50.6	SPS	Vega 69kV
	PRIOR QUEUED SUBTOTAL	**2,218.1**		
	AMARILLO SUBTOTAL	**2,218.1**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	ASGI-2010-010	42	SPS	Lovington 115kV
	GEN-2001-033	180	SPS	San Juan Mesa Tap 230kV
	GEN-2001-036	80	SPS	Caprock Tap 115kV
	GEN-2005-015	150	SPS	Tap Tuco - Oklaunion 345kV
	GEN-2006-018	170	SPS	Tuco 230kV
	GEN-2006-026	502	SPS	Hobbs 230kV
	GEN-2008-008	60	SPS	Graham 115kV
	GEN-2008-009	60	SPS	San Juan Mesa Tap 230kV
	GEN-2008-014	150	SPS	Tap Tuco – Oklaunion 345kV
	GEN-2008-016	248	SPS	Grassland 230kV
	GEN-2008-022	300	SPS	Tap Eddy – Tolk 345kV
	GEN-2009-017	60	SPS	Tap Pembrook – Stiles 138kV
	GEN-2009-067S	20	SPS	7 Rivers 69kV
	GEN-2010-006	205	SPS	Jones 230kV
	PRIOR QUEUED SUBTOTAL	**2,227**		
Cluster	**Request**	**Amount**	**Area**	**Proposed Point of Interconnection**
S Panhandle	ASGI-2010-020	50	SPS	Tap (LE) Tatum – (LE) Crossroads 69kV
	ASGI-2010-021	36.6	SPS	Tap (LE) Saunders Tap – (LE) Anderson 69kV
	GEN-2010-046	56	SPS	Tuco 230kV
	SOUTH PANHANDLE/NM SUBTOTAL	**142.6**		
	AREA SUBTOTAL	**2,369.6**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	GEN-2001-026	74	WFEC	Washita 138kV
	GEN-2003-004	101	WFEC	Washita 138kV
	GEN-2003-005	100	WFEC	Anadarko - Paradise 138kV
	GEN-2003-022	120	AEPW	Washita 138kV
	GEN-2004-020	27	AEPW	Washita 138kV
	GEN-2004-023	21	WFEC	Washita 138kV
	GEN-2005-003	31	WFEC	Washita 138kV
	GEN-2006-002	101	AEPW	Grapevine - Elk City 230kV
	GEN-2006-035	225	AEPW	Grapevine - Elk City 230kV
	GEN-2006-043	99	AEPW	Grapevine - Elk City 230kV
	GEN-2007-032	150	WFEC	Tap Clinton Junction – Clinton 138kV
	GEN-2007-043	200	OKGE	Tap Lawton Eastside – Cimarron 345kV
	GEN-2007-052	150	WFEC	Anadarko 138kV
	GEN-2008-023	150	AEPW	Hobart Junction 138kV
	GEN-2008-037	101	WFEC	Tap Washita – Blue Canyon 138kV
	GEN-2009-016	141	AEPW	Falcon Road 138kV
	GEN-2009-030	100.8	WFEC	Weatherford 138kV
	GEN-2009-060	84	WFEC	Gotebo 69kV
	PRIOR QUEUED SUBTOTAL	**1,975.8**		
Cluster	**Request**	**Amount**	**Area**	**Proposed Point of Interconnection**
SW Oklahoma	GEN-2010-012	65	WFEC	Brantley 138kV
	SW OKLAHOMA SUBTOTAL	**65**		
	AREA SUBTOTAL	**2,040.8**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	Wolf Creek	1170	WERE	Wolf Creek 345kV
	ASGI-2010-006	150	AECI	Tap Fairfax – Fairfax Tap 138kV
	ASGI-2010-007	150	AECI	Tap Fairfax – Fairfax Tap 138kV
	GEN-2002-004	200	WERE	Latham 345kV
	GEN-2005-013	201	WERE	Tap Latham - Neosho
	GEN-2007-025	300	WERE	Tap Woodring – Wichita 345kV
	GEN-2008-013	300	OKGE	Tap Woodring – Wichita 345kV
	GEN-2008-021	42	WERE	Wolf Creek 25kV
	GEN-2008-038	150	AEPW	Tap Shidler – West Pawhuska 138kV
	GEN-2008-071	76.8	OKGE	Newkirk 138kV
	GEN-2008-098	100.8	WERE	Tap Wolf Creek – LaCygne 345kV
	GEN-2008-127	200.1	WERE	Tap Sooner – Rose Hill 345kV
	GEN-2009-025	60	OKGE	Tap Deer Creek – Sinclair 69kV
	GEN-2010-003	100.8	WERE	GEN-2008-098 345kV
	GEN-2010-005	300	WERE	GEN-2007-025 345kV
	GEN-2010-013	50.4	WERE	GEN-2005-013 345kV
	PRIOR QUEUED SUBTOTAL	**3,551.9**		
	NORTH OKLAHOMA SUBTOTAL	**3,551.9**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection

Prior Queued	Genoa	4	NPPD	Genoa 115kV
	GEN-2006-020N	42	NPPD	Bloomfield 115kV
	GEN-2006-038N019	80	NPPD	Petersburg 115kV
	GEN-2006-044N	40.5	NPPD	Tap Neligh – Petersburg 115kV
	GEN-2006-044N02	100.5	NPPD	GEN-2008-086N02 230kV
	GEN-2007-011N06	75	NPPD	Tap Neligh – Petersburg 115kV
	GEN-2007-011N08	81	NPPD	Bloomfield 115kV
	GEN-2007-011N09	75	NPPD	Bloomfield 115kV
	GEN-2008-086N02	200	NPPD	Tap Ft. Randall – Columbus 230kV
	GEN-2010-010	100.5	NPPD	Emerick 69kV
	PRIOR QUEUED SUBTOTAL	**798.5**		
Cluster	**Request**	**Amount**	**Area**	**Proposed Point of Interconnection**
NE Nebraska	GEN-2010-051	200	NPPD	Tap Twin Church – Hoskins 230kV
	NE NEBRASKA SUBTOTAL	**200**		
	AREA SUBTOTAL	**998.5**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	Broken Bow	8.3	NPPD	Genoa 115kV
	Ord	10.8	NPPD	Bloomfield 115kV
	Stuart	2.1	NPPD	Petersburg 115kV
	Ainsworth	75	NPPD	Ainsworth Wind Tap 115kV
	Rosebud Wind Project	30	NPPD	St. Francis 115kV
	Broken Bow	80	NPPD	Broken Bow 115kV
	GEN-2006-037N1	75	NPPD	Broken Bow 115kV
	PRIOR QUEUED SUBTOTAL	**281.2**		
Cluster	**Request**	**Amount**	**Area**	**Proposed Point of Interconnection**
North Nebraska	GEN-2010-038	74.9	NPPD	Broken Bow 115kV
	NORTH NEBRASKA SUBTOTAL	**74.9**		
	AREA SUBTOTAL	**356.1**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	GEN-2003-006A-E	100	MKEC	Elm Creek 230kV
	GEN-2003-006A-W	100	MKEC	Elm Creek 230kV
	GEN-2003-019	250	MIDW	Smoky Hills Tap 230kV
	GEN-2006-031	75	MIDW	Knoll 115kV
	GEN-2006-032	200	MIDW	South Hays 230kV
	GEN-2008-092	201	MIDW	Knoll 115kV
	GEN-2009-008	199.5	SUNC	South Hays 230kV
	GEN-2009-011	50	MKEC	Tap Plainville – Phillipsburg 115kV
	GEN-2009-020	48.6	MIDW	Tap Bazine – Nekoma 69kV
	GEN-2009-040	73.8	WERE	Tap Smittyville – Knob Hill 115kV
	PRIOR QUEUED SUBTOTAL	**1,297.9**		
Cluster	**Request**	**Amount**	**Area**	**Proposed Point of Interconnection**
North Kansas	GEN-2010-048	70	MIDW	Tap Beach Station – Redline 115kV
	NORTH KANSAS SUBTOTAL	**70**		
	AREA SUBTOTAL	**1,367.9**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection
or Queu	ASGI-2010-001	400	AECI	Tap Cooper – Fairport 345kV

	ASGI-2010-002	201	AECI	Lathrop 161kV
	ASGI-2010-003	300	AECI	Maryville 161kV
	ASGI-2010-004	50	AECI	Tap Queen City – Lancaster 69kV
	ASGI-2010-005	99	AECI	Lathrop 161kV
	ASGI-2010-008	100	AECI	Maryville 161kV
	ASGI-2010-009	201	AECI	Osborn 161kV
	GEN-2006-014	300	MIPU	Tap Maryville – Clarinda 161kV & Tie to Midway 161kV
	GEN-2006-017	300	MIPU	Tap Maryville – Clarinda 161kV & Tie to Midway 161kV
	GEN-2007-015	135	WERE	Tap Humboldt – Kelly 161kV
	GEN-2007-017	100.5	MIPU	Tap Maryville – Clarinda 161kV & Tie to Midway 161kV
	GEN-2007-053	110	MIPU	Tap Maryville – Clarinda 161kV & Tie to Midway 161kV
	GEN-2008-119O	60	OPPD	Tap Humboldt – Kelly 161kV
	GEN-2008-129	80	MIPU	Pleasant Hill 161kV
	PRIOR QUEUED SUBTOTAL	**2,436.5**		
Cluster	**Request**	**Amount**	**Area**	**Proposed Point of Interconnection**
NW Missouri	GEN-2010-036	4.6	WERE	6th Street 115kV
	GEN-2010-041	10.5	OPPD	S 1399 161kV
	GEN-2010-047	72	NPPD	Tap Beatrice – Harbine 115kV
	GEN-2010-050	150.4	MIPU	Tap Centerville – Marmaton 161kV
	NORTHWEST MISSOURI SUBTOTAL	**237.5**		
	AREA SUBTOTAL	**2,674**		

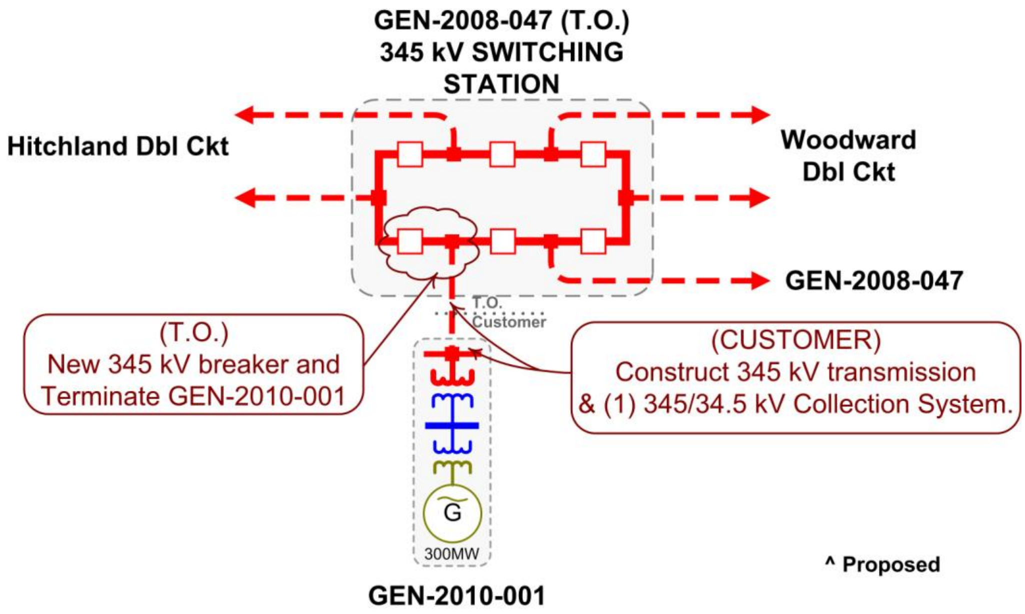
Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	GEN-2006-038	750	WFEC	Hugo 345kV
	GEN-2008-046	200	OKGE	Sunnyside 345kV
	GEN-2009-032S	6.4	OKGE	Foster 138kV
	PRIOR QUEUED SUBTOTAL	**956.4**		
Cluster	**Request**	**Amount**	**Area**	**Proposed Point of Interconnection**
SOUTH CENTRAL OKLAHOMA	GEN-2010-040	300	OKGE	Cimarron 345kV
	SOUTH CENTRAL OKLAHOMA SUBTOTAL	**300**		
	AREA SUBTOTAL	**1256.4**		

Cluster	Request	Amount	Area	Proposed Point of Interconnection
Prior Queued	GEN-2008-123N	89.7	NPPD	Tap Guide – Pauline 115kV
	PRIOR QUEUED SUBTOTAL	**89.7**		
	SOUTHWEST NEBRASKA	**89.7**		
	*****CLUSTERED TOTAL (w/o PRIOR QUEUED)**	**3,358.5**		
	*****CLUSTERED TOTAL (w/PRIOR QUEUED)**	**29,934.5**		

* Planned Facility
^ Proposed Facility
** Alternate requests - counted as one request for study purpose
*** Electrically Remote Interconnection Requests

D: Proposed Point of Interconnection One line Diagrams

GEN-2010-001



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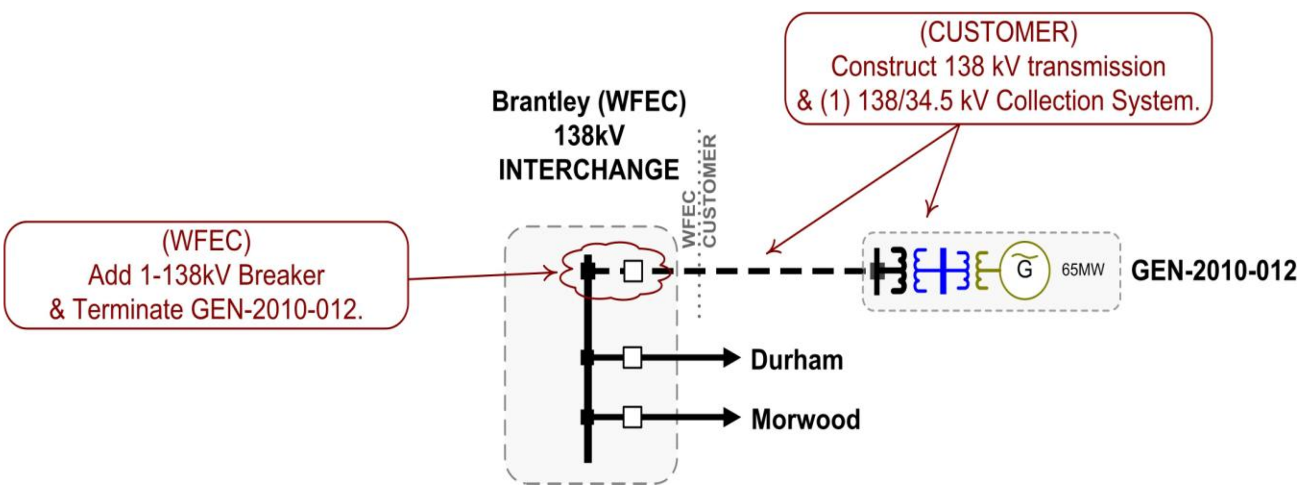

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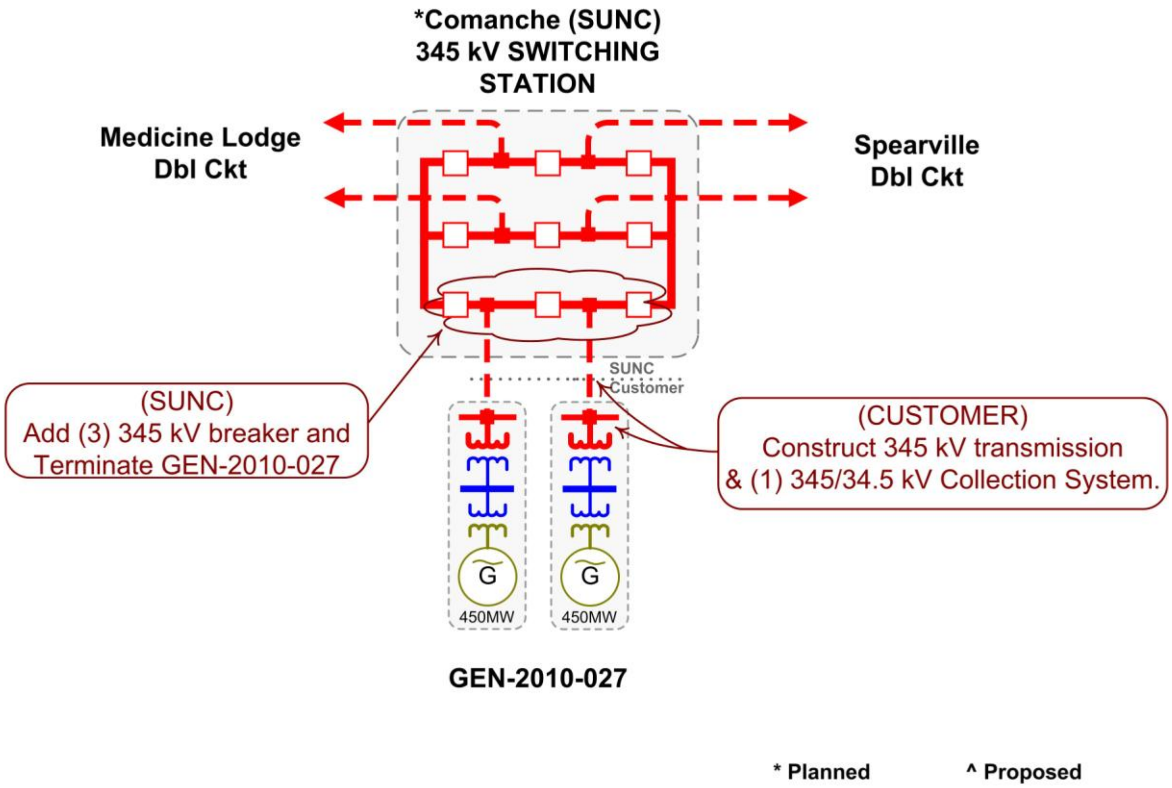

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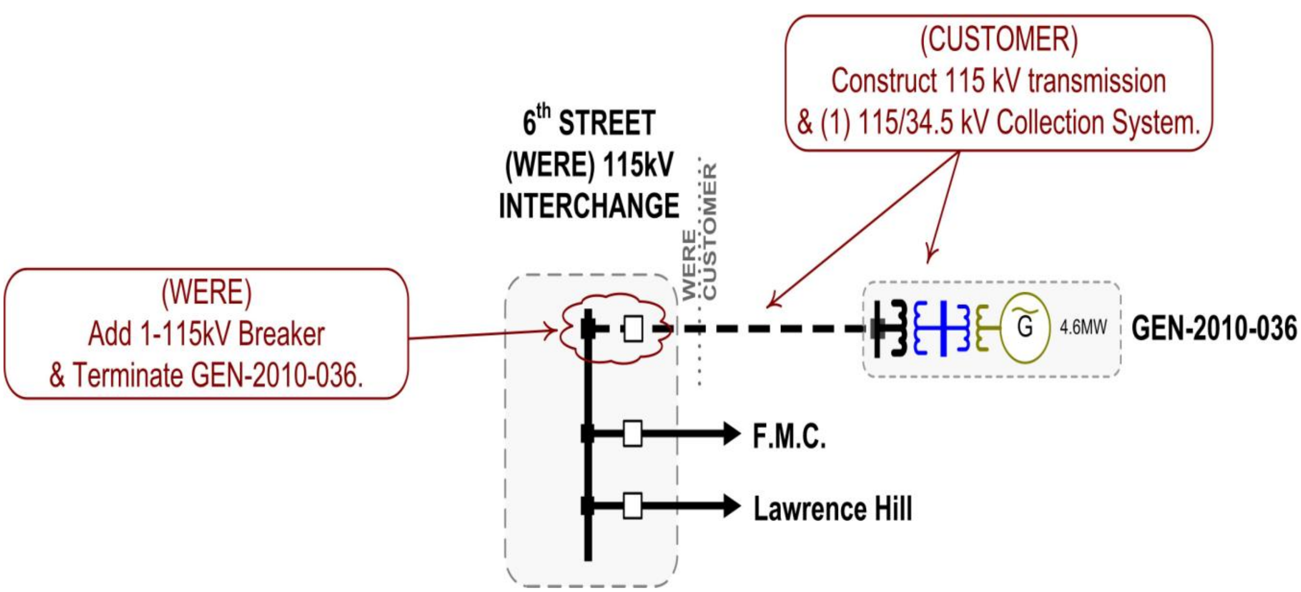

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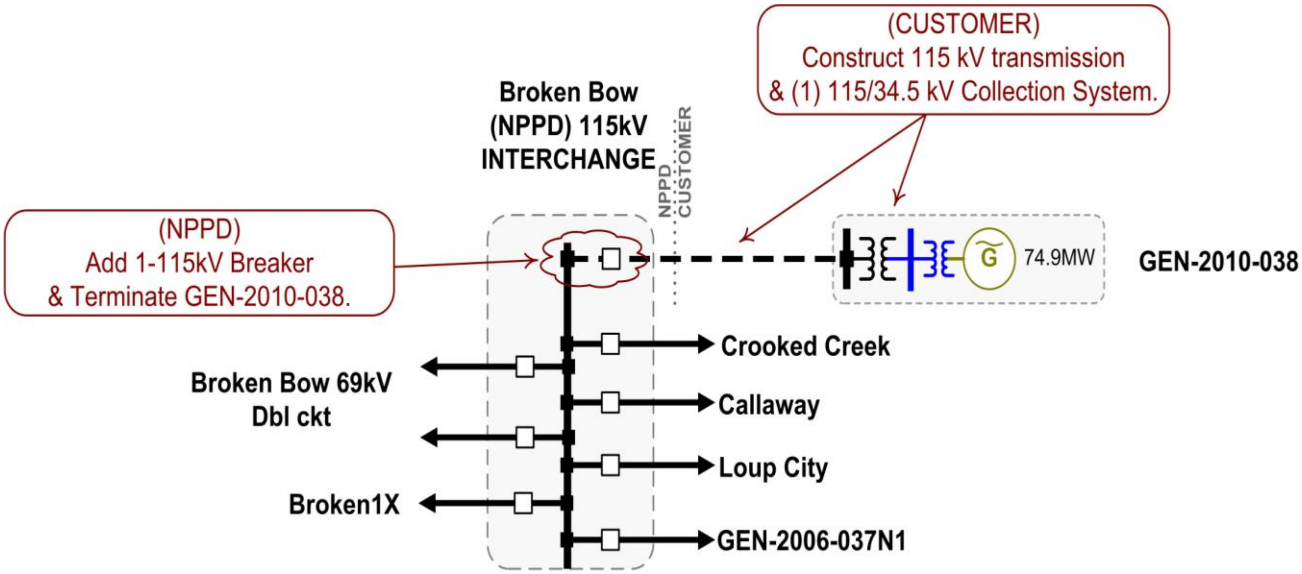

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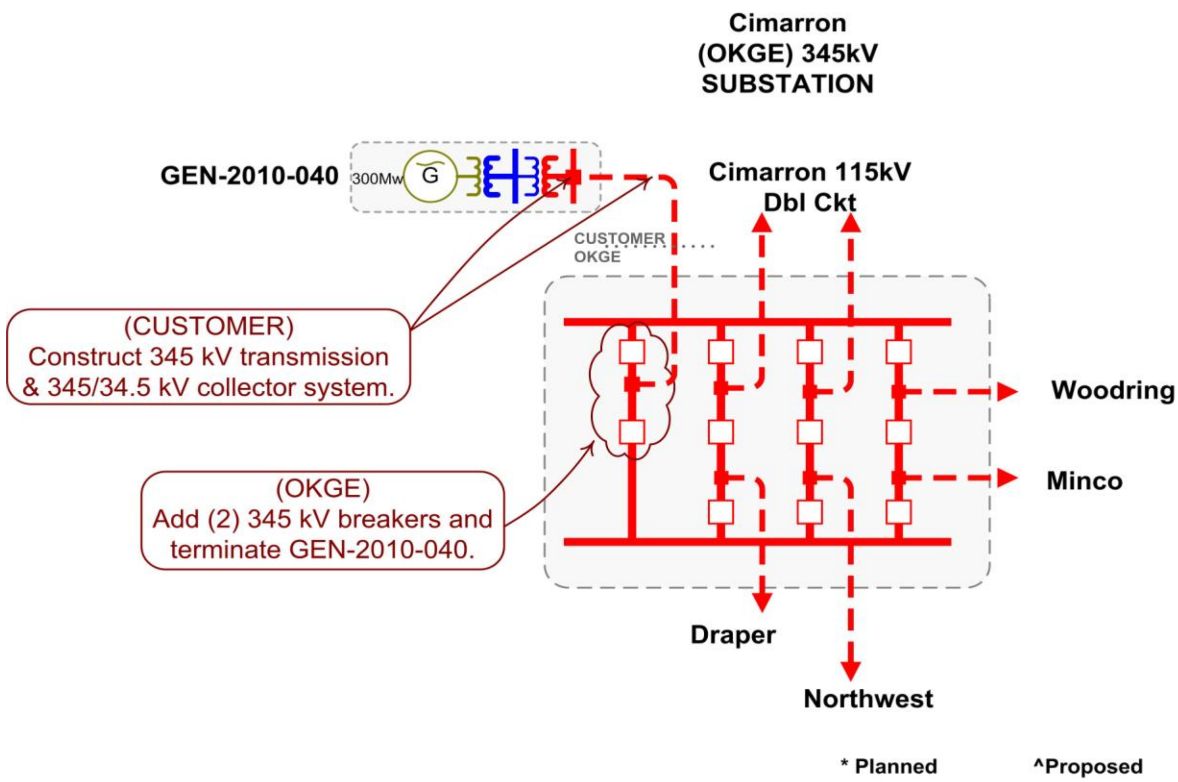

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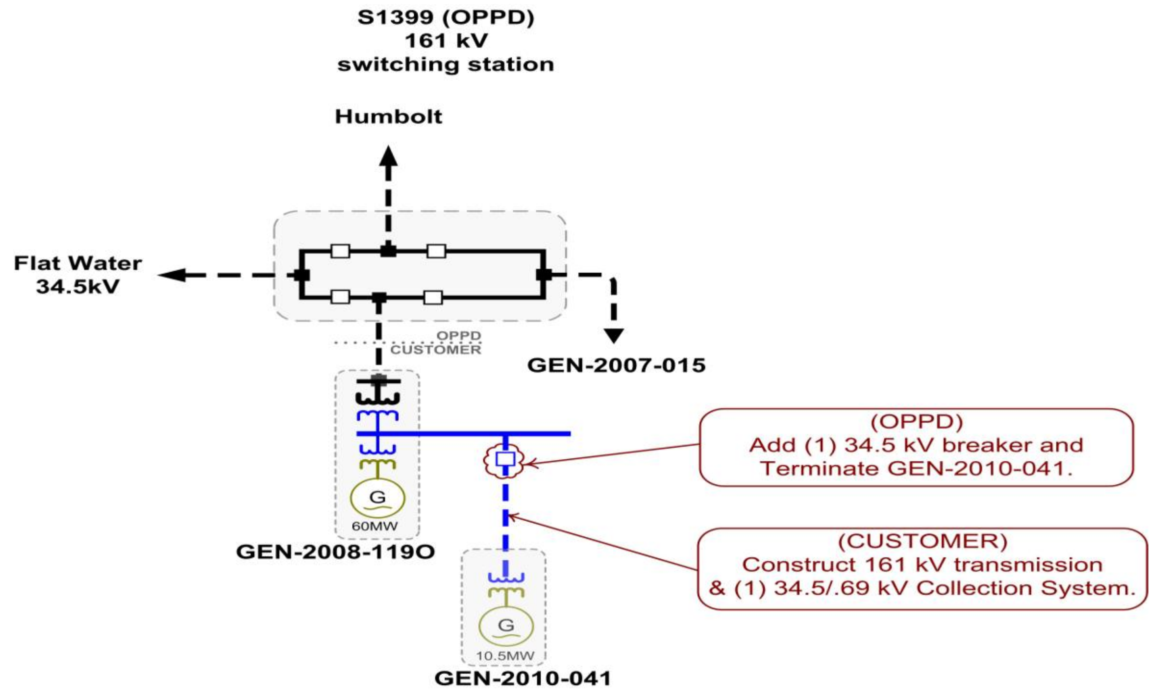

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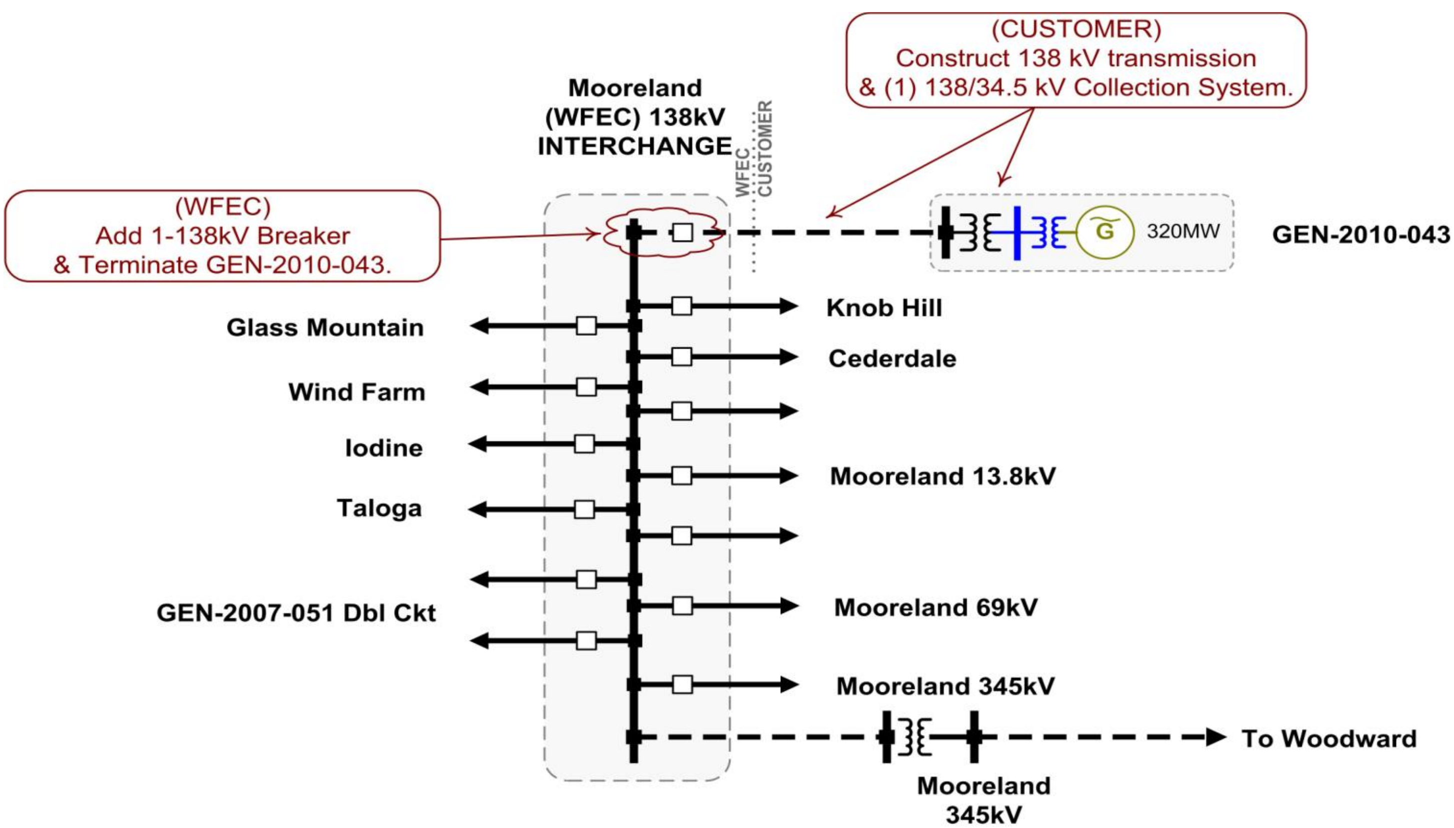

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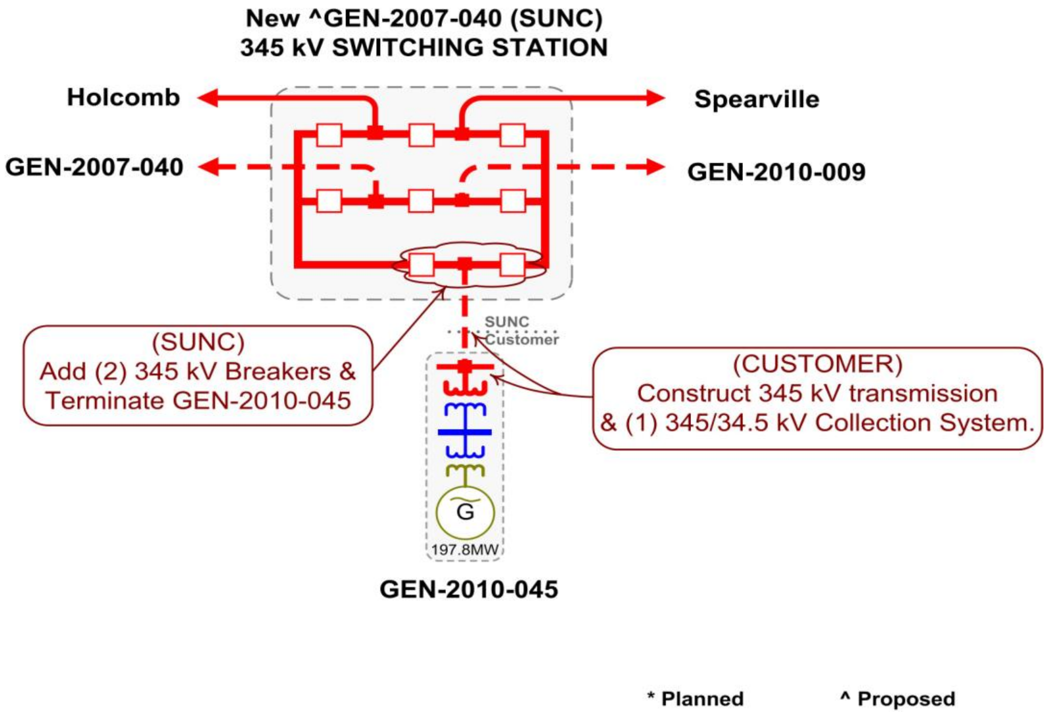

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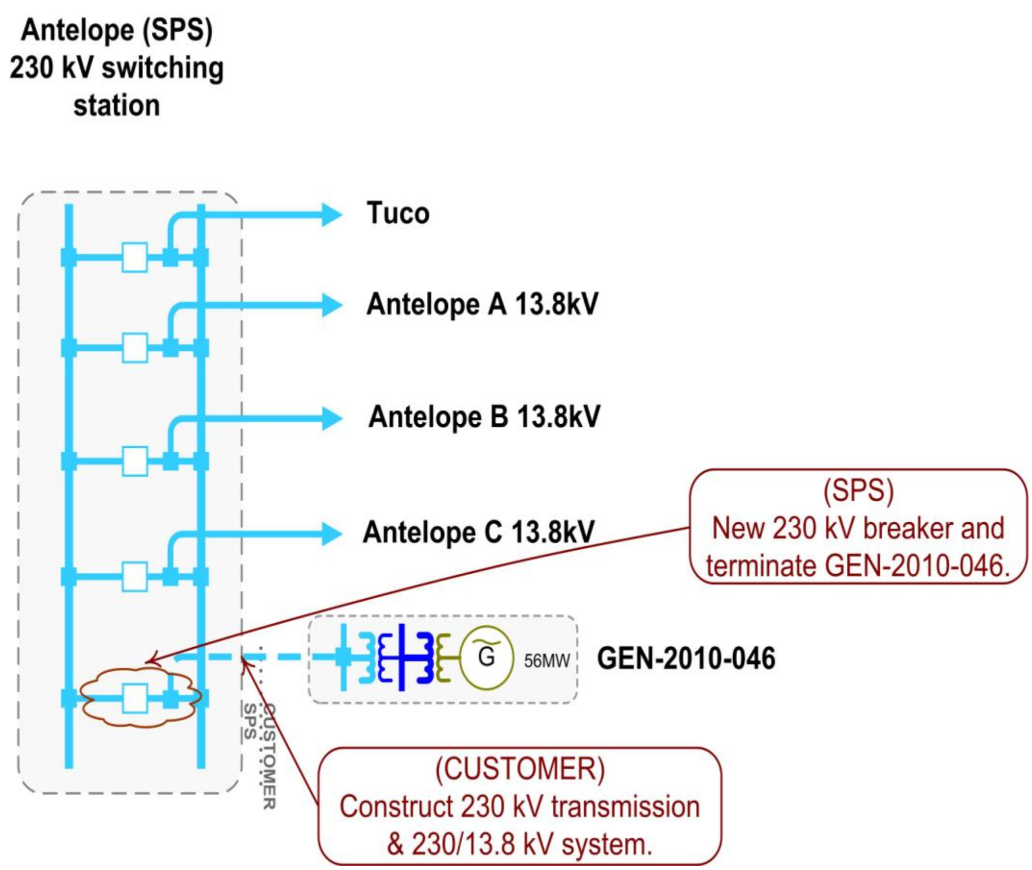

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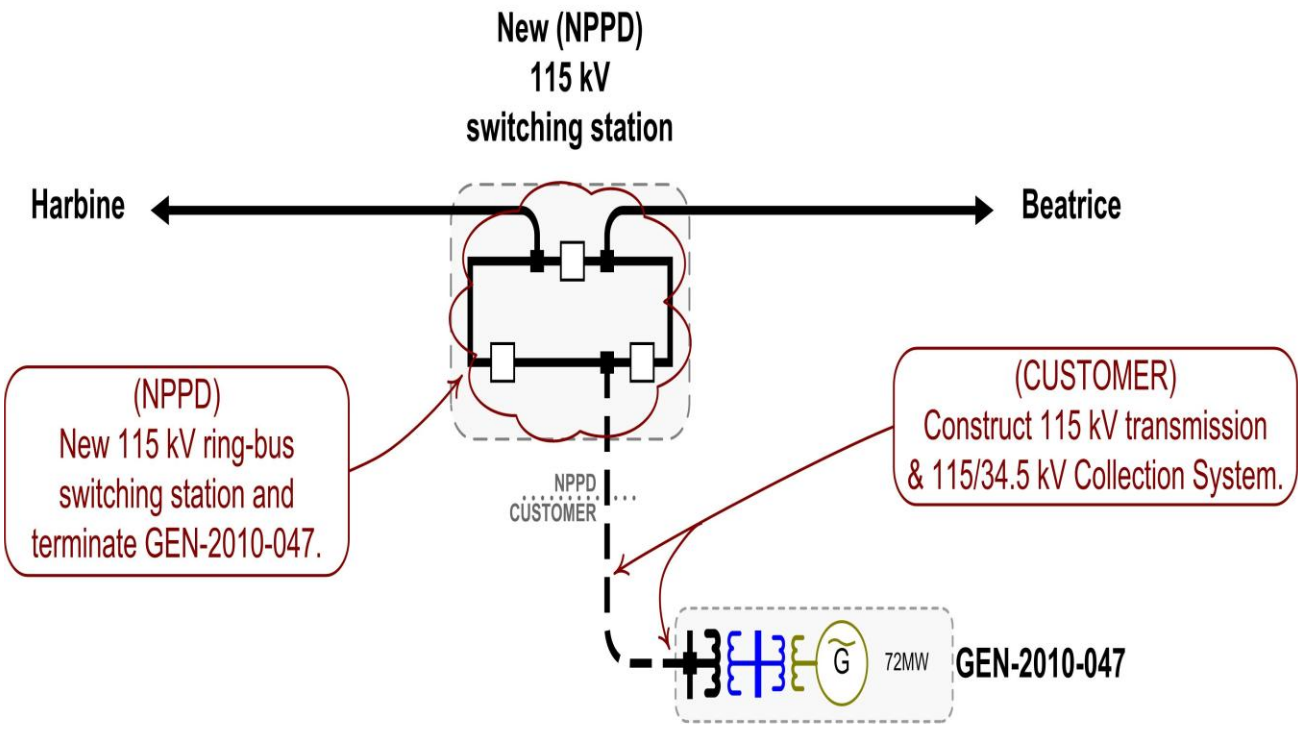

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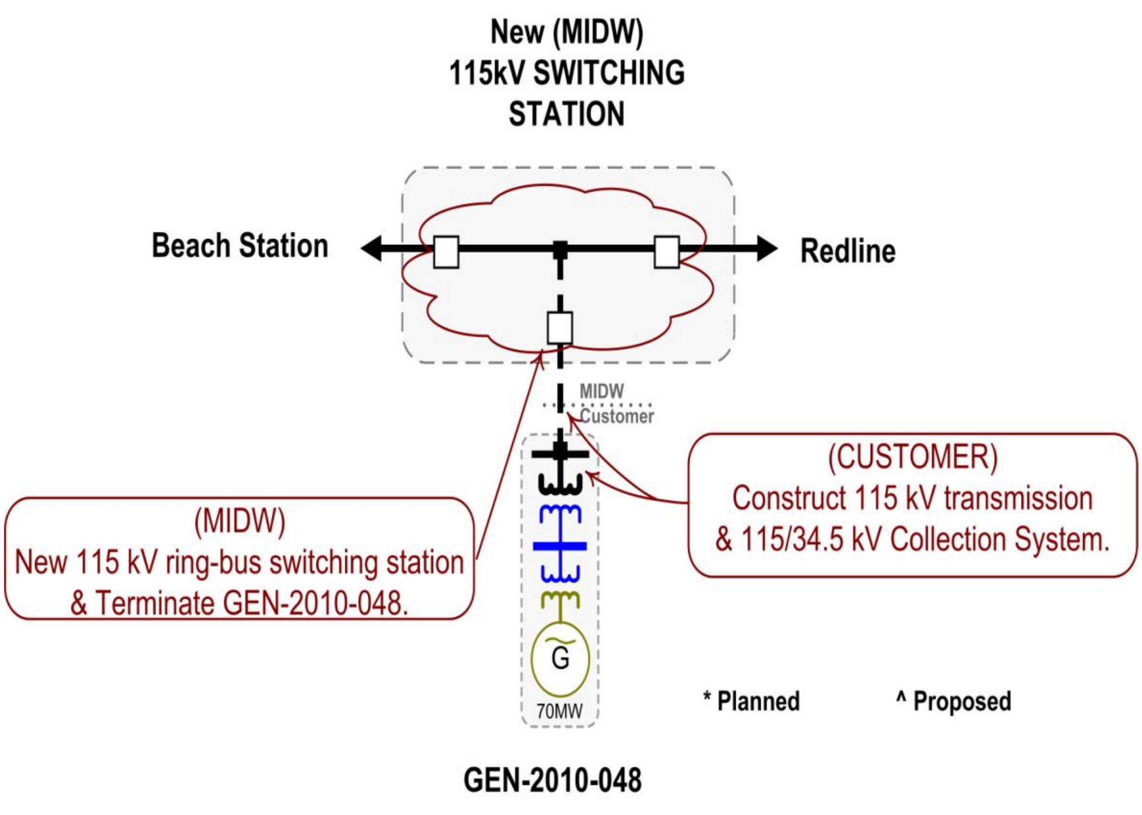

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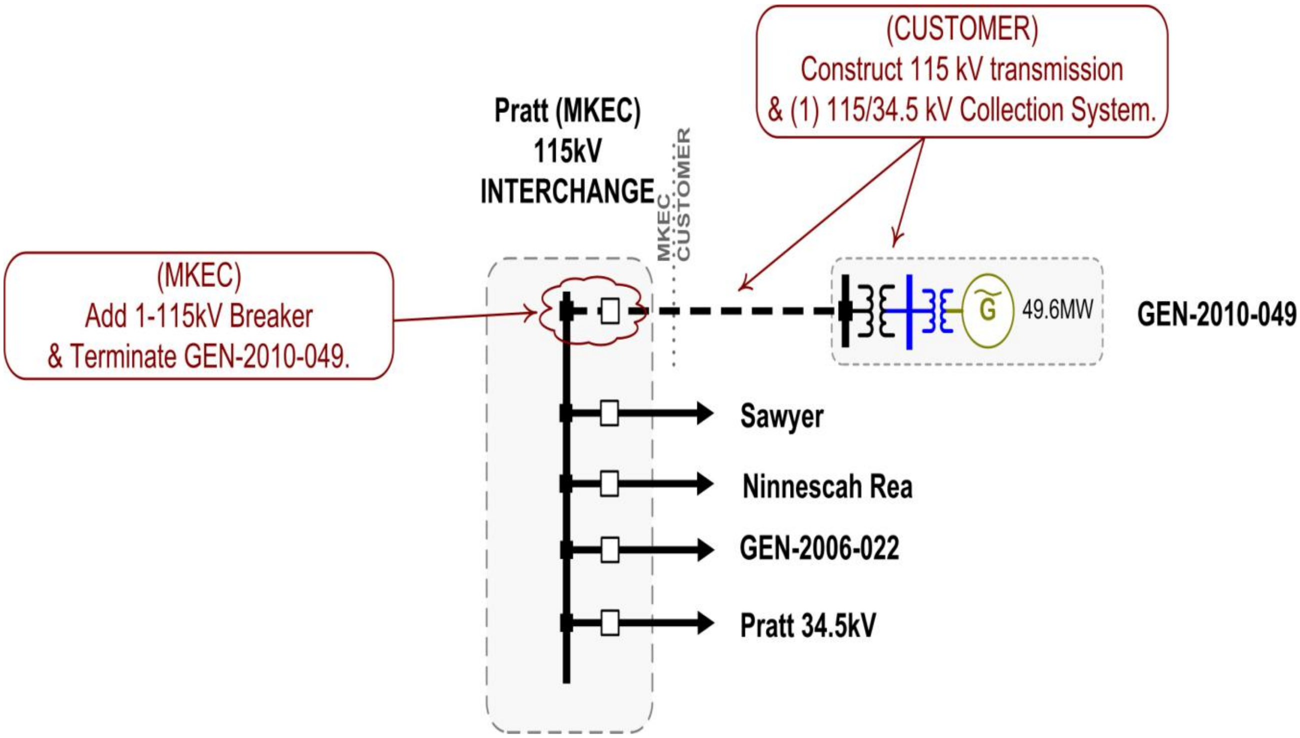

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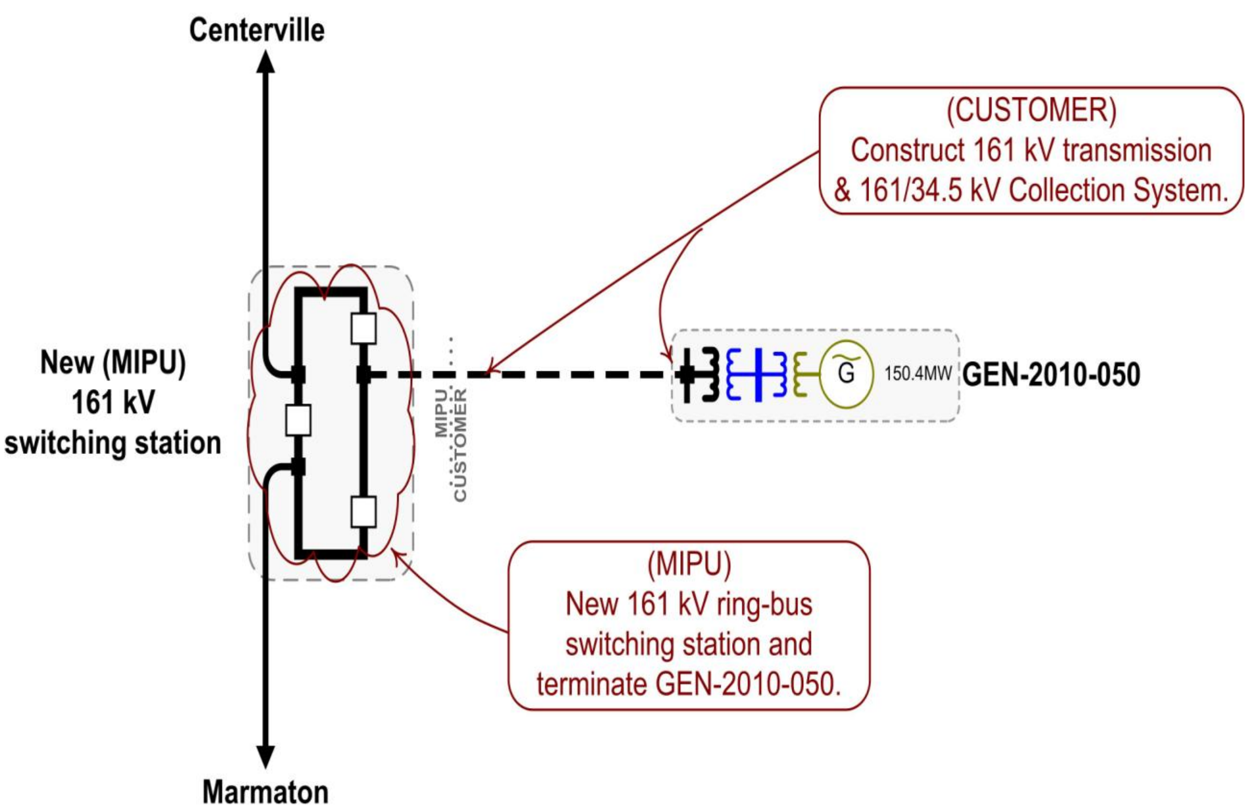

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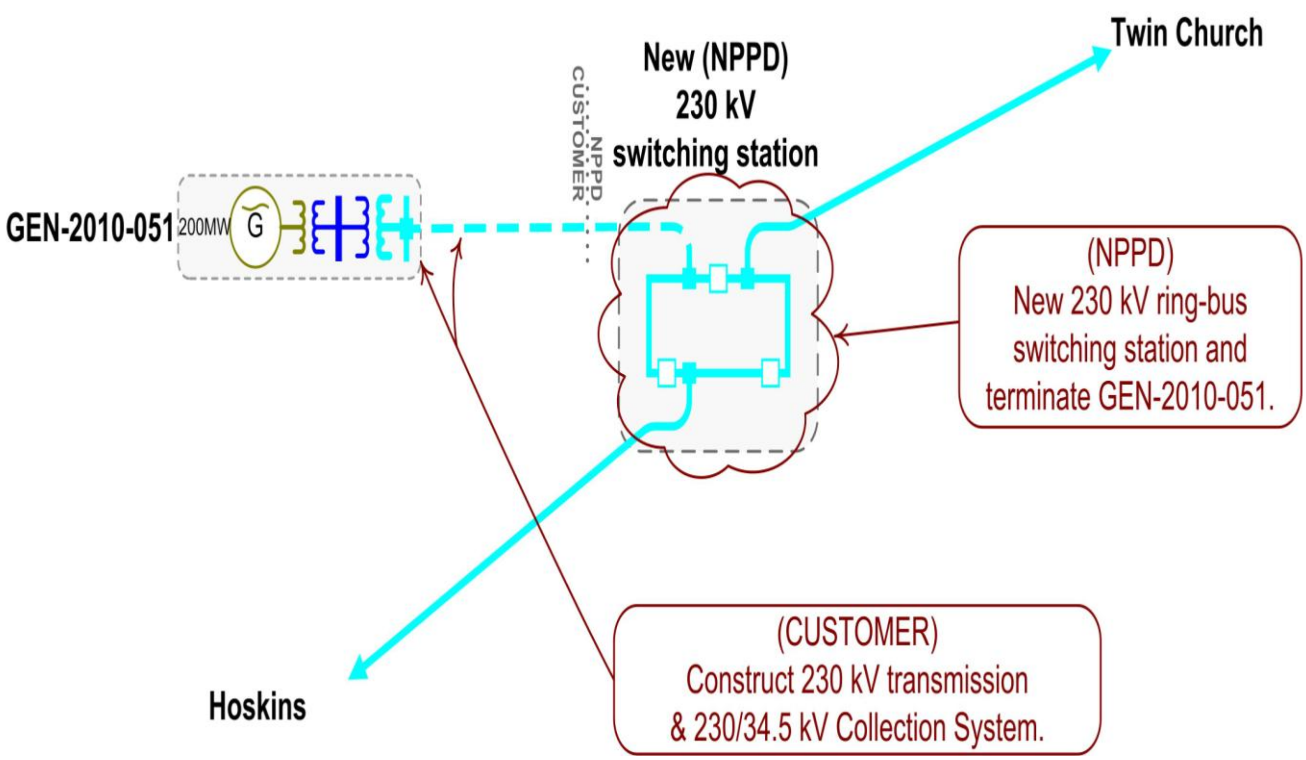

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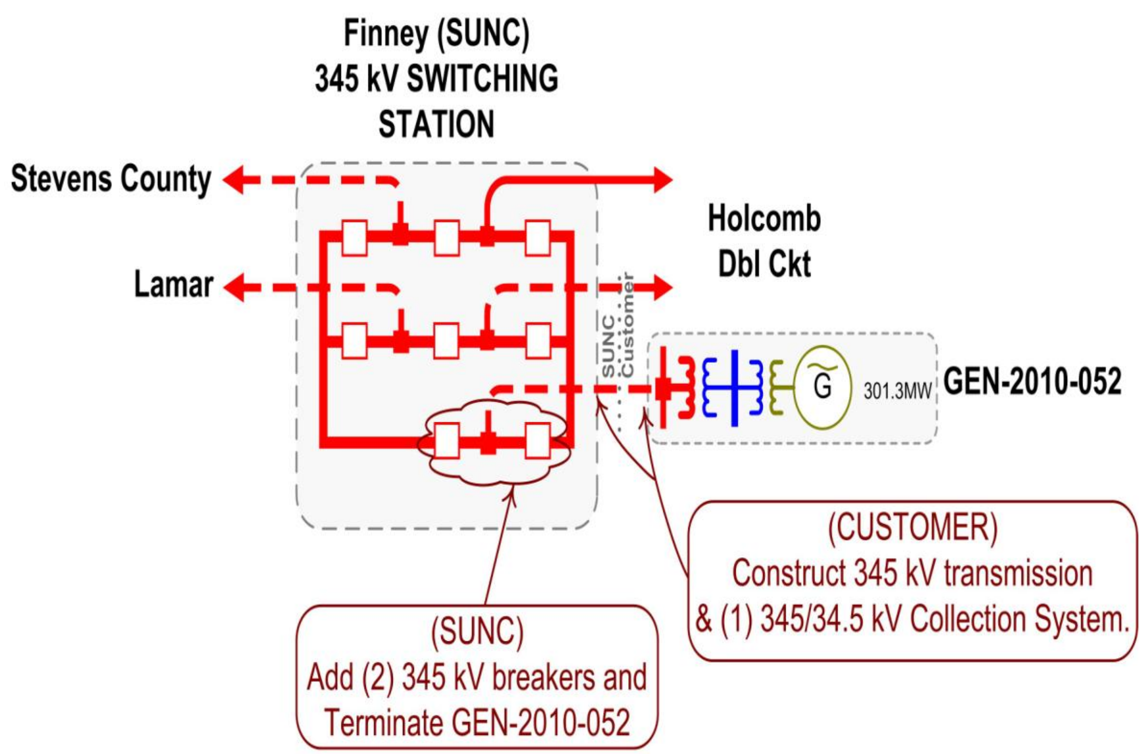
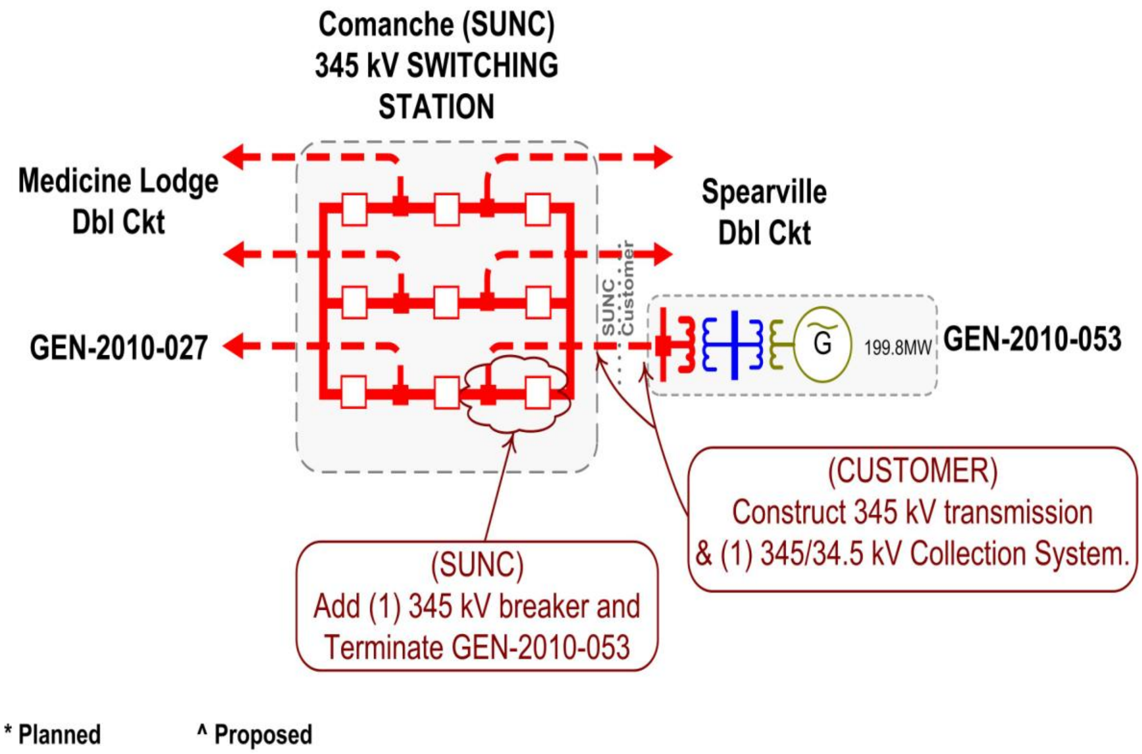
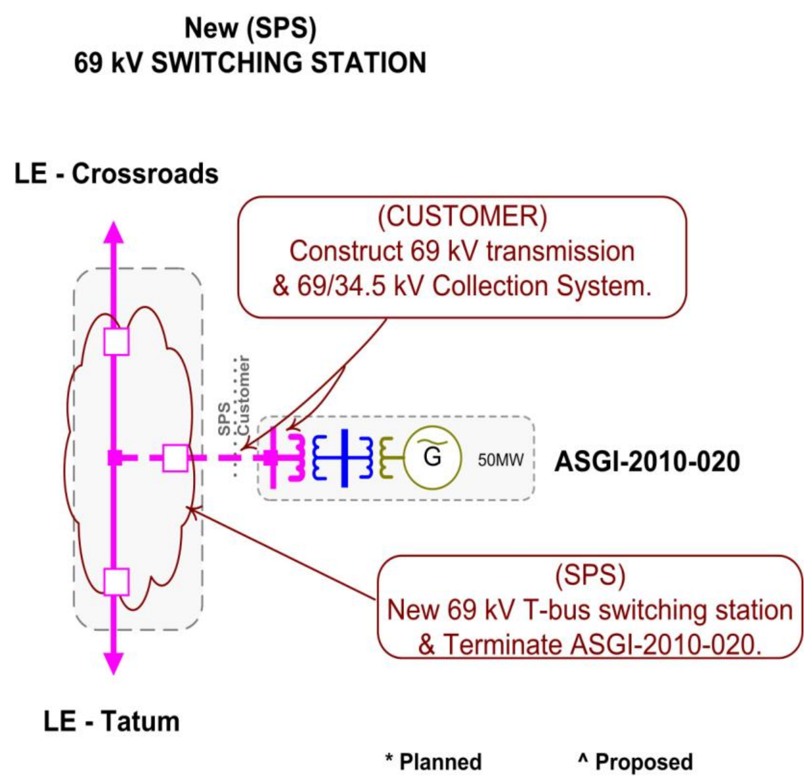


* Planned ^ Proposed

GEN-2010-053



ASGI-2010-020



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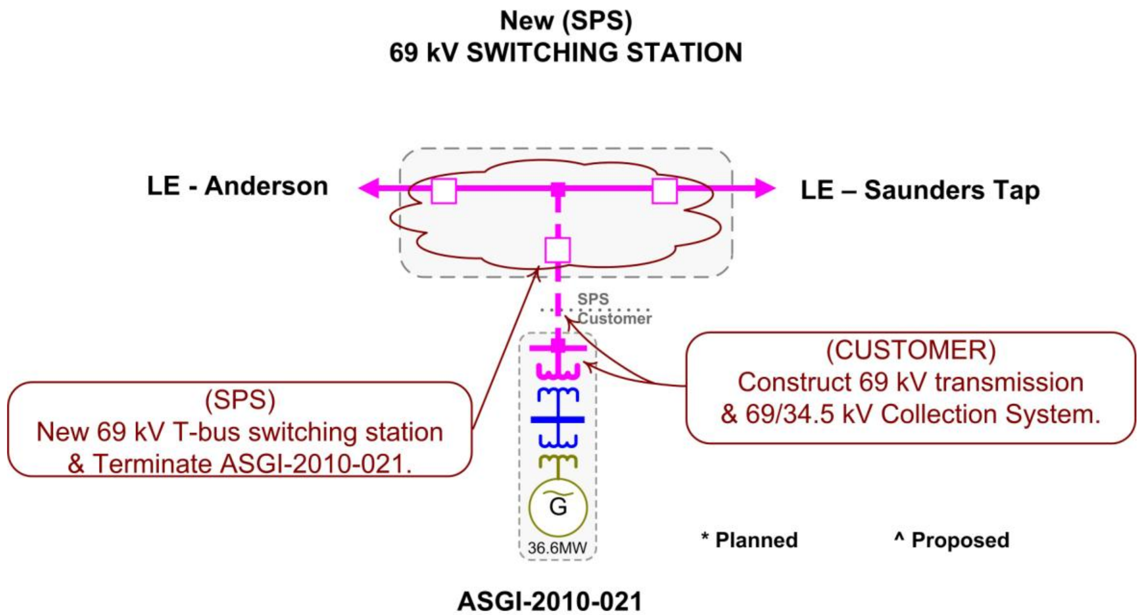

E: Cost Allocation per Interconnection Request (Including Prior Queued Upgrades)

Appendix E. - Cost Allocation Per Request

(Including Previously Allocated Network Upgrades*)

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
ASGI-2010-020			
ASGI-2010-020 Interconnection Costs* LCEC Costs	Current Study Allocation	$1.00	$1.00
ASGI-2010-20 Tap - Tatum 69KV CKT 1* LCEC Costs	Current Study Allocation	$1.00	$1.00
McDonald - Reed 69KV CKT 1* LCEC Costs	Current Study Allocation	$1.00	$1.00
McDonald - Tatum 69KV CKT 1* LCEC Costs	Current Study Allocation	$1.00	$1.00
Lovington Interchange - Reed 69KV CKT 1* LCEC Costs	Current Study Allocation	$1.00	$1.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		$148,727,500.00
Tuco Interchange 345/230/13.2KV Autotransformer CKT 2 Balanced Portfolio: Tuco 345/230 kV Transformer CKT 2 (Total Project E&C Cost Shown)	Previously Allocated		$11,250,000.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV	Previously Allocated		
Border - Gracemont 345KV CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$172,350,072.00
Beaver Co. - Hitchland CKT 1 Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$247,005,793.00
Medicine Lodge - Woodward 345KV CKT 1 Priority Project: Med Lodge - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$194,972,759.00
Hitchland Interchange 345/230KV Transformer CKT 2 Priority Project: Hitchland - Woodward Dbl 345kV CKT	Previously Allocated		
Hitchland 230/115KV Autotransformer CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$3,000,000.00
	Current Study Total	**$5.00**	
ASGI-2010-021			
ASGI-2010-021 Interconnection Costs* See Oneline Diagram	Current Study Allocation	$1.00	$1.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		$148,727,500.00
Tuco Interchange 345/230/13.2KV Autotransformer CKT 2 Balanced Portfolio: Tuco 345/230 kV Transformer CKT 2 (Total Project E&C Cost Shown)	Previously Allocated		$11,250,000.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV	Previously Allocated		
Border - Gracemont 345KV CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$172,350,072.00

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if neccesary.

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
Beaver Co. - Hitchland CKT 1 Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$247,005,793.00
Medicine Lodge - Woodward 345KV CKT 1 Priority Project: Med Lodge - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$194,972,759.00
Hitchland Interchange 345/230KV Transformer CKT 2 Priority Project: Hitchland - Woodward Dbl 345kV CKT	Previously Allocated		
Hitchland 230/115KV Autotransformer CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$3,000,000.00
	Current Study Total	**$1.00**	
GEN-2010-001			
GEN-2010-001 Interconnection Costs See Oneline Diagram	Current Study Allocation	$10,000,000.00	$10,000,000.00
Beaver Co. - Comanche 345KV CKT 1 Build 345kV between Beaver County - Comanche	Current Study Allocation	$16,858,377.74	$90,000,000.00
GEN-2008-047 Tap - Woodward 345kV CKT 1 Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$247,005,793.00
GEN-2008-047 Tap - Woodward 345kV CKT 2 Priority Project: Hitchland - Woodward Dbl 345kV CKT	Previously Allocated		
Border - Gracemont 345KV CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$172,350,072.00
Medicine Lodge - Woodward 345KV CKT 1 Priority Project: Med Lodge - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$194,972,759.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		$148,727,500.00
Hitchland - Border 345KV CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$128,120,399.00
	Current Study Total	**$26,858,377.74**	
GEN-2010-012			
GEN-2010-012 Interconnection Costs See Oneline Diagram	Current Study Allocation	$3,500,000.00	$3,500,000.00
Clinton Junction - Elk City 138KV CKT 1 Rebuild approximately 24 miles of 138kV between Clinton Junction and Elk City	Current Study Allocation	$16,800,000.00	$16,800,000.00
Gracemont Transformer 345/138/13.8KV CKT 1 Priority Project: Gracemont Transformer 345/138/13.8KV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		$8,000,000.00
Washita - Weatherford 138KV CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$40,000,000.00
Washita - Gracemont 138KV CKT 2 Per DISIS-2010-01 Restudy	Previously Allocated		$5,621,986.00
Woodward 345/138/13.8KV Autotransformer CKT 2 Balanced Portfolio: Tuco - Woodward 345kV	Previously Allocated		
Washita - Gracemont 138KV CKT 1 Priority Project: Gracemont Transformer 345/138/13.8KV CKT 1	Previously Allocated		

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if neccesary.

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
	Current Study Total	**$20,300,000.00**	
GEN-2010-027			
GEN-2010-027 Interconnection Costs See Oneline Diagram	Current Study Allocation	$8,000,000.00	$8,000,000.00
Beaver Co. - Comanche 345KV CKT 1 Build 345kV between Beaver County - Comanche	Current Study Allocation	$46,996,421.07	$90,000,000.00
Mulgren - Circle 345kV Dbl CKT Build approximately 79 miles of double 345kV Mulgren - Circle	Current Study Allocation	$70,937,027.08	$132,660,377.36
Spearville - Mulgren 345kV Dbl CKT Build approximately 74 miles of double 345kV Spearville - Mulgren	Current Study Allocation	$66,447,341.82	$124,264,150.94
Circle - Reno 345kV Dbl CKT Build approximately 6 miles of double 345kV Circle - Reno	Current Study Allocation	$5,387,622.31	$10,075,471.70
Comanche - Medicine Lodge 345KV Dbl CKT Priority Project: Spearville - Comanche - Med Lodge - Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$356,300,000.00
Spearville - GEN-2010-016 Tap 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT	Previously Allocated		
PostRock - GEN-2010-016 Tap 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT	Previously Allocated		
Axtell - PostRock 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$112,700,000.00
Border - Gracemont 345KV CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$172,350,072.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV	Previously Allocated		
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		$148,727,500.00
	Current Study Total	**$197,768,412.28**	
GEN-2010-036			
GEN-2010-036 Interconnection Costs See Oneline Diagram	Current Study Allocation	$2,000,000.00	$2,000,000.00
	Current Study Total	**$2,000,000.00**	
GEN-2010-038			
GEN-2010-038 Interconnection Costs See Oneline Diagram	Current Study Allocation	$1,200,000.00	$1,200,000.00
Broken Bow - Ord - North Loup 115KV CKT 1 Build approx. 35 mi. 115kV Broken Bow - Ord & Rebuild Approx. 12 mi. 115kV Ord - North loup	Current Study Allocation	$19,600,000.00	$19,600,000.00
	Current Study Total	**$20,800,000.00**	
GEN-2010-040			
Northwest 345/138/13.8KV Autotransformer CKT 1 NRIS only required upgrade: Per 2009-AG2-AFS6	Previously Allocated	$15,000,000.00	$15,000,000.00
GEN-2010-040 Interconnection Costs See Oneline Diagram	Current Study Allocation	$4,000,000.00	$4,000,000.00

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if neccesary.

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
	Current Study Total	**$19,000,000.00**	
GEN-2010-041			
GEN-2010-041 Interconnection Costs See Oneline Diagram	Current Study Allocation	$1.00	$1.00
Humboldt 161/69/13.8KV Autotransformer CKT 1 NRIS only required upgrade: New 161/69kV Humboldt Transformer	Current Study Allocation	$1,500,000.00	$1,500,000.00
	Current Study Total	**$1,500,001.00**	
GEN-2010-043			
GEN-2010-043 Interconnection Costs See Oneline Diagram	Current Study Allocation	$5,000,000.00	$5,000,000.00
Beaver Co. - Comanche 345KV CKT 1 Build 345kV between Beaver County - Comanche	Current Study Allocation	$6,496,427.61	$90,000,000.00
Glass Mountain - Mooreland 138 KV CKT 1 NRIS only required upgrade: Rebuild arroximately 24 miles 138kV between Glass Mountain - Mooreland	Current Study Allocation	$16,800,000.00	$16,800,000.00
Dover Southwest- Okeene 138 KV CKT 1 NRIS only required upgrade: Rebuild arroximately 27 miles 138kV between Dover Southwest - Okeene	Current Study Allocation	$10,800,000.00	$10,800,000.00
EL Reno - Roman Nose 138KV CKT 1 NRIS only required upgrade: Rebuild arroximately 27 miles 138kV between El Reno - Roman Nose	Current Study Allocation	$25,000,000.00	$25,000,000.00
Knob Hill - Mooreland 138KV CKT 1 NRIS only required upgrade: Rebuild arroximately 47 miles 138kV between Knob Hill - Mooreland	Current Study Allocation	$32,900,000.00	$32,900,000.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV	Previously Allocated		
Woodward 345/138/13.8KV Autotransformer CKT 2 Balanced Portfolio: Tuco - Woodward 345kV	Previously Allocated		
Medicine Lodge - Woodward 345KV CKT 1 Priority Project: Med Lodge - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$194,972,759.00
Border - Gracemont 345KV CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$172,350,072.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		$148,727,500.00
	Current Study Total	**$96,996,427.61**	
GEN-2010-045			
GEN-2010-045 Interconnection Costs See Oneline Diagram	Current Study Allocation	$5,000,000.00	$5,000,000.00
Beaver Co. - Comanche 345KV CKT 1 Build 345kV between Beaver County - Comanche	Current Study Allocation	$4,851,454.14	$90,000,000.00
Spearville - Mulgren 345kV Dbl CKT Build approximately 74 miles of double 345kV Spearville - Mulgren	Current Study Allocation	$18,181,770.89	$124,264,150.94
Circle - Reno 345kV Dbl CKT Build approximately 6 miles of double 345kV Circle - Reno	Current Study Allocation	$1,474,197.64	$10,075,471.70
Mulgren - Circle 345kV Dbl CKT Build approximately 79 miles of double 345kV Mulgren - Circle	Current Study Allocation	$19,410,268.92	$132,660,377.36

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if neccesary.

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
Cudahy - Kismet 115KV CKT 1 NRIS only required upgrade: Rebuild Cudahy - Kismet 115kV	Current Study Allocation	$5,516,264.96	$15,000,000.00
Cimarron River Tap - Kismet 115KV CKT 1 NRIS only required upgrade: Rebuild Cimarron River Tap - Kismet 115kV	Current Study Allocation	$1,838,754.99	$5,000,000.00
Spearville - GEN-2010-016 Tap 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT	Previously Allocated		
Comanche - Medicine Lodge 345KV Dbl CKT Priority Project: Spearville - Comanche - Med Lodge - Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$356,300,000.00
PostRock - GEN-2010-016 Tap 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT	Previously Allocated		
Axtell - PostRock 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$112,700,000.00
Border - Gracemont 345KV CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$172,350,072.00
	Current Study Total	**$56,272,711.54**	
GEN-2010-046			
GEN-2010-046 Interconnection Costs See Oneline Diagram	Current Study Allocation	$1,000,000.00	$1,000,000.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		$148,727,500.00
Tuco Interchange 345/230/13.2KV Autotransformer CKT 2 Balanced Portfolio: Tuco 345/230 kV Transformer CKT 2 (Total Project E&C Cost Shown)	Previously Allocated		$11,250,000.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV	Previously Allocated		
Border - Gracemont 345KV CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$172,350,072.00
Medicine Lodge - Woodward 345KV CKT 1 Priority Project: Med Lodge - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$194,972,759.00
Beaver Co. - Hitchland CKT 1 Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$247,005,793.00
Hitchland Interchange 345/230KV Transformer CKT 2 Priority Project: Hitchland - Woodward Dbl 345kV CKT	Previously Allocated		
	Current Study Total	**$1,000,000.00**	
GEN-2010-047			
GEN-2010-047 Interconnection Costs See Oneline Diagram	Current Study Allocation	$4,000,000.00	$4,000,000.00
Harbine - GEN-2010-047 Tap 115KV CKT 1 Rebuild 115kV between Harbine - GEN-2010-047 Tap	Current Study Allocation	$3,500,000.00	$3,500,000.00
	Current Study Total	**$7,500,000.00**	
GEN-2010-048			
GEN-2010-048 Interconnection Costs See Oneline Diagram	Current Study Allocation	$3,000,000.00	$3,000,000.00

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if neccesary.

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
Mulgren - Circle 345kV Dbl CKT Build approximately 79 miles of double 345kV Mulgren - Circle	Current Study Allocation	$3,534,867.04	$132,660,377.36
Circle - Reno 345kV Dbl CKT Build approximately 6 miles of double 345kV Circle - Reno	Current Study Allocation	$268,470.91	$10,075,471.70
Spearville - Mulgren 345kV Dbl CKT Build approximately 74 miles of double 345kV Spearville - Mulgren	Current Study Allocation	$3,311,141.28	$124,264,150.94
Spearville - GEN-2010-016 Tap 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT	Previously Allocated		
Post Rock 345/230/13.8KV Autotransformer CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT	Previously Allocated		
Axtell - PostRock 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$112,700,000.00
Comanche - Medicine Lodge 345KV Dbl CKT Priority Project: Spearville - Comanche - Med Lodge - Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$356,300,000.00
Greenleaf - Knob Hill 115KV CKT 1 Per 2008-AG1	Previously Allocated		
Post Rock - South Hays 230KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT	Previously Allocated		
	Current Study Total	**$10,114,479.23**	

GEN-2010-049

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
GEN-2010-049 Interconnection Costs See Oneline Diagram	Current Study Allocation	$2,000,000.00	$2,000,000.00
Medicine Lodge 345/115kV Transformer CKT 1 New 345/138kV Medicine Lodge Transformer	Current Study Allocation	$10,000,000.00	$10,000,000.00
Pratt Cap Bank Addition Add 24 MVAR (2X12 MVAR) to Exisiting Facilities	Current Study Allocation	$500,000.00	$500,000.00
St. John - St. John 115KV CKT 1 Rebuild 115kV between St. John - St. John	Current Study Allocation	$500,000.00	$500,000.00
Beaver Co. - Comanche 345KV CKT 1 Build 345kV between Beaver County - Comanche	Current Study Allocation	$994,827.18	$90,000,000.00
Mound Ridge 138/115/13.8KV Autotransformer CKT 1 NRIS only required upgrade: Replace 138/115kV Mound Ridge Transformer	Current Study Allocation	$3,000,000.00	$3,000,000.00
Clearwater - Milan Tap 138KV CKT 1 NRIS only required upgrade: Rebuild 138kV between Clearwater and Milan Tap	Current Study Allocation	$2,276,091.78	$15,000,000.00
Harper - Milan Tap 138KV CKT 1 NRIS only required upgrade: Rebuild 138kV between Harper - Milan Tap	Current Study Allocation	$2,276,091.78	$15,000,000.00
Axtell - PostRock 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$112,700,000.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV	Previously Allocated		
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		$148,727,500.00
	Current Study Total	**$21,547,010.74**	

GEN-2010-050

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if neccesary.

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
GEN-2010-050 Interconnection Costs See Oneline Diagram	Current Study Allocation	$3,500,000.00	$3,500,000.00
	Current Study Total	**$3,500,000.00**	
GEN-2010-051			
GEN-2010-051 Interconnection Costs See Oneline Diagram	Current Study Allocation	$6,500,000.00	$6,500,000.00
	Current Study Total	**$6,500,000.00**	
GEN-2010-052			
GEN-2010-052 Interconnection Costs See Oneline Diagram	Current Study Allocation	$3,000,000.00	$3,000,000.00
Circle - Reno 345kV Dbl CKT Build approximately 6 miles of double 345kV Circle - Reno	Current Study Allocation	$1,747,931.43	$10,075,471.70
Spearville - Mulgren 345kV Dbl CKT Build approximately 74 miles of double 345kV Spearville - Mulgren	Current Study Allocation	$21,557,820.99	$124,264,150.94
Mulgren - Circle 345kV Dbl CKT Build approximately 79 miles of double 345kV Mulgren - Circle	Current Study Allocation	$23,014,430.51	$132,660,377.36
Beaver Co. - Comanche 345KV CKT 1 Build 345kV between Beaver County - Comanche	Current Study Allocation	$3,358,843.13	$90,000,000.00
Comanche - Medicine Lodge 345KV Dbl CKT Priority Project: Spearville - Comanche - Med Lodge - Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$356,300,000.00
Border - Gracemont 345KV CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$172,350,072.00
Spearville - GEN-2010-016 Tap 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT	Previously Allocated		
PostRock - GEN-2010-016 Tap 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT	Previously Allocated		
	Current Study Total	**$52,679,026.06**	
GEN-2010-053			
GEN-2010-053 Interconnection Costs See Oneline Diagram	Current Study Allocation	$5,000,000.00	$5,000,000.00
Beaver Co. - Comanche 345KV CKT 1 Build 345kV between Beaver County - Comanche	Current Study Allocation	$10,443,649.13	$90,000,000.00
Mulgren - Circle 345kV Dbl CKT Build approximately 79 miles of double 345kV Mulgren - Circle	Current Study Allocation	$15,763,783.80	$132,660,377.36
Circle - Reno 345kV Dbl CKT Build approximately 6 miles of double 345kV Circle - Reno	Current Study Allocation	$1,197,249.40	$10,075,471.70
Spearville - Mulgren 345kV Dbl CKT Build approximately 74 miles of double 345kV Spearville - Mulgren	Current Study Allocation	$14,766,075.96	$124,264,150.94
Cimarron River Tap - Kismet 115KV CKT 1 NRIS only required upgrade: Rebuild Cimarron River Tap - Kismet 115kV	Current Study Allocation	$3,161,245.01	$5,000,000.00
Cudahy - Kismet 115KV CKT 1 NRIS only required upgrade: Rebuild Cudahy - Kismet 115kV	Current Study Allocation	$9,483,735.04	$15,000,000.00
Clearwater - Milan Tap 138KV CKT 1 NRIS only required upgrade: Rebuild 138kV between Clearwater and Milan Tap	Current Study Allocation	$12,723,908.22	$15,000,000.00

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if neccesary.

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
Harper - Milan Tap 138KV CKT 1 NRIS only required upgrade: Rebuild 138kV between Harper - Milan Tap	Current Study Allocation	$12,723,908.22	$15,000,000.00
Comanche - Medicine Lodge 345KV Dbl CKT Priority Project: Spearville - Comanche - Med Lodge - Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$356,300,000.00
Spearville - GEN-2010-016 Tap 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT	Previously Allocated		
PostRock - GEN-2010-016 Tap 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT	Previously Allocated		
Axtell - PostRock 345KV CKT 1 Balanced Portfolio: Spearville - PostRock - Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$112,700,000.00
Border - Gracemont 345KV CKT 1 Per DISIS-2010-01 Restudy	Previously Allocated		$172,350,072.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV	Previously Allocated		
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		$148,727,500.00
	Current Study Total	**$85,263,554.78**	

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if neccesary.

F: Cost Allocation per Proposed Study Network Upgrade

Appendix F. - Cost Allocation Per Upgrade Facility

Upgrade Facility	Allocated Costs	E + C Costs
ASGI-2010-020 Interconnection Costs*		**$1.00**
LCEC Costs		
ASGI-2010-020	$1.00	
Total	**$1.00**	
ASGI-2010-021 Interconnection Costs*		**$1.00**
See Oneline Diagram		
ASGI-2010-021	$1.00	
Total	**$1.00**	
ASGI-2010-20 Tap - Tatum 69KV CKT 1*		**$1.00**
LCEC Costs		
ASGI-2010-020	$1.00	
Total	**$1.00**	
Beaver Co. - Comanche 345KV CKT 1		**$90,000,000.00**
Build 345kV between Beaver County - Comanche		
GEN-2010-001	$16,858,377.74	
GEN-2010-027	$46,996,421.07	
GEN-2010-043	$6,496,427.61	
GEN-2010-045	$4,851,454.14	
GEN-2010-049	$994,827.18	
GEN-2010-052	$3,358,843.13	
GEN-2010-053	$10,443,649.13	
Total	**$90,000,000.00**	
Broken Bow - Ord - North Loup 115KV CKT 1		**$19,600,000.00**
Build approx. 35 mi. 115kV Broken Bow - Ord & Rebuild Approx. 12 mi. 115kV Ord - North loup		
GEN-2010-038	$19,600,000.00	
Total	**$19,600,000.00**	
Cimarron River Tap - Kismet 115KV CKT 1		**$5,000,000.00**
NRIS only required upgrade: Rebuild Cimarron River Tap - Kismet 115kV		
GEN-2010-045	$1,838,754.99	
GEN-2010-053	$3,161,245.01	
Total	**$5,000,000.00**	
Circle - Reno 345kV Dbl CKT		**$10,075,471.69**
Build approximately 6 miles of double 345kV Circle - Reno		
GEN-2010-027	$5,387,622.31	
GEN-2010-045	$1,474,197.64	
GEN-2010-048	$268,470.91	

Upgrade Facility		Allocated Costs	E + C Costs
GEN-2010-052		$1,747,931.43	
GEN-2010-053		$1,197,249.40	
	Total	**$10,075,471.69**	
Clearwater - Milan Tap 138KV CKT 1			**$15,000,000.00**
NRIS only required upgrade: Rebuild 138kV between Clearwater and Milan Tap			
GEN-2010-049		$2,276,091.78	
GEN-2010-053		$12,723,908.22	
	Total	**$15,000,000.00**	
Clinton Junction - Elk City 138KV CKT 1			**$16,800,000.00**
Rebuild approximately 24 miles of 138kV between Clinton Junction and Elk City			
GEN-2010-012		$16,800,000.00	
	Total	**$16,800,000.00**	
Cudahy - Kismet 115KV CKT 1			**$15,000,000.00**
NRIS only required upgrade: Rebuild Cudahy - Kismet 115kV			
GEN-2010-045		$5,516,264.96	
GEN-2010-053		$9,483,735.04	
	Total	**$15,000,000.00**	
Dover Southwest- Okeene 138 KV CKT 1			**$10,800,000.00**
NRIS only required upgrade: Rebuild arroximately 27 miles 138kV between Dover Southwest - Okeene			
GEN-2010-043		$10,800,000.00	
	Total	**$10,800,000.00**	
EL Reno - Roman Nose 138KV CKT 1			**$25,000,000.00**
NRIS only required upgrade: Rebuild arroximately 27 miles 138kV between El Reno - Roman Nose			
GEN-2010-043		$25,000,000.00	
	Total	**$25,000,000.00**	
GEN-2010-001 Interconnection Costs			**$10,000,000.00**
See Oneline Diagram			
GEN-2010-001		$10,000,000.00	
	Total	**$10,000,000.00**	
GEN-2010-012 Interconnection Costs			**$3,500,000.00**
See Oneline Diagram			
GEN-2010-012		$3,500,000.00	
	Total	**$3,500,000.00**	
GEN-2010-027 Interconnection Costs			**$8,000,000.00**
See Oneline Diagram			
GEN-2010-027		$8,000,000.00	
	Total	**$8,000,000.00**	

Upgrade Facility		Allocated Costs	E + C Costs
GEN-2010-036 Interconnection Costs			**$2,000,000.00**
See Oneline Diagram			
GEN-2010-036		$2,000,000.00	
	Total	**$2,000,000.00**	
GEN-2010-038 Interconnection Costs			**$1,200,000.00**
See Oneline Diagram			
GEN-2010-038		$1,200,000.00	
	Total	**$1,200,000.00**	
GEN-2010-040 Interconnection Costs			**$4,000,000.00**
See Oneline Diagram			
GEN-2010-040		$4,000,000.00	
	Total	**$4,000,000.00**	
GEN-2010-041 Interconnection Costs			**$1.00**
See Oneline Diagram			
GEN-2010-041		$1.00	
	Total	**$1.00**	
GEN-2010-043 Interconnection Costs			**$5,000,000.00**
See Oneline Diagram			
GEN-2010-043		$5,000,000.00	
	Total	**$5,000,000.00**	
GEN-2010-045 Interconnection Costs			**$5,000,000.00**
See Oneline Diagram			
GEN-2010-045		$5,000,000.00	
	Total	**$5,000,000.00**	
GEN-2010-046 Interconnection Costs			**$1,000,000.00**
See Oneline Diagram			
GEN-2010-046		$1,000,000.00	
	Total	**$1,000,000.00**	
GEN-2010-047 Interconnection Costs			**$4,000,000.00**
See Oneline Diagram			
GEN-2010-047		$4,000,000.00	
	Total	**$4,000,000.00**	
GEN-2010-048 Interconnection Costs			**$3,000,000.00**
See Oneline Diagram			
GEN-2010-048		$3,000,000.00	
	Total	**$3,000,000.00**	
GEN-2010-049 Interconnection Costs			**$2,000,000.00**
See Oneline Diagram			

Upgrade Facility		Allocated Costs	E + C Costs
GEN-2010-049		$2,000,000.00	
	Total	**$2,000,000.00**	
GEN-2010-050 Interconnection Costs			**$3,500,000.00**
See Oneline Diagram			
GEN-2010-050		$3,500,000.00	
	Total	**$3,500,000.00**	
GEN-2010-051 Interconnection Costs			**$6,500,000.00**
See Oneline Diagram			
GEN-2010-051		$6,500,000.00	
	Total	**$6,500,000.00**	
GEN-2010-052 Interconnection Costs			**$3,000,000.00**
See Oneline Diagram			
GEN-2010-052		$3,000,000.00	
	Total	**$3,000,000.00**	
GEN-2010-053 Interconnection Costs			**$5,000,000.00**
See Oneline Diagram			
GEN-2010-053		$5,000,000.00	
	Total	**$5,000,000.00**	
Glass Mountain - Mooreland 138 KV CKT 1			**$16,800,000.00**
NRIS only required upgrade: Rebuild arroximately 24 miles 138kV between Glass Mountain - Mooreland			
GEN-2010-043		$16,800,000.00	
	Total	**$16,800,000.00**	
Harbine - GEN-2010-047 Tap 115KV CKT 1			**$3,500,000.00**
Rebuild 115kV between Harbine - GEN-2010-047 Tap			
GEN-2010-047		$3,500,000.00	
	Total	**$3,500,000.00**	
Harper - Milan Tap 138KV CKT 1			**$15,000,000.00**
NRIS only required upgrade: Rebuild 138kV between Harper - Milan Tap			
GEN-2010-049		$2,276,091.78	
GEN-2010-053		$12,723,908.22	
	Total	**$15,000,000.00**	
Humboldt 161/69/13.8KV Autotransformer CKT 1			**$1,500,000.00**
NRIS only required upgrade: New 161/69kV Humboldt Transformer			
GEN-2010-041		$1,500,000.00	
	Total	**$1,500,000.00**	
Knob Hill - Mooreland 138KV CKT 1			**$32,900,000.00**
NRIS only required upgrade: Rebuild arroximately 47 miles 138kV between Knob Hill - Mooreland			
GEN-2010-043		$32,900,000.00	

Upgrade Facility		Allocated Costs	E + C Costs
	Total	**$32,900,000.00**	
Lovington Interchange - Reed 69KV CKT 1*			**$1.00**
LCEC Costs			
ASGI-2010-020		$1.00	
	Total	**$1.00**	
McDonald - Reed 69KV CKT 1*			**$1.00**
LCEC Costs			
ASGI-2010-020		$1.00	
	Total	**$1.00**	
McDonald - Tatum 69KV CKT 1*			**$1.00**
LCEC Costs			
ASGI-2010-020		$1.00	
	Total	**$1.00**	
Medicine Lodge 345/115kV Transformer CKT 1			**$10,000,000.00**
New 345/138kV Medicine Lodge Transformer			
GEN-2010-049		$10,000,000.00	
	Total	**$10,000,000.00**	
Mound Ridge 138/115/13.8KV Autotransformer CKT 1			**$3,000,000.00**
NRIS only required upgrade: Replace 138/115kV Mound Ridge Transformer			
GEN-2010-049		$3,000,000.00	
	Total	**$3,000,000.00**	
Mulgren - Circle 345kV Dbl CKT			**$132,660,377.35**
Build approximately 79 miles of double 345kV Mulgren - Circle			
GEN-2010-027		$70,937,027.08	
GEN-2010-045		$19,410,268.92	
GEN-2010-048		$3,534,867.04	
GEN-2010-052		$23,014,430.51	
GEN-2010-053		$15,763,783.80	
	Total	**$132,660,377.35**	
Northwest 345/138/13.8KV Autotransformer CKT 1			**$15,000,000.00**
NRIS only required upgrade: Per 2009-AG2-AFS6			
GEN-2010-040		$15,000,000.00	
	Total	**$15,000,000.00**	
Pratt Cap Bank Addition			**$500,000.00**
Add 24 MVAR (2X12 MVAR) to Exisiting Facilities			
GEN-2010-049		$500,000.00	
	Total	**$500,000.00**	

Upgrade Facility	Allocated Costs	E + C Costs
Spearville - Mulgren 345kV Dbl CKT Build approximately 74 miles of double 345kV Spearville - Mulgren		**$124,264,150.94**
GEN-2010-027	$66,447,341.82	
GEN-2010-045	$18,181,770.89	
GEN-2010-048	$3,311,141.28	
GEN-2010-052	$21,557,820.99	
GEN-2010-053	$14,766,075.96	
Total	**$124,264,150.94**	
St. John - St. John 115KV CKT 1 Rebuild 115kV between St. John - St. John		**$500,000.00**
GEN-2010-049	$500,000.00	
Total	**$500,000.00**	

Current Study Upgrades Total **$629,600,006.98**

G & H: Powerflow Analysis (Constraints For Mitigation and Constraints with greater than 3% TDF)

SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEA	RATEB	TDF	TC%LOADING	CONTNAME
11WP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.99822	120.2502	'BASE CASE'
16WP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.99837	119.7376	'BASE CASE'
11SP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.9987	119.6877	'BASE CASE'
11G	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.99838	119.4048	'BASE CASE'
16SP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.9988	119.1113	'BASE CASE'
11WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-LOVINGTON INTERCHANGE - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99822	104.0828	'LEA COUNTY REC-DENTON SUB - LEA COUNTY REC-REED 69KV CKT 1'
16WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-LOVINGTON INTERCHANGE - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99837	101.5545	'LEA COUNTY REC-DENTON SUB - LEA COUNTY REC-REED 69KV CKT 1'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-LOVINGTON INTERCHANGE - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99838	100.8607	'LEA COUNTY REC-DENTON SUB - LEA COUNTY REC-REED 69KV CKT 1'
11WP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99822	133.4746	'BASE CASE'
16WP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99837	130.1776	'BASE CASE'
11G	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99838	129.1375	'BASE CASE'
11SP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.9987	125.231	'BASE CASE'
16SP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.9988	120.7298	'BASE CASE'
11WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99822	137.9856	'BASE CASE'
16WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99837	135.1622	'BASE CASE'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99838	134.2779	'BASE CASE'
11SP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.9987	132.0712	'BASE CASE'
16SP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.9988	128.2765	'BASE CASE'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99871	104.0524	'BASE CASE'
11WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99822	103.4391	'LEA COUNTY REC-LOVINGTON INTERCHANGE 115/69KV TRANSFORMER CKT 1'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99838	100.7362	'LEA COUNTY REC-LOVINGTON INTERCHANGE 115/69KV TRANSFORMER CKT 1'
16WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99837	100.7292	'LEA COUNTY REC-LOVINGTON INTERCHANGE 115/69KV TRANSFORMER CKT 1'
11G	G10_001		NCONV	0	0	0.12329	9999	'DBL-MEDLO-WI'
11G	G10_001		NCONV	0	0	0.13957	9999	'DBL-MEDLO-WI'
11G	G10_001		NCONV	0	0	0.05009	9999	'SPP-SWPS-03'
11G	G10_001		NCONV	956	1052	0.17225	71.56281	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27481	110	'STATELINE INTERCHANGE - SWEETWT6 230.00 230KV CKT &1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27493	107.1	'STATELINE INTERCHANGE - SWEETWT6 230.00 230KV CKT &1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26691	105.1162	'CLINTON AIR FORCE BASE TAP - ELK CITY 138KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.20496	105.1108	'GEN560655 1-G07-32 12.000'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27481	104.0895	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26691	104.0376	'CLINTON AIR FORCE BASE TAP - HOBART JUNCTION 138KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27493	103.651	'SPP-SWPS-03'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.20508	102.2033	'GEN560655 1-G07-32 12.000'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26707	101.373	'CLINTON AIR FORCE BASE TAP - ELK CITY 138KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27493	101.2306	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27505	100.7963	'SPP-SWPS-03'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26707	100.2986	'CLINTON AIR FORCE BASE TAP - HOBART JUNCTION 138KV CKT 1'
11G	G10_027		NCONV	0	0	0.51231	9999	'DBL-COM-MEDL'
11G	G10_027		NCONV	0	0	0.51631	9999	'DBL-COM-MEDL'
11G	G10_027		NCONV	0	0	0.27546	9999	'DBL-MEDLO-WI'
11G	G10_027		NCONV	0	0	0.27776	9999	'DBL-MEDLO-WI'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49584	107.8903	'BROKEN BOW - CROOKED CREEK 115KV CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49584	107.6198	'CROOKED CREEK 230/115KV TRANSFORMER CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49609	101.7759	'BROKEN BOW - CROOKED CREEK 115KV CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49609	101.5122	'CROOKED CREEK 230/115KV TRANSFORMER CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.31038	100.4083	'GRAND ISLAND - SWEETWATER 345KV CKT 1'
16SP	G10_040	'FROM->TO'	'NORTHWEST (NORTWST2) 345/138/13.8KV TRANSFORMER CKT 1'	493	493	0.05858	107.6339	'NORTHWEST (NORTWST3) 345/138/13.8KV TRANSFORMER CKT 1'
16SP	G10_040	'FROM->TO'	'NORTHWEST (NORTWST2) 345/138/13.8KV TRANSFORMER CKT 1'	493	493	0.05858	104.7235	'NORTHWEST (NORTWST3) 345/138/13.8KV TRANSFORMER CKT 1'
11SP	G10_040	'FROM->TO'	'NORTHWEST (NORTWST2) 345/138/13.8KV TRANSFORMER CKT 1'	493	493	0.05836	100.9753	'NORTHWEST (NORTWST3) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.03874	102.4843	'S1263T1 AUTO'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.46428	102.4781	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.04885	102.3873	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.50613	102.1641	'S1263T1 AUTO'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.03875	102.0805	'S1263T1 AUTO'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.04887	101.3714	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.46428	100.2461	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.04885	100.1586	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.03874	100	'S1263T1 AUTO'
11G	G10_043	'TO->FROM'	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'	171	185	0.06587	105.6436	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'	171	185	0.07117	103.8949	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'	171	185	0.05524	102.5063	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'

11G	G10_043	'FROM->TO'	'CLEO CORNER - MEN TAP 138KV CKT 1'	191	191	0.0744	104.1285	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'FROM->TO'	'CLEO CORNER - MEN TAP 138KV CKT 1'	191	191	0.08054	102.4451	'DBL-WOOD-MED'
11G	G10_043	'FROM->TO'	'CLEO CORNER - MEN TAP 138KV CKT 1'	191	191	0.05983	100.6752	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.05893	119.9451	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.04692	116.3066	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.06322	115.5707	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.04643	111.1323	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.05738	110.738	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.04365	106.7469	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.05987	102.2461	'OKEENE - WATONGA SW 69KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.06155	101.9606	'CLEO CORNER - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.06155	101.8045	'IMO TAP - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.08415	101.4678	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.08415	101.4458	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04482	138.7005	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0465	137.2657	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04713	130.1745	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04445	128.1641	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04171	126.253	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04183	124.6062	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	121.824	'BASE CASE'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04033	120.9353	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	120.5311	'BASE CASE'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04409	119.854	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03964	117.6629	'TALOGA (TALOGA) 138/69/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05621	117.6349	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05621	117.6198	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03813	117.5386	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	117.4623	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04058	117.3784	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04058	117.3784	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	117.1123	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	116.777	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04623	116.7059	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	116.5147	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04213	116.4446	'TALOGA (TALOGA) 138/69/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04114	116.4126	'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04051	116.3982	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04142	116.3782	'CLEO CORNER - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04142	116.3326	'IMO TAP - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	116.3215	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04078	116.1479	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	116.0989	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04078	116.0733	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	115.9672	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04083	115.9436	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04083	115.9436	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03902	115.8265	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03902	115.8265	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.039	115.755	'CANTON - TALOGA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04124	115.7504	'WWRDEHV7 345.00 (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04123	115.7473	'WWRDEHV7 345.00 (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05372	115.7158	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05372	115.7021	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.6342	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	115.6259	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.039	115.5265	'CANTON - OKEENE 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.4987	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04175	115.4787	'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04175	115.4769	'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.4699	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	115.3642	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04067	115.3364	'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'

11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0465	115.3214	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03847	115.3045	'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.2357	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.2199	'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.2182	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.1384	'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0418	115.0824	'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.0544	'GEN509416 1-TURK GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04205	115.0363	'CLEO CORNER - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04205	114.9905	'IMO TAP - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.9625	'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0385	114.9527	'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.9424	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04004	114.8896	'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04004	114.8766	'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.8454	'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.8359	'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04165	114.8332	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.8186	'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03905	114.8013	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.7857	'GEN515040 1-SEMINOLE 1G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04165	114.7584	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.7329	'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.7223	'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03813	114.7198	'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.6639	'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.6341	'GEN509406 1-WELSH #3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.634	'GEN509404 1-WELSH #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.634	'GEN509405 1-WELSH #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.6043	'GEN520947 1-HUGO1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.5564	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04007	114.5421	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04007	114.5421	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04003	114.5119	'CANTON - TALOGA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.4975	'GEN334440 1-SABINE UNIT 4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.4746	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04184	114.4084	'WWRDEHV7 345.00 (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04184	114.4022	'WWRDEHV7 345.00 (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.3366	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.3101	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04003	114.2842	'CANTON - OKEENE 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04726	114.222	'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04726	114.221	'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04235	114.1141	'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0736	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0568	'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0558	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0036	'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.9187	'GEN509416 1-TURK GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03696	113.8385	'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.7944	'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.6906	'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.6813	'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.6636	'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04114	113.6367	'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04114	113.6234	'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0383	113.6125	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.579	'GEN515040 1-SEMINOLE 1G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04051	113.5772	'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.5618	'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.552	'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4926	'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03696	113.488	'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'

11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4876	'GEN509405 1-WELSH #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4876	'GEN509406 1-WELSH #3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4875	'GEN509404 1-WELSH #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.3944	'GEN514806 1-SOONER UNIT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.3884	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.3238	'GEN334440 1-SABINE UNIT 4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03766	111.0871	'OGE3TERM10'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03704	110.6753	'CIMARRON - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.6181	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03728	110.5878	'EL RENO - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.3111	'GEN520997 1-MORLND2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.2831	'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.1703	'GEN520998 1-MORLND3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04214	110.1114	'DEWEY - IODINE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0357	109.7578	'OGE3TERM10'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03995	109.5734	'CIMARRON - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	109.4344	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03691	109.3418	'EL RENO - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	109.2554	'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04214	109.1911	'IODINE - WWRDEHV4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	109.1047	'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	108.8482	'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04126	108.601	'DEWEY - IODINE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	108.0699	'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04126	107.6844	'IODINE - WWRDEHV4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	107.6804	'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03533	106.9978	'CIMARRON - EL RENO 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03841	105.9458	'CIMARRON - EL RENO 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	105.8011	'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	104.6195	'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	101.8727	'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	100.7111	'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06587	160.7172	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.07117	158.1031	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05524	156.0278	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0553	152.1984	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06476	151.7735	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05225	146.6365	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.09628	140.9336	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.09628	140.9086	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0657	139.0508	'KNOBHILL - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0657	139.0378	'KNOBHILL (KNOBHIL4) 138/69/13.2KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06596	136.4874	'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06596	136.275	'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06179	134.7798	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05483	134.375	'KNOBHILL - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05483	134.3624	'KNOBHILL (KNOBHIL4) 138/69/13.2KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0777	134.1878	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0777	134.1635	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0631	133.7292	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0631	133.7292	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06206	132.8401	'EL RENO - ROMAN NOSE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06438	132.5648	'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	132.423	'GEN514805 1-SOONER UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05429	131.8532	'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05429	131.641	'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	131.211	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06194	131.1774	'ALVA - KNOBHILL 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06124	131.0432	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06124	131.0432	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06009	130.969	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	130.5972	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05276	130.5962	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'

11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	130.3843	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	130.2381	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06708	130.0862	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06431	130.0048	'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06431	129.994	'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	129.8332	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	129.7743	'GEN514806 1-SOONER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	129.4565	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06227	128.9941	'DEWEY - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05085	128.9765	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05085	128.9765	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.8444	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.827	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05445	128.7145	'WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0604	128.581	'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06227	128.4119	'ROMAN NOSE - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05122	128.4103	'EL RENO - ROMAN NOSE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.2798	'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	128.2714	'GEN514805 1-SOONER UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06216	128.2381	'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.1447	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.1219	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.0901	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06042	128.0361	'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06083	128.0065	'ALVA - CHEROKEE SW 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05249	127.986	'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.8449	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06084	127.7891	'HAZELTON JCT - WAKITA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0621	127.7294	'ELK CITY - RHWIND4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06125	127.724	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.6743	'GEN512689 1-GRDA1 GSU1 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06197	127.6736	'ALINE - ALVA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.6086	'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5903	'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5805	'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5581	'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.532	'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5254	'GEN509394 1-FLINT CREEK'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06197	127.5226	'ALINE - CLEO 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.517	'GEN511839 1-NORTHEASTERN STATION #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06056	127.4683	'LAWTON EASTSIDE - SUNNYSIDE 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.4182	'GEN511840 1-NORTHEASTERN STATION #3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06009	127.3774	'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.3683	'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2754	'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2691	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2419	'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2168	'GEN300006 1-NEW MADRID UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2163	'GEN300007 1-NEW MADRID UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06197	127.1418	'CLEO - CLEO CORNER 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06218	127.1247	'DOVER SW - HENESSEY 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	127.0683	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05201	126.746	'ALVA - KNOBHILL 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05002	126.7249	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04994	126.5714	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04994	126.5714	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	126.4414	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	126.211	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	126.0577	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	125.6597	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	125.5876	'GEN514806 1-SOONER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05829	125.5778	'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05829	125.5663	'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'

11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05524	125.5222 'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	125.2669 'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	124.6938 'BASE CASE'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	124.647 'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	124.6279 'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05122	124.5879 'DEWEY - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0449	124.4402 'WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	124.0712 'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05122	124.0073 'ROMAN NOSE - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.9359 'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.9126 'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04695	123.8894 'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05151	123.8863 'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.8598 'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04966	123.6582 'ALVA - CHEROKEE SW 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.6276 'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.4347 'GEN512689 1-GRDA1 GSU1 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04947	123.4128 'HAZELTON JCT - WAKITA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3824 'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3709 'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04454	123.3689 'ELK CITY - RHWIND4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3588 'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04695	123.3515 'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3355 'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3081 'GEN509394 1-FLINT CREEK'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3027 'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.2916 'GEN511839 1-NORTHEASTERN STATION #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0502	123.2314 'ALINE - ALVA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.1931 'GEN511840 1-NORTHEASTERN STATION #3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04861	123.1553 'LAWTON EASTSIDE - SUNNYSIDE 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05002	123.1367 'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.1348 'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04932	123.1112 'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0502	123.0807 'ALINE - CLEO 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.0765 'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.041 'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.0063 'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.9771 'GEN300006 1-NEW MADRID UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.9766 'GEN300007 1-NEW MADRID UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.8728 'GEN336801 1-BAXTER WILSON UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.8651 'GEN511841 1-NORTHEASTERN STATION #4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06084	122.0201 'CLEO JCT - RINGWOOD 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06084	122.011 'CLEO CORNER - CLEO JCT 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.9619 'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.8329 'GEN560223 1-G07-62-3 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.8155 'GEN560224 1-G07-62-4 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.7525 'GEN560221 1-G07-62-1 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.7525 'GEN560222 1-G07-62-2 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.7306 'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05986	121.705 'OGE3TERM4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.5073 'GEN523971 1-HARRINGTON GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.4984 'GEN523973 1-HARRINGTON GEN #3 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.4979 'GEN523972 1-HARRINGTON GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.461 'GEN520922 1-SLEEPING 138.00'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	120.9282 'GEN515790 1-FPLWND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	120.3913 'BASE CASE'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	120.289 'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.8665 'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.778 'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.4943 'GEN520997 1-MORLND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.1722 'GEN520998 1-MORLND3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.6772 'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04947	117.6719 'CLEO CORNER - CLEO JCT 69KV CKT 1'

11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04947	117.6549 'CLEO JCT - RINGWOOD 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.5641 'GEN560223 1-G07-62-3 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.5467 'GEN560224 1-G07-62-4 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.4827 'GEN560221 1-G07-62-1 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.4827 'GEN560222 1-G07-62-2 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.4636 'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04907	117.4368 'OGE3TERM4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.2223 'GEN523971 1-HARRINGTON GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.2134 'GEN523973 1-HARRINGTON GEN #3 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.2129 'GEN523972 1-HARRINGTON GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.1758 'GEN520922 1-SLEEPING 138.00'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0534	117.0056 'IMO TAP - SOUTH 4TH ST 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.9999 'GEN520997 1-MORLND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	116.9949 'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.7888 'GEN520998 1-MORLND3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.6398 'GEN515790 1-FPLWND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.0081 'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	115.6185 'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	115.5069 'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04389	113.1328 'IMO TAP - SOUTH 4TH ST 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	112.7228 'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	109.1294 'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	104.8755 'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03359	105.6631 'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03359	105.1072 'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03223	102.789 'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03223	102.2343 'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.19715	107.3007 'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.17127	105.447 'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.15423	102.1777 'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.15064	100.8484 'DBL-MEDLO-WI'
11G	G10_045	'TO->FROM'	'CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.0825	105.5157 'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.09618	113.9222 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.0965	109.6676 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.05557	103.4434 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.05575	101.1715 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_045	'FROM->TO'	'CUDAHY - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.0825	107.3818 'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11WP	G10_045	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.03601	110.8045 'DBL-MEDLO-WI'
11WP	G10_045	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.03628	103.9628 'DBL-MEDLO-WI'
11G	G10_045	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.03176	112.337 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.03204	104.3944 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'GREENSBURG - SUN CITY 115KV CKT 1'	120.7	129.5	0.03176	104.7827 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'HAYS PLANT - SOUTH HAYS 115KV CKT 1'	80	88	0.07786	158.1485 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045	'FROM->TO'	'HAYS PLANT - VINE STREET 115KV CKT 1'	80	88	0.07786	140.7211 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045	'TO->FROM'	'KNOLL - N HAYS3 115.00 115KV CKT 1'	83	99	0.07786	113.6082 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045	'TO->FROM'	'MEDICINE LODGE - SUN CITY 115KV CKT 1'	120.7	129.5	0.03176	101.9355 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.08983	106.5911 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.0902	103.5049 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.10494	103.0916 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'TO->FROM'	'N HAYS3 115.00 - VINE STREET 115KV CKT 1'	83	99	0.07786	119.2459 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045		NCONV	0	0	0.12863	9999 'DBL-COM-MEDL'
11G	G10_045		NCONV	0	0	0.31474	9999 'DBL-COM-MEDL'
11G	G10_045		NCONV	0	0	0.31587	9999 'DBL-COM-MEDL'
11G	G10_045		NCONV	0	0	0.19206	9999 'DBL-MEDLO-WI'
11G	G10_045		NCONV	0	0	0.19269	9999 'DBL-MEDLO-WI'
11G	G10_045	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.09197	100.955 'DBL-MEDLO-WI'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05364	111.0232 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.07995	110.8506 'DBL-COM-MEDL'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.08047	109.9435 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05382	108.8703 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05549	107.568 'DBL-MEDLO-WI'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.08075	106.4645 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05373	106.1522 'AXTELL - POSTROCK7 345.00 345KV CKT 1'

11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.08081	102.0405 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04786	100.7322 'CIRCLE - MULLERGREN 230KV CKT 1'
16SP	G10_047	'FROM->TO'	'G10-47T 115.00 - HARBINE 115KV CKT 1'	99	99	0.42487	111.9806 'BEATRICE POWER STATION - SHELDON 115KV CKT 1'
11SP	G10_047	'FROM->TO'	'G10-47T 115.00 - HARBINE 115KV CKT 1'	99	99	0.42082	102.3099 'BEATRICE POWER STATION - SHELDON 115KV CKT 1'
11G	G10_048	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.10221	109.6676 'DBL-SPRVL-CO'
11G	G10_048	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.09211	101.1715 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_048	'FROM->TO'	'GREENLEAF - KNOB HILL 115KV CKT 1'	92	92	0.05649	115.5782 'ELMCREK6 230.00 - NWMANHT6 230.00 230KV CKT 1'
11G	G10_048	'FROM->TO'	'GREENLEAF - KNOB HILL 115KV CKT 1'	92	92	0.05652	114.6742 'ELMCREK6 230.00 - NWMANHT6 230.00 230KV CKT 1'
11G	G10_048	'FROM->TO'	'GREENLEAF - KNOB HILL 115KV CKT 1'	92	92	0.033	113.8876 'ELMCREK6 230.00 - NWMANHT6 230.00 230KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12139	111.565 'DBL-COM-MEDL'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12145	110.8506 'DBL-COM-MEDL'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12275	108.8703 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10248	108.1505 'DBL-MEDLO-WI'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10254	107.568 'DBL-MEDLO-WI'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12259	106.7622 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12225	106.4645 'DBL-SPRVL-CO'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12266	106.1522 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12225	102.6686 'DBL-SPRVL-CO'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12232	102.0405 'DBL-SPRVL-CO'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.03745	101.7188 'DBL-COM-MEDL'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10941	100 'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.06861	112.9732 'DBL-SPRVL-CO'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.06888	109.6676 'DBL-SPRVL-CO'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.0613	103.0301 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.06147	101.1715 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.04894	195.1345 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03563	152.3146 'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03563	152.3146 'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03569	150.1403 'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03569	150.1403 'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05047	148.4198 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05074	142.0614 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05094	136.9546 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	133.9711 'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03298	133.3375 'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03192	132.9654 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	132.3411 'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03304	131.4202 'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03197	130.86 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	129.6205 'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03202	129.0113 'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03538	128.8363 'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03313	128.6997 'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	127.9988 'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03229	127.4501 'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03208	127.065 'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03544	126.9489 'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.04	126.8801 'DBL-WOOD-MED'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03319	126.7951 'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03215	126.6117 'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03229	126.2982 'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03342	126.1266 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03229	125.8494 'SPP-WERE-32'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05132	125.842 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03234	125.8134 'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0324	125.614 'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	125.6079 'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05134	125.5791 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	125.3051 'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05134	125.2305 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03212	125.1156 'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0322	124.8915 'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03234	124.6521 'HOOVER NORTH - LAKERIDGE 138KV CKT 1'

11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	124.6321	'SPP-WERE-30'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	124.62	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.04007	124.5167	'DBL-WOOD-MED'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	124.4033	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03327	124.3663	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0325	124.2852	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	124.2804	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03221	124.2247	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	124.2127	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03234	124.2038	'SPP-WERE-32'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03347	124.202	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	124.0939	'SPP-WERE-28'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	123.9597	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.909	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03245	123.7681	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	123.6623	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0322	123.4729	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03217	123.4212	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.4093	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.3619	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.2602	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.2059	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.1227	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06837	123.0428	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	122.9889	'SPP-WERE-30'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.9753	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.9408	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.8868	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.8073	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.805	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	122.7533	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06837	122.733	'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03076	122.7231	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.6127	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03333	122.5858	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03187	122.5675	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.5634	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.5229	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.5204	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03227	122.4747	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03227	122.4712	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	122.4435	'SPP-WERE-28'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.3797	'GEN509394 1-FLINT CREEK'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.3724	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03256	122.3722	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.328	'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.2649	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.7429	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.7074	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03226	121.6528	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.5866	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.5491	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.5274	'GEN338146 1-INDEPENDENCE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.4631	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.284	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.2512	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.2166	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.1385	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03082	120.9993	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06843	120.9961	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.8638	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.8551	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03232	120.8394	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'

11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03192	120.8253	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.7141	'GEN509394 1-FLINT CREEK'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.7042	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06843	120.6836	'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.6584	'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.6334	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.6117	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.5978	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05155	120.099	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	118.9736	'BASE CASE'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	117.2947	'BASE CASE'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.8363	'GEN560356 1-G10-53 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03127	115.8046	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.6573	'GEN560522 1-G05-12 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475	'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475	'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475	'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475	'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03128	115.4208	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03829	115.4201	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.0807	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	114.9929	'GEN560279 1-G08-18 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	114.9771	'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	114.6548	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03132	114.1833	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	114.1785	'GEN560356 1-G10-53 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	114.0063	'GEN560522 1-G05-12 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03833	113.8541	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921	'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921	'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921	'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921	'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03133	113.7895	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.4766	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.3775	'GEN560279 1-G08-18 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.341	'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.3014	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03152	113.1245	'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03694	113.0351	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03694	113.0351	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03154	112.6964	'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03176	112.0583	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03176	112.0583	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03157	111.4212	'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03159	111.0482	'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03181	110.4958	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03181	110.4958	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03382	106.9884	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	106.7168	'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	105.0582	'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03308	102.9967	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11WP	G10_049	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.05813	107.764	'DBL-MEDLO-WI'
11WP	G10_049	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.05827	103.9628	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04894	240.1462	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03563	190.8151	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03563	190.8151	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03569	188.2495	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03569	188.2495	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05047	185.9568	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05074	178.5565	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05094	172.6586	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	169.6643	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03298	168.9046	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03192	168.6155	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	167.7673	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03304	166.6796	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03197	166.1695	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	164.6132	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03202	163.9746	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03538	163.6591	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03313	163.5458	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	162.7257	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03229	162.0721	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03208	161.7093	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04	161.6368	'DBL-WOOD-MED'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03544	161.466	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03319	161.3321	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03215	161.1151	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03229	160.7455	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03342	160.618	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03229	160.2278	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	160.1681	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0324	159.9925	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	159.9492	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05132	159.7567	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	159.6454	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05134	159.4484	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03212	159.3932	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0322	159.119	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05134	159.0478	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04007	158.895	'DBL-WOOD-MED'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.8527	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	158.8313	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	158.8224	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	158.5634	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	158.5632	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0325	158.4786	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.4527	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03221	158.409	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.3814	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03347	158.3797	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	158.3141	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	158.2012	'SPP-WERE-28'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	158.0336	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.0296	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03245	157.8507	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	157.7385	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0322	157.5348	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.4476	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03217	157.4247	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.3967	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.2764	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.2145	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.1206	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06837	157.0206	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.9436	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	156.9114	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.909	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.8484	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.7543	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.7481	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03076	156.6743	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06837	156.664	'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	156.6449	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.517	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03333	156.4982	'CIRCLE - MULLERGREN 230KV CKT 1'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03187	156.4739	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.4671	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.4249	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.4191	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03227	156.3779	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03227	156.3754	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	156.2825	'SPP-WERE-28'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.2587	'GEN509394 1-FLINT CREEK'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03256	156.2578	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.2449	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.1971	'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.16	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.1351	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.1271	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.1212	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.5138	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.4762	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03226	155.4223	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.3333	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.2914	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.2666	'GEN338146 1-INDEPENDENCE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.194	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.9858	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.9477	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.909	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.8139	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03082	154.6729	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06843	154.6431	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.499	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.4863	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03232	154.482	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03192	154.4519	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.3253	'GEN509394 1-FLINT CREEK'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.3087	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06843	154.2824	'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.2592	'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.2329	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.2077	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.1905	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	152.3184	'BASE CASE'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05155	152.2629	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	150.3694	'BASE CASE'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03127	148.6633	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.4669	'GEN560522 1-G05-12 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03128	148.2221	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03829	148.2149	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.8278	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.7084	'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.7015	'GEN560279 1-G08-18 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.309	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03132	146.7802	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.5487	'GEN560522 1-G05-12 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03833	146.398	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03133	146.3223	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.9651	'GEN525561 1-TOLK GEN #1 24 KV'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.8089	'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.7803	'GEN560279 1-G08-18 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.6938	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03152	145.5717	'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03694	145.3287	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03694	145.3287	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03154	145.0786	'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03176	144.4325	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03176	144.4325	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03157	143.5914	'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03159	143.1635	'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03181	142.61	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03181	142.61	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03382	138.462	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	138.2522	'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	136.3238	'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	133.8188	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	128.7706	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.20332	127.9427	'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05753	126.1579	'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03338	126.0141	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03338	124.5964	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03338	124.0424	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	123.822	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	123.5323	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0332	123.3683	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.20345	123.3574	'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03661	123.2158	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	123.1337	'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03349	122.9435	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	122.7096	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	122.7036	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03323	122.4723	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	122.3581	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03329	122.2568	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	122.187	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	122.0033	'SPP-WERE-28'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	121.8254	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	121.1318	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03325	120.9086	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.8974	'GEN338143 1-INDEPENDENCE UNIT #1'
16WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0525	120.8845	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.8402	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.8325	'GEN542955 1-LACYGNE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.6637	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.602	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03294	120.2844	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03459	119.9502	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.765	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.7599	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.6222	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.5048	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.4773	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.405	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.2225	'GEN532651 1-JEFFREY ENERGY CENTER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.1987	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.1053	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.9282	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.9024	'GEN532653 1-JEFFREY ENERGY CENTER UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.8925	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03278	118.8439	'EL PASO - ROSE HILL 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03336	118.8434	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03442	118.8356	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.8085	'GEN336831 1-BAXTER WILSON SES'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.7452	'GEN300007 1-NEW MADRID UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.7428	'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.7352	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.735	'GEN300006 1-NEW MADRID UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.6901	'GEN509394 1-FLINT CREEK'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03296	118.6558	'ROSE HILL - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03774	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03774	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
16WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05262	117.1379	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	115.3995	'BASE CASE'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	114.5601	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03789	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03789	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0344	112.1864	'GRAY CO 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	112.1417	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	111.8914	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03795	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03795	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	111.8275	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03236	111.6796	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	111.3285	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	110.749	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	109.923	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	109.4146	'GEN539630 1-FLATRDG1 34.500'
11SP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05409	108.6504	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03472	108.4701	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03262	108.0557	'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0307	107.6223	'DBL-COM-MEDL'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03264	107.5586	'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	107.0796	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	107.0661	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	106.9449	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11SP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05427	106.5919	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03562	105.568	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03562	105.568	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03396	105.5467	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	105.5256	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03397	105.517	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05813	105.4976	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03398	105.1749	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	105.0272	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	104.6445	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	104.3443	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03819	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03819	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03818	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03818	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03406	104.1641	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03403	104.0476	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0382	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0382	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	103.9721	'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03407	103.9563	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03488	103.9491	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03488	103.9436	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03487	103.5767	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	103.5248	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	103.4935	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	103.1419	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03342	103.1216	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	102.9126	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	102.7578	'SPP-WERE-28'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	102.5676	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03406	102.4511	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03388	102.3772	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03407	102.2243	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03408	102.1341	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03381	102.0699	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03406	101.9228	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.8173	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	101.7703	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03407	101.7182	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	101.6431	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.6185	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.6062	'GEN542955 1-LACYGNE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.5737	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	101.545	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03829	101.5285	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03829	101.5285	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.4872	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03725	101.4257	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.276	'GEN337652 1-WHITE BLUFF UNIT #1'
11WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05827	101.2482	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	101.222	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	101.188	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	101.0478	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	101.0336	'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03414	100.975	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03415	100.8565	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.7649	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	100.7409	'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.7157	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	100.6922	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.6505	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.5882	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.5227	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.4988	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.4708	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03342	100.4628	'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03417	100.4001	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.3339	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.2121	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	100.1851	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.1731	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.1666	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	100.111	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.0786	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0673	'GEN532651 1-JEFFREY ENERGY CENTER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0659	'GEN532653 1-JEFFREY ENERGY CENTER UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0548	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0515	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HUNTSVILLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'	83	92	0.05166	112.2013	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'HUNTSVILLE - ST_JOHN 115KV CKT 1'	80	88	0.05166	120.7984	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'HUNTSVILLE - ST_JOHN 115KV CKT 1'	80	88	0.21636	100.4407	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.03866	104.652	'RENO COUNTY - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.03866	104.6442	'RENO COUNTY - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.04116	106.2962	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049		NCONV	0	0	0.04113	9999	'DBL-COM-MEDL'
11G	G10_049		NCONV	0	0	0.04192	9999	'DBL-COM-MEDL'
11G	G10_049		NCONV	0	0	0.12812	9999	'DBL-MEDLO-WI'
11G	G10_049		NCONV	0	0	0.12861	9999	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.05949	100.955	'DBL-MEDLO-WI'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	121.9435	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	121.9364	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	118.2634	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'

16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	118.222	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	116.087	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	115.9963	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	115.804	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	115.677	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	112.5964	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	112.4055	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	112.3256	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	112.2074	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	108.6325	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	108.5704	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	105.3102	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	105.2489	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05166	162.6856	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04718	138.684	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21654	138.2874	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21666	133.5296	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04985	121.2907	'DBL-SPRVL-CO'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21137	120.8539	'DBL-SPRVL-CO'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05083	118.0124	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05083	118.0124	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21088	117.3673	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21088	117.3673	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21026	116.6745	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05025	116.2382	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04833	116.0982	'CIRCLE (CIRCLE1X) 230/115/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20922	115.7697	'CIRCLE (CIRCLE1X) 230/115/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05046	115.6847	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2115	115.389	'DBL-SPRVL-CO'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.27897	115.0117	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.07009	114.9623	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05046	114.8359	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21088	114.756	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21089	113.86	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05045	113.8337	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05025	113.585	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21126	113.4263	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05042	113.4204	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05042	113.4204	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21099	113.0135	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21099	113.0135	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04104	112.9359	'CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20999	112.7954	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20999	112.7954	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21037	112.5429	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21037	112.374	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.1718	112.1639	'CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05056	111.9334	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20933	111.4661	'CIRCLE (CIRCLE1X) 230/115/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20981	111.2745	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05056	110.7076	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05059	110.1177	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21099	110.0602	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20981	110.0035	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05058	109.7005	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.06846	109.6386	'SPP-MKEC-02'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21007	109.5053	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05079	109.4302	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.27912	109.3361	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05074	109.2629	'SPP-MKEC-08'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21101	109.16	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21019	109.0525	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21228	109.0414	'SPP-MKEC-02'

11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21137	109.0147	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.17189	108.7084	'CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21049	108.6701	'SPP-MKEC-08'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20993	108.4469	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2101	108.4392	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2101	108.4392	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21048	108.2293	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20992	107.1656	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20992	105.9685	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21018	105.2982	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21239	104.87	'SPP-MKEC-02'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05056	104.7391	'BASE CASE'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2103	104.7117	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2106	104.5196	'SPP-MKEC-08'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21004	104.3007	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20981	104.1532	'BASE CASE'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21575	100.6782	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05058	100.5835	'HOYT - JEFFERY ENERGY CENTER 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05695	100.4541	'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05059	100.3418	'WRTOD400'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.23201	100.0667	'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20992	100.0518	'BASE CASE'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20943	100	'HOYT - JEFFERY ENERGY CENTER 345KV CKT 1'
11G	G10_052		NCONV	0	0	0.22362	9999	'DBL-COM-MEDL'
11G	G10_052		NCONV	0	0	0.22482	9999	'DBL-COM-MEDL'
11G	G10_052		NCONV	0	0	0.16346	9999	'DBL-MEDLO-WI'
11G	G10_052		NCONV	0	0	0.16422	9999	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.03717	109.3657	'SPP-SUNC-14'
11G	G10_053	'TO->FROM'	'CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.07575	105.504	'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11G	G10_053	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.04481	103.4132	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_053	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.04498	101.1715	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_053	'FROM->TO'	'CLEARWATER - GILL ENERGY CENTER WEST 138KV CKT 1'	234	234	0.03162	111.7334	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03162	249.5631	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05458	195.1345	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05611	148.4198	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05638	142.0614	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05658	136.9546	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05697	125.842	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05698	125.5791	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05698	125.2305	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05719	120.099	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03379	103.5446	'DBL-SPRVL-CO'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03384	102.2108	'DBL-SPRVL-CO'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03137	101.5044	'DBL-SPRVL-CO'
11G	G10_053	'FROM->TO'	'CUDAHY - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.03717	111.2213	'SPP-SUNC-14'
11G	G10_053	'FROM->TO'	'CUDAHY - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.07575	107.3707	'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11WP	G10_053	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.04903	112.9362	'DBL-MEDLO-WI'
11WP	G10_053	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.04938	103.9628	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03162	303.2539	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05458	240.1462	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05611	185.9568	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05638	178.5565	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05658	172.6586	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05697	159.7567	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05698	159.4484	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05698	159.0478	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05719	152.2629	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03379	134.406	'DBL-SPRVL-CO'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	132.8082	'DBL-SPRVL-CO'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03137	131.9869	'DBL-SPRVL-CO'
16WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05788	128.7006	'DBL-MEDLO-WI'
11SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05966	120.433	'DBL-MEDLO-WI'
16WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03162	120.0234	'DBL-MEDLO-WI'

11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03023	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03023	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
16WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05826	117.1379	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03037	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03037	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03044	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03044	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03027	111.6206	'DBL-MEDLO-WI'
11WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04903	111.198	'DBL-MEDLO-WI'
11SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05997	108.6504	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03068	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03068	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03067	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03067	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03069	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03069	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
16SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05999	103.5727	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03078	101.5285	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03078	101.5285	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04938	101.2482	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'HAYS PLANT - SOUTH HAYS 115KV CKT 1'	80	88	0.07909	158.1831	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053	'FROM->TO'	'HAYS PLANT - VINE STREET 115KV CKT 1'	80	88	0.07909	140.7514	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053	'TO->FROM'	'KNOLL - N HAYS3 115.00 115KV CKT 1'	83	99	0.07909	113.6277	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.09392	106.7474	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.09431	103.5049	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.10905	103.2241	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'TO->FROM'	'N HAYS3 115.00 - VINE STREET 115KV CKT 1'	83	99	0.07909	119.2701	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053		NCONV	0	0	0.32907	9999	'DBL-COM-MEDL'
11G	G10_053		NCONV	0	0	0.5149	9999	'DBL-COM-MEDL'
11G	G10_053		NCONV	0	0	0.51631	9999	'DBL-COM-MEDL'
11G	G10_053		NCONV	0	0	0.277	9999	'DBL-MEDLO-WI'
11G	G10_053		NCONV	0	0	0.27776	9999	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.10757	100.955	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04838	111.0766	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.09684	110.8506	'DBL-COM-MEDL'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04856	108.8703	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05504	107.568	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04847	106.1522	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.03862	100.7152	'CIRCLE - MULLERGREN 230KV CKT 1'

SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEA	RATEB	TDF	TC%LOADING	CONTNAME
11WP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.99822	120.2502	'BASE CASE'
16WP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.99837	119.7376	'BASE CASE'
11SP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.9987	119.6877	'BASE CASE'
11G	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.99838	119.4048	'BASE CASE'
16SP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.9988	119.1113	'BASE CASE'
11WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-LOVINGTON INTERCHANGE - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99822	104.0828	'LEA COUNTY REC-DENTON SUB - LEA COUNTY REC-REED 69KV CKT 1'
16WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-LOVINGTON INTERCHANGE - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99837	101.5545	'LEA COUNTY REC-DENTON SUB - LEA COUNTY REC-REED 69KV CKT 1'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-LOVINGTON INTERCHANGE - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99838	100.8607	'LEA COUNTY REC-DENTON SUB - LEA COUNTY REC-REED 69KV CKT 1'
11WP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99822	133.4746	'BASE CASE'
16WP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99837	130.1776	'BASE CASE'
11G	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99838	129.1375	'BASE CASE'
11SP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.9987	125.231	'BASE CASE'
16SP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.9988	120.7298	'BASE CASE'
11WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99822	137.9856	'BASE CASE'
16WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99837	135.1622	'BASE CASE'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99838	134.2779	'BASE CASE'
11SP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.9987	132.0712	'BASE CASE'
16SP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.9988	128.2765	'BASE CASE'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99871	104.0524	'BASE CASE'
11WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99822	103.4391	'LEA COUNTY REC-LOVINGTON INTERCHANGE 115/69KV TRANSFORMER CKT 1'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99838	100.7362	'LEA COUNTY REC-LOVINGTON INTERCHANGE 115/69KV TRANSFORMER CKT 1'
16WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99837	100.7292	'LEA COUNTY REC-LOVINGTON INTERCHANGE 115/69KV TRANSFORMER CKT 1'
11G	G10_001		NCONV	0	0	0.12329	9999	'DBL-MEDLO-WI'
11G	G10_001		NCONV	0	0	0.13957	9999	'DBL-MEDLO-WI'
11G	G10_001		NCONV	0	0	0.05009	9999	'SPP-SWPS-03'
11G	G10_001		NCONV	956	1052	0.17225	71.56281	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27481	110	'STATELINE INTERCHANGE - SWEETWT6 230.00 230KV CKT &1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27493	107.1	'STATELINE INTERCHANGE - SWEETWT6 230.00 230KV CKT &1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26691	105.1162	'CLINTON AIR FORCE BASE TAP - ELK CITY 138KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.20496	105.1108	'GEN560655 1-G07-32 12.000'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27481	104.0895	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26691	104.0376	'CLINTON AIR FORCE BASE TAP - HOBART JUNCTION 138KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27493	103.651	'SPP-SWPS-03'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.20508	102.2033	'GEN560655 1-G07-32 12.000'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26707	101.373	'CLINTON AIR FORCE BASE TAP - ELK CITY 138KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27493	101.2306	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27505	100.7963	'SPP-SWPS-03'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26707	100.2986	'CLINTON AIR FORCE BASE TAP - HOBART JUNCTION 138KV CKT 1'
11G	G10_027		NCONV	0	0	0.51231	9999	'DBL-COM-MEDL'
11G	G10_027		NCONV	0	0	0.51631	9999	'DBL-COM-MEDL'
11G	G10_027		NCONV	0	0	0.27546	9999	'DBL-MEDLO-WI'
11G	G10_027		NCONV	0	0	0.27776	9999	'DBL-MEDLO-WI'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49584	107.8903	'BROKEN BOW - CROOKED CREEK 115KV CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49584	107.6198	'CROOKED CREEK 230/115KV TRANSFORMER CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49609	101.7759	'BROKEN BOW - CROOKED CREEK 115KV CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49609	101.5122	'CROOKED CREEK 230/115KV TRANSFORMER CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.31038	100.4083	'GRAND ISLAND - SWEETWATER 345KV CKT 1'
16SP	G10_040	'FROM->TO'	'NORTHWEST (NORTWST2) 345/138/13.8KV TRANSFORMER CKT 1'	493	493	0.05858	107.6339	'NORTHWEST (NORTWST3) 345/138/13.8KV TRANSFORMER CKT 1'
16SP	G10_040	'FROM->TO'	'NORTHWEST (NORTWST2) 345/138/13.8KV TRANSFORMER CKT 1'	493	493	0.05858	104.7235	'NORTHWEST (NORTWST3) 345/138/13.8KV TRANSFORMER CKT 1'
11SP	G10_040	'FROM->TO'	'NORTHWEST (NORTWST2) 345/138/13.8KV TRANSFORMER CKT 1'	493	493	0.05836	100.9753	'NORTHWEST (NORTWST3) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.03874	102.4843	'S1263T1 AUTO'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.46428	102.4781	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.04885	102.3873	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.50613	102.1641	'S1263T1 AUTO'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.03875	102.0805	'S1263T1 AUTO'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.04887	101.3714	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.46428	100.2461	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.04885	100.1586	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.03874	100	'S1263T1 AUTO'
11G	G10_043	'TO->FROM'	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'	171	185	0.06587	105.6436	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'	171	185	0.07117	103.8949	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'	171	185	0.05524	102.5063	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'

11G	G10_043	'FROM->TO'	'CLEO CORNER - MEN TAP 138KV CKT 1'	191	191	0.0744	104.1285	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'FROM->TO'	'CLEO CORNER - MEN TAP 138KV CKT 1'	191	191	0.08054	102.4451	'DBL-WOOD-MED'
11G	G10_043	'FROM->TO'	'CLEO CORNER - MEN TAP 138KV CKT 1'	191	191	0.05983	100.6752	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.05893	119.9451	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.04692	116.3066	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.06322	115.5707	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.04643	111.1323	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.05738	110.738	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.04365	106.7469	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.05987	102.2461	'OKEENE - WATONGA SW 69KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.06155	101.9606	'CLEO CORNER - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.06155	101.8045	'IMO TAP - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.08415	101.4678	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.08415	101.4458	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04482	138.7005	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0465	137.2657	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04713	130.1745	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04445	128.1641	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04171	126.253	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04183	124.6062	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	121.824	'BASE CASE'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04033	120.9353	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	120.5311	'BASE CASE'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04409	119.854	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03964	117.6629	'TALOGA (TALOGA) 138/69/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05621	117.6349	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05621	117.6198	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03813	117.5386	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	117.4623	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04058	117.3784	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04058	117.3784	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	117.1123	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	116.777	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04623	116.7059	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	116.5147	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04213	116.4446	'TALOGA (TALOGA) 138/69/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04114	116.4126	'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04051	116.3982	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04142	116.3782	'CLEO CORNER - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04142	116.3326	'IMO TAP - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	116.3215	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04078	116.1479	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	116.0989	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04078	116.0733	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	115.9672	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04083	115.9436	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04083	115.9436	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03902	115.8265	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03902	115.8265	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.039	115.755	'CANTON - TALOGA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04124	115.7504	'WWRDEHV7 345.00 (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04123	115.7473	'WWRDEHV7 345.00 (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05372	115.7158	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05372	115.7021	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.6342	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	115.6259	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.039	115.5265	'CANTON - OKEENE 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.4987	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04175	115.4787	'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04175	115.4769	'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.4699	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	115.3642	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04067	115.3364	'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'

11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0465	115.3214 'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03847	115.3045 'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.2357 'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.2199 'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.2182 'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.1384 'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0418	115.0824 'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.0544 'GEN509416 1-TURK GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04205	115.0363 'CLEO CORNER - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04205	114.9905 'IMO TAP - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.9625 'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0385	114.9527 'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.9424 'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04004	114.8896 'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04004	114.8766 'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.8454 'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.8359 'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04165	114.8332 'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.8186 'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03905	114.8013 'CLINTON JUNCTION - ELK CITY 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.7857 'GEN515040 1-SEMINOLE 1G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04165	114.7584 'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.7329 'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.7223 'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03813	114.7198 'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.6639 'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.6341 'GEN509406 1-WELSH #3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.634 'GEN509404 1-WELSH #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.634 'GEN509405 1-WELSH #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.6043 'GEN520947 1-HUGO1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.5564 'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04007	114.5421 'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04007	114.5421 'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04003	114.5119 'CANTON - TALOGA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.4975 'GEN334440 1-SABINE UNIT 4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.4746 'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04184	114.4084 'WWRDEHV7 345.00 (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04184	114.4022 'WWRDEHV7 345.00 (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.3366 'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.3101 'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04003	114.2842 'CANTON - OKEENE 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04726	114.222 'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04726	114.221 'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04235	114.1141 'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0736 'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0568 'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0558 'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0036 'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.9187 'GEN509416 1-TURK GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03696	113.8385 'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.7944 'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.6906 'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.6813 'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.6636 'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04114	113.6367 'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04114	113.6234 'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0383	113.6125 'CLINTON JUNCTION - ELK CITY 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.579 'GEN515040 1-SEMINOLE 1G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04051	113.5772 'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.5618 'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.552 'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4926 'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03696	113.488 'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'

11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4876	'GEN509405 1-WELSH #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4876	'GEN509406 1-WELSH #3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4875	'GEN509404 1-WELSH #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.3944	'GEN514806 1-SOONER UNIT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.3884	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.3238	'GEN334440 1-SABINE UNIT 4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03766	111.0871	'OGE3TERM10'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03704	110.6753	'CIMARRON - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.6181	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03728	110.5878	'EL RENO - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.3111	'GEN520997 1-MORLND2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.2831	'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.1703	'GEN520998 1-MORLND3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04214	110.1114	'DEWEY - IODINE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0357	109.7578	'OGE3TERM10'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03995	109.5734	'CIMARRON - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	109.4344	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03691	109.3418	'EL RENO - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	109.2554	'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04214	109.1911	'IODINE - WWRDEHV4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	109.1047	'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	108.8482	'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04126	108.601	'DEWEY - IODINE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	108.0699	'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04126	107.6844	'IODINE - WWRDEHV4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	107.6804	'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03533	106.9978	'CIMARRON - EL RENO 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03841	105.9458	'CIMARRON - EL RENO 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	105.8011	'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	104.6195	'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	101.8727	'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	100.7111	'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06587	160.7172	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.07117	158.1031	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05524	156.0278	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0553	152.1984	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06476	151.7735	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05225	146.6365	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.09628	140.9336	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.09628	140.9086	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0657	139.0508	'KNOBHILL - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0657	139.0378	'KNOBHILL (KNOBHIL4) 138/69/13.2KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06596	136.4874	'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06596	136.275	'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06179	134.7798	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05483	134.375	'KNOBHILL - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05483	134.3624	'KNOBHILL (KNOBHIL4) 138/69/13.2KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0777	134.1878	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0777	134.1635	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0631	133.7292	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0631	133.7292	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06206	132.8401	'EL RENO - ROMAN NOSE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06438	132.5648	'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	132.423	'GEN514805 1-SOONER UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05429	131.8532	'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05429	131.641	'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	131.211	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06194	131.1774	'ALVA - KNOBHILL 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06124	131.0432	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06124	131.0432	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06009	130.969	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	130.5972	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05276	130.5962	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'

11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	130.3843	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	130.2381	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06708	130.0862	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06431	130.0048	'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06431	129.994	'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	129.8332	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	129.7743	'GEN514806 1-SOONER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	129.4565	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06227	128.9941	'DEWEY - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05085	128.9765	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05085	128.9765	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.8444	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.827	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05445	128.7145	'WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0604	128.581	'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06227	128.4119	'ROMAN NOSE - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05122	128.4103	'EL RENO - ROMAN NOSE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.2798	'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	128.2714	'GEN514805 1-SOONER UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06216	128.2381	'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.1447	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.1219	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.0901	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06042	128.0361	'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06083	128.0065	'ALVA - CHEROKEE SW 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05249	127.986	'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.8449	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06084	127.7891	'HAZELTON JCT - WAKITA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0621	127.7294	'ELK CITY - RHWIND4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06125	127.724	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.6743	'GEN512689 1-GRDA1 GSU1 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06197	127.6736	'ALINE - ALVA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.6086	'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5903	'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5805	'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5581	'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.532	'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5254	'GEN509394 1-FLINT CREEK'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06197	127.5226	'ALINE - CLEO 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.517	'GEN511839 1-NORTHEASTERN STATION #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06056	127.4683	'LAWTON EASTSIDE - SUNNYSIDE 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.4182	'GEN511840 1-NORTHEASTERN STATION #3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06009	127.3774	'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.3683	'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2754	'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2691	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2419	'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2168	'GEN300006 1-NEW MADRID UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2163	'GEN300007 1-NEW MADRID UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06197	127.1418	'CLEO - CLEO CORNER 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06218	127.1247	'DOVER SW - HENESSEY 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	127.0683	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05201	126.746	'ALVA - KNOBHILL 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05002	126.7249	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04994	126.5714	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04994	126.5714	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	126.4414	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	126.211	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	126.0577	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	125.6597	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	125.5876	'GEN514806 1-SOONER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05829	125.5778	'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05829	125.5663	'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'

11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05524	125.5222	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	125.2669	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	124.6938	'BASE CASE'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	124.647	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	124.6279	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05122	124.5879	'DEWEY - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0449	124.4402	'WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	124.0712	'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05122	124.0073	'ROMAN NOSE - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.9359	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.9126	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04695	123.8894	'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05151	123.8863	'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.8598	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04966	123.6582	'ALVA - CHEROKEE SW 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.6276	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.4347	'GEN512689 1-GRDA1 GSU1 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04947	123.4128	'HAZELTON JCT - WAKITA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3824	'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3709	'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04454	123.3689	'ELK CITY - RHWIND4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3588	'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04695	123.3515	'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3355	'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3081	'GEN509394 1-FLINT CREEK'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3027	'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.2916	'GEN511839 1-NORTHEASTERN STATION #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0502	123.2314	'ALINE - ALVA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.1931	'GEN511840 1-NORTHEASTERN STATION #3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04861	123.1553	'LAWTON EASTSIDE - SUNNYSIDE 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05002	123.1367	'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.1348	'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04932	123.1112	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0502	123.0807	'ALINE - CLEO 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.0765	'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.041	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.0063	'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.9771	'GEN300006 1-NEW MADRID UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.9766	'GEN300007 1-NEW MADRID UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.8728	'GEN336801 1-BAXTER WILSON UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.8651	'GEN511841 1-NORTHEASTERN STATION #4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06084	122.0201	'CLEO JCT - RINGWOOD 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06084	122.011	'CLEO CORNER - CLEO JCT 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.9619	'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.8329	'GEN560223 1-G07-62-3 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.8155	'GEN560224 1-G07-62-4 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.7525	'GEN560221 1-G07-62-1 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.7525	'GEN560222 1-G07-62-2 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.7306	'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05986	121.705	'OGE3TERM4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.5073	'GEN523971 1-HARRINGTON GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.4984	'GEN523973 1-HARRINGTON GEN #3 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.4979	'GEN523972 1-HARRINGTON GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.461	'GEN520922 1-SLEEPING 138.00'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	120.9282	'GEN515790 1-FPLWND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	120.3913	'BASE CASE'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	120.289	'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.8665	'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.778	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.4943	'GEN520997 1-MORLND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.1722	'GEN520998 1-MORLND3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.6772	'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04947	117.6719	'CLEO CORNER - CLEO JCT 69KV CKT 1'

11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04947	117.6549 'CLEO JCT - RINGWOOD 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.5641 'GEN560223 1-G07-62-3 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.5467 'GEN560224 1-G07-62-4 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.4827 'GEN560221 1-G07-62-1 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.4827 'GEN560222 1-G07-62-2 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.4636 'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04907	117.4368 'OGE3TERM4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.2223 'GEN523971 1-HARRINGTON GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.2134 'GEN523973 1-HARRINGTON GEN #3 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.2129 'GEN523972 1-HARRINGTON GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.1758 'GEN520922 1-SLEEPING 138.00'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0534	117.0056 'IMO TAP - SOUTH 4TH ST 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.9999 'GEN520997 1-MORLND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	116.9949 'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.7888 'GEN520998 1-MORLND3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.6398 'GEN515790 1-FPLWND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.0081 'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	115.6185 'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	115.5069 'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04389	113.1328 'IMO TAP - SOUTH 4TH ST 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	112.7228 'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	109.1294 'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	104.8755 'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03359	105.6631 'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03359	105.1072 'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03223	102.789 'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03223	102.2343 'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.19715	107.3007 'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.17127	105.447 'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.15423	102.1777 'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.15064	100.8484 'DBL-MEDLO-WI'
11G	G10_045	'TO->FROM'	'CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.0825	105.5157 'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.09618	113.9222 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.0965	109.6676 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.05557	103.4434 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.05575	101.1715 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_045	'FROM->TO'	'CUDAHY - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.0825	107.3818 'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11WP	G10_045	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.03601	110.8045 'DBL-MEDLO-WI'
11WP	G10_045	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.03628	103.9628 'DBL-MEDLO-WI'
11G	G10_045	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.03176	112.337 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.03204	104.3944 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'GREENSBURG - SUN CITY 115KV CKT 1'	120.7	129.5	0.03176	104.7827 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'HAYS PLANT - SOUTH HAYS 115KV CKT 1'	80	88	0.07786	158.1485 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045	'FROM->TO'	'HAYS PLANT - VINE STREET 115KV CKT 1'	80	88	0.07786	140.7211 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045	'TO->FROM'	'KNOLL - N HAYS3 115.00 115KV CKT 1'	83	99	0.07786	113.6082 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045	'TO->FROM'	'MEDICINE LODGE - SUN CITY 115KV CKT 1'	120.7	129.5	0.03176	101.9355 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.08983	106.5911 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.0902	103.5049 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.10494	103.0916 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'TO->FROM'	'N HAYS3 115.00 - VINE STREET 115KV CKT 1'	83	99	0.07786	119.2459 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045		NCONV	0	0	0.12863	9999 'DBL-COM-MEDL'
11G	G10_045		NCONV	0	0	0.31474	9999 'DBL-COM-MEDL'
11G	G10_045		NCONV	0	0	0.31587	9999 'DBL-COM-MEDL'
11G	G10_045		NCONV	0	0	0.19206	9999 'DBL-MEDLO-WI'
11G	G10_045		NCONV	0	0	0.19269	9999 'DBL-MEDLO-WI'
11G	G10_045	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.09197	100.955 'DBL-MEDLO-WI'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05364	111.0232 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.07995	110.8506 'DBL-COM-MEDL'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.08047	109.9435 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05382	108.8703 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05549	107.568 'DBL-MEDLO-WI'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.08075	106.4645 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05373	106.1522 'AXTELL - POSTROCK7 345.00 345KV CKT 1'

11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.08081	102.0405 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04786	100.7322 'CIRCLE - MULLERGREN 230KV CKT 1'
16SP	G10_047	'FROM->TO'	'G10-47T 115.00 - HARBINE 115KV CKT 1'	99	99	0.42487	111.9806 'BEATRICE POWER STATION - SHELDON 115KV CKT 1'
11SP	G10_047	'FROM->TO'	'G10-47T 115.00 - HARBINE 115KV CKT 1'	99	99	0.42082	102.3099 'BEATRICE POWER STATION - SHELDON 115KV CKT 1'
11G	G10_048	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.10221	109.6676 'DBL-SPRVL-CO'
11G	G10_048	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.09211	101.1715 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_048	'FROM->TO'	'GREENLEAF - KNOB HILL 115KV CKT 1'	92	92	0.05649	115.5782 'ELMCREK6 230.00 - NWMANHT6 230.00 230KV CKT 1'
11G	G10_048	'FROM->TO'	'GREENLEAF - KNOB HILL 115KV CKT 1'	92	92	0.05652	114.6742 'ELMCREK6 230.00 - NWMANHT6 230.00 230KV CKT 1'
11G	G10_048	'FROM->TO'	'GREENLEAF - KNOB HILL 115KV CKT 1'	92	92	0.033	113.8876 'ELMCREK6 230.00 - NWMANHT6 230.00 230KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12139	111.565 'DBL-COM-MEDL'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12145	110.8506 'DBL-COM-MEDL'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12275	108.8703 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10248	108.1505 'DBL-MEDLO-WI'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10254	107.568 'DBL-MEDLO-WI'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12259	106.7622 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12225	106.4645 'DBL-SPRVL-CO'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12266	106.1522 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12225	102.6686 'DBL-SPRVL-CO'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12232	102.0405 'DBL-SPRVL-CO'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.03745	101.7188 'DBL-COM-MEDL'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10941	100 'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.06861	112.9732 'DBL-SPRVL-CO'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.06888	109.6676 'DBL-SPRVL-CO'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.0613	103.0301 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.06147	101.1715 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.04894	195.1345 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03563	152.3146 'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03563	152.3146 'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03569	150.1403 'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03569	150.1403 'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05047	148.4198 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05074	142.0614 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05094	136.9546 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	133.9711 'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03298	133.3375 'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03192	132.9654 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	132.3411 'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03304	131.4202 'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03197	130.86 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	129.6205 'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03202	129.0113 'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03538	128.8363 'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03313	128.6997 'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	127.9988 'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03229	127.4501 'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03208	127.065 'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03544	126.9489 'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.04	126.8801 'DBL-WOOD-MED'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03319	126.7951 'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03215	126.6117 'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03229	126.2982 'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03342	126.1266 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03229	125.8494 'SPP-WERE-32'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05132	125.842 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03234	125.8134 'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0324	125.614 'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	125.6079 'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05134	125.5791 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	125.3051 'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05134	125.2305 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03212	125.1156 'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0322	124.8915 'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03234	124.6521 'HOOVER NORTH - LAKERIDGE 138KV CKT 1'

11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	124.6321	'SPP-WERE-30'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	124.62	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.04007	124.5167	'DBL-WOOD-MED'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	124.4033	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03327	124.3663	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0325	124.2852	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	124.2804	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03221	124.2247	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	124.2127	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03234	124.2038	'SPP-WERE-32'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03347	124.202	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	124.0939	'SPP-WERE-28'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	123.9597	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.909	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03245	123.7681	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	123.6623	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0322	123.4729	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03217	123.4212	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.4093	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.3619	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.2602	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.2059	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.1227	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06837	123.0428	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	122.9889	'SPP-WERE-30'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.9753	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.9408	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.8868	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.8073	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.805	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	122.7533	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06837	122.733	'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03076	122.7231	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.6127	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03333	122.5858	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03187	122.5675	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.5634	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.5229	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.5204	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03227	122.4747	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03227	122.4712	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	122.4435	'SPP-WERE-28'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.3797	'GEN509394 1-FLINT CREEK'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.3724	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03256	122.3722	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.328	'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.2649	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.7429	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.7074	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03226	121.6528	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.5866	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.5491	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.5274	'GEN338146 1-INDEPENDENCE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.4631	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.284	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.2512	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.2166	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.1385	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03082	120.9993	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06843	120.9961	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.8638	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.8551	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03232	120.8394	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'

11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03192	120.8253 'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.7141 'GEN509394 1-FLINT CREEK'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.7042 'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06843	120.6836 'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.6584 'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.6334 'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.6117 'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.5978 'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05155	120.099 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	118.9736 'BASE CASE'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	117.2947 'BASE CASE'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.8363 'GEN560356 1-G10-53 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03127	115.8046 'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.6573 'GEN560522 1-G05-12 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475 'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475 'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475 'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475 'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03128	115.4208 'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03829	115.4201 'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.0807 'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	114.9929 'GEN560279 1-G08-18 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	114.9771 'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	114.6548 'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03132	114.1833 'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	114.1785 'GEN560356 1-G10-53 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	114.0063 'GEN560522 1-G05-12 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03833	113.8541 'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921 'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921 'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921 'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921 'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03133	113.7895 'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.4766 'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.3775 'GEN560279 1-G08-18 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.341 'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.3014 'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03152	113.1245 'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03694	113.0351 'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03694	113.0351 'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03154	112.6964 'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03176	112.0583 'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03176	112.0583 'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03157	111.4212 'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03159	111.0482 'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03181	110.4958 'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03181	110.4958 'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03382	106.9884 'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	106.7168 'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	105.0582 'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03308	102.9967 'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11WP	G10_049	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.05813	107.764 'DBL-MEDLO-WI'
11WP	G10_049	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.05827	103.9628 'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04894	240.1462 'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03563	190.8151 'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03563	190.8151 'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03569	188.2495 'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03569	188.2495 'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05047	185.9568 'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05074	178.5565 'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05094	172.6586 'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	169.6643 'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03298	168.9046 'NORTHWEST - TATONGA7 345.00 345KV CKT 1'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03192	168.6155	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	167.7673	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03304	166.6796	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03197	166.1695	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	164.6132	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03202	163.9746	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03538	163.6591	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03313	163.5458	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	162.7257	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03229	162.0721	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03208	161.7093	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04	161.6368	'DBL-WOOD-MED'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03544	161.466	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03319	161.3321	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03215	161.1151	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03229	160.7455	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03342	160.618	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03229	160.2278	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	160.1681	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0324	159.9925	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	159.9492	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05132	159.7567	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	159.6454	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05134	159.4484	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03212	159.3932	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0322	159.119	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05134	159.0478	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04007	158.895	'DBL-WOOD-MED'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.8527	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	158.8313	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	158.8224	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	158.5634	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	158.5632	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0325	158.4786	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.4527	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03221	158.409	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.3814	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03347	158.3797	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	158.3141	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	158.2012	'SPP-WERE-28'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	158.0336	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.0296	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03245	157.8507	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	157.7385	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0322	157.5348	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.4476	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03217	157.4247	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.3967	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.2764	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.2145	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.1206	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06837	157.0206	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.9436	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	156.9114	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.909	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.8484	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.7543	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.7481	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03076	156.6743	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06837	156.664	'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	156.6449	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.517	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03333	156.4982	'CIRCLE - MULLERGREN 230KV CKT 1'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03187	156.4739	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.4671	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.4249	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.4191	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03227	156.3779	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03227	156.3754	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	156.2825	'SPP-WERE-28'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.2587	'GEN509394 1-FLINT CREEK'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03256	156.2578	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.2449	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.1971	'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.16	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.1351	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.1271	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.1212	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.5138	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.4762	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03226	155.4223	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.3333	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.2914	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.2666	'GEN338146 1-INDEPENDENCE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.194	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.9858	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.9477	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.909	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.8139	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03082	154.6729	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06843	154.6431	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.499	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.4863	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03232	154.482	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03192	154.4519	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.3253	'GEN509394 1-FLINT CREEK'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.3087	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06843	154.2824	'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.2592	'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.2329	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.2077	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.1905	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	152.3184	'BASE CASE'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05155	152.2629	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	150.3694	'BASE CASE'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03127	148.6633	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.4669	'GEN560522 1-G05-12 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03128	148.2221	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03829	148.2149	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.8278	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.7084	'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.7015	'GEN560279 1-G08-18 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.309	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03132	146.7802	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.5487	'GEN560522 1-G05-12 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03833	146.398	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03133	146.3223	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.9651	'GEN525561 1-TOLK GEN #1 24 KV'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.8089 'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.7803 'GEN560279 1-G08-18 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.6938 'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03152	145.5717 'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03694	145.3287 'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03694	145.3287 'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03154	145.0786 'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03176	144.4325 'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03176	144.4325 'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03157	143.5914 'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03159	143.1635 'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03181	142.61 'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03181	142.61 'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03382	138.462 'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	138.2522 'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	136.3238 'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	133.8188 'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	128.7706 'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.20332	127.9427 'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05753	126.1579 'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03338	126.0141 'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03338	124.5964 'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03338	124.0424 'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	123.822 'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	123.5323 'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0332	123.3683 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.20345	123.3574 'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03661	123.2158 'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	123.1337 'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03349	122.9435 'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	122.7096 'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	122.7036 'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03323	122.4723 'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	122.3581 'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03329	122.2568 'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	122.187 'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	122.0033 'SPP-WERE-28'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	121.8254 'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	121.1318 'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03325	120.9086 'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.8974 'GEN338143 1-INDEPENDENCE UNIT #1'
16WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0525	120.8845 'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.8402 'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.8325 'GEN542955 1-LACYGNE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.6637 'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.602 'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03294	120.2844 'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03459	119.9502 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.765 'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.7599 'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.6222 'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.5048 'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.4773 'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.405 'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.2225 'GEN532651 1-JEFFREY ENERGY CENTER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.1987 'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.1053 'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.9282 'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.9024 'GEN532653 1-JEFFREY ENERGY CENTER UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.8925 'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03278	118.8439 'EL PASO - ROSE HILL 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03336	118.8434 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03442	118.8356 'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.8085	'GEN336831 1-BAXTER WILSON SES'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.7452	'GEN300007 1-NEW MADRID UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.7428	'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.7352	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.735	'GEN300006 1-NEW MADRID UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.6901	'GEN509394 1-FLINT CREEK'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03296	118.6558	'ROSE HILL - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03774	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03774	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
16WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05262	117.1379	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	115.3995	'BASE CASE'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	114.5601	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03789	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03789	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0344	112.1864	'GRAY CO 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	112.1417	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	111.8914	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03795	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03795	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	111.8275	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03236	111.6796	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	111.3285	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	110.749	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	109.923	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	109.4146	'GEN539630 1-FLATRDG1 34.500'
11SP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05409	108.6504	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03472	108.4701	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03262	108.0557	'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0307	107.6223	'DBL-COM-MEDL'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03264	107.5586	'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	107.0796	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	107.0661	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	106.9449	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11SP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05427	106.5919	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03562	105.568	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03562	105.568	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03396	105.5467	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	105.5256	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03397	105.517	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05813	105.4976	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03398	105.1749	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	105.0272	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	104.6445	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	104.3443	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03819	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03819	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03818	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03818	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03406	104.1641	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03403	104.0476	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0382	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0382	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	103.9721	'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03407	103.9563	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03488	103.9491	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03488	103.9436	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03487	103.5767	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	103.5248	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	103.4935	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	103.1419	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03342	103.1216	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	102.9126	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	102.7578	'SPP-WERE-28'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	102.5676 'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03406	102.4511 'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03388	102.3772 'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03407	102.2243 'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03408	102.1341 'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03381	102.0699 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03406	101.9228 'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.8173 'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	101.7703 'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03407	101.7182 'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	101.6431 'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.6185 'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.6062 'GEN542955 1-LACYGNE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.5737 'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	101.545 'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03829	101.5285 'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03829	101.5285 'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.4872 'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03725	101.4257 'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.276 'GEN337652 1-WHITE BLUFF UNIT #1'
11WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05827	101.2482 'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	101.222 'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	101.188 'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	101.0478 'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	101.0336 'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03414	100.975 'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03415	100.8565 'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.7649 'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	100.7409 'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.7157 'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	100.6922 'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.6505 'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.5882 'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.5227 'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.4988 'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.4708 'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03342	100.4628 'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03417	100.4001 'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.3339 'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.2121 'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	100.1851 'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.1731 'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.1666 'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	100.111 'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.0786 'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0673 'GEN532651 1-JEFFREY ENERGY CENTER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0659 'GEN532653 1-JEFFREY ENERGY CENTER UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0548 'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0515 'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HUNTSVILLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'	83	92	0.05166	112.2013 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'HUNTSVILLE - ST_JOHN 115KV CKT 1'	80	88	0.05166	120.7984 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'HUNTSVILLE - ST_JOHN 115KV CKT 1'	80	88	0.21636	100.4407 'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.03866	104.652 'RENO COUNTY - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.03866	104.6442 'RENO COUNTY - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.04116	106.2962 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049		NCONV	0	0	0.04113	9999 'DBL-COM-MEDL'
11G	G10_049		NCONV	0	0	0.04192	9999 'DBL-COM-MEDL'
11G	G10_049		NCONV	0	0	0.12812	9999 'DBL-MEDLO-WI'
11G	G10_049		NCONV	0	0	0.12861	9999 'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.05949	100.955 'DBL-MEDLO-WI'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	121.9435 'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	121.9364 'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	118.2634 'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'

16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	118.222	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	116.087	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	115.9963	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	115.804	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	115.677	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	112.5964	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	112.4055	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	112.3256	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	112.2074	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	108.6325	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	108.5704	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	105.3102	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	105.2489	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05166	162.6856	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04718	138.684	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21654	138.2874	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21666	133.5296	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04985	121.2907	'DBL-SPRVL-CO'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21137	120.8539	'DBL-SPRVL-CO'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05083	118.0124	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05083	118.0124	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21088	117.3673	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21088	117.3673	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21026	116.6745	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05025	116.2382	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04833	116.0982	'CIRCLE (CIRCLE1X) 230/115/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20922	115.7697	'CIRCLE (CIRCLE1X) 230/115/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05046	115.6847	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2115	115.389	'DBL-SPRVL-CO'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.27897	115.0117	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.07009	114.9623	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05046	114.8359	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21088	114.756	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21089	113.86	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05045	113.8337	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05025	113.585	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21126	113.4263	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05042	113.4204	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05042	113.4204	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21099	113.0135	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21099	113.0135	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04104	112.9359	'CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20999	112.7954	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20999	112.7954	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21037	112.5429	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21037	112.374	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.1718	112.1639	'CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05056	111.9334	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20933	111.4661	'CIRCLE (CIRCLE1X) 230/115/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20981	111.2745	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05056	110.7076	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05059	110.1177	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21099	110.0602	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20981	110.0035	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05058	109.7005	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.06846	109.6386	'SPP-MKEC-02'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21007	109.5053	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05079	109.4302	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.27912	109.3361	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05074	109.2629	'SPP-MKEC-08'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21101	109.16	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21019	109.0525	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21228	109.0414	'SPP-MKEC-02'

11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21137	109.0147	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.17189	108.7084	'CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21049	108.6701	'SPP-MKEC-08'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20993	108.4469	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2101	108.4392	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2101	108.4392	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21048	108.2293	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20992	107.1656	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20992	105.9685	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21018	105.2982	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21239	104.87	'SPP-MKEC-02'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05056	104.7391	'BASE CASE'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2103	104.7117	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2106	104.5196	'SPP-MKEC-08'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21004	104.3007	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20981	104.1532	'BASE CASE'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21575	100.6782	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05058	100.5835	'HOYT - JEFFERY ENERGY CENTER 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05695	100.4541	'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05059	100.3418	'WRTOD400'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.23201	100.0667	'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20992	100.0518	'BASE CASE'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20943	100	'HOYT - JEFFERY ENERGY CENTER 345KV CKT 1'
11G	G10_052		NCONV	0	0	0.22362	9999	'DBL-COM-MEDL'
11G	G10_052		NCONV	0	0	0.22482	9999	'DBL-COM-MEDL'
11G	G10_052		NCONV	0	0	0.16346	9999	'DBL-MEDLO-WI'
11G	G10_052		NCONV	0	0	0.16422	9999	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.03717	109.3657	'SPP-SUNC-14'
11G	G10_053	'TO->FROM'	'CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.07575	105.504	'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11G	G10_053	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.04481	103.4132	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_053	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.04498	101.1715	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_053	'FROM->TO'	'CLEARWATER - GILL ENERGY CENTER WEST 138KV CKT 1'	234	234	0.03162	111.7334	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03162	249.5631	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05458	195.1345	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05611	148.4198	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05638	142.0614	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05658	136.9546	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05697	125.842	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05698	125.5791	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05698	125.2305	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05719	120.099	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03379	103.5446	'DBL-SPRVL-CO'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03384	102.2108	'DBL-SPRVL-CO'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03137	101.5044	'DBL-SPRVL-CO'
11G	G10_053	'FROM->TO'	'CUDAHY - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.03717	111.2213	'SPP-SUNC-14'
11G	G10_053	'FROM->TO'	'CUDAHY - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.07575	107.3707	'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11WP	G10_053	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.04903	112.9362	'DBL-MEDLO-WI'
11WP	G10_053	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.04938	103.9628	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03162	303.2539	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05458	240.1462	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05611	185.9568	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05638	178.5565	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05658	172.6586	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05697	159.7567	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05698	159.4484	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05698	159.0478	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05719	152.2629	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03379	134.406	'DBL-SPRVL-CO'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	132.8082	'DBL-SPRVL-CO'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03137	131.9869	'DBL-SPRVL-CO'
16WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05788	128.7006	'DBL-MEDLO-WI'
11SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05966	120.433	'DBL-MEDLO-WI'
16WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03162	120.0234	'DBL-MEDLO-WI'

11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03023	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03023	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
16WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05826	117.1379	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03037	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03037	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03044	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03044	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03027	111.6206	'DBL-MEDLO-WI'
11WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04903	111.198	'DBL-MEDLO-WI'
11SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05997	108.6504	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03068	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03068	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03067	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03067	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03069	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03069	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
16SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05999	103.5727	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03078	101.5285	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03078	101.5285	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04938	101.2482	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'HAYS PLANT - SOUTH HAYS 115KV CKT 1'	80	88	0.07909	158.1831	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053	'FROM->TO'	'HAYS PLANT - VINE STREET 115KV CKT 1'	80	88	0.07909	140.7514	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053	'TO->FROM'	'KNOLL - N HAYS3 115.00 115KV CKT 1'	83	99	0.07909	113.6277	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.09392	106.7474	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.09431	103.5049	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.10905	103.2241	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'TO->FROM'	'N HAYS3 115.00 - VINE STREET 115KV CKT 1'	83	99	0.07909	119.2701	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053		NCONV	0	0	0.32907	9999	'DBL-COM-MEDL'
11G	G10_053		NCONV	0	0	0.5149	9999	'DBL-COM-MEDL'
11G	G10_053		NCONV	0	0	0.51631	9999	'DBL-COM-MEDL'
11G	G10_053		NCONV	0	0	0.277	9999	'DBL-MEDLO-WI'
11G	G10_053		NCONV	0	0	0.27776	9999	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.10757	100.955	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04838	111.0766	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.09684	110.8506	'DBL-COM-MEDL'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04856	108.8703	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05504	107.568	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04847	106.1522	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.03862	100.7152	'CIRCLE - MULLERGREN 230KV CKT 1'

SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEA	RATEB	TDF	TC%LOADING	CONTNAME
11WP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.99822	120.2502	'BASE CASE'
16WP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.99837	119.7376	'BASE CASE'
11SP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.9987	119.6877	'BASE CASE'
11G	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.99838	119.4048	'BASE CASE'
16SP	ASGI_2010_020	'FROM->TO'	'ASGI-10-20T 69.000 - LEA COUNTY REC-TATUM 69KV CKT 1'	41	54	0.9988	119.1113	'BASE CASE'
11WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-LOVINGTON INTERCHANGE - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99822	104.0828	'LEA COUNTY REC-DENTON SUB - LEA COUNTY REC-REED 69KV CKT 1'
16WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-LOVINGTON INTERCHANGE - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99837	101.5545	'LEA COUNTY REC-DENTON SUB - LEA COUNTY REC-REED 69KV CKT 1'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-LOVINGTON INTERCHANGE - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99838	100.8607	'LEA COUNTY REC-DENTON SUB - LEA COUNTY REC-REED 69KV CKT 1'
11WP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99822	133.4746	'BASE CASE'
16WP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99837	130.1776	'BASE CASE'
11G	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.99838	129.1375	'BASE CASE'
11SP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.9987	125.231	'BASE CASE'
16SP	ASGI_2010_020	'FROM->TO'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-REED 69KV CKT 1'	32	41	0.9988	120.7298	'BASE CASE'
11WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99822	137.9856	'BASE CASE'
16WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99837	135.1622	'BASE CASE'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99838	134.2779	'BASE CASE'
11SP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.9987	132.0712	'BASE CASE'
16SP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.9988	128.2765	'BASE CASE'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99871	104.0524	'BASE CASE'
11WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99822	103.4391	'LEA COUNTY REC-LOVINGTON INTERCHANGE 115/69KV TRANSFORMER CKT 1'
11G	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99838	100.7362	'LEA COUNTY REC-LOVINGTON INTERCHANGE 115/69KV TRANSFORMER CKT 1'
16WP	ASGI_2010_020	'TO->FROM'	'LEA COUNTY REC-MCDONALD - LEA COUNTY REC-TATUM 69KV CKT 1'	32	41	0.99837	100.7292	'LEA COUNTY REC-LOVINGTON INTERCHANGE 115/69KV TRANSFORMER CKT 1'
11G	G10_001		NCONV	0	0	0.12329	9999	'DBL-MEDLO-WI'
11G	G10_001		NCONV	0	0	0.13957	9999	'DBL-MEDLO-WI'
11G	G10_001		NCONV	0	0	0.05009	9999	'SPP-SWPS-03'
11G	G10_001		NCONV	956	1052	0.17225	71.56281	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27481	110	'STATELINE INTERCHANGE - SWEETWT6 230.00 230KV CKT &1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27493	107.1	'STATELINE INTERCHANGE - SWEETWT6 230.00 230KV CKT &1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26691	105.1162	'CLINTON AIR FORCE BASE TAP - ELK CITY 138KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.20496	105.1108	'GEN560655 1-G07-32 12.000'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27481	104.0895	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26691	104.0376	'CLINTON AIR FORCE BASE TAP - HOBART JUNCTION 138KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27493	103.651	'SPP-SWPS-03'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.20508	102.2033	'GEN560655 1-G07-32 12.000'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26707	101.373	'CLINTON AIR FORCE BASE TAP - ELK CITY 138KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27493	101.2306	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.27505	100.7963	'SPP-SWPS-03'
11G	G10_012	'TO->FROM'	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'	143	143	0.26707	100.2986	'CLINTON AIR FORCE BASE TAP - HOBART JUNCTION 138KV CKT 1'
11G	G10_027		NCONV	0	0	0.51231	9999	'DBL-COM-MEDL'
11G	G10_027		NCONV	0	0	0.51631	9999	'DBL-COM-MEDL'
11G	G10_027		NCONV	0	0	0.27546	9999	'DBL-MEDLO-WI'
11G	G10_027		NCONV	0	0	0.27776	9999	'DBL-MEDLO-WI'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49584	107.8903	'BROKEN BOW - CROOKED CREEK 115KV CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49584	107.6198	'CROOKED CREEK 230/115KV TRANSFORMER CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49609	101.7759	'BROKEN BOW - CROOKED CREEK 115KV CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.49609	101.5122	'CROOKED CREEK 230/115KV TRANSFORMER CKT 1'
11G	G10_038	'FROM->TO'	'BROKEN BOW - LOUP CITY 115KV CKT 1'	120	120	0.31038	100.4083	'GRAND ISLAND - SWEETWATER 345KV CKT 1'
16SP	G10_040	'FROM->TO'	'NORTHWEST (NORTWST2) 345/138/13.8KV TRANSFORMER CKT 1'	493	493	0.05858	107.6339	'NORTHWEST (NORTWST3) 345/138/13.8KV TRANSFORMER CKT 1'
16SP	G10_040	'FROM->TO'	'NORTHWEST (NORTWST2) 345/138/13.8KV TRANSFORMER CKT 1'	493	493	0.05858	104.7235	'NORTHWEST (NORTWST3) 345/138/13.8KV TRANSFORMER CKT 1'
11SP	G10_040	'FROM->TO'	'NORTHWEST (NORTWST2) 345/138/13.8KV TRANSFORMER CKT 1'	493	493	0.05836	100.9753	'NORTHWEST (NORTWST3) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.03874	102.4843	'S1263T1 AUTO'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.46428	102.4781	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.04885	102.3873	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.50613	102.1641	'S1263T1 AUTO'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.03875	102.0805	'S1263T1 AUTO'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.04887	101.3714	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.46428	100.2461	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.04885	100.1586	'SUB 1263 BROCK (S1263 T1) 161/69/13.8KV TRANSFORMER CKT 1'
11G	G10_041	'FROM->TO'	'HUMBOLDT (S975 T4) 161/69/13.8KV TRANSFORMER CKT 1'	67.2	67.2	0.03874	100	'S1263T1 AUTO'
11G	G10_043	'TO->FROM'	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'	171	185	0.06587	105.6436	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'	171	185	0.07117	103.8949	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'	171	185	0.05524	102.5063	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'

11G	G10_043	'FROM->TO'	'CLEO CORNER - MEN TAP 138KV CKT 1'	191	191	0.0744	104.1285	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'FROM->TO'	'CLEO CORNER - MEN TAP 138KV CKT 1'	191	191	0.08054	102.4451	'DBL-WOOD-MED'
11G	G10_043	'FROM->TO'	'CLEO CORNER - MEN TAP 138KV CKT 1'	191	191	0.05983	100.6752	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.05893	119.9451	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.04692	116.3066	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.06322	115.5707	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.04643	111.1323	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.05738	110.738	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.04365	106.7469	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.05987	102.2461	'OKEENE - WATONGA SW 69KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.06155	101.9606	'CLEO CORNER - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.06155	101.8045	'IMO TAP - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.08415	101.4678	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'DOVER SW - OKEENE 138KV CKT 1'	137	143	0.08415	101.4458	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04482	138.7005	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0465	137.2657	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04713	130.1745	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04445	128.1641	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04171	126.253	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04183	124.6062	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	121.824	'BASE CASE'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04033	120.9353	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	120.5311	'BASE CASE'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04409	119.854	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03964	117.6629	'TALOGA (TALOGA) 138/69/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05621	117.6349	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05621	117.6198	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03813	117.5386	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	117.4623	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04058	117.3784	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04058	117.3784	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	117.1123	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	116.777	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04623	116.7059	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	116.5147	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04213	116.4446	'TALOGA (TALOGA) 138/69/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04114	116.4126	'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04051	116.3982	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04142	116.3782	'CLEO CORNER - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04142	116.3326	'IMO TAP - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	116.3215	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04078	116.1479	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	116.0989	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04078	116.0733	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	115.9672	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04083	115.9436	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04083	115.9436	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03902	115.8265	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03902	115.8265	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.039	115.755	'CANTON - TALOGA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04124	115.7504	'WWRDEHV7 345.00 (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04123	115.7473	'WWRDEHV7 345.00 (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05372	115.7158	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.05372	115.7021	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.6342	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	115.6259	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.039	115.5265	'CANTON - OKEENE 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.4987	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04175	115.4787	'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04175	115.4769	'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.4699	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	115.3642	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04067	115.3364	'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'

11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0465	115.3214	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03847	115.3045	'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.2357	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.2199	'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.2182	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.1384	'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0418	115.0824	'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	115.0544	'GEN509416 1-TURK GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04205	115.0363	'CLEO CORNER - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04205	114.9905	'IMO TAP - MEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.9625	'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0385	114.9527	'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.9424	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04004	114.8896	'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04004	114.8766	'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.8454	'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.8359	'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04165	114.8332	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.8186	'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03905	114.8013	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.7857	'GEN515040 1-SEMINOLE 1G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04165	114.7584	'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.7329	'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.7223	'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03813	114.7198	'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.6639	'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.6341	'GEN509406 1-WELSH #3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.634	'GEN509404 1-WELSH #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.634	'GEN509405 1-WELSH #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.6043	'GEN520947 1-HUGO1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.5564	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04007	114.5421	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04007	114.5421	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04003	114.5119	'CANTON - TALOGA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	114.4975	'GEN334440 1-SABINE UNIT 4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.4746	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04184	114.4084	'WWRDEHV7 345.00 (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04184	114.4022	'WWRDEHV7 345.00 (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.3366	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.3101	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04003	114.2842	'CANTON - OKEENE 69KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04726	114.222	'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04726	114.221	'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04235	114.1141	'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0736	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0568	'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0558	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	114.0036	'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.9187	'GEN509416 1-TURK GENERATION'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03696	113.8385	'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.7944	'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.6906	'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.6813	'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.6636	'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04114	113.6367	'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04114	113.6234	'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0383	113.6125	'CLINTON JUNCTION - ELK CITY 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.579	'GEN515040 1-SEMINOLE 1G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04051	113.5772	'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.5618	'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.552	'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4926	'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03696	113.488	'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'

11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4876	'GEN509405 1-WELSH #2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4876	'GEN509406 1-WELSH #3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.4875	'GEN509404 1-WELSH #1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.3944	'GEN514806 1-SOONER UNIT 2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.3884	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	113.3238	'GEN334440 1-SABINE UNIT 4'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03766	111.0871	'OGE3TERM10'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03704	110.6753	'CIMARRON - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.6181	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03728	110.5878	'EL RENO - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.3111	'GEN520997 1-MORLND2'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.2831	'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	110.1703	'GEN520998 1-MORLND3'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04214	110.1114	'DEWEY - IODINE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0357	109.7578	'OGE3TERM10'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03995	109.5734	'CIMARRON - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	109.4344	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03691	109.3418	'EL RENO - JENSEN TAP 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	109.2554	'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04214	109.1911	'IODINE - WWRDEHV4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	109.1047	'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	108.8482	'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04126	108.601	'DEWEY - IODINE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	108.0699	'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.04126	107.6844	'IODINE - WWRDEHV4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	107.6804	'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03533	106.9978	'CIMARRON - EL RENO 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03841	105.9458	'CIMARRON - EL RENO 138KV CKT 1'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	105.8011	'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	104.6195	'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.03815	101.8727	'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'EL RENO - ROMAN NOSE 138KV CKT 1'	171	185	0.0395	100.7111	'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06587	160.7172	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.07117	158.1031	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05524	156.0278	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0553	152.1984	'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06476	151.7735	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05225	146.6365	'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.09628	140.9336	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.09628	140.9086	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0657	139.0508	'KNOBHILL - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0657	139.0378	'KNOBHILL (KNOBHIL4) 138/69/13.2KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06596	136.4874	'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06596	136.275	'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06179	134.7798	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05483	134.375	'KNOBHILL - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05483	134.3624	'KNOBHILL (KNOBHIL4) 138/69/13.2KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0777	134.1878	'MOORELAND 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0777	134.1635	'MOORELAND 345.00 (MRLNDAUTO) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0631	133.7292	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0631	133.7292	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06206	132.8401	'EL RENO - ROMAN NOSE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06438	132.5648	'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	132.423	'GEN514805 1-SOONER UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05429	131.8532	'CEDARDALE - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05429	131.641	'CEDARDALE - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	131.211	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06194	131.1774	'ALVA - KNOBHILL 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06124	131.0432	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06124	131.0432	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06009	130.969	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	130.5972	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05276	130.5962	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'

11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	130.3843	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	130.2381	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06708	130.0862	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06431	130.0048	'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06431	129.994	'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	129.8332	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	129.7743	'GEN514806 1-SOONER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	129.4565	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06227	128.9941	'DEWEY - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05085	128.9765	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05085	128.9765	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.8444	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.827	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05445	128.7145	'WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0604	128.581	'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06227	128.4119	'ROMAN NOSE - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05122	128.4103	'EL RENO - ROMAN NOSE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.2798	'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	128.2714	'GEN514805 1-SOONER UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06216	128.2381	'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.1447	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.1219	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	128.0901	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06042	128.0361	'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06083	128.0065	'ALVA - CHEROKEE SW 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05249	127.986	'DOVER SW - OKEENE 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.8449	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06084	127.7891	'HAZELTON JCT - WAKITA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0621	127.7294	'ELK CITY - RHWIND4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06125	127.724	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.6743	'GEN512689 1-GRDA1 GSU1 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06197	127.6736	'ALINE - ALVA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.6086	'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5903	'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5805	'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5581	'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.532	'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.5254	'GEN509394 1-FLINT CREEK'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06197	127.5226	'ALINE - CLEO 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.517	'GEN511839 1-NORTHEASTERN STATION #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06056	127.4683	'LAWTON EASTSIDE - SUNNYSIDE 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.4182	'GEN511840 1-NORTHEASTERN STATION #3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06009	127.3774	'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.3683	'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2754	'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2691	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2419	'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2168	'GEN300006 1-NEW MADRID UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	127.2163	'GEN300007 1-NEW MADRID UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06197	127.1418	'CLEO - CLEO CORNER 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06218	127.1247	'DOVER SW - HENESSEY 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	127.0683	'GEN336821 1-GRAND GULF UNIT'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05201	126.746	'ALVA - KNOBHILL 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05002	126.7249	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04994	126.5714	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04994	126.5714	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	126.4414	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	126.211	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	126.0577	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	125.6597	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	125.5876	'GEN514806 1-SOONER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05829	125.5778	'MOORELAND - NINMILE 4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05829	125.5663	'MOREWOOD SW - NINMILE 4 138.00 138KV CKT 1'

11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05524	125.5222 'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	125.2669 'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	124.6938 'BASE CASE'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	124.647 'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	124.6279 'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05122	124.5879 'DEWEY - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0449	124.4402 'WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	124.0712 'GEN337041 1-GERALD ANDRUS'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05122	124.0073 'ROMAN NOSE - SOUTHARD 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.9359 'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.9126 'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04695	123.8894 'CIMARRON - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05151	123.8863 'BORDER 7345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.8598 'GEN512688 2-GRDA1 GSU2 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04966	123.6582 'ALVA - CHEROKEE SW 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.6276 'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.4347 'GEN512689 1-GRDA1 GSU1 22'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04947	123.4128 'HAZELTON JCT - WAKITA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3824 'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3709 'GEN515225 1-MUSKOGEE 5G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04454	123.3689 'ELK CITY - RHWIND4 138.00 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3588 'GEN515226 1-MUSKOGEE 6G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04695	123.3515 'GRACMNT7 345.00 - MINCO 7 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3355 'GEN515223 1-MUSKOGEE 4G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3081 'GEN509394 1-FLINT CREEK'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.3027 'GEN336831 1-BAXTER WILSON SES'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.2916 'GEN511839 1-NORTHEASTERN STATION #2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0502	123.2314 'ALINE - ALVA 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.1931 'GEN511840 1-NORTHEASTERN STATION #3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04861	123.1553 'LAWTON EASTSIDE - SUNNYSIDE 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05002	123.1367 'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.1348 'GEN335206 1-NELSON UNIT 6'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04932	123.1112 'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0502	123.0807 'ALINE - CLEO 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.0765 'GEN509403 1-PIRKEY GENERATION'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.041 'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	123.0063 'GEN501812 1-RODEMACHER UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.9771 'GEN300006 1-NEW MADRID UNIT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.9766 'GEN300007 1-NEW MADRID UNIT 2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.8728 'GEN336801 1-BAXTER WILSON UNIT #1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	122.8651 'GEN511841 1-NORTHEASTERN STATION #4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06084	122.0201 'CLEO JCT - RINGWOOD 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06084	122.011 'CLEO CORNER - CLEO JCT 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.9619 'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.8329 'GEN560223 1-G07-62-3 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.8155 'GEN560224 1-G07-62-4 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.7525 'GEN560221 1-G07-62-1 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.7525 'GEN560222 1-G07-62-2 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.7306 'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.05986	121.705 'OGE3TERM4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.5073 'GEN523971 1-HARRINGTON GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.4984 'GEN523973 1-HARRINGTON GEN #3 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.4979 'GEN523972 1-HARRINGTON GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	121.461 'GEN520922 1-SLEEPING 138.00'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	120.9282 'GEN515790 1-FPLWND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	120.3913 'BASE CASE'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	120.289 'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.8665 'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.778 'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.4943 'GEN520997 1-MORLND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	119.1722 'GEN520998 1-MORLND3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.6772 'GEN515389 1-TLGAWND1 34.500'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04947	117.6719 'CLEO CORNER - CLEO JCT 69KV CKT 1'

11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04947	117.6549 'CLEO JCT - RINGWOOD 69KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.5641 'GEN560223 1-G07-62-3 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.5467 'GEN560224 1-G07-62-4 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.4827 'GEN560221 1-G07-62-1 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.4827 'GEN560222 1-G07-62-2 0.6900'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.4636 'GEN515393 1-OGEWND2G'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04907	117.4368 'OGE3TERM4'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.2223 'GEN523971 1-HARRINGTON GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.2134 'GEN523973 1-HARRINGTON GEN #3 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.2129 'GEN523972 1-HARRINGTON GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	117.1758 'GEN520922 1-SLEEPING 138.00'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0534	117.0056 'IMO TAP - SOUTH 4TH ST 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.9999 'GEN520997 1-MORLND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	116.9949 'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.7888 'GEN520998 1-MORLND3'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.6398 'GEN515790 1-FPLWND2'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	116.0081 'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	115.6185 'GEN560429 1-G08-29 0.6400'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	115.5069 'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.04389	113.1328 'IMO TAP - SOUTH 4TH ST 138KV CKT 1'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	112.7228 'GEN560180 1-G07-51 0.6000'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.06011	109.1294 'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'	124	124	0.0492	104.8755 'GEN560225 1-G10-43 18.000'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03359	105.6631 'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03359	105.1072 'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03223	102.789 'GLASS MOUNTAIN - MOORELAND 138KV CKT 1'
11G	G10_043	'TO->FROM'	'KNOBHILL - MOORELAND 138KV CKT 1'	96	96	0.03223	102.2343 'CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.19715	107.3007 'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.17127	105.447 'DBL-WOOD-MED'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.15423	102.1777 'DBL-MEDLO-WI'
11G	G10_043	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.15064	100.8484 'DBL-MEDLO-WI'
11G	G10_045	'TO->FROM'	'CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.0825	105.5157 'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.09618	113.9222 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.0965	109.6676 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.05557	103.4434 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_045	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.05575	101.1715 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_045	'FROM->TO'	'CUDAHY - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.0825	107.3818 'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11WP	G10_045	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.03601	110.8045 'DBL-MEDLO-WI'
11WP	G10_045	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.03628	103.9628 'DBL-MEDLO-WI'
11G	G10_045	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.03176	112.337 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.03204	104.3944 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'GREENSBURG - SUN CITY 115KV CKT 1'	120.7	129.5	0.03176	104.7827 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'HAYS PLANT - SOUTH HAYS 115KV CKT 1'	80	88	0.07786	158.1485 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045	'FROM->TO'	'HAYS PLANT - VINE STREET 115KV CKT 1'	80	88	0.07786	140.7211 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045	'TO->FROM'	'KNOLL - N HAYS3 115.00 115KV CKT 1'	83	99	0.07786	113.6082 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045	'TO->FROM'	'MEDICINE LODGE - SUN CITY 115KV CKT 1'	120.7	129.5	0.03176	101.9355 'DBL-SPRVL-CO'
11G	G10_045	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.08983	106.5911 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.0902	103.5049 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.10494	103.0916 'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'TO->FROM'	'N HAYS3 115.00 - VINE STREET 115KV CKT 1'	83	99	0.07786	119.2459 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_045		NCONV	0	0	0.12863	9999 'DBL-COM-MEDL'
11G	G10_045		NCONV	0	0	0.31474	9999 'DBL-COM-MEDL'
11G	G10_045		NCONV	0	0	0.31587	9999 'DBL-COM-MEDL'
11G	G10_045		NCONV	0	0	0.19206	9999 'DBL-MEDLO-WI'
11G	G10_045		NCONV	0	0	0.19269	9999 'DBL-MEDLO-WI'
11G	G10_045	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.09197	100.955 'DBL-MEDLO-WI'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05364	111.0232 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.07995	110.8506 'DBL-COM-MEDL'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.08047	109.9435 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05382	108.8703 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05549	107.568 'DBL-MEDLO-WI'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.08075	106.4645 'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05373	106.1522 'AXTELL - POSTROCK7 345.00 345KV CKT 1'

11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.08081	102.0405	'DBL-SPRVL-CO'
11G	G10_045	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04786	100.7322	'CIRCLE - MULLERGREN 230KV CKT 1'
16SP	G10_047	'FROM->TO'	'G10-47T 115.00 - HARBINE 115KV CKT 1'	99	99	0.42487	111.9806	'BEATRICE POWER STATION - SHELDON 115KV CKT 1'
11SP	G10_047	'FROM->TO'	'G10-47T 115.00 - HARBINE 115KV CKT 1'	99	99	0.42082	102.3099	'BEATRICE POWER STATION - SHELDON 115KV CKT 1'
11G	G10_048	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.10221	109.6676	'DBL-SPRVL-CO'
11G	G10_048	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.09211	101.1715	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_048	'FROM->TO'	'GREENLEAF - KNOB HILL 115KV CKT 1'	92	92	0.05649	115.5782	'ELMCREK6 230.00 - NWMANHT6 230.00 230KV CKT 1'
11G	G10_048	'FROM->TO'	'GREENLEAF - KNOB HILL 115KV CKT 1'	92	92	0.05652	114.6742	'ELMCREK6 230.00 - NWMANHT6 230.00 230KV CKT 1'
11G	G10_048	'FROM->TO'	'GREENLEAF - KNOB HILL 115KV CKT 1'	92	92	0.033	113.8876	'ELMCREK6 230.00 - NWMANHT6 230.00 230KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12139	111.565	'DBL-COM-MEDL'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12145	110.8506	'DBL-COM-MEDL'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12275	108.8703	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10248	108.1505	'DBL-MEDLO-WI'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10254	107.568	'DBL-MEDLO-WI'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12259	106.7622	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12225	106.4645	'DBL-SPRVL-CO'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12266	106.1522	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12225	102.6686	'DBL-SPRVL-CO'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.12232	102.0405	'DBL-SPRVL-CO'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.03745	101.7188	'DBL-COM-MEDL'
11G	G10_048	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10941	100	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.06861	112.9732	'DBL-SPRVL-CO'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.06888	109.6676	'DBL-SPRVL-CO'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.0613	103.0301	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.06147	101.1715	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.04894	195.1345	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03563	152.3146	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03563	152.3146	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03569	150.1403	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03569	150.1403	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05047	148.4198	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05074	142.0614	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05094	136.9546	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	133.9711	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03298	133.3375	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03192	132.9654	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	132.3411	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03304	131.4202	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03197	130.86	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	129.6205	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03202	129.0113	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03538	128.8363	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03313	128.6997	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	127.9988	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03229	127.4501	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03208	127.065	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03544	126.9489	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.04	126.8801	'DBL-WOOD-MED'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03319	126.7951	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03215	126.6117	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03229	126.2982	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03342	126.1266	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03229	125.8494	'SPP-WERE-32'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05132	125.842	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03234	125.8134	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0324	125.614	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	125.6079	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05134	125.5791	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	125.3051	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05134	125.2305	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03212	125.1156	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0322	124.8915	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03234	124.6521	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'

11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	124.6321	'SPP-WERE-30'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	124.62	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.04007	124.5167	'DBL-WOOD-MED'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	124.4033	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03327	124.3663	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0325	124.2852	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	124.2804	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03221	124.2247	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	124.2127	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03234	124.2038	'SPP-WERE-32'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03347	124.202	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03218	124.0939	'SPP-WERE-28'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	123.9597	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.909	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03245	123.7681	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	123.6623	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.0322	123.4729	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03217	123.4212	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.4093	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.3619	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.2602	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.2059	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	123.1227	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06837	123.0428	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	122.9889	'SPP-WERE-30'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.9753	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.9408	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.8868	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.8073	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.805	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	122.7533	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06837	122.733	'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03076	122.7231	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.6127	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03333	122.5858	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03187	122.5675	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.5634	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.5229	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.5204	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03227	122.4747	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03227	122.4712	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03224	122.4435	'SPP-WERE-28'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.3797	'GEN509394 1-FLINT CREEK'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.3724	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03256	122.3722	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	122.328	'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	122.2649	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.7429	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.7074	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03226	121.6528	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.5866	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.5491	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.5274	'GEN338146 1-INDEPENDENCE UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.4631	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.284	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.2512	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.2166	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	121.1385	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03082	120.9993	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06843	120.9961	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.8638	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.8551	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03232	120.8394	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'

11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03192	120.8253	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.7141	'GEN509394 1-FLINT CREEK'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.7042	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.06843	120.6836	'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.6584	'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.6334	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.6117	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	120.5978	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05155	120.099	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	118.9736	'BASE CASE'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	117.2947	'BASE CASE'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.8363	'GEN560356 1-G10-53 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03127	115.8046	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.6573	'GEN560522 1-G05-12 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475	'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475	'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475	'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.4475	'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03128	115.4208	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03829	115.4201	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	115.0807	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	114.9929	'GEN560279 1-G08-18 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	114.9771	'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	114.6548	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03132	114.1833	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	114.1785	'GEN560356 1-G10-53 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	114.0063	'GEN560522 1-G05-12 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03833	113.8541	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921	'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921	'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921	'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.7921	'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03133	113.7895	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.4766	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.3775	'GEN560279 1-G08-18 0.6900'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.341	'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	113.3014	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03152	113.1245	'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03694	113.0351	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03694	113.0351	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03154	112.6964	'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03176	112.0583	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03176	112.0583	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03157	111.4212	'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03159	111.0482	'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03181	110.4958	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03181	110.4958	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03382	106.9884	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.032	106.7168	'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03205	105.0582	'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03308	102.9967	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11WP	G10_049	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.05813	107.764	'DBL-MEDLO-WI'
11WP	G10_049	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.05827	103.9628	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04894	240.1462	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03563	190.8151	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03563	190.8151	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03569	188.2495	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03569	188.2495	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05047	185.9568	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05074	178.5565	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05094	172.6586	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	169.6643	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03298	168.9046	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03192	168.6155	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	167.7673	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03304	166.6796	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03197	166.1695	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	164.6132	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03202	163.9746	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03538	163.6591	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03313	163.5458	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	162.7257	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03229	162.0721	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03208	161.7093	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04	161.6368	'DBL-WOOD-MED'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03544	161.466	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03319	161.3321	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03215	161.1151	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03229	160.7455	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03342	160.618	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03229	160.2278	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	160.1681	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0324	159.9925	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	159.9492	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05132	159.7567	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	159.6454	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05134	159.4484	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03212	159.3932	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0322	159.119	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05134	159.0478	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04007	158.895	'DBL-WOOD-MED'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.8527	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	158.8313	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	158.8224	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	158.5634	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	158.5632	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0325	158.4786	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.4527	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03221	158.409	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.3814	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03347	158.3797	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	158.3141	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03218	158.2012	'SPP-WERE-28'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	158.0336	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	158.0296	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03245	157.8507	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	157.7385	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0322	157.5348	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.4476	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03217	157.4247	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.3967	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.2764	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.2145	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	157.1206	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06837	157.0206	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.9436	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	156.9114	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.909	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.8484	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.7543	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.7481	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03076	156.6743	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06837	156.664	'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	156.6449	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.517	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03333	156.4982	'CIRCLE - MULLERGREN 230KV CKT 1'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03187	156.4739	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.4671	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.4249	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.4191	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03227	156.3779	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03227	156.3754	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03224	156.2825	'SPP-WERE-28'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.2587	'GEN509394 1-FLINT CREEK'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03256	156.2578	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.2449	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.1971	'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.16	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.1351	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	156.1271	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	156.1212	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.5138	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.4762	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03226	155.4223	'MINGO - SETAB 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.3333	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.2914	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.2666	'GEN338146 1-INDEPENDENCE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	155.194	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.9858	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.9477	'GEN337653 1-WHITE BLUFF UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.909	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.8139	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03082	154.6729	'MULLERGREN - SPEARVILLE 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06843	154.6431	'NINNESC3 115.00 - PRATT 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.499	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.4863	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03232	154.482	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03192	154.4519	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.3253	'GEN509394 1-FLINT CREEK'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.3087	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.06843	154.2824	'NINNESC3 115.00 - ST JOHN 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.2592	'GEN542951 5-HAWTHORN UNIT #5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.2329	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.2077	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	154.1905	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	152.3184	'BASE CASE'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05155	152.2629	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	150.3694	'BASE CASE'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03127	148.6633	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.4669	'GEN560522 1-G05-12 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	148.2283	'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03128	148.2221	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03829	148.2149	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.8278	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.7084	'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.7015	'GEN560279 1-G08-18 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	147.309	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03132	146.7802	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.5487	'GEN560522 1-G05-12 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03833	146.398	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03133	146.3223	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560317 1-G10-27-1 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560318 1-G10-27-2 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560319 1-G10-27-3 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	146.3055	'GEN560320 1-G10-27-4 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.9651	'GEN525561 1-TOLK GEN #1 24 KV'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.8089	'GEN525562 1-TOLK GEN #2 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.7803	'GEN560279 1-G08-18 0.6900'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	145.6938	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03152	145.5717	'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03694	145.3287	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03694	145.3287	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03154	145.0786	'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03176	144.4325	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03176	144.4325	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03157	143.5914	'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03159	143.1635	'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03181	142.61	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03181	142.61	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03382	138.462	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.032	138.2522	'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03205	136.3238	'GEN539630 1-FLATRDG1 34.500'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	133.8188	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	128.7706	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.20332	127.9427	'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05753	126.1579	'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03338	126.0141	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03338	124.5964	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03338	124.0424	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	123.822	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	123.5323	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0332	123.3683	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.20345	123.3574	'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03661	123.2158	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	123.1337	'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03349	122.9435	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	122.7096	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	122.7036	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03323	122.4723	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	122.3581	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03329	122.2568	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	122.187	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03327	122.0033	'SPP-WERE-28'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	121.8254	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	121.1318	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03325	120.9086	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.8974	'GEN338143 1-INDEPENDENCE UNIT #1'
16WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0525	120.8845	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.8402	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.8325	'GEN542955 1-LACYGNE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.6637	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	120.602	'GEN337652 1-WHITE BLUFF UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03294	120.2844	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03459	119.9502	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.765	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.7599	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.6222	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.5048	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.4773	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.405	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.2225	'GEN532651 1-JEFFREY ENERGY CENTER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.1987	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	119.1053	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.9282	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.9024	'GEN532653 1-JEFFREY ENERGY CENTER UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.8925	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03278	118.8439	'EL PASO - ROSE HILL 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03336	118.8434	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03442	118.8356	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.8085	'GEN336831 1-BAXTER WILSON SES'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.7452	'GEN300007 1-NEW MADRID UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.7428	'GEN501813 1-RODEMACHER UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.7352	'GEN501801 1-DOLET HILLS UNIT1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.735	'GEN300006 1-NEW MADRID UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	118.6901	'GEN509394 1-FLINT CREEK'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03296	118.6558	'ROSE HILL - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03774	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03774	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
16WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05262	117.1379	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	115.3995	'BASE CASE'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	114.5601	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03789	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03789	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0344	112.1864	'GRAY CO 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03234	112.1417	'G05-13T 345.00 - G05-16T 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	111.8914	'GEN525561 1-TOLK GEN #1 24 KV'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03795	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03795	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	111.8275	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03236	111.6796	'G05-16T 345.00 - NEOSHO 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	111.3285	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	110.749	'GEN531447 1-HOLCOMB GENERATOR'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	109.923	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03308	109.4146	'GEN539630 1-FLATRDG1 34.500'
11SP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05409	108.6504	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03472	108.4701	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03262	108.0557	'ANDERSONCO 345.00 - WOLF CREEK 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0307	107.6223	'DBL-COM-MEDL'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03264	107.5586	'ANDERSONCO 345.00 - LACYGNE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	107.0796	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	107.0661	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	106.9449	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11SP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05427	106.5919	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03562	105.568	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03562	105.568	'MED-LDG5 345.00 - WWRDEHV7 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03396	105.5467	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	105.5256	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03397	105.517	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05813	105.4976	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03398	105.1749	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	105.0272	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	104.6445	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	104.3443	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03819	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03819	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03818	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03818	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03406	104.1641	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03403	104.0476	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0382	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.0382	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	103.9721	'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03407	103.9563	'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03488	103.9491	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03488	103.9436	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03487	103.5767	'TATONGA7 345.00 - WWRDEHV7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	103.5248	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	103.4935	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	103.1419	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03342	103.1216	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	102.9126	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	102.7578	'SPP-WERE-28'

11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	102.5676	'GEN335831 1-RIVERBEND UNIT#1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03406	102.4511	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03388	102.3772	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03407	102.2243	'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03408	102.1341	'BORDER 7345.00 - GRACMNT7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03381	102.0699	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03406	101.9228	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.8173	'GEN337910 1-ARKANSAS NUCLEAR ONE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	101.7703	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03407	101.7182	'SPP-WERE-32'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	101.6431	'CENTENNIAL - COWSKIN 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.6185	'GEN542956 2-LACYGNE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.6062	'GEN542955 1-LACYGNE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.5737	'GEN338143 1-INDEPENDENCE UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	101.545	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03829	101.5285	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03829	101.5285	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.4872	'GEN542962 2-IATAN UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03725	101.4257	'BENTON - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	101.276	'GEN337652 1-WHITE BLUFF UNIT #1'
11WP	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05827	101.2482	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	101.222	'G10-16T 345.00 - SPEARVILLE 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	101.188	'WICHITA (WICHT11X) 345/138/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	101.0478	'GEN336821 1-GRAND GULF UNIT'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	101.0336	'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03414	100.975	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03415	100.8565	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.7649	'GEN337041 1-GERALD ANDRUS'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	100.7409	'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.7157	'GEN514805 1-SOONER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	100.6922	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.6505	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.5882	'GEN300003 1-THOMAS HILL UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.5227	'SPP-WERE-30'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.4988	'GEN336252 1-NINEMILE POINT UNIT#5'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.4708	'GEN336251 1-NINEMILE POINT UNIT#4'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03342	100.4628	'G05-15T 345.00 - OKLAUNION 345KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03417	100.4001	'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.3339	'GEN514806 1-SOONER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.2121	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03378	100.1851	'GEN336153 1-WATERFORD UNIT#3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.1731	'GEN512688 2-GRDA1 GSU2 22'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.1666	'GEN542957 1-IATAN UNIT #1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03376	100.111	'GEN337911 1-ARKANSAS NUCLEAR ONE UNIT #2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03395	100.0786	'CENTENNIAL - WACO 138KV CKT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0673	'GEN532651 1-JEFFREY ENERGY CENTER UNIT 1'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0659	'GEN532653 1-JEFFREY ENERGY CENTER UNIT 3'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0548	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03365	100.0515	'GEN640009 1-COOPER NUCLEAR STATION'
11G	G10_049	'FROM->TO'	'HUNTSVILLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'	83	92	0.05166	112.2013	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'HUNTSVILLE - ST_JOHN 115KV CKT 1'	80	88	0.05166	120.7984	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'HUNTSVILLE - ST_JOHN 115KV CKT 1'	80	88	0.21636	100.4407	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.03866	104.652	'RENO COUNTY - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.03866	104.6442	'RENO COUNTY - WICHITA 345KV CKT 1'
11G	G10_049	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.04116	106.2962	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049		NCONV	0	0	0.04113	9999	'DBL-COM-MEDL'
11G	G10_049		NCONV	0	0	0.04192	9999	'DBL-COM-MEDL'
11G	G10_049		NCONV	0	0	0.12812	9999	'DBL-MEDLO-WI'
11G	G10_049		NCONV	0	0	0.12861	9999	'DBL-MEDLO-WI'
11G	G10_049	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.05949	100.955	'DBL-MEDLO-WI'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	121.9435	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	121.9364	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	118.2634	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'

16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05467	118.222	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	116.087	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	115.9963	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	115.804	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	115.677	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	112.5964	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05455	112.4055	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	112.3256	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
16SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05477	112.2074	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	108.6325	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	108.5704	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	105.3102	'HEIZER 6 230.00 - MULLERGREN 230KV CKT 1'
11SP	G10_049	'FROM->TO'	'SEWRDMW3 (SEWARD T1) 115/69/12.5KV TRANSFORMER CKT 1'	40	44.8	0.05469	105.2489	'HEIZER 6 230.00 (HEIZER T1) 230/115/12.5KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05166	162.6856	'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04718	138.684	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21654	138.2874	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21666	133.5296	'CIRCLE - MULLERGREN 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04985	121.2907	'DBL-SPRVL-CO'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21137	120.8539	'DBL-SPRVL-CO'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05083	118.0124	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05083	118.0124	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21088	117.3673	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21088	117.3673	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21026	116.6745	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05025	116.2382	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04833	116.0982	'CIRCLE (CIRCLE1X) 230/115/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20922	115.7697	'CIRCLE (CIRCLE1X) 230/115/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05046	115.6847	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2115	115.389	'DBL-SPRVL-CO'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.27897	115.0117	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.07009	114.9623	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05046	114.8359	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21088	114.756	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21089	113.86	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05045	113.8337	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05025	113.585	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21126	113.4263	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05042	113.4204	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05042	113.4204	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21099	113.0135	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21099	113.0135	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04104	112.9359	'CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20999	112.7954	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20999	112.7954	'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21037	112.5429	'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21037	112.374	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.1718	112.1639	'CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05056	111.9334	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20933	111.4661	'CIRCLE (CIRCLE1X) 230/115/13.8KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20981	111.2745	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05056	110.7076	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05059	110.1177	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21099	110.0602	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20981	110.0035	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05058	109.7005	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.06846	109.6386	'SPP-MKEC-02'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21007	109.5053	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05079	109.4302	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.27912	109.3361	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05074	109.2629	'SPP-MKEC-08'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21101	109.16	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21019	109.0525	'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21228	109.0414	'SPP-MKEC-02'

11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21137	109.0147 'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.17189	108.7084 'CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21049	108.6701 'SPP-MKEC-08'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20993	108.4469 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2101	108.4392 'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2101	108.4392 'COMANCH5 345.00 - MED-LDG5 345.00 345KV CKT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21048	108.2293 'KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20992	107.1656 'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20992	105.9685 'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21018	105.2982 'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21239	104.87 'SPP-MKEC-02'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05056	104.7391 'BASE CASE'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2103	104.7117 'MINGO - RED WILLOW 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.2106	104.5196 'SPP-MKEC-08'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21004	104.3007 'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20981	104.1532 'BASE CASE'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.21575	100.6782 'DBL-MEDLO-WI'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05058	100.5835 'HOYT - JEFFERY ENERGY CENTER 345KV CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05695	100.4541 'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05059	100.3418 'WRTOD400'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.23201	100.0667 'MED-LDG5 345.00 345/138KV TRANSFORMER CKT 1'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20992	100.0518 'BASE CASE'
11G	G10_049	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.20943	100 'HOYT - JEFFERY ENERGY CENTER 345KV CKT 1'
11G	G10_052		NCONV	0	0	0.22362	9999 'DBL-COM-MEDL'
11G	G10_052		NCONV	0	0	0.22482	9999 'DBL-COM-MEDL'
11G	G10_052		NCONV	0	0	0.16346	9999 'DBL-MEDLO-WI'
11G	G10_052		NCONV	0	0	0.16422	9999 'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.03717	109.3657 'SPP-SUNC-14'
11G	G10_053	'TO->FROM'	'CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.07575	105.504 'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11G	G10_053	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.04481	103.4132 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_053	'TO->FROM'	'CIRCLE - MULLERGREN 230KV CKT 1'	319	319	0.04498	101.1715 'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
11G	G10_053	'FROM->TO'	'CLEARWATER - GILL ENERGY CENTER WEST 138KV CKT 1'	234	234	0.03162	111.7334 'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03162	249.5631 'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05458	195.1345 'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05611	148.4198 'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05638	142.0614 'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05658	136.9546 'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05697	125.842 'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05698	125.5791 'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05698	125.2305 'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.05719	120.099 'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03379	103.5446 'DBL-SPRVL-CO'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03384	102.2108 'DBL-SPRVL-CO'
11G	G10_053	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	110	0.03137	101.5044 'DBL-SPRVL-CO'
11G	G10_053	'FROM->TO'	'CUDAHY - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.03717	111.2213 'SPP-SUNC-14'
11G	G10_053	'FROM->TO'	'CUDAHY - KISMET 3 115.00 115KV CKT 1'	120.7	129.5	0.07575	107.3707 'GRAY CO 345.00 - HOLCOMB 345KV CKT 1'
11WP	G10_053	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.04903	112.9362 'DBL-MEDLO-WI'
11WP	G10_053	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	105.2	105.2	0.04938	103.9628 'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03162	303.2539 'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05458	240.1462 'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05611	185.9568 'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05638	178.5565 'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05658	172.6586 'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05697	159.7567 'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05698	159.4484 'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05698	159.0478 'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05719	152.2629 'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03379	134.406 'DBL-SPRVL-CO'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03384	132.8082 'DBL-SPRVL-CO'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03137	131.9869 'DBL-SPRVL-CO'
16WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05788	128.7006 'DBL-MEDLO-WI'
11SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05966	120.433 'DBL-MEDLO-WI'
16WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03162	120.0234 'DBL-MEDLO-WI'

11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03023	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03023	117.6289	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
16WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05826	117.1379	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03037	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03037	113.7406	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03044	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03044	111.8809	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03027	111.6206	'DBL-MEDLO-WI'
11WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04903	111.198	'DBL-MEDLO-WI'
11SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05997	108.6504	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03068	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03068	104.3421	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03067	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03067	104.245	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03069	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03069	103.9831	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
16SP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.05999	103.5727	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03078	101.5285	'MED-LDG5 345.00 - WICHITA 345KV CKT 1'
11G	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.03078	101.5285	'MED-LDG5 345.00 - WICHITA 345KV CKT 2'
11WP	G10_053	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	95.6	95.6	0.04938	101.2482	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'HAYS PLANT - SOUTH HAYS 115KV CKT 1'	80	88	0.07909	158.1831	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053	'FROM->TO'	'HAYS PLANT - VINE STREET 115KV CKT 1'	80	88	0.07909	140.7514	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053	'TO->FROM'	'KNOLL - N HAYS3 115.00 115KV CKT 1'	83	99	0.07909	113.6277	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.09392	106.7474	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.09431	103.5049	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	453.3	470.5	0.10905	103.2241	'G10-16T 345.00 - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'TO->FROM'	'N HAYS3 115.00 - VINE STREET 115KV CKT 1'	83	99	0.07909	119.2701	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
11G	G10_053		NCONV	0	0	0.32907	9999	'DBL-COM-MEDL'
11G	G10_053		NCONV	0	0	0.5149	9999	'DBL-COM-MEDL'
11G	G10_053		NCONV	0	0	0.51631	9999	'DBL-COM-MEDL'
11G	G10_053		NCONV	0	0	0.277	9999	'DBL-MEDLO-WI'
11G	G10_053		NCONV	0	0	0.27776	9999	'DBL-MEDLO-WI'
11G	G10_053	'TO->FROM'	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'	1195	1195	0.10757	100.955	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04838	111.0766	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.09684	110.8506	'DBL-COM-MEDL'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04856	108.8703	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.05504	107.568	'DBL-MEDLO-WI'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.04847	106.1522	'AXTELL - POSTROCK7 345.00 345KV CKT 1'
11G	G10_053	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.03862	100.7152	'CIRCLE - MULLERGREN 230KV CKT 1'

I : Stability Study for Group 1

SPP DISIS-2010-002 Group 1
Definitive Impact Study

Draft Report for

Southwest Power Pool

Prepared by:
Excel Engineering, Inc.

January 28, 2011

Principal Contributor:

William Quaintance, P.E.

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0. Certification

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the Laws of the State of **Oklahoma**.

William Quaintance
Oklahoma License Number 24320

1. Background and Scope

The DISIS-2010-002 Group 1 Definitive Impact Study is a generation interconnection study performed by Excel Engineering, Inc. for its non-affiliated client, Southwest Power Pool (SPP). Its purpose is to study the impacts of interconnecting the projects shown in Table 1-1. The in-service date assumed for the generation addition was 2011.

Table 1-1. Interconnection Requests to be Evaluated

Request	Size	Wind Turbine Model	Point of Interconnection	POI Bus	Gen Buses
GEN-2010-043	320	GENROU	Mooreland 138kV (520999)	520999	580076 580077

The prior-queued requests shown in Table 1-2 were included in this study and dispatched at 100% of rated capacity.

The study included stability analysis of each proposed interconnection request. Contingencies that resulted in a prior-queued project tripping off-line, if any, were re-run with the prior-queued project's voltage and frequency tripping disabled. A power factor analysis was not needed because the study project uses conventional synchronous generators.

ATC (Available Transfer Capability) studies were not performed as part of this study. These studies will be required at the time transmission service is actually requested. Additional transmission upgrades may be required based on that analysis.

Study assumptions in general have been based on Excel's knowledge of the electric power system and on the specific information and data provided by SPP. The accuracy of the conclusions contained within this study is sensitive to the assumptions made with respect to generation additions and transmission improvements being contemplated. Changes in the assumptions of the timing of other generation additions or transmission improvements will affect this study's conclusions.

Table 1-2. Nearby Interconnection Requests Already in the Queue

Request	Size	Wind Turbine Model	Point of Interconnection	POI Bus	Gen Buses
GEN-2001-014	94.5	Suzlon 2.1MW	Fort Supply 138kV (520920)	520920	579003
GEN-2001-037	102	GE 1.5MW	Woodward-Mooreland 138kV (515785)	515785	515790
GEN-2005-005	18.4	Siemens SWT 2.3MW	Woodward-Mooreland 138kV (515785)	515785	573805
GEN-2005-008	120	GE 1.5MW	Woodward 138kV (514785)	514785	515364
GEN-2006-024S	18.9	Suzlon 2.1MW	Buffalo Bear 69kV (521120)	521120	579154
GEN-2006-046	132.0	Mitsubishi 2.3MW	Dewey 138kV (514787)	514787	579192
GEN-2007-006	161.7	Suzlon 2.1MW	Roman Nose 138kV (514823)	514823	579213
GEN-2007-021	200	GE 1.6MW	Tatonga 345kV (515407)	515407	579256
GEN-2007-044	299.2	GE 1.6MW	Tatonga 345kV (515407)	515407	579271
GEN-2007-050	172.5	Siemens 2.3MW	Woodward 138kV (515376)	515376	579317
GEN-2007-051	199.5	GE 1.5MW	Mooreland 138kV (520999)	520999	579331
GEN-2007-062	765	GE 1.5MW	Woodward 345kV (515375)	515375	579352
GEN-2008-003	101.2	Siemens 2.3MW	Woodward 138kV (515376)	515376	1031
GEN-2008-019	300	Mitsubishi 2.3MW	Tatonga 345kV (515407)	515407	3291
GEN-2008-029	250.5	GE 1.5MW	Woodward 138kV (515376)	515376	291
GEN-2008-044	197.8	Siemens SWT 2.3MW	Tatonga 345kV (515407)	515407	576500
GEN-2010-008	64.4	Vestas V90 1.8MW	Fargo Jct 69kV (521196)	521196	575114
GEN-2010-011	29.7	Siemens SWT 2.3MW	Addition to Gen-2008-044 34.5kV bus (576503)	576503	576600

2. Executive Summary

The DISIS-2010-002 Group 1 Definitive Impact Study evaluated the impacts of interconnecting project GEN-2010-043 to the SPP transmission system at the Mooreland 138 kV station.

Following Fault 9 on the Tatonga-Northwest 345 kV line, instabilities were seen in voltages and prior-queued projects along the 138 kV system underlying the Tatonga-Northwest 345 kV line. This underlying 138 kV system includes transmission lines running southwest from Mooreland 138, ultimately through Roman Nose and on to Cimarron.

Addition of the following 345 kV lines is needed to ensure stability following Fault 9:

- Hitchland-Border 345 kV double-circuit line
- Border-Gracemont 345 kV line

The following line was shown to provide additional benefit following Fault 9:

- Clark-Beaver 345 kV line

With the assumptions and upgrades described in this report, DISIS-2010-002 Group 1 should be able to connect without causing any stability problems on the SPP transmission grid.

3. Study Development and Assumptions

3.1 Simulation Tools

The Siemens Power Technologies, Inc. PSS/E power system simulation program Version 30.3.3 was used in this study.

3.2 Models Used

SPP provided its latest stability database cases for both summer and winter peak seasons. The model included the study and prior-queued projects. A power flow one-line diagram of the study project is shown in Figure 3-1. GEN-2010-043 is a combined-cycle plant with one gas turbine generator and one steam turbine generator. Steady-state and dynamic model data for the study plants are given in Appendix D.

No special modeling is required of line relays in these cases, except for the special modeling related to the wind-turbine tripping.

3.3 Monitored Facilities

All generators and transmission buses in Areas 520, 524, 526, 534, and 539 were monitored.

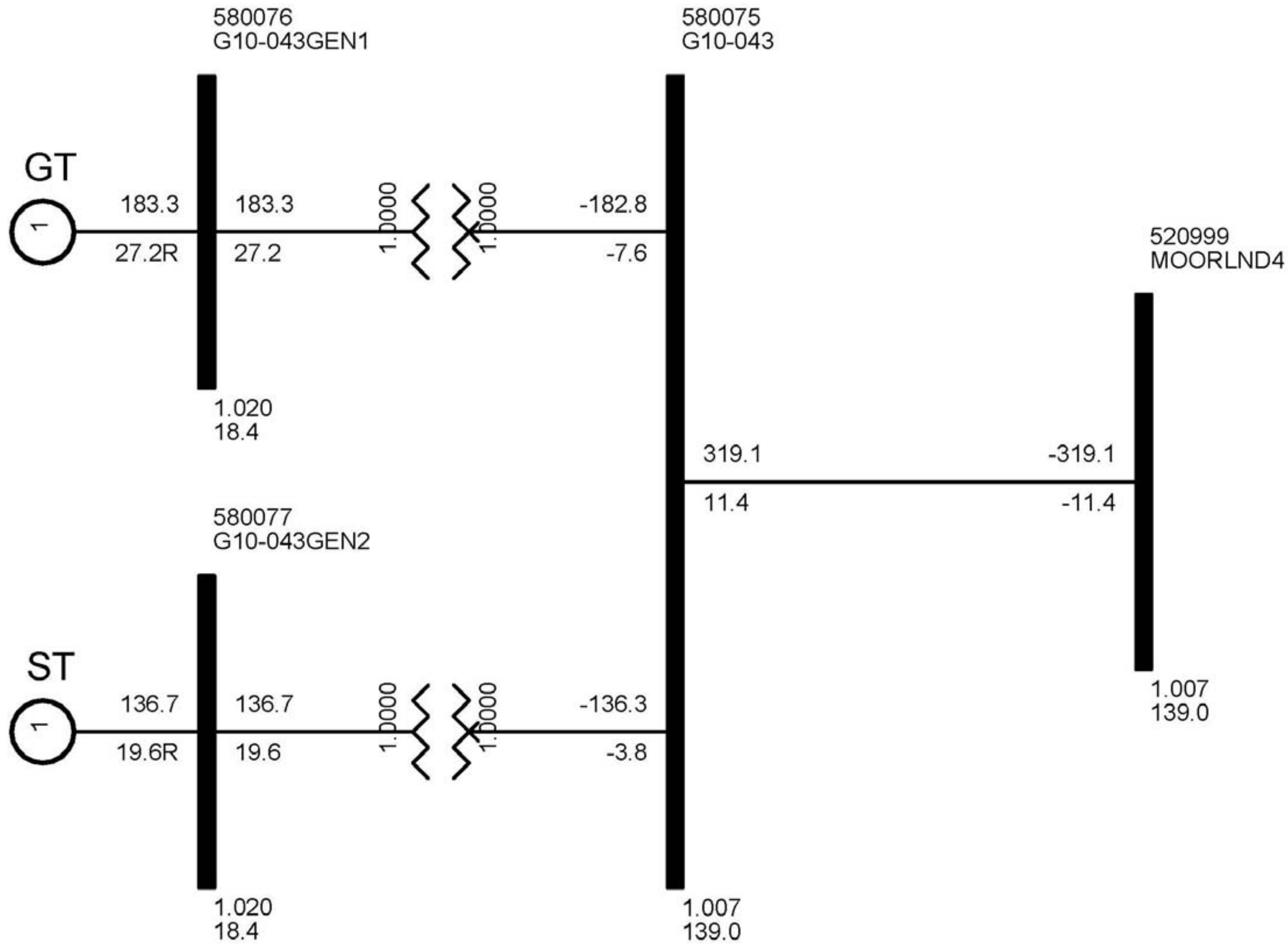

Figure 3-1. Power Flow One-line for GEN-2010-043

3.4 Performance Criteria

Any wind generators must comply with FERC Order 661A on low voltage ride through for wind farms. Therefore, the wind generators should not trip off line for faults for under voltage relay actuation. If a wind generator trips off line, an appropriately sized SVC or STATCOM device may need to be specified to keep the wind generator on-line for the fault. SPP was consulted to determine if the addition of an SVC or STATCOM is warranted for the specific condition.

Contingencies that resulted in a prior-queued project tripping off-line, if any, were re-run with the prior-queued project's voltage and frequency tripping disabled to check for stability issues.

3.5 Performance Evaluation Methods

Since none of the interconnection requests are wind projects, a power factor analysis was not performed.

ATC studies were not performed as part of this study. These studies will be required at the time transmission service is actually requested. Additional transmission facilities may be required based on subsequent ATC analysis.

Stability analysis was performed for each proposed interconnection request. Faults were simulated on transmission lines at the POIs and on other nearby transmission equipment. The faults in Table 3-1 were run for each case (three phase and single phase as noted).

Table 3-1. Fault Definitions for DISIS-2010-002 Group 1

Cont. No.	Contingency Name	Contingency Description
1	FLT01-3PH	3 phase fault on one of the Woodward (515375) to Tatonga (515407) 345kV lines, near Woodward. a. Apply fault at the Woodward 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
2	FLT02-1PH	*Single phase fault and sequence like previous*
3	FLT03-3PH	3 phase fault on one of the Woodward (515375) to Hitchland (523097) 345kV lines, near Woodward. a. Apply fault at the Woodward 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
4	FLT04-1PH	*Single phase fault and sequence like previous*
5	FLT05-3PH	3 phase fault on one of the Woodward (515375) to Medicine Lodge (765342) 345kV line, near Woodward. a. Apply fault at the Woodward 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
6	FLT06-1PH	*Single phase fault and sequence like previous*
7	FLT07-3PH	3 phase fault on the Woodward 345kV (515375) to 138kV (515376) transformer, near the 345 kV bus. a. Apply fault at the Woodward 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
8	FLT08-1PH	*Single phase fault and sequence like previous*
9	FLT09-3PH	3 phase fault on the Tatonga (515407) to Northwest (514880) 345kV line, near Tatonga. a. Apply fault at the Tatonga 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
10	FLT10-1PH	*Single phase fault and sequence like previous*
11	FLT11-3PH	3 phase fault on the Northwest (514880) to Spring Creek (514881) 345kV line, near Northwest. a. Apply fault at the Northwest 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
12	FLT12-1PH	*Single phase fault and sequence like previous*
13	FLT13-3PH	3 phase fault on the Northwest (514880) to Cimarron (514901) 345kV line, near Northwest. a. Apply fault at the Northwest 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
14	FLT14-1PH	*Single phase fault and sequence like previous*

Cont. No.	Contingency Name	Contingency Description
15	FLT15-3PH	3 phase fault on Northwest 345kV (514880) to 138kV (514879) transformer T2, near the 345 kV bus. a. Apply fault at the Northwest 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
16	FLT16-1PH	*Single phase fault and sequence like previous*
17	FLT17-3PH	3 phase fault on the Arcadia (514908) to Northwest (514880) 345kV line, near Arcadia. a. Apply fault at the Arcadia 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
18	FLT18-1PH	*Single phase fault and sequence like previous*
19	FLT19-3PH	3 phase fault on the Woodward EHV (515376) to Iodine (514796) 138kV line, near Woodward EHV. a. Apply fault at the Woodward EHV 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
20	FLT20-1PH	*Single phase fault and sequence like previous*
21	FLT21-3PH	3 phase fault on the Mooreland (520999) to GEN-2001-037 (515785) 138kV line, near Mooreland. a. Apply fault at the Mooreland 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
22	FLT22-1PH	*Single phase fault and sequence like previous*
23	FLT23-3PH	3 phase fault on the Mooreland (520999) to Glass Mountain (514788) 138kV line, near Mooreland. a. Apply fault at the Mooreland 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
24	FLT24-1PH	*Single phase fault and sequence like previous*
25	FLT25-3PH	3 phase fault on the Mooreland (520999) to Windfarm (515785) 138kV line, near Mooreland. a. Apply fault at the Mooreland 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
26	FLT26-1PH	*Single phase fault and sequence like previous*
27	FLT27-3PH	3 phase fault on the Taloga (521065) to Dewey (514787) 138kV line, near Taloga. a. Apply fault at the Taloga 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
28	FLT28-1PH	*Single phase fault and sequence like previous*
29	FLT29-3PH	3 phase fault on the Dewey (514787) to Southard (514822) 138kV line, near Dewey. a. Apply fault at the Dewey 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
30	FLT30-1PH	*Single phase fault and sequence like previous*

Cont. No.	Contingency Name	Contingency Description
31	FLT31-3PH	3 phase fault on the Woodward (515375) to Midpoint/Wheeler (525835) 345kV line, near Woodward. a. Apply fault at the Woodward 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
32	FLT32-1PH	*Single phase fault and sequence like previous*
33	FLT33-3PH	3 phase fault on the Hitchland (523095) 230kV to Hitchland (523097) 345kV transformer, 230 kV bus. a. Apply fault at the Hitchland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
34	FLT34-1PH	*Single phase fault and sequence like previous*
35	FLT35-3PH	3 phase fault on the Ninemile (521128) to Mooreland (520999) 138kV line, near Ninemile. a. Apply fault at Ninemile 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
36	FLT36-1PH	*Single phase fault and sequence like previous*
37	FLT37-3PH	3 phase fault on the Fargo Jct (521196) to Ft. Supply (520919) 69kV line, near Fargo Jct. a. Apply fault at the Fargo Jct 69kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
38	FLT38-1PH	*Single phase fault and sequence like previous*
39	FLT39-3PH	3 phase fault on the Knob Hill (514795) to Mooreland (520999) 138kV line, near Knob Hill. a. Apply fault at the Knob Hill 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
40	FLT40-1PH	*Single phase fault and sequence like previous*
41	FLT41-3PH	3 phase fault on the Cedardale (520848) to Mooreland (520999) 138kV line, near Cedardale. a. Apply fault at Cedardale 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
42	FLT42-1PH	*Single phase fault and sequence like previous*
43	FLT43-3PH	3 phase fault on the Iodine (520957) to Mooreland (520999) 138kV line, near Iodine. a. Apply fault at Iodine 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
44	FLT44-1PH	*Single phase fault and sequence like previous*
45	FLT45-3PH	3 phase fault on the Taloga (521065) to Mooreland (520999) 138kV line, near Taloga. a. Apply fault at Taloga 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
46	FLT46-1PH	*Single phase fault and sequence like previous*

Cont. No.	Contingency Name	Contingency Description
47	FLT47-3PH	3 phase fault on one of the Ft. Supply (520920) 230kV to Ft. Supply (520919) 69kV transformer, 230 kV bus. a. Apply fault at the Ft. Supply 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
48	FLT48-1PH	*Single phase fault and sequence like previous*

4. Results and Observations

4.1 Stability Analysis Results

All faults were run for both summer and winter peak conditions. If a prior-queued generator tripped for any of these faults, the voltage and frequency tripping was disabled, and the fault was re-run to check for system stability. No tripping occurred in this study.

Table 4-1 summarizes the overall results for all faults. Figure 4-1 through Figure 4-2 show representative summer peak season plots for faults at the POI of the study project. Complete sets of plots for both summer and winter peak seasons for each fault and each project are included in Appendices A and B.

All simulations showed stable responses except for Fault 9, a three-phase fault on the Tatonga-Northwest 345 kV line. The outage of this line causes a significant increase in flow on the underlying 138 kV transmission system. Low voltages are seen on this 138 kV system, especially at Roman Nose. After adding proposed upgrades from DISIS-2010-001, which included the Hitchland-Border 345kV double circuit and the Border-Gracemont 345kV line, the results were somewhat improved, but voltages at Roman Nose 138kV were observed at 86% and dropping (Figure 4-3). This response is somewhat due to the type of wind turbines being studied at GEN-2007-006 (Suzlon) that tend to absorb reactive power when the voltages approach 90%. With increased reactive compensation at Roman Nose, this voltage could be increased.

Additional upgrades that were necessary for DISIS-2010-002 Group 3 projects were tested for response. The second upgrade tested was a new 345 kV line from Clark to Beaver. This upgrade is in addition to the upgrades mentioned in the previous paragraph. Following Fault 9, the voltage at Roman Nose 138 settles to around 90% at t=10s (Figure 4-4). This performance is considered acceptable.

Table 4-1. Summary of Results

Cont. No.	Contingency Name	Contingency Description	Summer Peak Results	Winter Peak Results
1	FLT01-3PH	3 phase fault on one of the Woodward (515375) to Tatonga (515407) 345kV lines, near Woodward.	OK	OK
2	FLT02-1PH	*Single phase fault and sequence like previous*	OK	OK
3	FLT03-3PH	3 phase fault on one of the Woodward (515375) to Hitchland (523097) 345kV lines, near Woodward.	OK	OK
4	FLT04-1PH	*Single phase fault and sequence like previous*	OK	OK
5	FLT05-3PH	3 phase fault on one of the Woodward (515375) to Medicine Lodge (765342) 345kV line, near Woodward.	OK	OK
6	FLT06-1PH	*Single phase fault and sequence like previous*	OK	OK
7	FLT07-3PH	3 phase fault on the Woodward 345kV (515375) to 138kV (515376) transformer, near the 345 kV bus.	OK	OK
8	FLT08-1PH	*Single phase fault and sequence like previous*	OK	OK
9	FLT09-3PH	3 phase fault on the Tatonga (515407) to Northwest (514880) 345kV line, near Tatonga.	**Unstable**	**Unstable**
10	FLT10-1PH	*Single phase fault and sequence like previous*	OK	OK
11	FLT11-3PH	3 phase fault on the Northwest (514880) to Spring Creek (514881) 345kV line, near Northwest.	OK	OK
12	FLT12-1PH	*Single phase fault and sequence like previous*	OK	OK
13	FLT13-3PH	3 phase fault on the Northwest (514880) to Cimarron (514901) 345kV line, near Northwest.	OK	OK
14	FLT14-1PH	*Single phase fault and sequence like previous*	OK	OK
15	FLT15-3PH	3 phase fault on Northwest 345kV (514880) to 138kV (514879) transformer T2, near the 345 kV bus.	OK	OK
16	FLT16-1PH	*Single phase fault and sequence like previous*	OK	OK
17	FLT17-3PH	3 phase fault on the Arcadia (514908) to Northwest (514880) 345kV line, near Arcadia.	OK	OK
18	FLT18-1PH	*Single phase fault and sequence like previous*	OK	OK
19	FLT19-3PH	3 phase fault on the Woodward EHV (515376) to Iodine (514796) 138kV line, near Woodward EHV.	OK	OK
20	FLT20-1PH	*Single phase fault and sequence like previous*	OK	OK
21	FLT21-3PH	3 phase fault on the Mooreland (520999) to GEN-2001-037 (515785) 138kV line, near Mooreland.	OK	OK
22	FLT22-1PH	*Single phase fault and sequence like previous*	OK	OK
23	FLT23-3PH	3 phase fault on the Mooreland (520999) to Glass Mountain (514788) 138kV line, near Mooreland.	OK	OK
24	FLT24-1PH	*Single phase fault and sequence like previous*	OK	OK
25	FLT25-3PH	3 phase fault on the Mooreland (520999) to Windfarm (515785) 138kV line, near Mooreland.	OK	OK

Cont. No.	Contingency Name	Contingency Description	Summer Peak Results	Winter Peak Results
26	FLT26-1PH	*Single phase fault and sequence like previous*	OK	OK
27	FLT27-3PH	3 phase fault on the Taloga (521065) to Dewey (514787) 138kV line, near Taloga.	OK	OK
28	FLT28-1PH	*Single phase fault and sequence like previous*	OK	OK
29	FLT29-3PH	3 phase fault on the Dewey (514787) to Southard (514822) 138kV line, near Dewey.	OK	OK
30	FLT30-1PH	*Single phase fault and sequence like previous*	OK	OK
31	FLT31-3PH	3 phase fault on the Woodward (515375) to Midpoint/Wheeler (525835) 345kV line, near Woodward.	OK	OK
32	FLT32-1PH	*Single phase fault and sequence like previous*	OK	OK
33	FLT33-3PH	3 phase fault on the Hitchland (523095) 230kV to Hitchland (523097) 345kV transformer, 230 kV bus.	OK	OK
34	FLT34-1PH	*Single phase fault and sequence like previous*	OK	OK
35	FLT35-3PH	3 phase fault on the Ninemile (521128) to Mooreland (520999) 138kV line, near Ninemile.	OK	OK
36	FLT36-1PH	*Single phase fault and sequence like previous*	OK	OK
37	FLT37-3PH	3 phase fault on the Fargo Jct (521196) to Ft. Supply (520919) 69kV line, near Fargo Jct.	OK	OK
38	FLT38-1PH	*Single phase fault and sequence like previous*	OK	OK
39	FLT39-3PH	3 phase fault on the Knob Hill (514795) to Mooreland (520999) 138kV line, near Knob Hill.	OK	OK
40	FLT40-1PH	*Single phase fault and sequence like previous*	OK	OK
41	FLT41-3PH	3 phase fault on the Cedardale (520848) to Mooreland (520999) 138kV line, near Cedardale.	OK	OK
42	FLT42-1PH	*Single phase fault and sequence like previous*	OK	OK
43	FLT43-3PH	3 phase fault on the Iodine (520957) to Mooreland (520999) 138kV line, near Iodine.	OK	OK
44	FLT44-1PH	*Single phase fault and sequence like previous*	OK	OK
45	FLT45-3PH	3 phase fault on the Taloga (521065) to Mooreland (520999) 138kV line, near Taloga.	OK	OK
46	FLT46-1PH	*Single phase fault and sequence like previous*	OK	OK
47	FLT47-3PH	3 phase fault on one of the Ft. Supply (520920) 230kV to Ft. Supply (520919) 69kV transformer, 230 kV bus.	OK	OK
48	FLT48-1PH	*Single phase fault and sequence like previous*	OK	OK

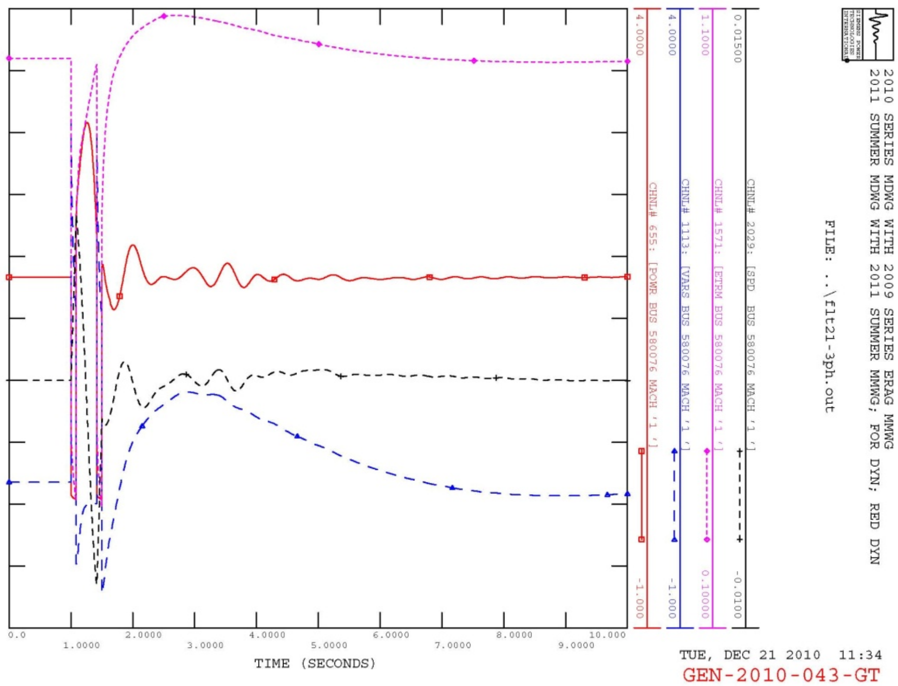

Figure 4-1. **GEN-2010-043-GT Plot for Fault 21 – 3-Phase Fault on the Mooreland (520999) to GEN-2001-037 (515785) 138kV line, near Mooreland**

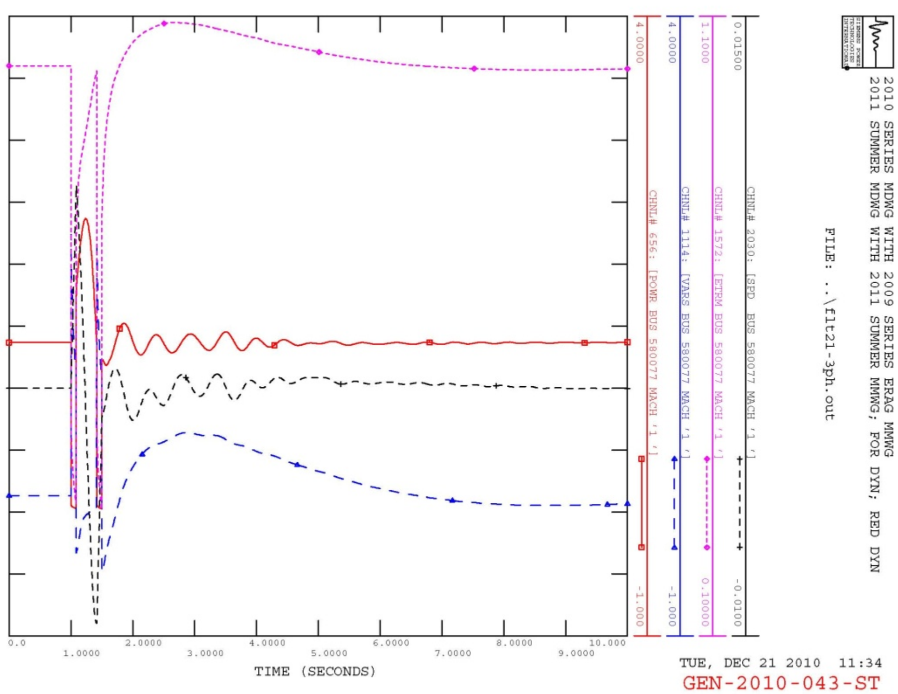

Figure 4-2. **GEN-2010-043-ST for Fault 21 – 3-Phase Fault on the Mooreland (520999) to GEN-2001-037 (515785) 138kV line, near Mooreland**

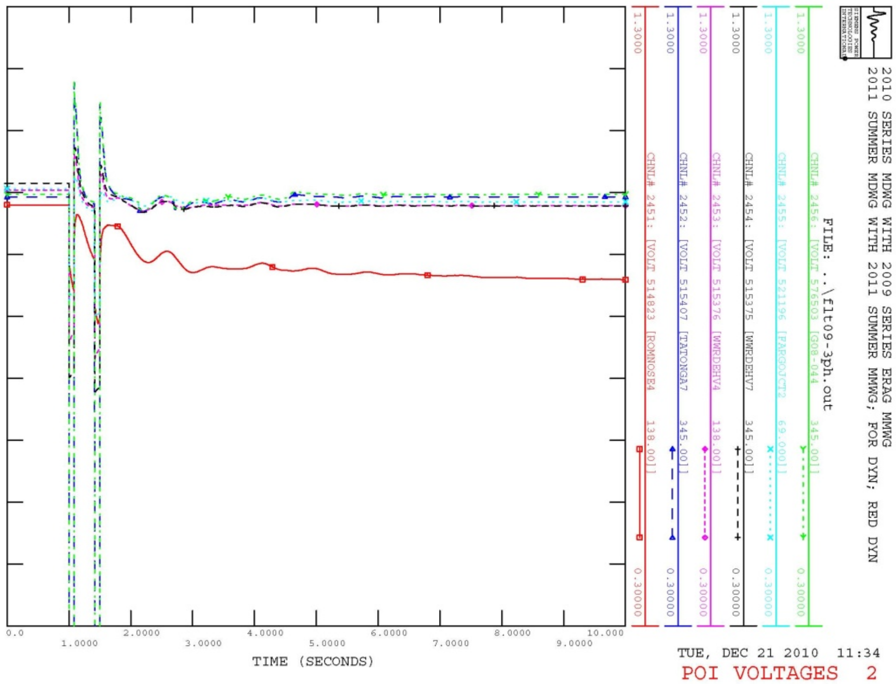

Figure 4-3. POI Voltages for Fault 9 – 3-Phase Fault on Tatonga-Northwest 345kV, near Tatonga; with Hitchland-Border-Gracemont 345 kV upgrades

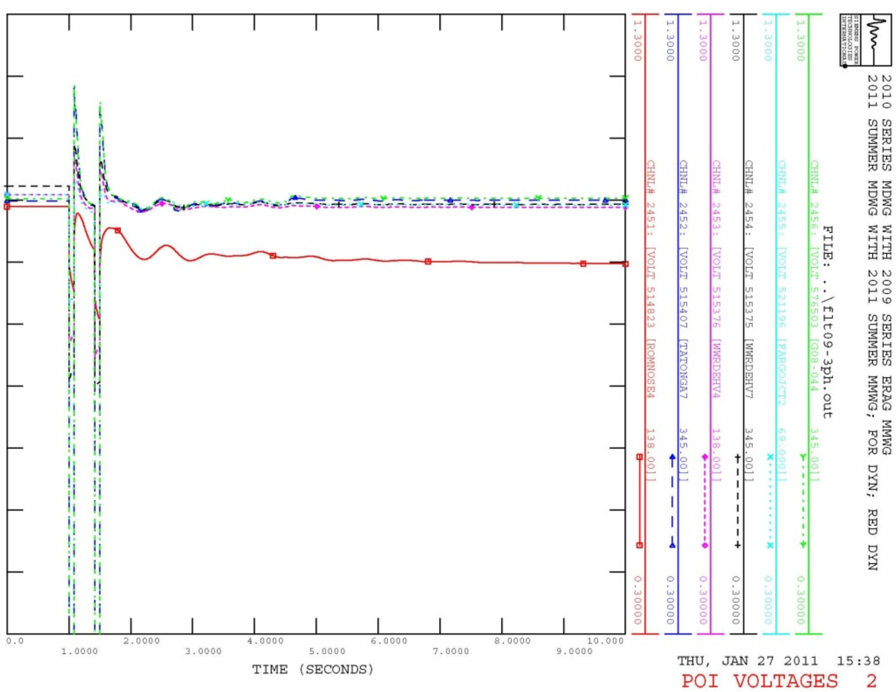

Figure 4-4. POI Voltages for Fault 9 – 3-Phase Fault on Tatonga-Northwest 345kV, near Tatonga; with Hitchland-Border-Gracemont and Clark-Beaver 345 kV upgrades

4.2 Power Factor Requirements

Since the study project uses conventional synchronous generators, no power factor analysis is required.

5. Conclusions

The DISIS-2010-002 Group 1 Definitive Impact Study evaluated the impacts of interconnecting each of the projects shown below.

Table 5-1. Interconnection Requests Evaluated in this Study

Request	Size	Wind Turbine Model	Point of Interconnection
GEN-2010-043	320	GENROU	Mooreland 138kV

Following Fault 9 on the Tatonga-Northwest 345 kV line, instabilities were seen in voltages and prior-queued projects along the 138 kV system underlying the Tatonga-Northwest 345 kV line. This underlying 138 kV system includes transmission lines running southwest from Mooreland 138, ultimately through Roman Nose and on to Cimarron.

Addition of the following 345 kV lines is needed to ensure stability following Fault 9:

- Hitchland-Border 345 kV double-circuit line
- Border-Gracemont 345 kV line

The following line was shown to provide additional benefit following Fault 9:

- Clark-Beaver 345 kV line

With the assumptions and upgrades described in this report, DISIS-2010-002 Group 1 should be able to connect without causing any stability problems on the SPP transmission grid.

Appendix A – Summer Peak Plots

See attachment.

Appendix B – Winter Peak Plots

See attachment.

Appendix C – Power Factor Details

Not applicable.

Appendix D – Project Model Data

See attachment.

Appendix E – SPP 345 kV System Including Required Upgrades

See attachment.

J: Stability Study for Group 2

Final Report

For

Southwest Power Pool

From

S&C Electric Company

DEFINITIVE IMPACT STUDY
DISIS-2010-001 (Group 2 Sub)

S&C Project No. 5092

January 26, 2011

S&C Electric Company

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APPENDICES .... ERROR! BOOKMARK NOT DEFINED.

APPENDIX A –GROUP 2 PROJECT DATA .... ERROR! BOOKMARK NOT DEFINED.

APPENDIX B –REDUCED STABILITY PLOTS FOR SUMMER 2010/2011 (FLAT RUN AND FAULT CONTINGENCIES #0 THRU #46) .... ERROR! BOOKMARK NOT DEFINED.

APPENDIX C –REDUCED STABILITY PLOTS FOR WINTER 2010/2011 (FLAT RUN AND FAULT CONTINGENCIES #0 THRU #46) .... ERROR! BOOKMARK NOT DEFINED.

APPENDIX D –REDUCED STABILITY PLOTS FOR SUMMER 2010/2011 (FLAT RUN AND FAULT CONTINGENCY #12 WITH GEN-2003-013 WIND TURBINE PROTECTION DISABLED) .... ERROR! BOOKMARK NOT DEFINED.

APPENDIX E –REDUCED STABILITY PLOTS FOR WINTER 2010/2011 (FLAT RUN AND FAULT CONTINGENCY #12 WITH GEN-2003-013 WIND TURBINE PROTECTION DISABLED).. ERROR! BOOKMARK NOT DEFINED.

APPENDIX F –COMPLETE STABILITY PLOTS FOR SUMMER 2010/2011 (FLAT RUN AND FAULT CONTINGENCIES #0 THRU #46) .... ERROR! BOOKMARK NOT DEFINED.

APPENDIX G –COMPLETE STABILITY PLOTS FOR WINTER 2010/2011 (FLAT RUN AND FAULT CONTINGENCIES #0 THRU #46) .... ERROR! BOOKMARK NOT DEFINED.

APPENDIX H –COMPLETE STABILITY PLOTS FOR SUMMER 2010/2011 (FLAT RUN AND FAULT CONTINGENCY #12 WITH GEN-2003-013 WIND TURBINE PROTECTION DISABLED).. ERROR! BOOKMARK NOT DEFINED.

APPENDIX I –COMPLETE STABILITY PLOTS FOR WINTER 2010/2011 (FLAT RUN AND FAULT CONTINGENCY #12 WITH GEN-2003-013 WIND TURBINE PROTECTION DISABLED).. ERROR! BOOKMARK NOT DEFINED.

Report Revision History:

Date of Report	Issue	Comments
January 14, 2011	Rev. A	Draft report issued for review and approval
January 26, 2011	Rev. 0	Final report issued. Additional fault contingencies studied (#45 and #46).

Prepared by: **George S. Tsai Li** Senior Engineer S&C Electric Company	Reviewed by: **Ernst Camm** Principal Engineer S&C Electric Company
	Approved by: **Terrance A. Bellei** Power Systems Services Technical Director S&C Electric Company

EXECUTIVE SUMMARY

S&C Electric Company has performed an interconnection impact study for the Definitive Impact Study DISIS-2011-002 (Group 2) in response to a request through the Southwest Power Pool (SPP) Tariff studies. Group 2 consists of GEN-2010-001, which is a proposed 300 MW wind farm project that would tap the existing Hitchland to Woodward 345 kV line in Texas. Group 2 and prior queued projects in the SPS area were studied at 100% output power using 2010/2011 summer and winter peak loading cases provided by SPP. Wind farms at remote locations with low wind penetration were studied at 20% output power. Group 2 was studied with Suzlon 2.1 MW wind turbine generators.

Power factor analysis indicates that Group 2 should supply reactive power (up to ±95% power factor) to meet a voltage schedule of 345 kV nominal voltage at the Hitchland to Woodward tap. These requirements are summarized as follows:

- 95% lagging power factor (capacitive) at the Hitchland to Woodward tap for an outage of the GEN-2003-013 to Finney 345 kV line in the winter 2010/2011 peak case.
- 99.88 % leading power factor (inductive) at the Hitchland to Woodward tap for an outage of the Hitchland 115 kV (523093) to 230 kV (523095) transformer in the Summer 2010/2011 peak case.

Transient stability analysis indicates that Group 2 will ride through each fault contingency specified by SPP and the nearby areas will retain angular, frequency and voltage stability. Group 2 can successfully interconnect into the transmission system at the desired location without reduction in output power.

In both summer and winter cases, GEN-2003-013 will not ride through a 3-phase fault near GEN-2003-013 on the GEN-2003-013 to Finney 345 kV line due to limited low voltage ride through capability of the wind farm. No further action needs to be pursued to keep GEN-2003-013 connected. With the protection disabled at GEN-2003-013, the system will retain stability with Group 2 in service.

1. INTRODUCTION

S&C Electric Company has performed an interconnection impact study for the Definitive Impact Study DISIS-2011-002 (Group 2) in response to a request through the Southwest Power Pool (SPP) Tariff studies. Group 2 consists of GEN-2010-001, which is a proposed 300 MW wind farm project that would tap the existing Hitchland to Woodward 345 kV line in Texas. Group 2 and prior queued projects in the SPS area were studied at 100% output power using 2010/2011 summer and winter peak loading cases provided by SPP. Wind farms at remote locations with low wind penetration were studied at 20% output power. Group 2 was studied with Suzlon 2.1 MW wind turbine generators.

2. TRANSMISSION SYSTEM AND STUDY AREA

The wind generation projects in Group 2 will interconnect into Southwestern Public Service (SPS). In addition to the SPS area, the following areas were monitored:

Midwest Energy, Inc. (MIDW)

AEP West (AEPW)

Oklahoma Gas and Electric (OKGE)

Western Farmers Electric Cooperative (WFEC)

Sunflower Electric Power Company (SUNC)

Westar Energy, Inc (WERE)

3. POWER FLOW BASE CASES

The following power flow base cases were provided by SPP:

MDWG_2010_2011SP_DISIS-2010-002-G2.sav – Summer peak 2010/2011, which includes aggregate representation of wind turbine generators for Definitive Impact Study DISIS-2011-002 (Group 2) and prior queued projects at 100% output power. Other cluster projects were also included with wind farms at 20% output power.

MDWG_2010_2011WP_DISIS-2010-002-G2.sav – Winter peak 2010/2011, which includes aggregate representation of generation interconnect projects for Definitive Impact Study DISIS-2011-002 (Group 2) and prior queued projects at 100% output power. Other cluster projects were also included with wind farms at 20% output power.

4 POWER FLOW MODEL

Definitive Impact Study DISIS-2011-002 (Group 2) and prior queued projects were modeled as aggregates of wind turbine generators. The aggregate models were part of the base case supplied by SPP. Single-line diagrams and other information corresponding to the Group 2 project can be found in Appendix A.

4.1 Suzlon S88, 2.1 MW/60 Hz Wind Turbine Generator

The Suzlon S88 2.1 MW/60 Hz wind turbine generator is a wound rotor induction generator with variable slip featuring an electrical pitch system. The manufacturer provides 14 steps of capacitor banks intended for local power factor control. At full load, the wind turbine generator can operate between 0.92 inductive to 0.9995 capacitive power factor. By default, the S88 operates at unity power factor.

5. POWER FACTOR REQUIREMENTS AT THE POINT OF INTERCONNECTION

SPP has specific voltage requirements for interconnecting wind farm requests. Such projects are required to meet a voltage schedule at the POI consistent with the voltage in the SPP base case or nominal voltage, whichever is higher, for single transmission facility outage contingencies specified by SPP.

5.1 Facility Outage Contingencies

Single transmission facility outage contingencies specified by SPP are listed in Table 5.1.

Table 5.1: List of Power Flow Contingencies

Cont. No.	Type	Description
0	N-0	Normal system condition
1	N-1	Outage of the Hitchland (523097) to GEN-2003-013 (560029) 345kV line
2	N-1	Outage of the Hitchland (523097) to GEN-2005-017 (579118) 345kV line
3	N-1	Outage of the Hitchland 230kV (523095) to 345kV (523097) transformer
4	N-1	Outage of the Hitchland (523095) to Moore Co (523309) 230kV near Moore Co.
5	N-1	Outage of the GEN-2005-017 (579118) to Potter Co. (523961) 345kV line
6	N-1	Outage of the Moore Co. (523309) to Potter Co (523959) 230kV line
7	N-1	Outage of the Pringle (523267) to Harrington (523979) 230kV line
8	N-1	Outage of the GEN-2003-013 (560029) to Finney (523853) 345kV line
9	N-1	Outage of the Holcomb (531449) to Setab (531465) 345kV line
10	N-1	Outage of the Holcomb (531449) to GEN-2007-040 (531000) 345kV line
11	N-1	Outage of the Woodward (515375) to Tatonga (515407) 345kV line
12	N-1	Outage of the DWS Frisco (523160) to Lasley (523175) 115kV line
13	N-1	Outage of the Hitchland 115kV (523093) to 230kV (523095) transformer
14	N-1	Outage of the Pringle (523266) to Spearman (523186) 115kV line #1
15	N-1	Outage of the Moore Co. East 115kV (523308) to 230kV (523309) transformer
16	N-1	Outage of the Spearman (523186) to Spearman Sub (523203) 115kV line
17	N-1	Outage of the Texas Co. 115kV phase shifting transformer (523090 to 523106)
18	N-1	Outage of the Gen-2010-007 Tap (575090) to Pringle (523266) 115kV line
19	N-1	Outage of the Pringle 115kV (523266) to Pringle 230kV (523267) transformer
20	N-1	Outage of the Riverview (523377) to Harrington Tap (523352) 115kV line
21	N-1	Outage of the Hutchison 115kV (523546) to the Hutchison 230kV (523551) transformer
22	N-1	Outage of the Pringle (523266) to Q_RYTON_TP (523478) 115kV line #1
23	N-1	Outage of the TMP_MIDPT (525835) – Woodward (515375) 345 kV line
24	N-1	Outage of one of the Finney (523853) to Holcomb (531449) 345kV line
25	N-1	Outage of the Hitchland (523097) to Gen-2008-047 Tap (580500) 345kV line
26	N-1	Outage of the Woodward (515375) to Gen-2008-047 Tap (580500) 345kV line
27	N-2	Outage of the Hitchland (523097) to Gen-2008-047 Tap (580500) 345kV line and Outage of the Hitchland (523097) to Woodward (515375) 345kV line (parallel circuit)
28	N-2	Outage of the Woodward (515375) to Gen-2008-047 Tap (580500) 345kV line and Outage of the Hitchland (523097) to Woodward (515375) 345kV line (parallel circuit)

The base case voltages at the point of interconnection for summer and winter are listed in Table 5.2.

Table 5.2: Base Case Voltage at the Point of Interconnection

Point of Interconnection	Summer Peak 2010/2011 (pu)	Winter Peak 2010/2011 (pu)
Tap (580500) on Hitchland to Woodward 345kV line	0.9923	0.9862

The power factor required to maintain a voltage schedule at the POI of 1.0 per unit voltage in accordance with SPP requirements for each of the power flow contingencies in Table 5.1 is summarized in Table 5.3.

Table 5.3: Power Factor Requirements at the POI for Power Flow Contingencies in Table 5.1

Cont. No.	Summer				Winter			
	P (MW)	Q (MVAR)	Power Factor		P (MW)	Q (MVAR)	Power Factor	
0	-294.7	4.9	99.99%	leading	-294.8	-28.1	99.55%	lagging
1	-294.7	-38.4	99.16%	lagging	-294.8	-109.1	93.78%	lagging
2	-294.7	2.7	100.00%	leading	-294.8	-30.8	99.46%	lagging
3	-294.7	25.3	99.63%	leading	-294.8	9.4	99.95%	leading
4	-294.7	-1.1	100.00%	lagging	-294.8	-31.6	99.43%	lagging
5	-294.7	0.3	100.00%	leading	-294.8	-23	99.70%	lagging
6	-294.7	4.2	99.99%	leading	-294.8	-29.2	99.51%	lagging
7	-294.7	6.1	99.98%	leading	-294.8	-27.4	99.57%	lagging
8	-294.7	-222.4	79.82%	lagging	-294.8	-327.7	66.88%	lagging
9	-294.7	-20.7	99.75%	lagging	-294.8	-51.5	98.51%	lagging
10	-294.7	-93.2	95.35%	lagging	-294.8	-114.7	93.19%	lagging
11	-294.7	-18.2	99.81%	lagging	-294.8	-55.5	98.27%	lagging
12	-294.7	0.9	100.00%	leading	-294.8	-32.4	99.40%	lagging
13	-294.7	14.7	99.88%	leading	-294.8	-11.3	99.93%	lagging
14	-294.7	4.5	99.99%	leading	-294.8	-28.2	99.55%	lagging
15	-294.7	4.9	99.99%	leading	-294.8	-28.1	99.55%	lagging
16	-294.7	6.9	99.97%	leading	-294.8	-26.2	99.61%	lagging
17	-294.7	4.9	99.99%	leading	-294.8	-28.1	99.55%	lagging
18	-294.7	4.5	99.99%	leading	-294.8	-28.5	99.54%	lagging
19	-294.7	6.1	99.98%	leading	-294.8	-27.4	99.57%	lagging
20	-294.7	3.8	99.99%	leading	-294.8	-27.6	99.56%	lagging
21	-294.7	4.9	99.99%	leading	-294.8	-28.1	99.55%	lagging
22	-294.7	4.4	99.99%	leading	-294.8	-28.4	99.54%	lagging
23	-294.7	-4.2	99.99%	lagging	-294.8	-41.4	99.03%	lagging
24	-294.7	4.6	99.99%	leading	-294.8	-28.4	99.54%	lagging
25	-294.7	5.2	99.98%	leading	-294.8	-4.4	99.99%	lagging
26	-294.8	-46.9	98.76%	lagging	-294.8	-70.5	97.26%	lagging
27	-294.7	8.6	99.95%	leading	-294.7	0.6	99.99%	leading
28	-294.8	-67.0	97.51%	lagging	-294.8	-103.6	94.34%	lagging

Outage of the GEN-2003-013 to Finney 345 kV line would result in power factor requirements for the summer and winter cases, which would exceed the capability normally expected from wind generation projects consisting of asynchronous generators. Outage of the

Hitchland to GEN-2003-013 345 kV line or outage of the Holcomb to GEN-2007-040 345 kV line in the winter peak case would also result in a power factor requirements that exceed the capability normally expected from wind generation projects.

The S88 is capable of supplying reactive power at 0.9995 lagging power factor at rated voltage. To deliver additional capacitive reactive power in order to meet the schedule at the POI of 1.0 per unit voltage, external sources of reactive power such as capacitor banks will be needed. Wind farms are not required by FERC 661-A to operate at the POI beyond a power factor range of ±95% for voltages from 95 to 105% of nominal; therefore, capacitors were sized to meet the FERC 661-A power factor requirements for an outage of the GEN-2003-013 to Finney 345 kV line.

The sizes of the capacitor banks located at 34.5 kV are limited by the top rating of the substation transformers. For study purposes, a total of 57.6 MVAR capacitor banks were specified for each 34.5 kV substation and a single 50 MVAR capacitor bank for the 345 kV substation. Each 34.5 kV capacitor bank could be half of the total MVAR (i.e., 28.8 MVAR) to limit the voltage step change to less than 3%. Figure 5.1 shows the power flow model of Group 2 for winter peak (normal system condition). Notice that only one 28.8 MVAR capacitor bank is switched on at each 34.5 kV bus although two capacitor banks could be online for a number of outage contingencies.

Table 5.4: Summary of wind farm control, capacitor bank sizes and transformer tap settings

Project Name	Wind Turbine Generator			Voltage Schedule at POI to be Met by Project Request		Cap Bank Requirement	XFMR No-Load Tap Setting (% of High Side Winding)	
	Make	PF Range (%)	Control Scheme	Summer (per unit)	Winter (per unit)		Substation XFMR	WTG GSU
GEN-2010-001	Suzlon S88, 2.1 MW	-92 to 99.95	Operate at unity power factor at the terminals of the turbines	1.00	1.00	Two (2) 28.8 MVAR @34.5 kV Bus #1 Two (2) 28.8 MVAR @34.5 kV Bus #2 One (1) 50 MVAR@345 kV	102.5	100

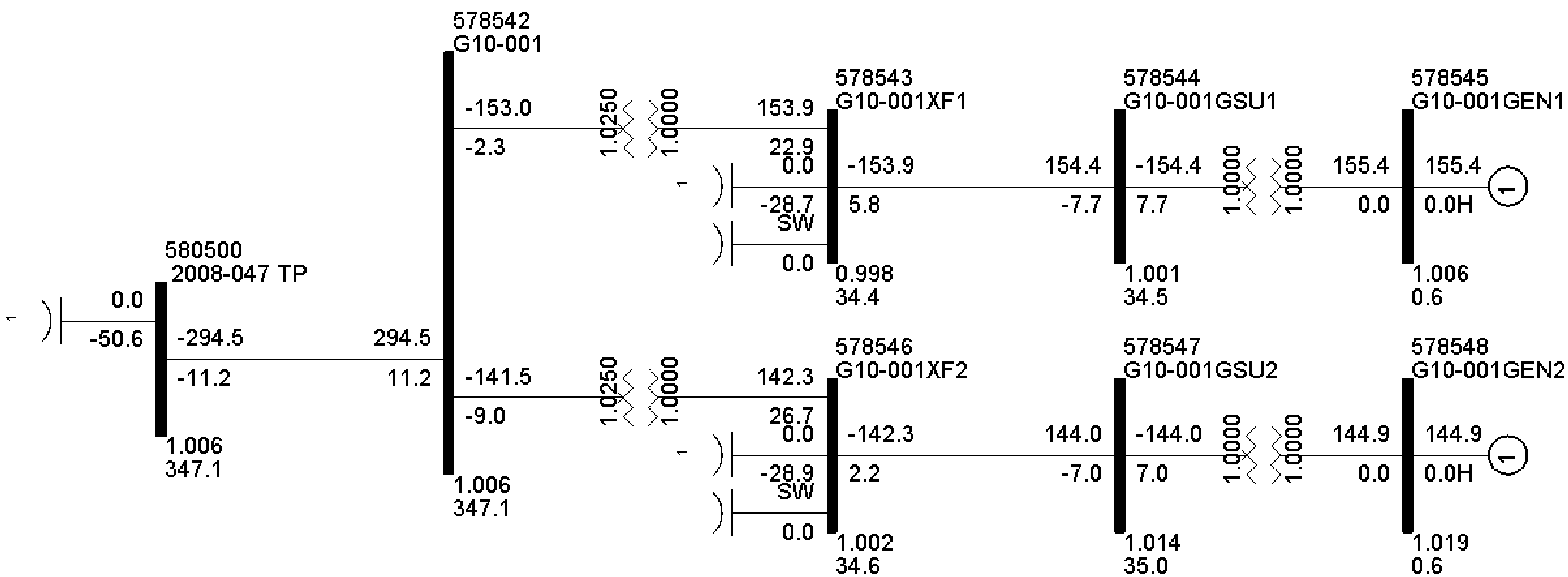

Figure 5.1: Power Flow Diagram of Group 2 for Winter Peak (Normal System Condition)

6. TRANSIENT STABILITY ANALYSIS

Transient stability analysis was performed for the fault contingencies in Table 6.1, which were specified by SPP.

Table 6.1: SPP fault contingencies

Cont. No.	Cont. Name	Description
1	FLT01-3PH	3 phase fault on the Hitchland (523097) to GEN-2003-013 (560029) 345kV line, near Hitchland.
		a. Apply fault at the Hitchland 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
2	FLT02-1PH	Single phase fault on the line in previous
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
3	FLT03-3PH	3 phase fault on the Hitchland (523097) to GEN-2005-017 (579118) 345kV line, near Hitchland.
		a. Apply fault at the Hitchland 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
4	FLT04-1PH	Single phase fault on the line in previous
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
5	FLT07-3PH	3 phase fault on the Hitchland 230kV (523095) to 345kV (523097) transformer, near the 230kV bus.
		a. Apply fault at the Hitchland 230kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer.
6	FLT08-3PH	3 phase fault on the Hitchland (523095) to Moore Co (523309) 230kV near Moore Co.
		a. Apply fault at the Moore Co 230kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
7	FLT09-3PH	3 phase fault on the GEN-2005-017 (579118) to Potter Co. (523961) 345kV line, near GEN-2005-017.
		a. Apply fault at the GEN-2005-017 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
8	FLT10-1PH	Single phase fault on the line in previous
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
9	FLT11-3PH	3 phase fault on the Moore Co. (523309) to Potter Co (523959) 230kV line, near Potter Co.
		a. Apply fault at the Potter Co. 230kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.

Cont. No.	Cont. Name	Description
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
10	FLT12-3PH	3 phase fault on the Pringle (523267) to Harrington (523979) 230kV line, near Pringle.
		a. Apply fault at the Pringle 230kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
11	FLT13-1PH	*Single phase fault and sequence like previous*
12	FLT14-3PH	3 phase fault on the GEN-2003-013 (560029) to Finney (523853) 345kV line, near GEN-2003-013.
		a. Apply fault at the GEN-2003-013 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line
13	FLT15-1PH	Single phase fault on the line in previous
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
14	FLT16-3PH	3 phase fault on the Holcomb (531449) to Setab (531465) 345kV line, near Holcomb.
		a. Apply fault at the Holcomb 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
15	FLT17-1PH	*Single phase fault and sequence like previous*
16	FLT18-3PH	3 phase fault on the Holcomb (531449) to GEN-2007-040 (531000) 345kV line, near Holcomb.
		a. Apply fault at the Holcomb 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
17	FLT19-1PH	*Single phase fault and sequence like previous*
18	FLT20-3PH	3 phase fault on the Woodward (515375) to Tatonga (515407) 345kV line, near Woodward.
		a. Apply fault at the Woodward 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
19	FLT23-3PH	3 phase fault on the DWS Frisco (523160) to Lasley (523175) 115kV line, near DWS Frisco.
		a. Apply fault at the DWS Frisco 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line (all segments listed above).
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
20	FLT24-1PH	*Single phase fault and sequence like previous*
21	FLT27-3PH	3 phase fault on the Hitchland 115kV (523093) to 230kV (523095) transformer, near the 115 kV bus.
		a. Apply fault at the Hitchland 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer.
22	FLT28-3PH	3 phase fault on the Pringle (523266) to Spearman (523186) 115kV line #1, near Pringle.
		a. Apply fault at the Pringle 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.

Cont. No.	Cont. Name	Description
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
23	FLT29-1PH	*Single phase fault and sequence like previous*
24	FLT36-3PH	3 phase fault on the Moore Co. East 115kV (523308) to 230kV (523309) transformer, near the 115 kV bus.
		a. Apply fault at the Moore Co. East 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer.
25	FLT37-1PH	*Single phase fault and sequence like previous*
26	FLT38-3PH	3 phase fault on the Spearman (523186) to Spearman Sub (523203) 115kV line, near Spearman.
		a. Apply fault at the Spearman 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
27	FLT39-1PH	*Single phase fault and sequence like previous*
28	FLT40-3PH	3 phase fault on the Texas Co. 115kV phase shifting transformer (523090 to 523106), near the main 115 kV bus.
		a. Apply fault at the main Texas Co. 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer.
29	FLT41-3PH	3 phase fault on the Gen-2010-007 Tap (575090) to Pringle (523266) 115kV line, near Gen-2010-007 Tap.
		a. Apply fault at the Gen-2010-007 Tap 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
30	FLT42-1PH	*Single phase fault and sequence like previous*
31	FLT45-3PH	3 phase fault on the Pringle 115kV (523266) to Pringle 230kV (523267) transformer near the 115 kV bus.
		a. Apply fault at the Pringle 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer.
32	FLT46-3PH	3 phase fault on the Riverview (523377) to Harrington Tap (523352) 115kV line, near Riverview.
		a. Apply fault at the Riverview 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
33	FLT47-1PH	*Single phase fault and sequence like previous*
34	FLT50_3PH	3 phase fault on the Hutchison 115kV (523546) to the Hutchison 230kV (523551) transformer near the 115 kV bus.
		a. Apply fault at the Hutchison 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer.
35	FLT51-3PH	3 phase fault on the Pringle (523266) to Q_RYTON_TP (523478) 115kV line #1, near Pringle.
		a. Apply fault at the Pringle 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Cont. No.	Cont. Name	Description
36	FLT52-1PH	*Single phase fault and sequence like previous*
37	FLT53-3PH	3 phase fault on the TMP_MIDPT (525835) – Woodward (515375) 345 kV line, at TMP_MIDPT (525835).
		a Apply fault at TMP_MIDPT (525835)
		b. Clear fault after 5 cycles, and
		c. Trip TMP_MIDPT (525835) – Woodward (515375) 345kV, and
		d. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		e. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
38	FLT54-1PH	*Single phase fault and sequence like previous*
39	FLT55-3PH	3 phase fault on one of the Finney (523853) to Holcomb (531449) 345kV lines, near Finney.
		a. Apply fault at the Finney 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
40	FLT56-1PH	Single phase fault on the line in previous
		a. Apply single phase fault.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
41	FLT57-3PH	3 phase fault on the Hitchland (523097) to Gen-2008-047 Tap (580500) 345kV lines, near Hitchland.
		a. Apply fault at the Hitchland 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
42	FLT58-1PH	Single phase fault on the line in previous
		a. Apply single phase fault.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
43	FLT59-3PH	3 phase fault on the Woodward (515375) to Gen-2008-047 Tap (580500) 345kV lines, near Woodward.
		a. Apply fault at the Woodward 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
44	FLT60-1PH	Single phase fault on the line in previous
		a. Apply single phase fault.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
45	FLT61-3PH	3 phase fault on the Hitchland (523097) to Gen-2008-047 Tap (580500) 345kV lines, near Hitchland. a. Apply fault at the Hitchland 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line and also tripping the Hitchland (523097) to Woodward (515375) 345kV line (parallel line) at the same time.
46	FLT62-3PH	3 phase fault on the Woodward (515375) to Gen-2008-047 Tap (580500) 345kV lines, near Woodward. a. Apply fault at the Woodward 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line and also tripping the Hitchland (523097) to Woodward (515375) 345kV line (parallel line) at the same time.

Single line to ground faults were simulated in a manner consistent with currently accepted practices, that is to assume that a single line to ground will cause a voltage drop at the fault location of 60% of nominal.

The prior queued projects monitored are listed in Table 6.2.

Table 6.2: Prior queued wind farm projects monitored

Request	Size (MW)	Wind Turbine Model	Point of Interconnection
GEN-2002-006	150	GE 1.5MW	Texas Co. 115kV (523090)
GEN-2002-008	240	GE 1.5MW	Hitchland 345kV (523097)
GEN-2002-009	80	Suzlon 2.1MW	Hansford 115kV (523195)
GEN-2003-013	196	GE 1.5 MW	Hitchland – Finney 345kV (560029)
GEN-2003-020	160	GE 1.5 MW	Martin 115 kV (523928)
GEN-2005-017	340	GE 1.5 MW	Hitchland – Potter 345kV (579118)
GEN-2006-020	19.5	GE 1.5 MW	Hitchland – Lasley Tap 115 kV(523160)
GEN-2006-044	370	GE 1.5 MW	Hitchland 345kV (523097)
GEN-2006-049	400	GE 1.5 MW	Hitchland – Finney 345kV (560029)
GEN-2007-046	199.5	GE 1.5MW	Hitchland 115kV (523093)
GEN-2007-057	34.5	GE 1.5MW	Moore Co. East 115kV (523308)
GEN-2008-047	300	GE 1.5MW	Tap (580500) on Hitchland to Woodward 345kV line
GEN-2008-110	300	GE 1.5MW	Hitchland 345kV (523097)
GEN-2010-007	73.8	Vestas V100 1.8MW	Riverview 115 kV Tap (523377)
GEN-2010-014	358.8	Siemens SWT 2.3MW	Hitchland 345kV (523097)

6.1 Stability Criteria

Disturbances including three-phase and single-phase to ground faults should not cause synchronous and asynchronous plants to become unstable or disconnect from the transmission grid.

The criterion for synchronous generator stability as defined by NERC is:

“Power system stability is defined as that condition in which the difference of the angular positions of synchronous machine rotor becomes constant following an aperiodic system disturbance.”

Voltage magnitudes and frequencies at terminals of asynchronous generators should not exceed magnitudes and durations that will cause protection elements to operate. Furthermore, the response after the disturbance needs to be studied at the terminals of the machine to insure that there are no sustained oscillations in power output, speed, frequency, etc.

Voltage magnitudes and angles after the disturbance should settle to a constant and reasonable operating level. Frequencies should settle to the nominal 60 Hz power frequency.

6.2 *Suzlon S88, 2.1 MW/60 Hz Wind Turbine Generator*

Dynamic simulations used Version V418_V3_60 of the Suzlon S88 model with PSS/E 30.3.3. Default voltage and frequency relay settings were used to evaluate low voltage ride through (LVRT) capabilities of Group 2.

Table 6.3: Suzlon S88, 2.1 MW Voltage and Frequency Protection Settings

Relay type	Description	Trip setting and time delay	Units
Undervoltage (27-1)	Relay trips if |Vbus|< for t =	0.90 1800	Pu S
Undervoltage (27-2)	Relay trips if |Vbus|< for t =	0.80 2.50	Pu S
Undervoltage (27-3)	Relay trips if |Vbus|< for t =	0.55 1.75	Pu S
Undervoltage (27-4)	Relay trips if |Vbus|< for t =	0.30 1.12	Pu S
Undervoltage (27-5)	Relay trips if |Vbus|< for t =	0.15 1.12	Pu S
Overvoltage (59-1)	Relay trips if |Vbus|> for t =	1.15 60.00	Pu S
Overvoltage (59-2)	Relay trips if |Vbus|> for t =	1.20 1.00	Pu S
Underfrequency (81U-1)	Relay trips if Fbus < for t =	57 1.00	Hz S
Overfrequency (81O-1)	Relay trips if Fbus > for t =	63 1.00	Hz S

6.4 Transient Stability Results

Undisturbed runs of 10 seconds were performed with the summer and winter peak cases to verify proper initialization of dynamic models. GEN-2006-046, which was being dispatched in the summer and winter power flow cases at 20% of rated output power, failed to initialize properly and disconnected during initialization. This is likely due to a problem with the Mitsubishi MWT-92/95 model or the result of a negative interaction with another model. The problem has been discussed with SPP previously. The presence or absence of GEN-2006-046 has little impact on the results due to its low penetration into the SPS area.

Results are consistent between the summer and winter peak cases. In both summer and winter cases, GEN-2003-013 will not ride through fault #12, which is a 3-phase fault near GEN-2003-013 on the GEN-2003-013 to Finney 345 kV line. This result cannot be attributed to Group 2 since the same result has been observed with Group 2 out of service. Instead, GEN-2003-013 fails to ride through due to limited voltage ride through capability. No further action needs to be pursued to keep GEN-2003-013 connected. With the protection disabled at GEN-2003-013, the system will retain stability with Group 2 in service.

Group 2 will ride through each fault disturbance in Table 6.1. Voltage, frequency and angular stability will be retained. Transient stability plots of the undisturbed runs and #1 through #46 fault contingencies for summer and winter can be found in the Appendix section of this report.

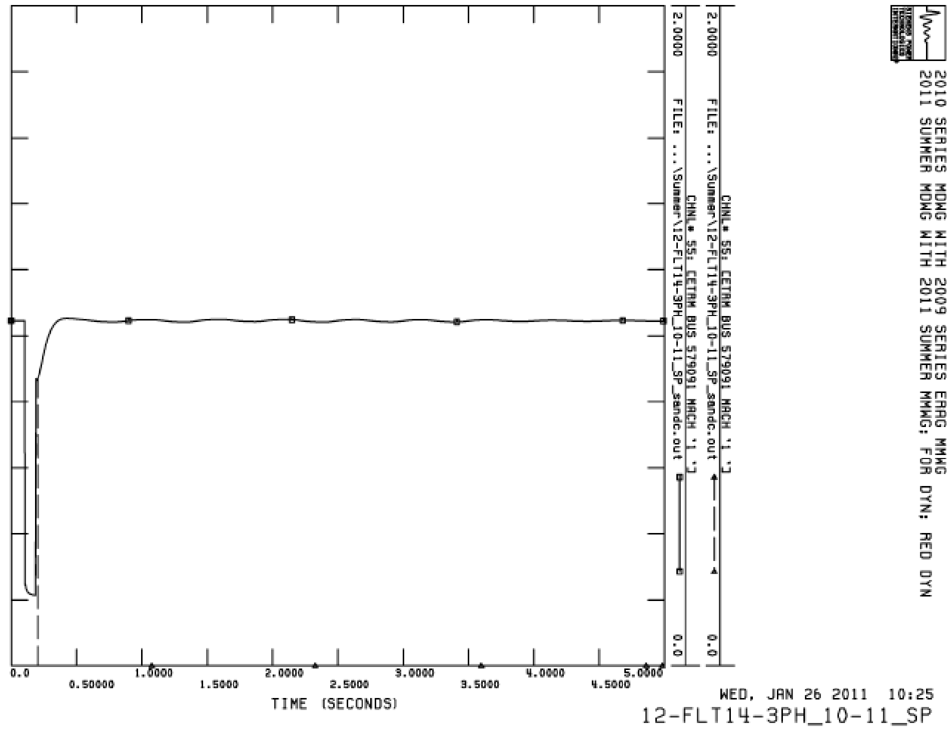

Figure 6.1: Terminal Voltage of GEN-2003-013 Turbines with Voltage Protection Enabled (dashed) and Disabled (solid) for Summer Peak

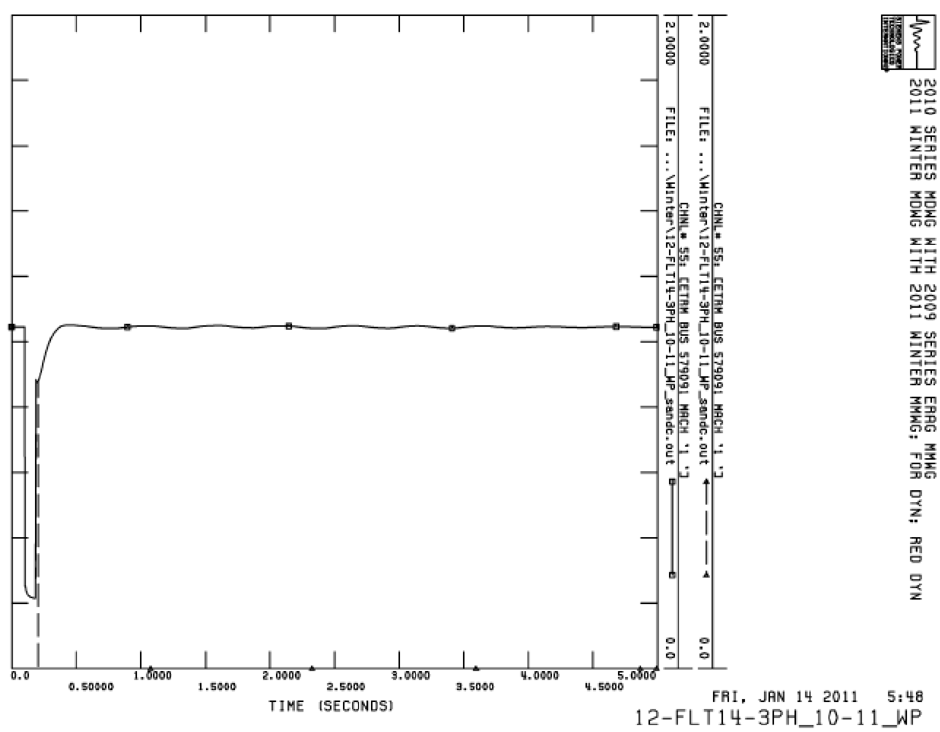

Figure 6.2: Terminal Voltage of GEN-2003-013 Turbines with Voltage Protection Enabled (dashed) and Disabled (solid) for Winter Peak

Table 6.4: Summary of Transient Stability Results

Cont. No.	Cont. Name	Summer Peak 2010/2011	Winter Peak 2010/2011
1	FLT01-3PH	STABLE	STABLE
2	FLT02-1PH	STABLE	STABLE
3	FLT03-3PH	STABLE	STABLE
4	FLT04-1PH	STABLE	STABLE
5	FLT07-3PH	STABLE	STABLE
6	FLT08-3PH	STABLE	STABLE
7	FLT09-3PH	STABLE	STABLE
8	FLT10-1PH	STABLE	STABLE
9	FLT11-3PH	STABLE	STABLE
10	FLT12-3PH	STABLE	STABLE
11	FLT13-1PH	STABLE	STABLE
12	FLT14-3PH	STABLE	STABLE
13	FLT15-1PH	STABLE	STABLE
14	FLT16-3PH	STABLE	STABLE
15	FLT17-1PH	STABLE	STABLE
16	FLT18-3PH	STABLE	STABLE
17	FLT19-1PH	STABLE	STABLE
18	FLT20-3PH	STABLE	STABLE
19	FLT23-3PH	STABLE	STABLE
20	FLT24-1PH	STABLE	STABLE
21	FLT27-3PH	STABLE	STABLE
22	FLT28-3PH	STABLE	STABLE
23	FLT29-1PH	STABLE	STABLE
24	FLT36-3PH	STABLE	STABLE
25	FLT37-1PH	STABLE	STABLE
26	FLT38-3PH	STABLE	STABLE
27	FLT39-1PH	STABLE	STABLE
28	FLT40-3PH	STABLE	STABLE
29	FLT41-3PH	STABLE	STABLE
30	FLT42-1PH	STABLE	STABLE
31	FLT45-3PH	STABLE	STABLE
32	FLT46-3PH	STABLE	STABLE
33	FLT47-1PH	STABLE	STABLE
34	FLT50_3PH	STABLE	STABLE
35	FLT51-3PH	STABLE	STABLE
36	FLT52-1PH	STABLE	STABLE
37	FLT53-3PH	STABLE	STABLE
38	FLT54-1PH	STABLE	STABLE
39	FLT55-3PH	STABLE	STABLE
40	FLT56-1PH	STABLE	STABLE
41	FLT57-3PH	STABLE	STABLE
42	FLT58-1PH	STABLE	STABLE
43	FLT59-3PH	STABLE	STABLE
44	FLT60-1PH	STABLE	STABLE

Cont. No.	Cont. Name	Summer Peak 2010/2011	Winter Peak 2010/2011
45	FLT61-3PH	STABLE	STABLE
46	FLT62-3PH	STABLE	STABLE

7. CONCLUSIONS AND RECOMMENDATIONS

Transient analysis results indicate that definitive Impact Study DISIS-2011-002 (Group 2) can successfully interconnect into the transmission system at 100% output power and at the desired location.

Group 2 must meet the following power factor requirements:

- 95% lagging power factor (capacitive) at the Hitchland to Woodward tap for an outage of the GEN-2003-013 to Finney 345kV line in the winter 2010/2011 peak case.
- 99.88 % leading power factor (inductive) at the Hitchland to Woodward tap for an outage of the Hitchland 115kV (523093) to 230 kV (523095) transformer in the Summer 2010/2011 peak case.

K: Stability Study for Group 3

SPP DISIS-2010-002 Group 3 Definitive Impact Study

Draft Report for

Southwest Power Pool

Prepared by:
Excel Engineering, Inc.

January 31, 2011

Principal Contributor:

William Quaintance, P.E.

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0. Certification

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the Laws of the State of **Kansas**.

William Quaintance
Kansas License Number 20756

1. Background and Scope

The DISIS-2010-002 Group 3 Definitive Impact Study is a generation interconnection study performed by Excel Engineering, Inc. for its non-affiliated client, Southwest Power Pool (SPP). Its purpose is to study the impacts of interconnecting the projects shown in Table 1-1. The in-service date assumed for the generation addition was 2011.

Table 1-1. Interconnection Requests Evaluated in this Study

Request	Size	Wind Turbine Model	Point of Interconnection	POI Bus	Gen Buses
GEN-2010-027	900.0	GE 2.5 MW	Comanche 345kV (765341)	765341	580030 580034 580038 580042
GEN-2010-045	197.8	Siemens 2.3MW	Holcomb (531449) – Spearville (531469) 345kV. (Bus 531000)	531000	580054 580055
GEN-2010-049	49.6	GE 1.6MW	Pratt 115kV (539687)	539687	580004
GEN-2010-052	301.3	Siemens 2.3MW	Finney 345kV (523853)	523853	580019
GEN-2010-053	199.8	Vestas V90 1.8MW	Comanche 345kV (765341)	765341	580069

The prior-queued requests shown in Table 1-2 were included in this study and dispatched at 100% of rated capacity.

The study included stability analysis of each proposed interconnection request. Contingencies that resulted in a prior-queued project tripping off-line, if any, were re-run with the prior-queued project's voltage and frequency tripping disabled. A power factor analysis was performed for the wind farms in Table 1-1.

ATC (Available Transfer Capability) studies were not performed as part of this study. These studies will be required at the time transmission service is actually requested. Additional transmission upgrades may be required based on that analysis.

Study assumptions in general have been based on Excel's knowledge of the electric power system and on the specific information and data provided by SPP. The accuracy of the conclusions contained within this study is sensitive to the assumptions made with respect to generation additions and transmission improvements being contemplated. Changes in the assumptions of the timing of other generation additions or transmission improvements will affect this study's conclusions.

Table 1-2. Nearby Interconnection Requests Already in the Queue

Request	Size	Wind Turbine Model	Point of Interconnection	POI Bus	Gen Buses
GEN-2001-039A	105	Clipper 2.5MW	FTDODGE3 (539671) – Greensburg 115kV (539664) POI - (579025)	579025	579028
GEN-2002-025A	150	GE 1.5 MW	Spearville 230kV (539695)	539695	562102
GEN-2004-014	154.5	GE 1.5 MW	Spearville 230kV (539695)	539695	562701
GEN-2005-012	249	Vestas V90 3.0MW	Spearville 345kV (531469)	531469	561805 561806
GEN-2006-006	205.5	GE 1.5 MW	Spearville 345kV (531469)	531469	562704
GEN-2006-021	100	Clipper 2.5MW	Tap Harper (539668) – Medicine Lodge (539674) 138kV. (Bus 539638)	539638	579142
GEN-2006-022	150	Clipper 2.5MW	Pratt 115kV (539687)	539687	579146
GEN-2007-038	200	Clipper 2.5MW	Spearville 345kV (531469)	531469	1381 1382
GEN-2007-040	200.1	Siemens 2.3MW	Holcomb (531449) – Spearville (531469) 345kV. (Bus 531000)	531000	531004
GEN-2008-018	405	GE 1.5 MW	Finney 345kV (523853)	523853	1181 1182
GEN-2008-079	100.5	G.E. 1.5 MW	Tap Cudahy (539659) – Judson Large (539671) 115kV. (Bus 573029)	573029	573023
GEN-2008-124	200.1	Siemens 2.3MW	Spearville (531469) 345kV	531469	128 224
GEN-2009-059	100.5	GE 1.5MW	Tap G08-79T – Cudahy 115kV (573029-539659) POI - (560280)	560280	575023
GEN-2009-062	115	GENROU	Hugoton 115kV (531481)	531481	575141
GEN-2010-009	165.6	Siemens 2.3MW	Gray County 345kV (531000)(G07-040-POI)	531000	575124
GEN-2010-015	200.1	Siemens 2.3MW	Spearville 345kV (531469)	531469	576300 576310
GEN-2010-016	199.8	Vestas V90 1.8MW	Tap Spearville (531469) – POSTROCK (530583) 345kV POI - (576704)	576704	576700

2. Executive Summary

The DISIS-2010-002 Group 3 Definitive Impact Study evaluated the impacts of interconnecting the Table 1-1 study projects to the SPP transmission system.

Numerous stability problems were seen in the initial simulations. Some wind farms went unstable, some tripped, and the simulation program crashed. The first issue was traced to the 345-kV transmission line connecting the 900 MW GEN-2010-027 wind farm to Comanche (aka Clark) 345 kV substation. The final solution for GEN-2010-027 interconnection is to use Option B1, splitting GEN-2010-027 onto two separate 345 kV interconnection lines. Secondly, a new Clark-Beaver 345 kV line is required to maintain stability of the Group 3 projects. Finally, the Spearville-Mullergren-Circle-Reno 345 kV double circuit included in the base cases is a pre-requisite for the DISIS-2010-002 Group 3 projects.

Power factor and capacitor requirements for the Group 3 projects are listed in Table 4-2.

With the assumptions and upgrades described in this report, DISIS-2010-002 Group 3 should be able to connect without causing any stability problems on the SPP transmission grid.

Any change in system or wind farm models or assumptions could change these results.

3. Study Development and Assumptions

3.1 Simulation Tools

The Siemens Power Technologies, Inc. PSS/E power system simulation program Version 30.3.3 was used in this study.

3.2 Models Used

SPP provided its latest stability database cases for both summer and winter peak seasons. The model included the study and prior-queued projects. Power flow one-line diagrams of the study projects are shown in Figure 3-1 through Figure 3-8. Figure 3-1 through Figure 3-4 show the four different connection options for GEN-2010-027 studied in this project.

Transmission lines and substation transformers are modeled explicitly in the power flow cases. The 34.5 kV collector systems and wind turbines are modeled as a single equivalent for each substation transformer. Steady-state and dynamic model data for the study plants are given in Appendix D.

A review of all study plant models found unusually high reactive power losses in the GEN-2010-052 substation transformer. After discussions with the requester, this transformer impedance was reduced from 16% to 11% on OA rating.

A one-line diagram of the 345 kV system in the Group 3 area is shown in Appendix E.

No special modeling is required of line relays in these cases, except for the special modeling related to the wind-turbine tripping.

3.3 Monitored Facilities

All generators and transmission buses in Areas 520, 524, 525, 526, 531, 534, 536, 539, 541, 640, 645, 650, and 652 were monitored.

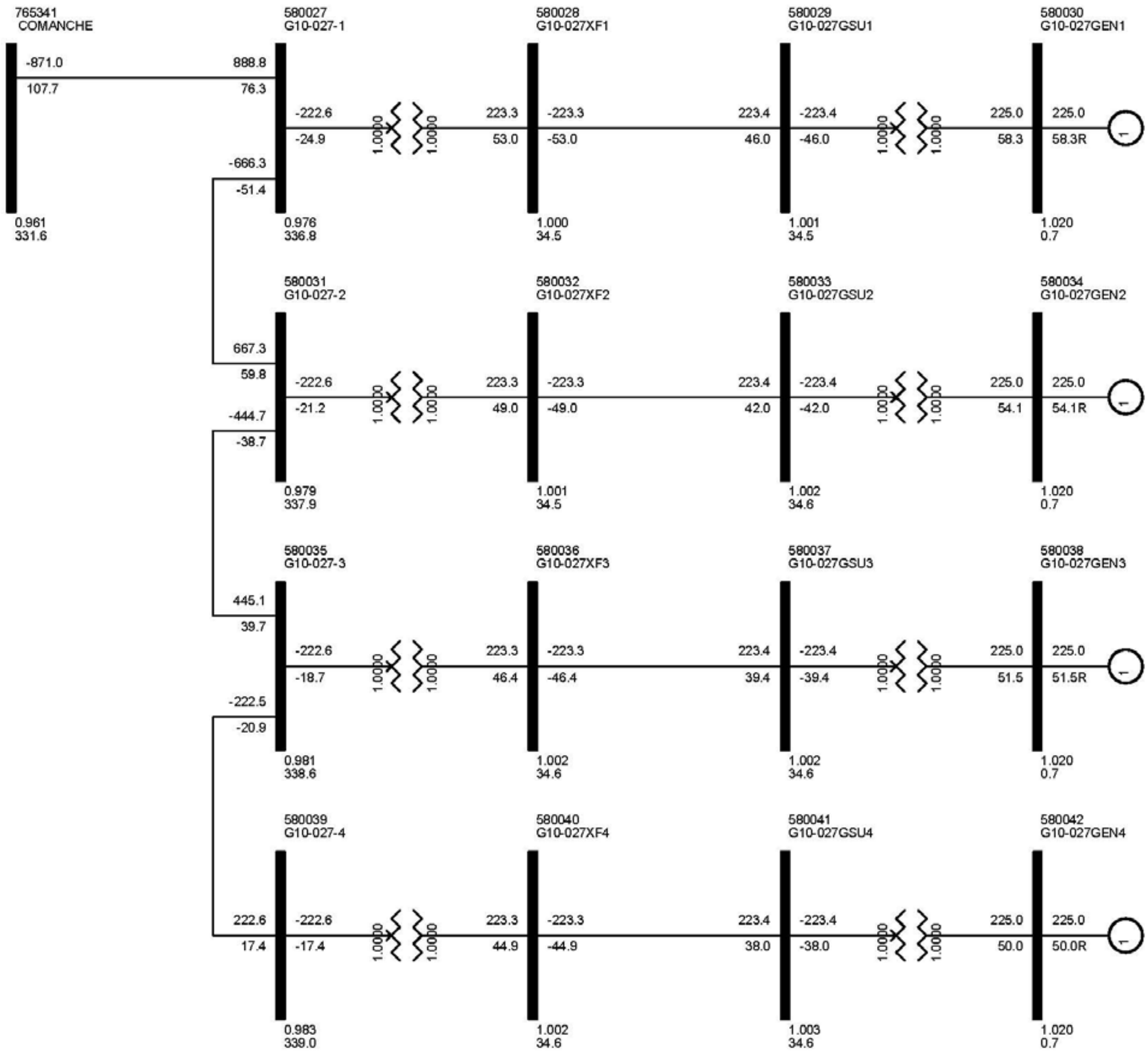

Figure 3-1. Power Flow One-line for GEN-2010-027 – Original Design

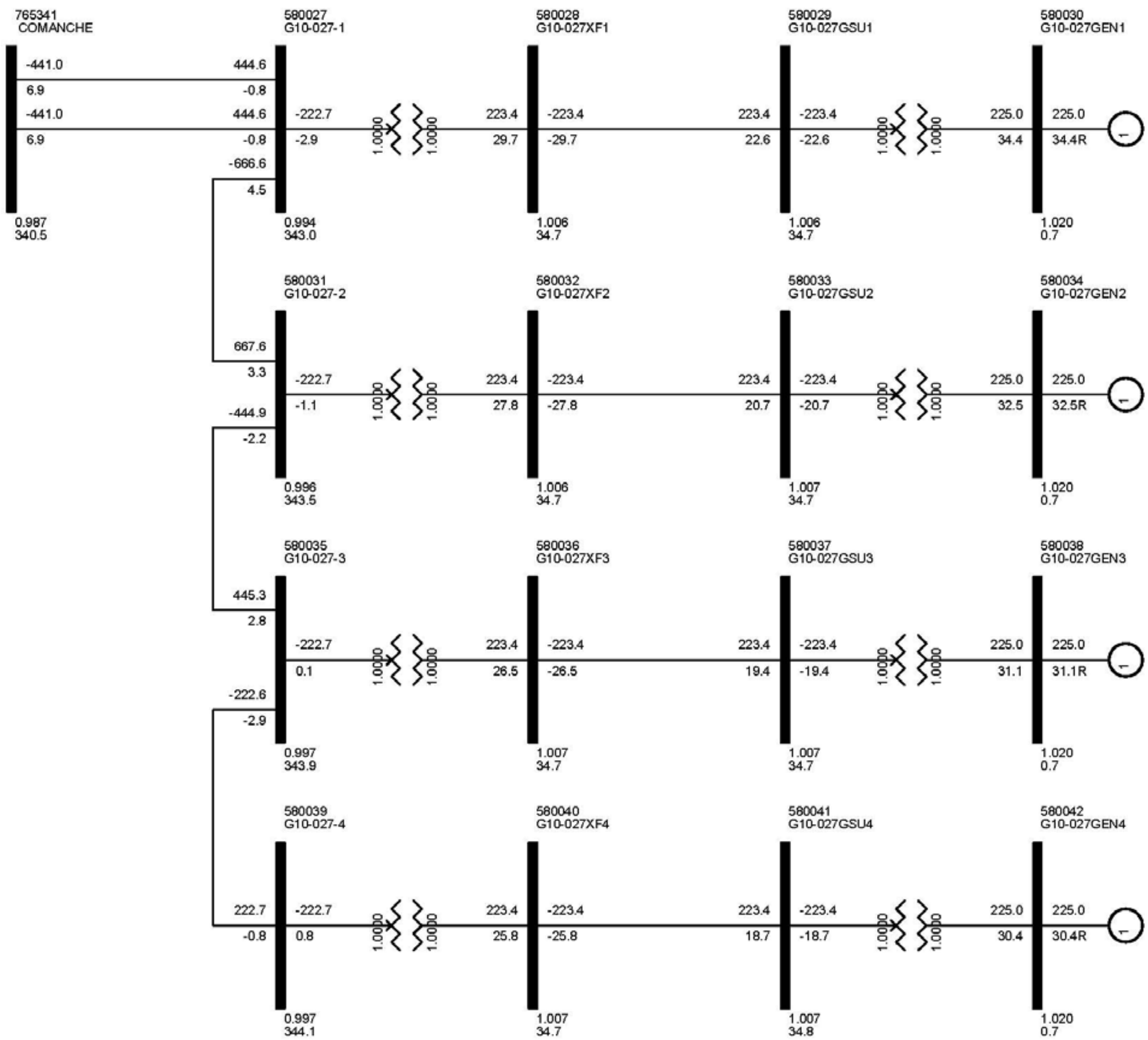

Figure 3-2. Power Flow One-line for GEN-2010-027 – Double Circuit Interconnection

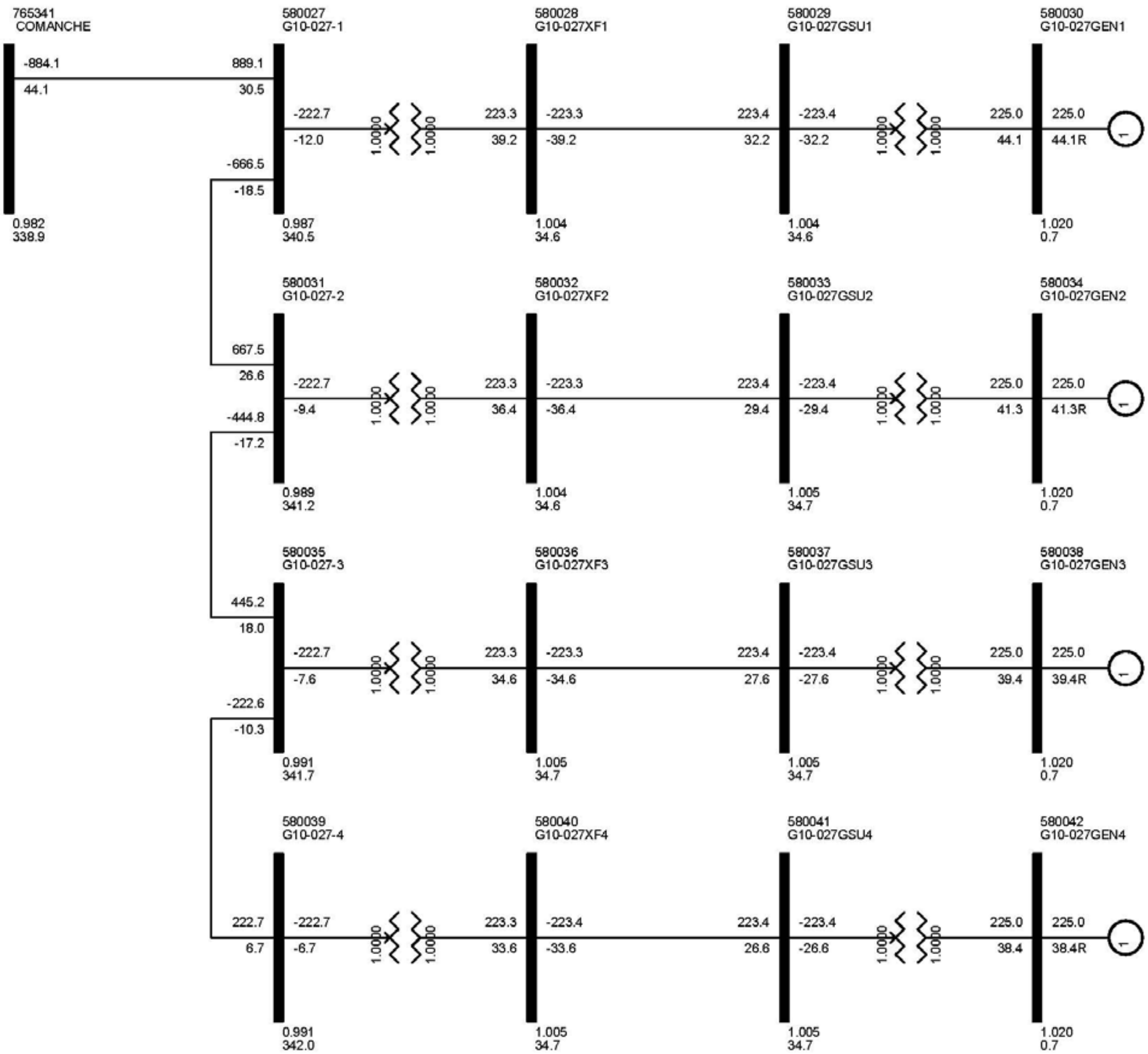

Figure 3-3. Power Flow One-line for GEN-2010-027 – Option A1, Quad Bundle Interconnection

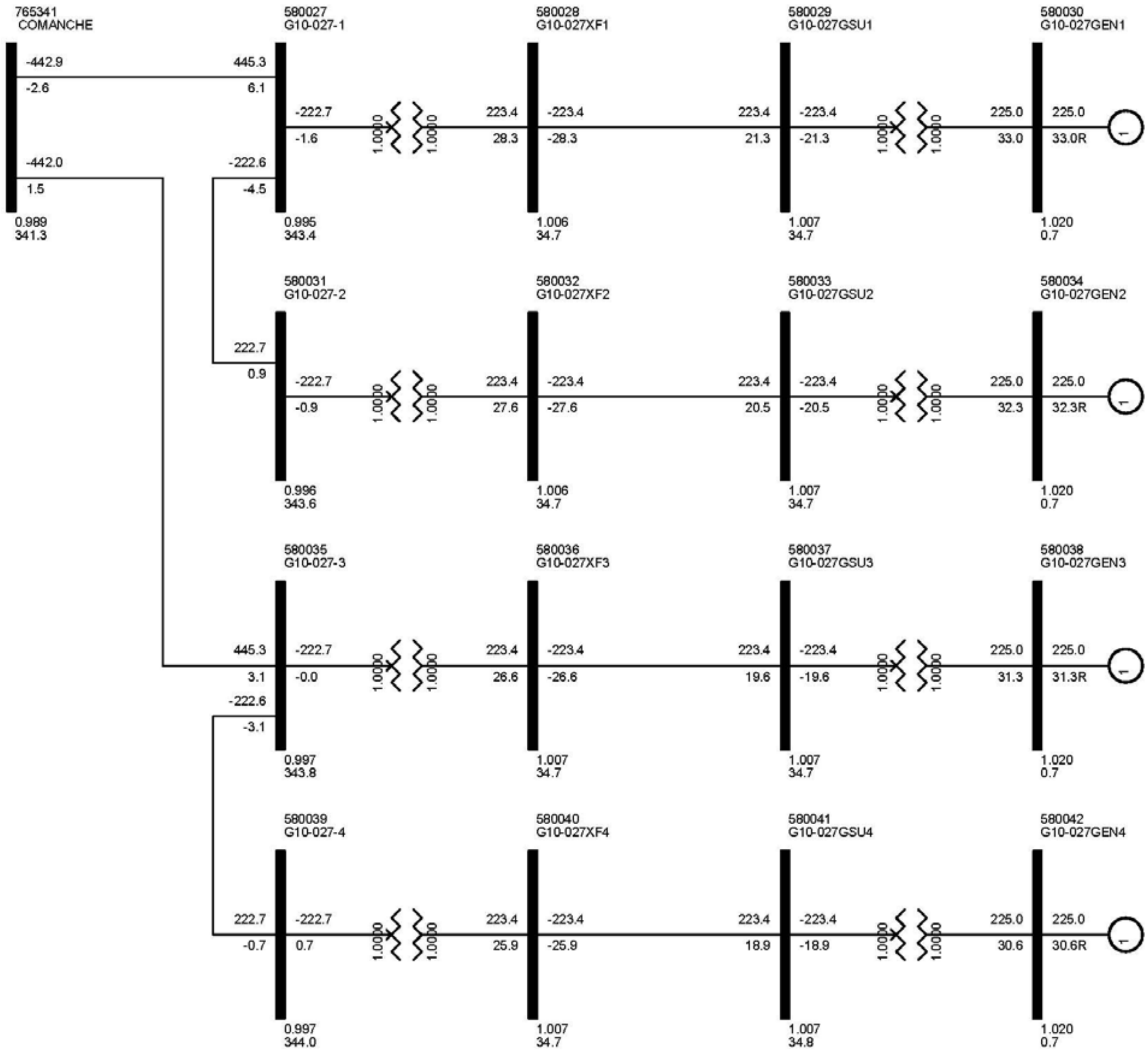

Figure 3-4. Power Flow One-line for GEN-2010-027 – Option B1, Split Interconnection

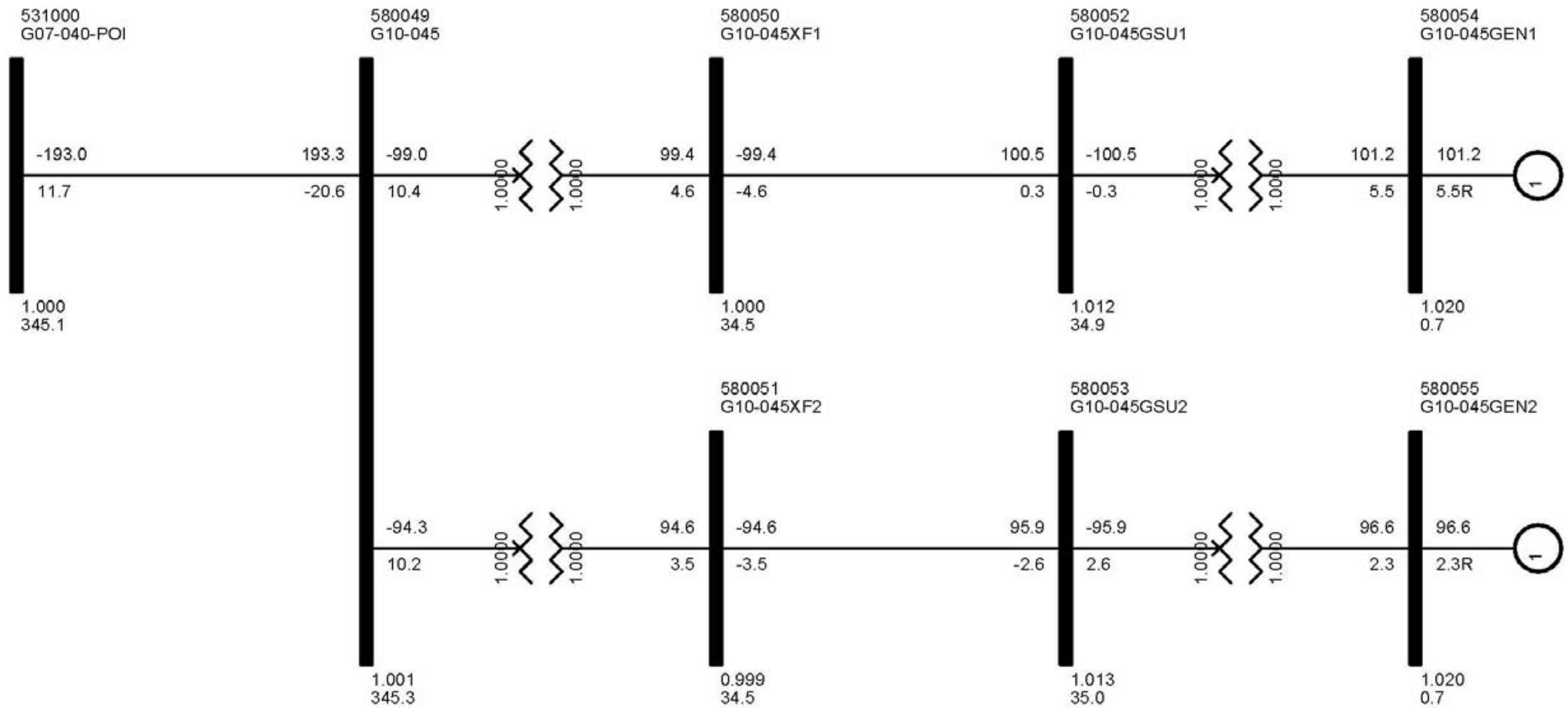

Figure 3-5. **Power Flow One-line for GEN-2010-045**

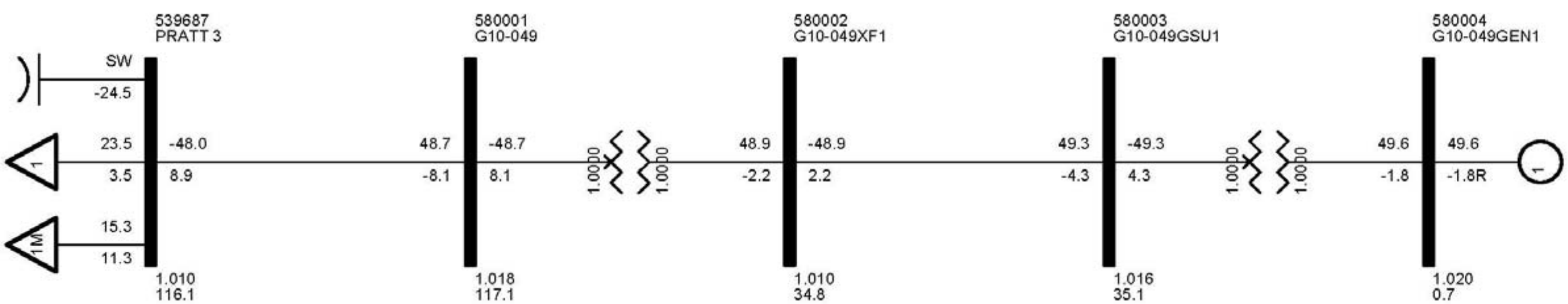

Figure 3-6. **Power Flow One-line for GEN-2010-049**

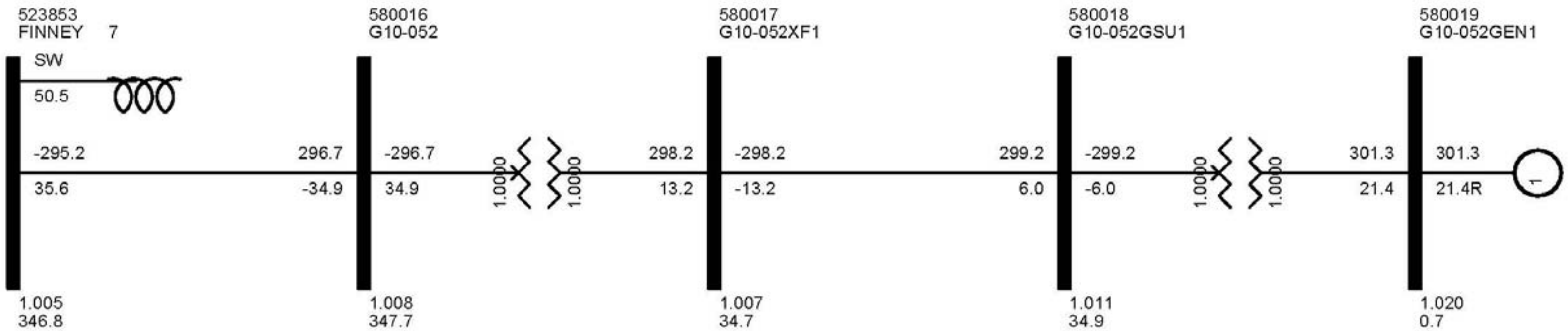

Figure 3-7. Power Flow One-line for GEN-2010-052

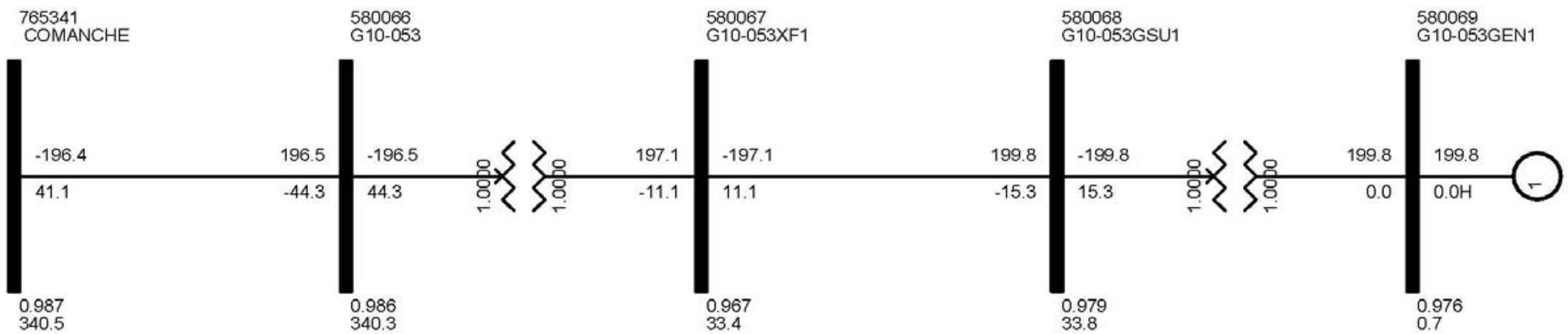

Figure 3-8. Power Flow One-line for GEN-2010-053

3.4 Performance Criteria

Any wind generators must comply with FERC Order 661A on low voltage ride through for wind farms. Therefore, the wind generators should not trip off line for faults for under voltage relay actuation. If a wind generator trips off line, an appropriately sized SVC or STATCOM device may need to be specified to keep the wind generator on-line for the fault. SPP was consulted to determine if the addition of an SVC or STATCOM is warranted for the specific condition.

Contingencies that resulted in a prior-queued project tripping off-line, if any, were re-run with the prior-queued project's voltage and frequency tripping disabled to check for stability issues.

3.5 Performance Evaluation Methods

A power factor analysis was performed for all study projects that are wind farms. The power factor analysis consisted of modeling a var generator in each wind farm holding a voltage schedule at the POI. The voltage schedule was set to the higher of the voltage with the wind farm off-line or 1.0 per unit.

If the required power factor at the POI is beyond the capability of the studied wind turbines, then capacitor banks would be considered. Factors used in sizing capacitor banks would include two requirements of FERC Order 661A: the ability of the wind farm to ride through low voltage with and without capacitor banks and the ability of the wind farm to recover to pre-fault voltage. If a wind generator trips on high voltage, a leading power factor may be required.

ATC studies were not performed as part of this study. These studies will be required at the time transmission service is actually requested. Additional transmission facilities may be required based on subsequent ATC analysis.

Stability analysis was performed for each proposed interconnection request. Faults were simulated on transmission lines at the POIs and on other nearby transmission equipment. The faults in Table 3-1 were run for each case (three phase and single phase as noted).

Table 3-1. Fault Definitions for DISIS-2010-002 Group 3

Cont. No.	Contingency Name	Contingency Description
1	FLT01-3PH	3 phase fault on the Finney (523853) to GEN-2003-013 (560029) 345kV line, near Finney. a. Apply fault at the Finney 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
2	FLT02-1PH	Single phase fault on the line in previous a. Apply single phase fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
3	FLT03-3PH	3 phase fault on one of the Finney (523853) to Holcomb (531449) 345kV lines, near Finney. a. Apply fault at the Finney 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
4	FLT04-1PH	Single phase fault on the line in previous a. Apply single phase fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
5	FLT05-3PH	3 phase fault on the Holcomb (531449) to Setab (531465) 345kV line, near Holcomb. a. Apply fault at the Holcomb 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
6	FLT06-1PH	Single phase fault on the line in previous a. Apply single phase fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
7	FLT07-3PH	3 phase fault on the GEN-2007-040 (531000) to Holcomb (531449) 345kV line, near GEN-2007-040. a. Apply fault at the GEN-2007-040 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
8	FLT08-1PH	Single phase fault on the line in previous a. Apply single phase fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
9	FLT09-3PH	3 phase fault on the Holcomb 345kV (531449) to 115kV (531448) transformer, near the 345 kV bus. a. Apply fault at the Holcomb 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
10	FLT10-3PH	3 phase fault on the Finney (523853) to Lamar (599950) 345kV line, near Finney. a. Apply fault at Finney 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
11	FLT11-1PH	Single phase fault and sequence like previous

Cont. No.	Contingency Name	Contingency Description
12	FLT12-3PH	3 phase fault on the GEN-2007-040 (531000) to Spearville (531469) 345kV line, near GEN-2007-040. a. Apply fault at the GEN-2007-040 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
13	FLT13-1PH	Single phase fault and sequence like previous
14	FLT14-3PH	3 phase fault on one of the Spearville (531469) to Comanche (765341) 345kV lines, near Spearville. a. Apply fault at the Spearville 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
15	FLT15-1PH	Single phase fault on the line in previous a. Apply single phase fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
16	FLT16-3PH	3 phase fault on the Spearville 345kV (531469) to 230kV (539695) transformer, near the 345 kV bus. a. Apply fault at the Spearville 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
17	FLT17-3PH	3 phase fault on the Spearville 230kV (539695) to 115kV (539694) transformer, near the 230 kV bus. a. Apply fault at the Spearville 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
18	FLT18-3PH	3 phase fault on the Spearville 345kV (531469) to 115kV (539694) transformer, near the 345 kV bus. a. Apply fault at the Spearville 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
19	FLT19-3PH	3 phase fault on the Spearville (539695) to Mullergren (539679) 230kV line, near Spearville. a. Apply fault at the Spearville 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
20	FLT20-1PH	Single phase fault and sequence like previous
21	FLT21-3PH	3 phase fault on the Mullergren (539679) to South Hays (530582) 230kV line, near Mullergren. a. Apply fault at the Mullergren 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
22	FLT22-1PH	Single phase fault and sequence like previous
23	FLT23-3PH	3 phase fault on the Mullergren (539679) to Circle (532871) 230kV line, near Mullergren. a. Apply fault at the Mullergren 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
24	FLT24-1PH	Single phase fault and sequence like previous

Cont. No.	Contingency Name	Contingency Description
25	FLT25-3PH	3 phase fault on the Comanche (765341) to Medicine Lodge (765342) 345kV line Ckt1, near Comanche. a. Apply fault at the Comanche 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
26	FLT26-1PH	Single phase fault and sequence like previous
27	FLT27-3PH	3 phase fault on the GEN-2003-013 (560029) to Hitchland (523097) 345kV line, near GEN-2003-013. a. Apply fault at the GEN-2003-013 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
28	FLT28-1PH	Single phase fault on the line in previous a. Apply single phase fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
29	FLT29-3PH	3 phase fault on the Woodward (515375) to Hitchland (523097) 345kV line, near Woodward. a. Apply fault at the Woodward 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
30	FLT30-1PH	Single phase fault on the line in previous a. Apply single phase fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
31	FLT31-3PH	3 phase fault on the Knoll (530558) to Post Rock (530584) 230kV line, near Knoll. a. Apply fault at the Knoll 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
32	FLT32-1PH	Single phase fault and sequence like previous
33	FLT33-3PH	3 phase fault on the Post Rock (530583) to Axtell (640065) 345kV line, near Post Rock. a. Apply fault at the Post Rock 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
34	FLT34-1PH	Single phase fault and sequence like previous
35	FLT35-3PH	3 phase fault on the Post Rock 345kV (530583) to 230kV (530584) transformer, near the 345 kV bus. a. Apply fault at the Post Rock 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
36	FLT36-3PH	3 phase fault on the GEN-2001-039A (579025) to Fort Dodge (539671) 115kV line, near GEN-2001-039A. a. Apply fault at the GEN-2001-039A 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
37	FLT37-1PH	Single phase fault and sequence like previous

Cont. No.	Contingency Name	Contingency Description
38	FLT38-3PH	3 phase fault on the GEN-2010-016 (576704) to Spearville (531469) 345kV line, near GEN-2010-016. a. Apply fault at GEN-2010-016 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
39	FLT39-1PH	Single phase fault on the line in previous a. Apply single phase fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
40	FLT40-3PH	3 phase fault on the GEN-2009-059 (560280) to Cudahy (539659) 115kV line, near GEN-2009-059. a. Apply fault at the GEN-2009-059 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
41	FLT41-1PH	Single phase fault and sequence like previous
42	FLT42-3PH	3 phase fault on the Kismet (539646) to CMRIVTP (539652) 115kV line, near Kismet. a. Apply fault at the Kismet 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
43	FLT43-1PH	Single phase fault and sequence like previous
44	FLT44-3PH	3 phase fault on the CMRIVTP (539652) to E-Liberty (539672) 115kV line, near CMRIVTP. a. Apply fault at the CMRIVTP 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
45	FLT45-1PH	Single phase fault and sequence like previous
46	FLT46-3PH	3 phase fault on the Hugoton (531481) to Grant Tap (531483)115kV line, near Hugoton. a. Apply fault at the Hugoton 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
47	FLT47-1PH	Single phase fault and sequence like previous
48	FLT48-3PH	3 phase fault on the Pratt (539687) to Ninnescah (539648) 115kV line, near Pratt. a. Apply fault at the Pratt 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
49	FLT49-1PH	Single phase fault and sequence like previous
50	FLT50-3PH	3 phase fault on the Pratt (539687) to Sawyer (539649) 115kV line, near Pratt. a. Apply fault at the Pratt 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
51	FLT51-1PH	Single phase fault and sequence like previous

Cont. No.	Contingency Name	Contingency Description
52	FLT52-3PH	3 phase fault on the Medicine Lodge (539673) to Sun City (539697) 115kV line, near Medicine Lodge. a. Apply fault at the Medicine Lodge 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
53	FLT53-1PH	Single phase fault and sequence like previous
54	FLT54-3PH	3 phase fault on the Spearville (531469) to Mullergren (100321) 345kV line Ckt1, near Spearville. a. Apply fault at the Spearville 345kV bus Ckt1. b. Clear fault after 5 cycles by tripping the faulted line.
55	FLT55-1PH	Single phase fault on the line in previous a. Apply single phase fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
56	FLT56-3PH	3 phase fault on the Mullergren (100321) to Circle (100322) 345kV line Ckt1, near Mullergren. a. Apply fault at the Mullergren 345kV bus Ckt1. b. Clear fault after 5 cycles by tripping the faulted line.
57	FLT57-1PH	Single phase fault on the line in previous a. Apply single phase fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
58	FLT58-3PH	3 phase fault on the Circle (100322) to Reno (532771) 345kV line Ckt1, near Circle. a. Apply fault at the Circle 345kV bus Ckt1. b. Clear fault after 5 cycles by tripping the faulted line.
59	FLT59-1PH	Single phase fault on the line in previous a. Apply single phase fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
60	FLT60-3PH	3 phase fault on both of the Spearville (531469) to Comanche (765341) 345kV lines, near Spearville. a. Apply fault at the Spearville 345kV bus. b. Clear fault after 5 cycles by tripping both lines.
61	FLT61-3PH	3 phase fault on both of the Comanche (765341) to Medicine Lodge (765342) 345kV lines, near Comanche. a. Apply fault at the Comanche 345kV bus. b. Clear fault after 5 cycles by tripping both lines.
62	FLT62-3PH	3 phase fault on both of the Spearville (531469) to Mullergren (100321) 345kV lines, near Spearville. a. Apply fault at the Spearville 345kV bus. b. Clear fault after 5 cycles by tripping both lines.

4. Results and Observations

4.1 Stability Analysis Results

The initial simulations were run on the summer peak case, and all faults at Spearville 345 kV caused PSS/E to crash (faults 14, 16, 18, and 54), indicating significant stability problems (see Figure 4-1 as an example). In addition, GEN-2010-027 tripped following fault 25 (Comanche-Medicine Lodge).

GEN-2010-027 Interconnecting Transmission Line

When GEN-2010-027 was modeled with the 55.4 mile 345 kV transmission line originally provided by the requester (Figure 3-1), there were very large reactive power losses of around 180 Mvar on this line. The reactance of the line was provided as 0.02733 per unit on 100 MVA base. When converted to plant base of 900 MW, this becomes 0.24597 per unit, or 24.6%. This is a very large radial impedance to hang a plant on, which makes stability very difficult to maintain. This line impedance exceeds the combined impedances of the GEN-2010-027 substation transformers, collector cables, and GSU transformers. With the given B of 0.48421 p.u., the surge impedance loading (SIL) of this line is SQRT(0.48421/0.02733)=4.21pu or 421 MW. As a line is loaded beyond its SIL, reactive power losses go up in proportion to the square of the current. For this 900 MW wind farm, this transmission line will be loaded to more than double its SIL, and this is why the reactive power losses are so high. For short transmission lines, SIL is not very important and ampacity can be the limiting factor. For lines of significant length, SIL and reactive power become the limiting factors.

The original GEN-2010-027 data submittal assumed that the plant would connect to Spearville 345 55.4 miles away. However, SPP determined that Comanche 345 (now planned to be Clark County) is the preferred POI. If GEN-2010-027 is connected to Comanche, it was estimated that the interconnection line will be about 85% as long as the line to Spearville. However, when reducing the length to this level, the impedance, stability, and reactive power problems remained. The SIL is the same and the line was still consuming about 150 Mvar at full plant output.

Given this line design and the size of the plant, adding a 2nd parallel circuit of the same design was tested (Figure 3-2). Two lines like this will have an SIL of 2*421= 842 MW, which is sufficient for this plant. A second circuit will double the capacitive line charging while halving the series reactive losses, resulting in a small net reactive loss of 12.4 Mvar at full plant output. This double-circuit scenario also assumed the 85% length to Comanche. Additional benefits of two circuits are improved voltage profile throughout the wind farm, reduced MW losses (882 MW injection at the POI versus 874 MW), reduced Mvar output from the wind turbines, and elimination of any need for capacitors. All single-circuit simulations were run in summer and winter cases with a second 345 kV transmission line at GEN-2010-027, and all were stable with no wind turbine tripping (double-circuit outages are discussed below).

After discussions with the GEN-2010-027 requesters, they submitted additional interconnection options to be tested. The following two options were tested:

- A1: Use a four-conductor (quad) bundle per phase instead of the original two-conductor bundle (Figure 3-3).
- B1: Split the wind farm onto two separate interconnection lines (Figure 3-4).

Even though Option A1 uses the same amount of wire as two separate circuits, it does not halve the series impedance or double the shunt capacitance like two separate circuits. The performance of Option A1 was insufficient, with parts of GEN-2010-027 tripping off-line following Fault 25 on one of the Comanche-Medicine Lodge 345 kV lines in the Winter case (Figure 4-2).

Option B1 showed very good performance. All of the single-circuit faults in the area showed stable responses with no generation tripping. Option B1 is the preferred connection option for GEN-2010-027.

<u>Double-circuit Faults</u>
NERC and SPP standards require the analysis of the simultaneous outage of both circuits of a double-circuit transmission line. Once the single-circuit faults were running well, double-circuit faults were tested. With GEN-2010-027 Option B1, Faults 60-62 were simulated on the Spearville-Comanche, Comanche-Medicine Lodge, and Spearville-Mullergren 345 kV double circuits, respectively. Instability (PSS/E crashing) was found for Fault 60 on the Spearville-Comanche 345 kV double circuit (Figure 4-3).

Addition of a new 345 kV line from Comanche (aka Clark) to the GEN-2008-047 POI (aka Beaver) was tested as a solution (called Option B1R1). With this line added to the model, all double-circuit faults become stable. See for example the Fault 60 plot in Figure 4-4.

The final configuration to ensure stability for all Group 3 plants for all faults includes interconnection option B1 for GEN-2010-027 and a new 345 kV line from Clark to Beaver. With these upgrades, the SPP system will remain stable after the addition of the Group 3 projects.

Table 4-1 summarizes the results. Figure 4-5 through Figure 4-8 show representative summer peak season plots for faults at the POI's of the study projects. Complete sets of plots for both summer and winter peak seasons for each fault and each project are included in Appendices A and B.

Table 4-1. Summary of Stability Results

Cont. No.	Contingency Name	Contingency Description	Summer Peak Results	Winter Peak Results
1	FLT01-3PH	3 phase fault on the Finney (523853) to GEN-2003-013 (560029) 345kV line, near Finney.	OK	OK
2	FLT02-1PH	Single phase fault on the line in previous	OK	OK
3	FLT03-3PH	3 phase fault on one of the Finney (523853) to Holcomb (531449) 345kV lines, near Finney.	OK	OK

Cont. No.	Contingency Name	Contingency Description	Summer Peak Results	Winter Peak Results
4	FLT04-1PH	Single phase fault on the line in previous	OK	OK
5	FLT05-3PH	3 phase fault on the Holcomb (531449) to Setab (531465) 345kV line, near Holcomb.	OK	OK
6	FLT06-1PH	Single phase fault on the line in previous	OK	OK
7	FLT07-3PH	3 phase fault on the GEN-2007-040 (531000) to Holcomb (531449) 345kV line, near GEN-2007-040.	OK	OK
8	FLT08-1PH	Single phase fault on the line in previous	OK	OK
9	FLT09-3PH	3 phase fault on the Holcomb 345kV (531449) to 115kV (531448) transformer, near the 345 kV bus.	OK	OK
10	FLT10-3PH	3 phase fault on the Finney (523853) to Lamar (599950) 345kV line, near Finney.	OK	OK
11	FLT11-1PH	Single phase fault and sequence like previous	OK	OK
12	FLT12-3PH	3 phase fault on the GEN-2007-040 (531000) to Spearville (531469) 345kV line, near GEN-2007-040.	OK	OK
13	FLT13-1PH	Single phase fault and sequence like previous	OK	OK
14	FLT14-3PH	3 phase fault on one of the Spearville (531469) to Comanche (765341) 345kV lines, near Spearville.	**Unstable**	**-**
14-B1	FLT14-3PH	3 phase fault on one of the Spearville (531469) to Comanche (765341) 345kV lines, near Spearville. **With Option B1**	**OK**	**OK**
15	FLT15-1PH	Single phase fault on the line in previous	OK	OK
16	FLT16-3PH	3 phase fault on the Spearville 345kV (531469) to 230kV (539695) transformer, near the 345 kV bus.	**Unstable**	-
16-B1	FLT16-3PH	3 phase fault on the Spearville 345kV (531469) to 230kV (539695) transformer, near the 345 kV bus. **With Option B1**	**OK**	**OK**
17	FLT17-3PH	3 phase fault on the Spearville 230kV (539695) to 115kV (539694) transformer, near the 230 kV bus.	OK	OK
18	FLT18-3PH	3 phase fault on the Spearville 345kV (531469) to 115kV (539694) transformer, near the 345 kV bus.	**Unstable**	-
18-B1	FLT18-3PH	3 phase fault on the Spearville 345kV (531469) to 115kV (539694) transformer, near the 345 kV bus. **With Option B1**	**OK**	**OK**
19	FLT19-3PH	3 phase fault on the Spearville (539695) to Mullergren (539679) 230kV line, near Spearville.	OK	OK
20	FLT20-1PH	Single phase fault and sequence like previous	OK	OK
21	FLT21-3PH	3 phase fault on the Mullergren (539679) to South Hays (530582) 230kV line, near Mullergren.	OK	OK
22	FLT22-1PH	Single phase fault and sequence like previous	OK	OK
23	FLT23-3PH	3 phase fault on the Mullergren (539679) to Circle (532871) 230kV line, near Mullergren.	OK	OK
24	FLT24-1PH	Single phase fault and sequence like previous	OK	OK

Cont. No.	Contingency Name	Contingency Description	Summer Peak Results	Winter Peak Results
25	FLT25-3PH	3 phase fault on the Comanche (765341) to Medicine Lodge (765342) 345kV line Ckt1, near Comanche.	**Unstable**	-
25-A1	FLT25-3PH	3 phase fault on the Comanche (765341) to Medicine Lodge (765342) 345kV line Ckt1, near Comanche. **With Option A1**	OK	**Unstable**
25-B1	FLT25-3PH	3 phase fault on the Comanche (765341) to Medicine Lodge (765342) 345kV line Ckt1, near Comanche. **With Option B1**	**OK**	**OK**
26	FLT26-1PH	Single phase fault and sequence like previous	OK	OK
27	FLT27-3PH	3 phase fault on the GEN-2003-013 (560029) to Hitchland (523097) 345kV line, near GEN-2003-013.	OK	OK
28	FLT28-1PH	Single phase fault on the line in previous	OK	OK
29	FLT29-3PH	3 phase fault on the Woodward (515375) to Hitchland (523097) 345kV line, near Woodward.	OK	OK
30	FLT30-1PH	Single phase fault on the line in previous	OK	OK
31	FLT31-3PH	3 phase fault on the Knoll (530558) to Post Rock (530584) 230kV line, near Knoll.	OK	OK
32	FLT32-1PH	Single phase fault and sequence like previous	OK	OK
33	FLT33-3PH	3 phase fault on the Post Rock (530583) to Axtell (640065) 345kV line, near Post Rock.	OK	OK
34	FLT34-1PH	Single phase fault and sequence like previous	OK	OK
35	FLT35-3PH	3 phase fault on the Post Rock 345kV (530583) to 230kV (530558) transformer, near the 345 kV bus.	OK	OK
36	FLT36-3PH	3 phase fault on the GEN-2001-039A (579025) to Fort Dodge (539671) 115kV line, near GEN-2001-039A.	OK	OK
37	FLT37-1PH	Single phase fault and sequence like previous	OK	OK
38	FLT38-3PH	3 phase fault on the GEN-2010-016 (576704) to Spearville (531469) 345kV line, near GEN-2010-016.	OK	OK
39	FLT39-1PH	Single phase fault on the line in previous	OK	OK
40	FLT40-3PH	3 phase fault on the GEN-2009-059 (560280) to Cudahy (539659) 115kV line, near GEN-2009-059.	OK	OK
41	FLT41-1PH	Single phase fault and sequence like previous	OK	OK
42	FLT42-3PH	3 phase fault on the Kismet (539646) to CMRIVTP (539652) 115kV line, near Kismet.	OK	OK
43	FLT43-1PH	Single phase fault and sequence like previous	OK	OK
44	FLT44-3PH	3 phase fault on the CMRIVTP (539652) to E-Liberty (539672) 115kV line, near CMRIVTP.	OK	OK
45	FLT45-1PH	Single phase fault and sequence like previous	OK	OK
46	FLT46-3PH	3 phase fault on the Hugoton (531481) to Grant Tap (531483)115kV line, near Hugoton.	OK	OK
47	FLT47-1PH	Single phase fault and sequence like previous	OK	OK

Cont. No.	Contingency Name	Contingency Description	Summer Peak Results	Winter Peak Results
48	FLT48-3PH	3 phase fault on the Pratt (539687) to Ninnescah (539648) 115kV line, near Pratt.	OK	OK
49	FLT49-1PH	Single phase fault and sequence like previous	OK	OK
50	FLT50-3PH	3 phase fault on the Pratt (539687) to Sawyer (539649) 115kV line, near Pratt.	OK	OK
51	FLT51-1PH	Single phase fault and sequence like previous	OK	OK
52	FLT52-3PH	3 phase fault on the Medicine Lodge (539673) to Sun City (539697) 115kV line, near Medicine Lodge.	OK	OK
53	FLT53-1PH	Single phase fault and sequence like previous	OK	OK
54	FLT54-3PH	3 phase fault on the Spearville (531469) to Mullergren (100321) 345kV line Ckt1, near Spearville.	**Unstable**	-
54-B1	FLT54-3PH	3 phase fault on the Spearville (531469) to Mullergren (100321) 345kV line Ckt1, near Spearville. **With Option B1**	**OK**	**OK**
55	FLT55-1PH	Single phase fault on the line in previous	OK	OK
56	FLT56-3PH	3 phase fault on the Mullergren (100321) to Circle (100322) 345kV line Ckt1, near Mullergren.	OK	OK
57	FLT57-1PH	Single phase fault on the line in previous	OK	OK
58	FLT58-3PH	3 phase fault on the Circle (100322) to Reno (532771) 345kV line Ckt1, near Circle.	OK	OK
59	FLT59-1PH	Single phase fault on the line in previous	OK	OK
60-B1	FLT60-3PH	3 phase fault on both of the Spearville (531469) to Comanche (765341) 345kV lines, near Spearville. **With Option B1**	**Unstable**	**Unstable**
60-B1R1	FLT60-3PH	3 phase fault on both of the Spearville (531469) to Comanche (765341) 345kV lines, near Spearville. **With Option B1 plus Clark-Beaver 345 line**	**OK**	**OK**
61-B1	FLT61-3PH	3 phase fault on both of the Comanche (765341) to Medicine Lodge (765342) 345kV lines, near Comanche. **With Option B1**	OK	OK
62-B1	FLT62-3PH	3 phase fault on both of the Spearville (531469) to Mullergren (100321) 345kV lines, near Spearville. **With Option B1**	OK	OK

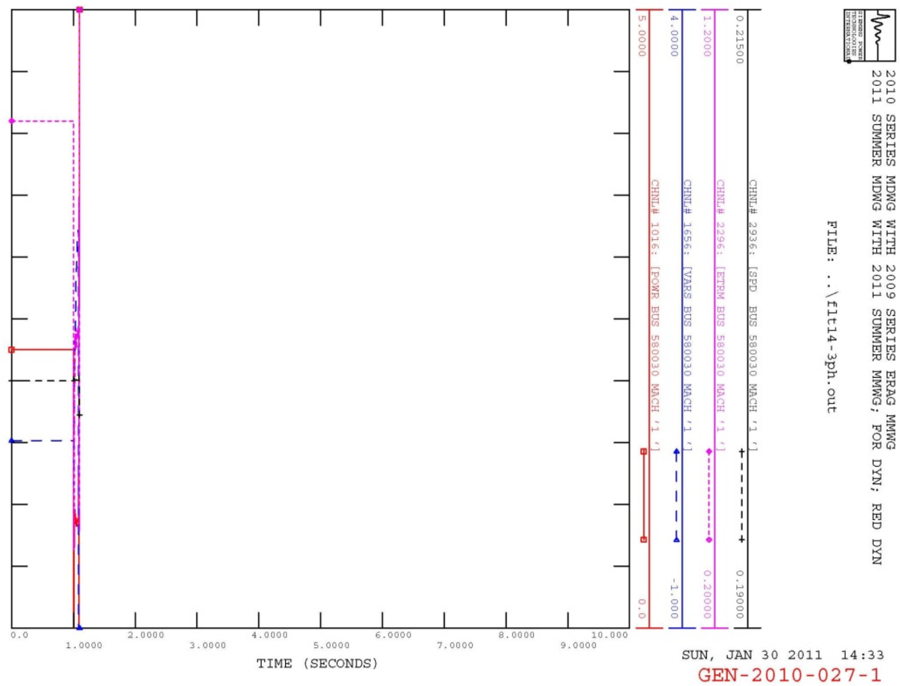

Figure 4-1. GEN-2010-027 Plot for Fault 14 – 3-Phase Fault on Spearville (531469) to Comanche (765341) 345kV circuit 1, near Spearville - Base Case

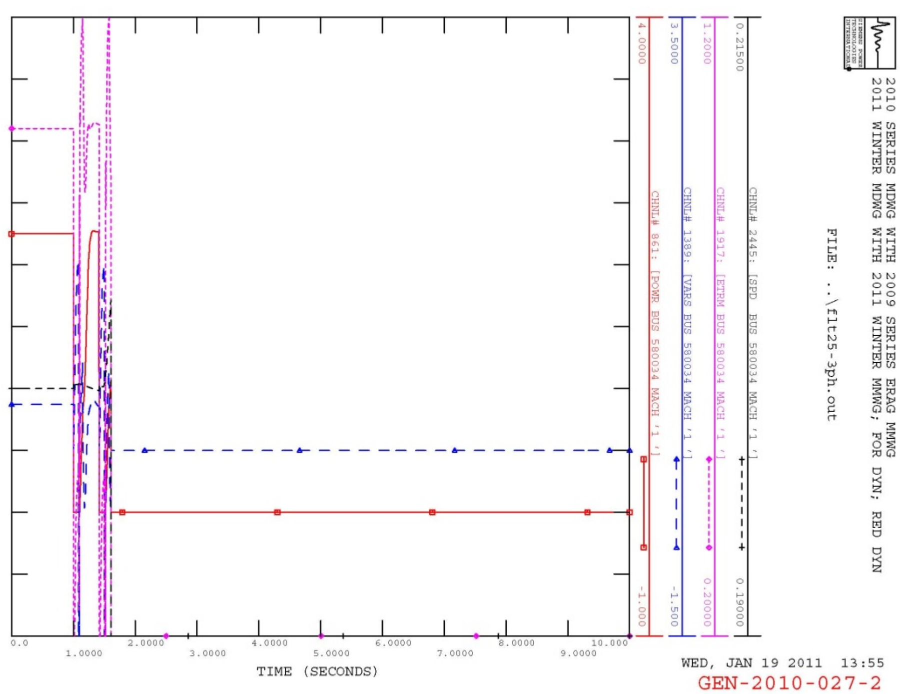

Figure 4-2. GEN-2010-027 Plot for Fault 25 – 3-Phase Fault on Comanche (765341) to Medicine Lodge (765342) 345kV circuit 1, near Comanche – Option A1

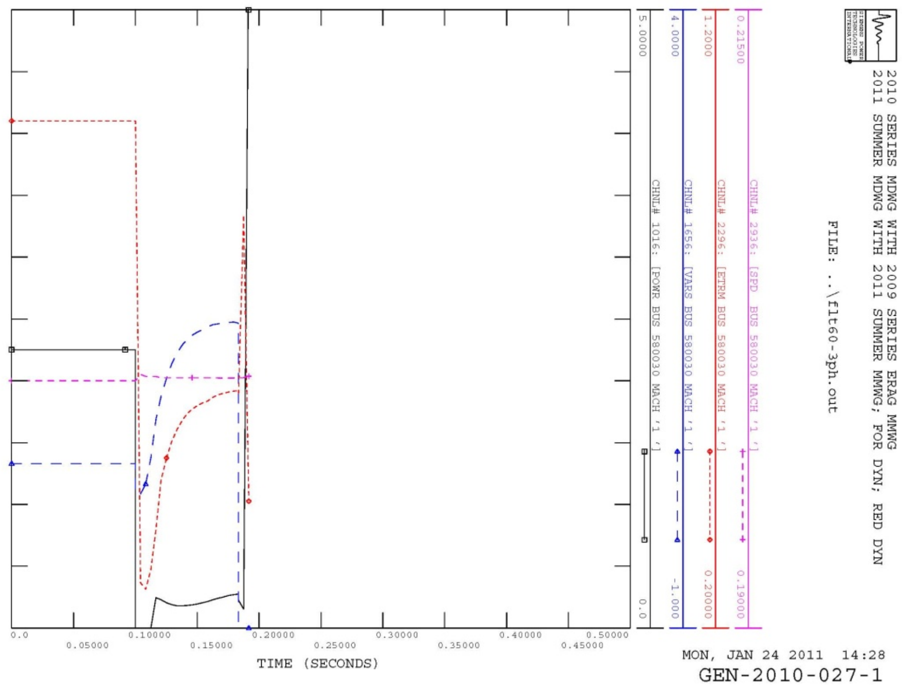

Figure 4-3. GEN-2010-027 Plot for Fault 60 – 3-Phase Fault on both Spearville (531469) to Comanche (765341) 345kV lines, near Spearville – Option B1

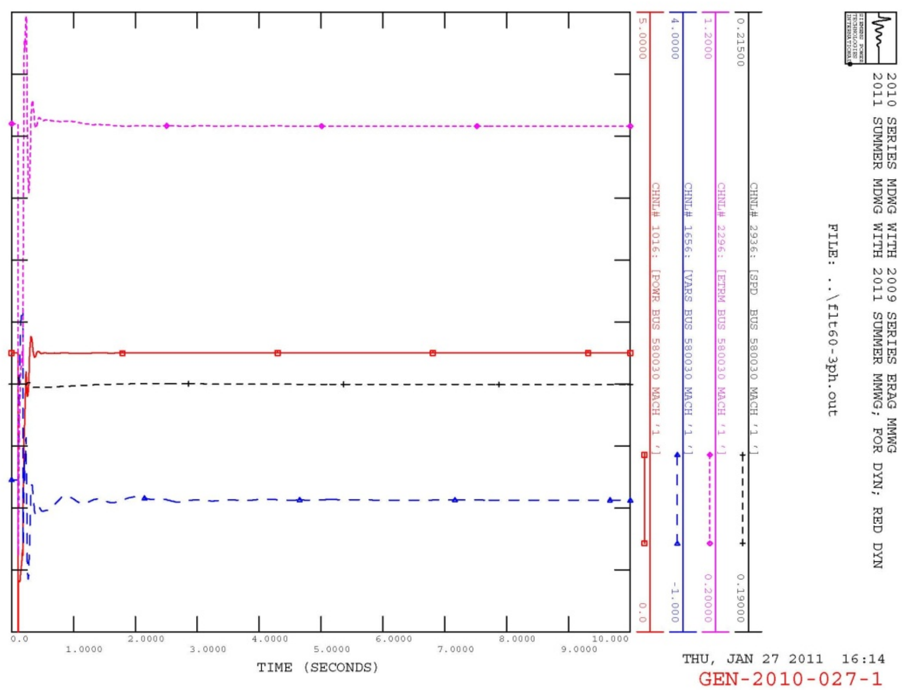

Figure 4-4. GEN-2010-027 Plot for Fault 60 – 3-Phase Fault on both Spearville-Comanche lines, near Spearville – Option B1R1 (includes Clark-Beaver 345 kV line)

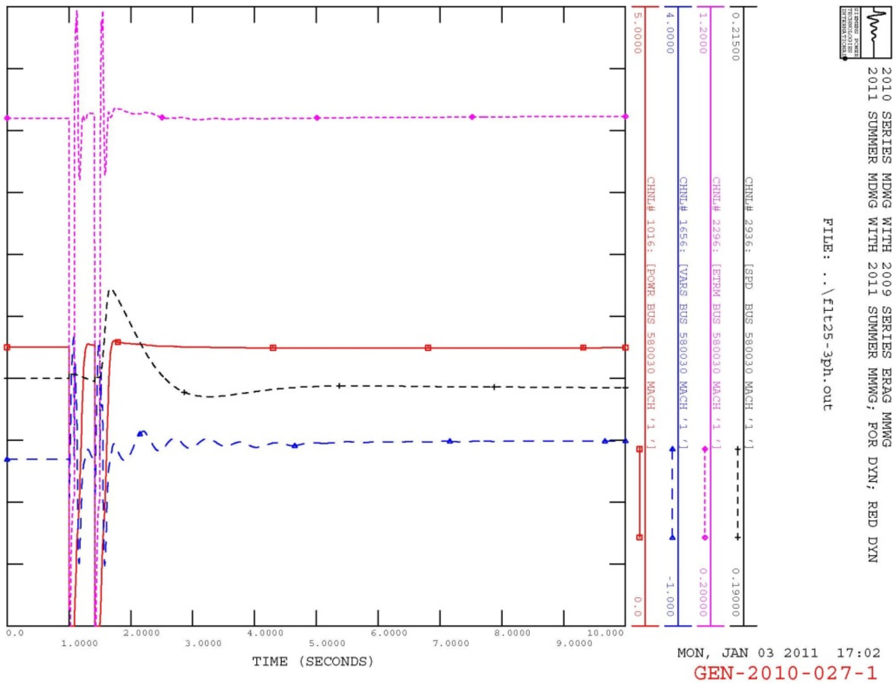

Figure 4-5. **GEN-2010-027 Plot for Fault 25 – 3-Phase Fault on Comanche (765341) to Medicine Lodge (765342) 345kV circuit 1, near Comanche**

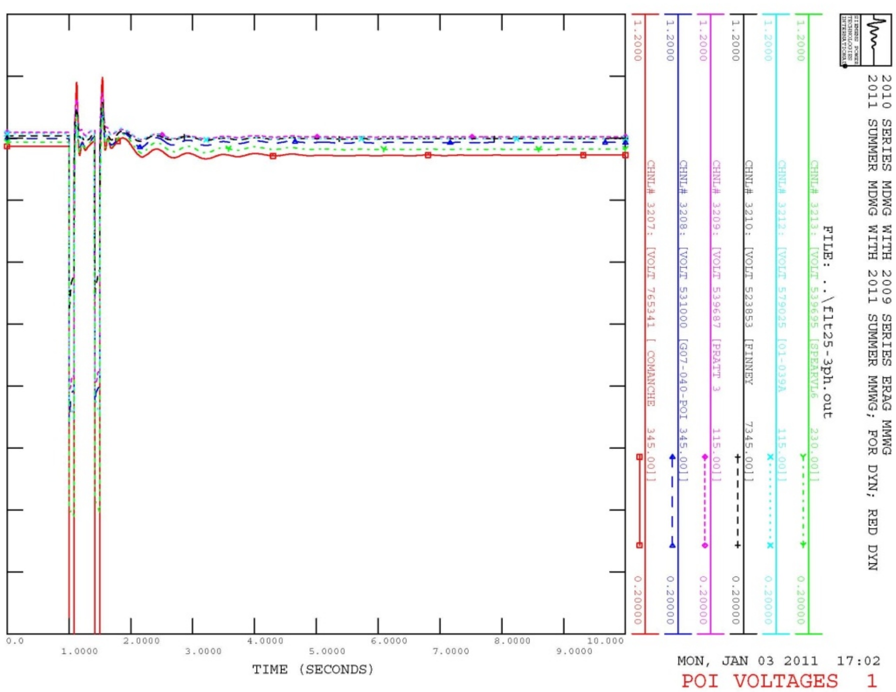

Figure 4-6. **POI Voltages for Fault 25 – 3-Phase Fault on Comanche (765341) to Medicine Lodge (765342) 345kV circuit 1, near Comanche**

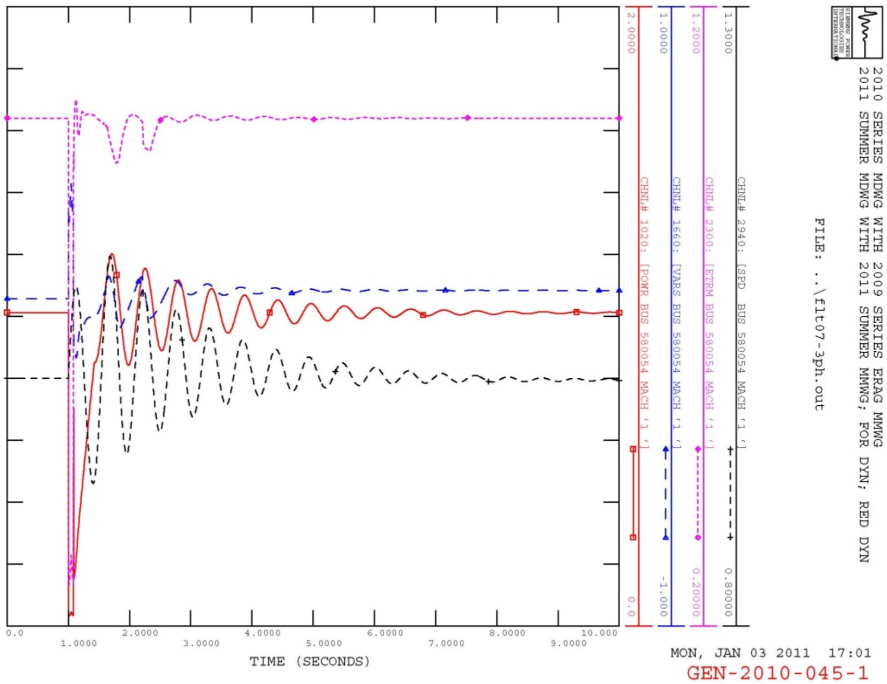

Figure 4-7. GEN-2010-045 Plot for Fault 7 – 3-Phase Fault on the GEN-2007-040 (531000) to Holcomb (531449) 345kV line, near GEN-2007-040

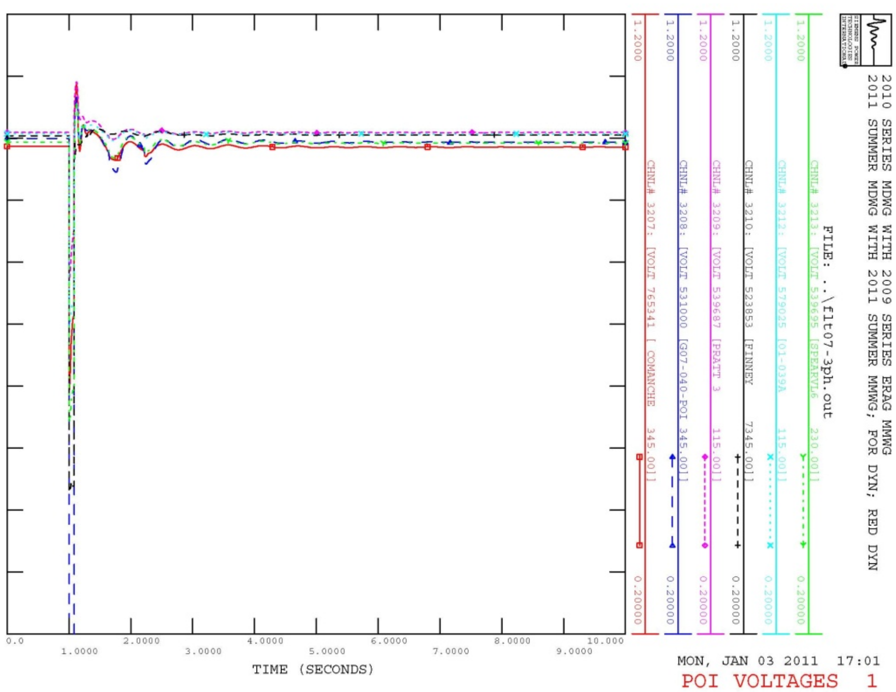

Figure 4-8. POI Voltages for Fault 7 – 3-Phase Fault on the GEN-2007-040 (531000) to Holcomb (531449) 345kV line, near GEN-2007-040

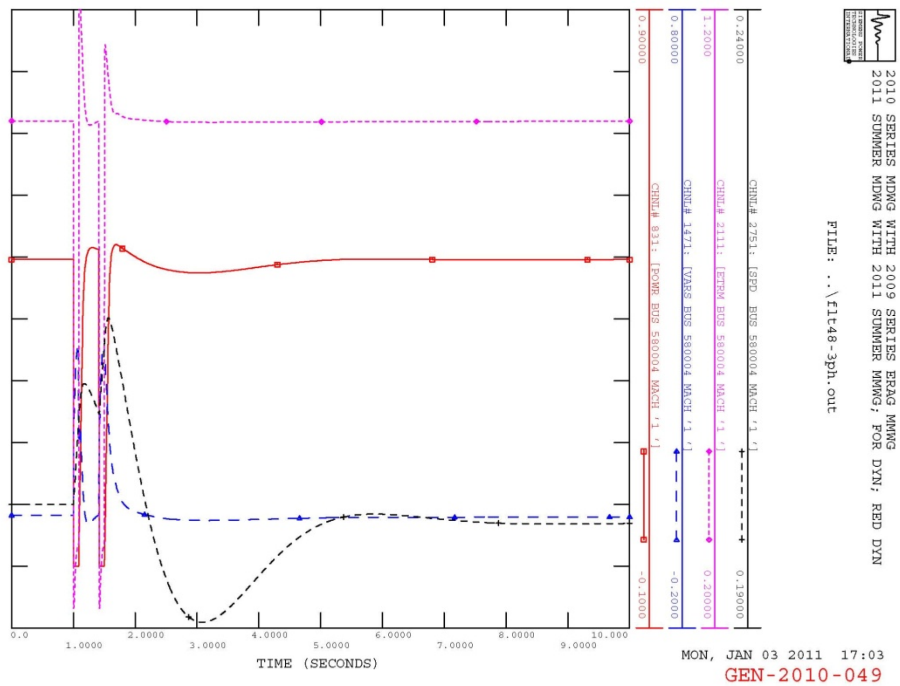

Figure 4-9. GEN-2010-049 Plot for Fault 48 – 3-Phase Fault on the Pratt (539687) to Ninnescah (539648) 115kV line, near Pratt

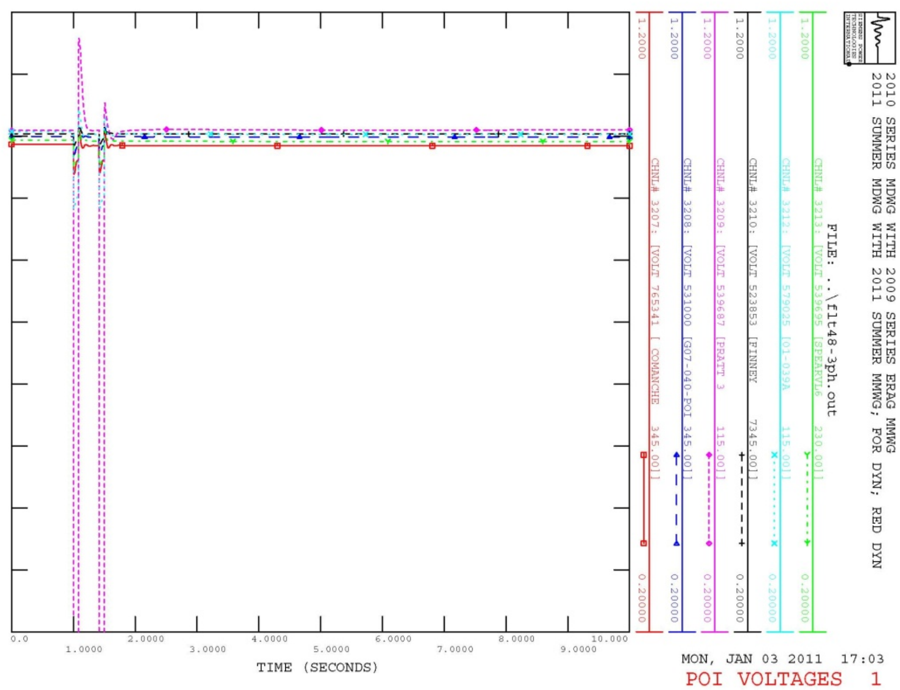

Figure 4-10. POI Voltages for Fault 48 – 3-Phase Fault on the Pratt (539687) to Ninnescah (539648) 115kV line, near Pratt

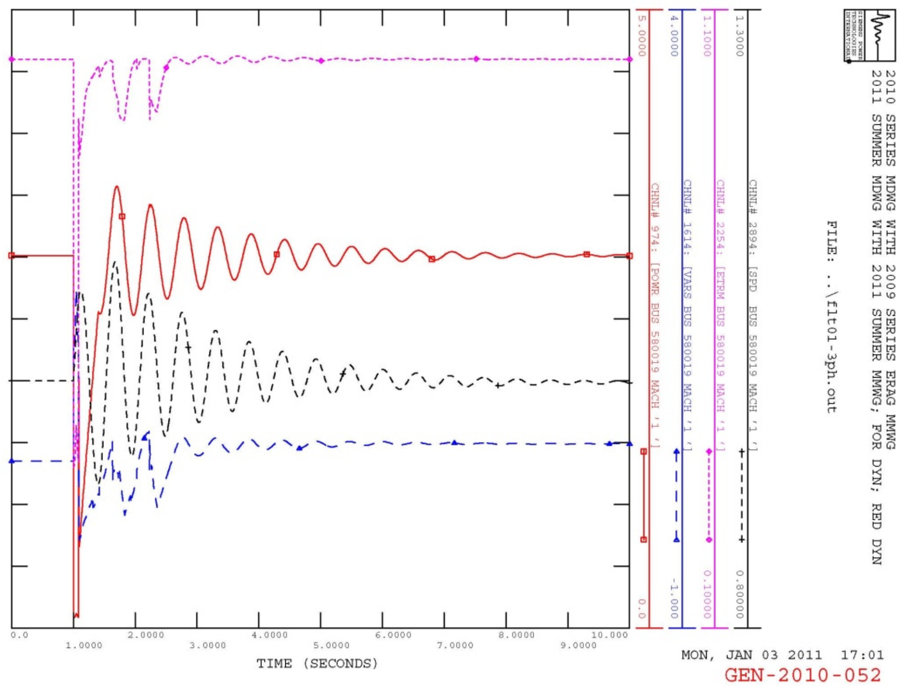

Figure 4-11. GEN-2010-052 Plot for Fault 01 – 3-Phase Fault on the Finney (523853) to GEN-2003-013 (560029) 345kV line, near Finney

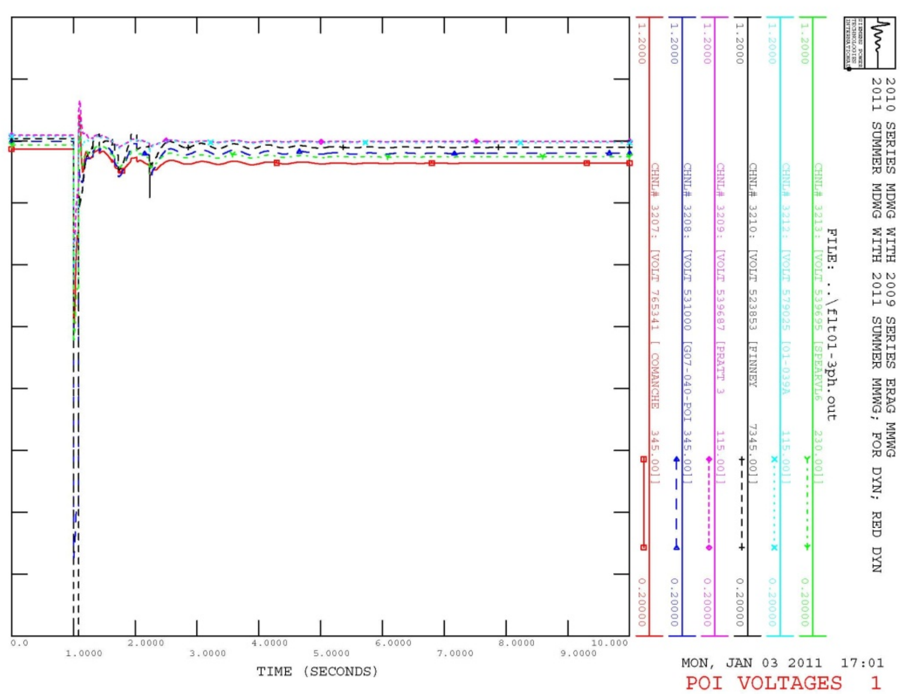

Figure 4-12. POI Voltages for Fault 01 – 3-Phase Fault on the Finney (523853) to GEN-2003-013 (560029) 345kV line, near Finney

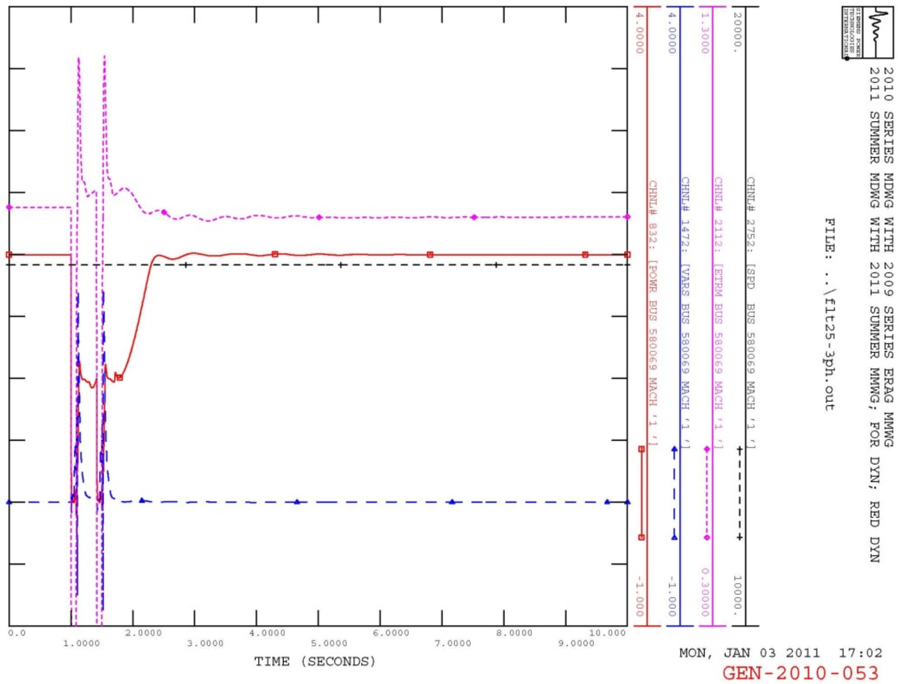

Figure 4-13. GEN-2010-053 Plot for Fault 25 – 3-Phase Fault on the Comanche (765341) to Medicine Lodge (765342) 345kV line Ckt1, near Comanche

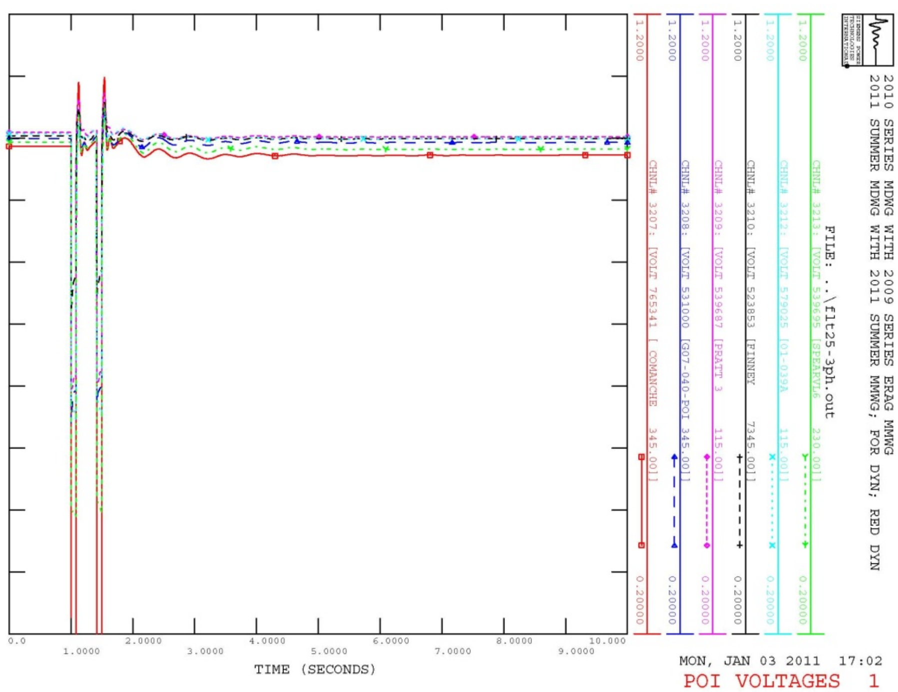

Figure 4-14. POI Voltages for Fault 25 – 3-Phase Fault on the Comanche (765341) to Medicine Lodge (765342) 345kV line Ckt1, near Comanche

4.2 Power Factor Requirements

All stability faults were tested as power flow contingencies to determine the power factor requirements for the wind farm study projects to maintain scheduled voltage at their respective points of interconnection (POI). The voltage schedules are set equal to the voltages at the POIs before the projects are added, with a minimum of 1.0 per unit. Fictitious reactive power sources were added to the study projects to maintain scheduled voltage during all studied contingencies. The MW and Mvar injections from the study projects at the POIs were recorded and the resulting power factors were calculated for all contingencies for summer peak and winter peak cases. The most leading and most lagging power factors determine the minimum power factor range capability that the study projects must install before commercial operation.

If more than one study project shared a single POI, the projects were grouped together and a common power factor requirement was determined for those study projects. This ensures that none of the study projects is required to provide more or less than its fair share of the reactive power requirements at a single POI. *Prior-queued* projects at the same POI, if any, were not grouped with the study projects because their interconnection requirements were determined in previous studies. The voltage schedules of prior-queued and study projects at the same POI were coordinated.

Per FERC and SPP Tariff requirements, if the power factor needed to maintain scheduled voltage is less than 0.95 lagging, then the requirement is limited to 0.95 lagging. The lower limit for leading power factor requirement is also 0.95. If a project never operated leading under any contingency, then the leading requirement is set to 1.0. The same applies on the lagging side.

Power factor analysis using the original requester data showed a need for 81 Mvar of capacitors at GEN-2010-027 and 23 Mvar at GEN-2010-052. However, after the modifications discussed previously, GEN-2010-027 needs no capacitors and GEN-2010-052 needs only 7 Mvar. GEN-2010-053 requires at least 83 Mvar of capacitors to meet its power factor requirement due to the lack of any reactive power capability in the Vestas V90 wind turbines. GEN-2010-045 needs at least 9 Mvar and GEN-2010-049 needs at least 2 Mvar.

The final power factor requirements are shown in Table 4-2 below. These are only the minimum power factor ranges based on steady-state analysis. A project developer may install more capability than this if desired.

The full details for each contingency in summer and winter peak cases are given in Appendix C.

Table 4-2. Power Factor Requirements [1]

Request	Size (MW)	Generator Model	Point of Interconnection	Final PF Requirement		Estimated Capacitor Requirement (Mvar)
				Lagging [2]	Leading [3]	
GEN-2010-027	900.0	GE 2.5 MW	Comanche 345kV (765341)	0.95	0.999	-
GEN-2010-045	197.8	Siemens 2.3MW	Holcomb (531449) – Spearville (531469) 345kV. (Bus 531000)	0.955	0.999	9
GEN-2010-049	49.6	GE 1.6MW	Pratt 115kV (539687)	0.971	0.95	2
GEN-2010-052	301.3	Siemens 2.3MW	Finney 345kV (523853)	0.95	0.993	7
GEN-2010-053	199.8	Vestas V90 1.8MW	Comanche 345kV (765341)	0.95	0.999	83

Notes:

1. For each plant, the table shows the minimum required power factor capability at the point of interconnection that must be designed and installed with the plant. The power factor capability at the POI includes the net effect of the generators, transformers, line impedances, and any reactive compensation devices installed on the plant side of the meter. Installing more capability than the minimum requirement is acceptable.
2. Lagging is when the generating plant is supplying reactive power to the transmission grid. In this situation, the alternating current sinusoid “lags” behind the alternating voltage sinusoid, meaning that the current peaks shortly after the voltage.
3. Leading is when the generating plant is taking reactive power from the transmission grid. In this situation, the alternating current sinusoid “leads” the alternating voltage sinusoid, meaning that the current peaks shortly before the voltage.

5. Conclusions

The DISIS-2010-002 Group 3 Definitive Impact Study evaluated the impacts of interconnecting each of the projects shown below.

Table 5-1. Interconnection Requests Evaluated in this Study

Request	Size	Wind Turbine Model	Point of Interconnection	POI Bus	Gen Buses
GEN-2010-027	900.0	GE 2.5 MW	Comanche 345kV (765341)	765341	580030 580034 580038 580042
GEN-2010-045	197.8	Siemens 2.3MW	Holcomb (531449) – Spearville (531469) 345kV. (Bus 531000)	531000	580054 580055
GEN-2010-049	49.6	GE 1.6MW	Pratt 115kV (539687)	539687	580004
GEN-2010-052	301.3	Siemens 2.3MW	Finney 345kV (523853)	523853	580019
GEN-2010-053	199.8	Vestas V90 1.8MW	Comanche 345kV (765341)	765341	580069

Numerous stability problems were seen in the initial simulations. Some wind farms went unstable, some tripped, and the simulation program crashed. The first issue was traced to the 345-kV transmission line connecting the 900 MW GEN-2010-027 wind farm to Comanche (aka Clark) 345 kV substation. The final solution for GEN-2010-027 interconnection is to use Option B1, splitting GEN-2010-027 onto two separate 345 kV interconnection lines. Secondly, a new Clark-Beaver 345 kV line is required to maintain stability of the Group 3 projects. Finally, the Spearville-Mullergren-Circle-Reno 345 kV double circuit included in the base cases is a pre-requisite for the DISIS-2010-002 Group 3 projects.

Power factor and capacitor requirements for the Group 3 projects are listed in Table 4-2.

With the assumptions and upgrades described in this report, DISIS-2010-002 Group 3 should be able to connect without causing any stability problems on the SPP transmission grid.

Any change in system or wind farm models or assumptions could change these results.

Appendix A – Summer Peak Plots

See attachment.

Appendix B – Winter Peak Plots

See attachment.

Appendix C – Power Factor Details

See attachment.

Appendix D – Project Model Data

See attachment.

Appendix E – 345 kV Transmission One-line

See attachment.

L: Stability Study for Group 6

DISIS 2010-002 Group 6 Study

January 28, 2011





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EXECUTIVE SUMMARY

The Southwest Power Pool (SPP), on behalf of generation interconnection customers, desires a definitive interconnection system impact study for Group 6 of SPP Definitive Interconnection System Impact Study DISIS 2010-002. Group 6 contains the following gas turbine interconnection in Abernathy, Texas:

Request	Size (MW)	Turbine Model	Point of Interconnection
GEN-2010-046	56	GENSAL	Tuco 230 kV (525830)

The case will contain the following previous queued and later queued requests. These projects will be monitored and their generating status shall be reported for each contingency. The projects are as follows:

Request	Size (MW)	Turbine Model	Point of Interconnection
GEN-2001-033	180	Mitsubishi 1000	San Juan Mesa 230kV (524885)
GEN-2001-036	80	CIMTR	Curry-Tucumcari 115kV (524502)
GEN-2005-010	160	Gamesa	Tolk – Roosevelt 230kV (560819)
GEN-2005-015	150	Gamesa	Tuco – Oklaunion 345kV (560813)
GEN-2008-008	60	GE 1.5MW	Graham 69kV (526693)
GEN-2008-009	60	GE 1.5MW	San Juan Mesa 230kV (524885)
GEN-2008-014	150	Vestas V90	Tuco – Oklaunion 345kV (560813) (same POI as GEN-2005-015)
GEN-2008-016	248.4	Siemens 2.3MW	Grassland 230kV (526677)
GEN-2009-017	150	Siemens 2.3MW	Tap Pembrook (522966) – Stiles (522960) 138kV. (Bus 570917)
GEN-2008-022	300	GE 2.5MW	Eddy Cnty (527802) – Tolk (525549) 345kV
GEN-2009-067S	20	STCNPG (usrmdl)	Seven Rivers 69kV (528093)
GEN-2010-006	205W/ 180S	Genrou	Jones_bus2 230kV(526338)
ASGI-2010-010	42	Genrou	Lovington 115kV (528334)

SPP requested a stability analysis as part of the study of the generator in DISIS 2010-002 Group 6. SPP did not request an Available Transfer Capability (ATC) study or a power factor analysis as part of this study.

Transient stability analysis shows no new problems with the dynamic response of study generation in the region of interest for the faults and clearing times studied. Some pre-existing problems were found, though. FLT07, FLT30, FLT31, and FLT44 cause GEN-2001-033 to trip offline in both the summer and winter cases for low voltage, with or without the GEN-2010-046 generation. In addition, FLT07 and FLT44 cause oscillations on GEN-2001-036 in both summer and winter cases, and FLT28 causes oscillations on GEN-2001-036 in the summer case, with or without GEN-2010-046.

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1. INTRODUCTION

The Southwest Power Pool (hereafter referred to as SPP) commissioned AMEC Earth and Environmental (hereafter referred to as AMEC) to perform a Definitive Interconnection System Impact Study of a group of generators in the SPP interconnection queue referred to as Group 6. The generators studied are in Hale County, Texas.

SPP did not request an Available Transfer Capability (ATC) study. The ATC study will be required when the generation companies request transmission service.

SPP requested a stability analysis based on a list of faults provided by SPP. The results of this study

a. Determine the ability of the generators to remain in synchronism following three-phase and single-line-to-ground faults.

2. STUDY METHODOLOGY

SPP provided 2010 summer peak and 2011 winter peak load flow cases in PSS/E format. Table 1 below shows the total demand and generation in the monitored areas.

Table 1: Description of Study Areas

Area No.	Area Name	2011 Summer Peak		2011 Winter Peak	
		Load (MW)	Generation (MW)	Load (MW)	Generation (MW)
520	AEPW	10245.7	8202.2	7877.9	5832.0
524	OKGE	5939.7	6778.7	4186.1	4563.0
525	WFEC	1409.0	1632.7	1297.6	1531.4
526	SPS	5621.1	7931.0	4044.8	6566.0
531	MIDW	261.0	290.7	199.2	239.6
534	SUNC	565.9	1194.7	466.0	1145.1
536	WERE	5939.7	5545.1	3956.1	3939.1

- **DYNAMIC ANALYSIS**

The study areas shown in Table 1 were monitored in the dynamic analysis. The transmission line and transformer faults were simulated and synchronous machine rotor angles and wind turbine generator speeds were monitored to check whether synchronism of the synchronous machines is maintained and whether the wind turbine generators trip offline during the disturbance.

Following is a summary of the faults simulated in this analysis.

Table 2: Fault Descriptions

Cont. No.	Cont. Name	Description
1	FLT01-3PH	3 phase fault on the Eddy Co. 230kV (527800) to 345kV (527802) transformer, near the 230kV bus. a. Apply fault at the Eddy Co. 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
2	FLT02-3PH	3 phase fault on the Eddy Co (527802) to GEN-2008-022 (577104) 345kV line, near GEN-2008-022. a. Apply fault at the GEN-2008-022 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
3	FLT03-1PH	*Single phase fault and sequence like previous*
4	FLT04-3PH	3 phase fault on the Tolk (525549) to GEN-2008-022 (577104) 345kV line, near GEN-2008-022. a. Apply fault at the GEN-2008-022 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
5	FLT05-1PH	*Single phase fault and sequence like previous*
6	FLT06-3PH	3 phase fault on the Tolk 230kV (525543) to 345kV (525549) transformer, near the 230kV bus. a. Apply fault at the Tolk 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
7	FLT07-3PH	3 phase fault on the Tolk E (525524) to Tuco (525830) 230kV line, near Tolk E. a. Apply fault at the Tolk E 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
8	FLT08-1PH	*Single phase fault and sequence like previous*

Cont. No.	Cont. Name	Description
9	FLT09-3PH	3 phase fault on the Grassland (526676) to Lynn Co. (526656) 115kV line, near Grassland. a. Apply fault at the Grassland 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
10	FLT10-1PH	*Single phase fault and sequence like previous*
11	FLT11-3PH	3 phase fault on the Grassland 230kV (526677) to 115kV (526676) transformer, near the 230kV bus. a. Apply fault at the Grassland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
12	FLT12-3PH	3 phase fault on the Grassland (526677) to Borden (526830) 230kV line, near Grassland. a. Apply fault at the Grassland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
13	FLT13-1PH	*Single phase fault and sequence like previous*
14	FLT14-3PH	3 phase fault on the Grassland (526677) to Jones (526338) 230kV line, near Grassland. a. Apply fault at the Grassland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
15	FLT15-1PH	*Single phase fault and sequence like previous*
16	FLT16-3PH	3 phase fault on the Jones (526338) to Lubbock E (526299) 230kV line, near Jones Bus2. a. Apply fault at the Jones 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
17	FLT17-3PH	3 phase fault on the Jones (526337) to Tuco (525830) 230kV line, near Jones Bus1. a. Apply fault at the Jones 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
18	FLT18-1PH	*Single phase fault and sequence like previous*
19	FLT19-3PH	3 phase fault on the Tuco (525830) to Swisher (525213) 230kV line, near Tuco. a. Apply fault at the Tuco 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
20	FLT20-1PH	*Single phase fault and sequence like previous*

Cont. No.	Cont. Name	Description
21	FLT21-3PH	3 phase fault on the Tuco 230kV (525830) to 345kV (525832) transformer, near the 230kV bus. a. Apply fault at the Tuco 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
22	FLT22-3PH	3 phase fault on the GEN-2005-015 (560813) to Tuco (525832) 345kV line, near GEN-2005-015. a. Apply fault at the GEN-2005-015 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
23	FLT23-1PH	*Single phase fault and sequence like previous*
24	FLT24-3PH	3 phase fault on the GEN-2005-015 (560813) to Oklaunion (511456) 345kV line, near GEN-2005-015. a. Apply fault at the GEN-2005-015 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
25	FLT25-1PH	*Single phase fault and sequence like previous*
26	FLT26-3PH	3 phase fault on the Tuco (525832) to Wheeler/Midpoint (525835) 345kV line, near Tuco. a. Apply fault at the Tuco 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
27	FLT27-1PH	*Single phase fault and sequence like previous*
28	FLT28-3PH	3 phase fault on the Roosevelt S (524911) to Tolk (525554) 230kV line, near Roosevelt S. a. Apply fault at the Roosevelt S 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
29	FLT29-1PH	*Single phase fault and sequence like previous*
30	FLT30-3PH	3 phase fault on the San Juan (524885) to Oasis (524875) 230kV line, near Oasis. a. Apply fault at the Oasis 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
31	FLT31-1PH	*Single phase fault and sequence like previous*
32	FLT42-3PH	3 phase fault on the Potter (523961) to GEN-2005-017 (579118) 345kV line, near Potter a. Apply fault at the Potter 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
33	FLT43-1PH	*Single phase fault and sequence like previous*

Cont. No.	Cont. Name	Description
34	FLT44-3PH	3 phase fault on the Tolk East (525524) to Plant X (525481) 230kV line, near Tolk East. a. Apply fault at the Tolk East 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
35	FLT45-1PH	*Single phase fault and sequence like previous*
36	FLT46-3PH	3 phase fault on the Plant X (525481) to Deafsmith (524623) 230kV line, near Deafsmith. a. Apply fault at the Deafsmith 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
37	FLT47-1PH	*Single phase fault and sequence like previous*
38	FLT48-3PH	3 phase fault on the Plant X (525481) to Sundown (526435) 230kV line, near Sundown. a. Apply fault at the Sundown 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
39	FLT49-1PH	*Single phase fault and sequence like previous*
40	FLT50-3PH	3 phase fault on the Plant X (525481) to G06-39T (56009) 230kV line, near G06-39T. a. Apply fault at the G06-39T 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
41	FLT51-1PH	*Single phase fault and sequence like previous*
42	FLT52-3PH	3 phase fault on the Tolk West (525531) to Lamb County (525637) 230kV line, near Lamb County. a. Apply fault at the Lamb County 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
43	FLT53-1PH	*Single phase fault and sequence like previous*
44	FLT54-3PH	3 phase fault on the Tolk West (525531) to Yoakum (526935) 230kV line, near Yoakum. a. Apply fault at the Yoakum 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
45	FLT55-1PH	*Single phase fault and sequence like previous*

In order to simulate 1PH faults, equivalent shunt Mvar[1] were determined to be applied at the faulted buses. Table 6 presents equivalent reactors used in the transient stability study.

Table 3: Equivalent Shunt Mvar at Faulted Bus for Single-Line-to-Ground Faults

Fault No.	Faulted Bus No.	2011 Summer Peak (Mvar)	2011 Winter Peak (Mvar)
FLT03-1PH	577104	-1395.0	-1313.9
FLT05-1PH	577104	-1395.0	-1313.9
FLT08-1PH	525524	-6406.0	-4837.6
FLT10-1PH	526676	-980.6	-985.1
FLT13-1PH	526677	-1809.8	-1808.9
FLT15-1PH	526677	-1809.8	-1808.9
FLT18-1PH	526337	-3991.7	-3949.8
FLT20-1PH	525830	-4138.2	-4020.3
FLT23-1PH	560813	-2199.7	-2077.1
FLT25-1PH	560813	-2199.7	-2077.1
FLT27-1PH	525832	-2995.3	-2860.1
FLT29-1PH	524911	-2651.5	-2420.1
FLT31-1PH	524875	-1986.5	-1868.1
FLT43-1PH	523961	-3082.2	-3052.5
FLT45-1PH	525524	-6406.0	-4837.6
FLT47-1PH	524623	-2472.0	-2409.4
FLT49-1PH	526435	-2471.9	-2382.3
FLT51-1PH	560009	-3071.0	-3016.0
FLT53-1PH	525637	-1356.0	-1307.3
FLT55-1PH	526935	-3467.3	-3069.5

Because the proposed generator is a gas turbine and not a wind farm, FERC Order 661A does not apply. Therefore, Low Voltage Ride Through (LVRT) was not analyzed.

[1] The equivalent shunt Mvar causes the voltage at the faulted bus to drop to 0.60 PU.

3. PROJECT DESCRIPTION

Following is a descriptive table of the proposed gas turbine in Group 6.

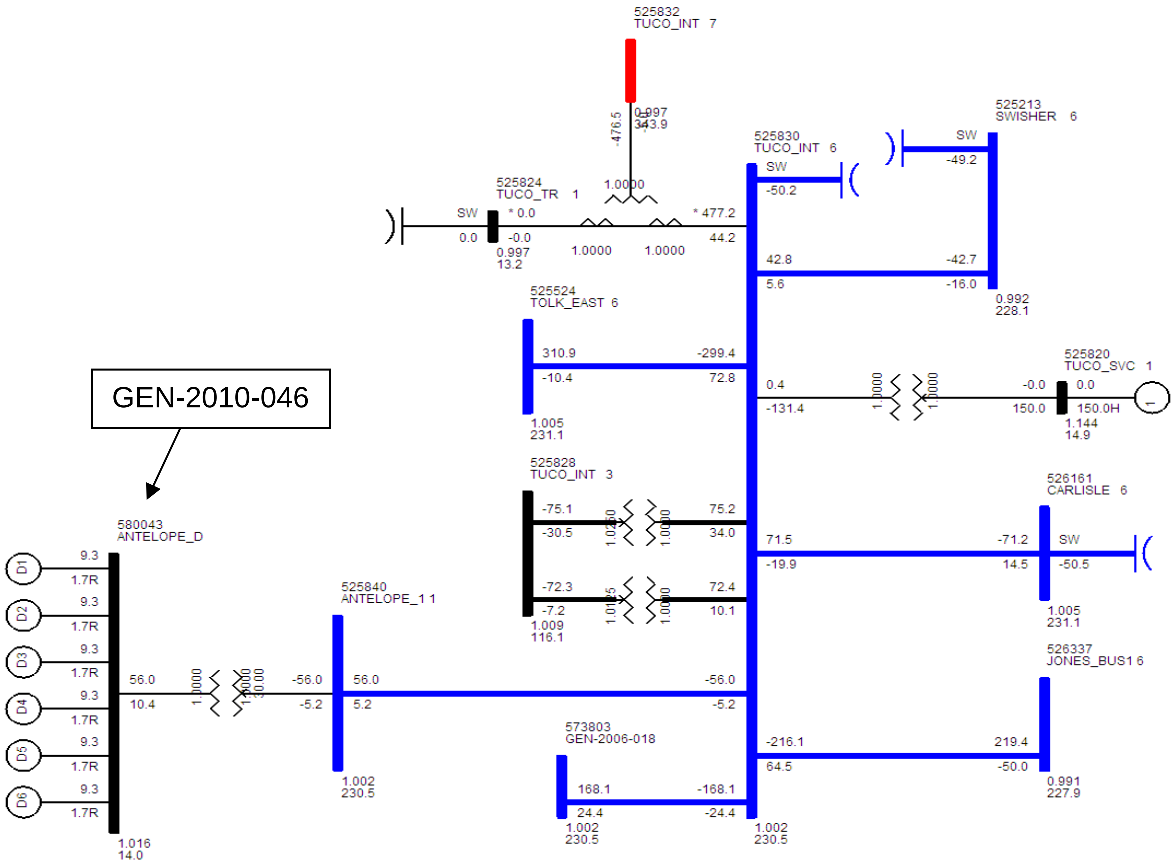
Table 4: Point of Interconnection for Gen-2010-046

Request	Size (MW)	Turbine Model	Point Of Interconnection	
			Bus No.	Bus Name in model
GEN-2010-046	56	GENSAL	525830	Tuco 230 kV

The one-line diagram of GEN-2010-046 uses the following color codes for nominal voltages:

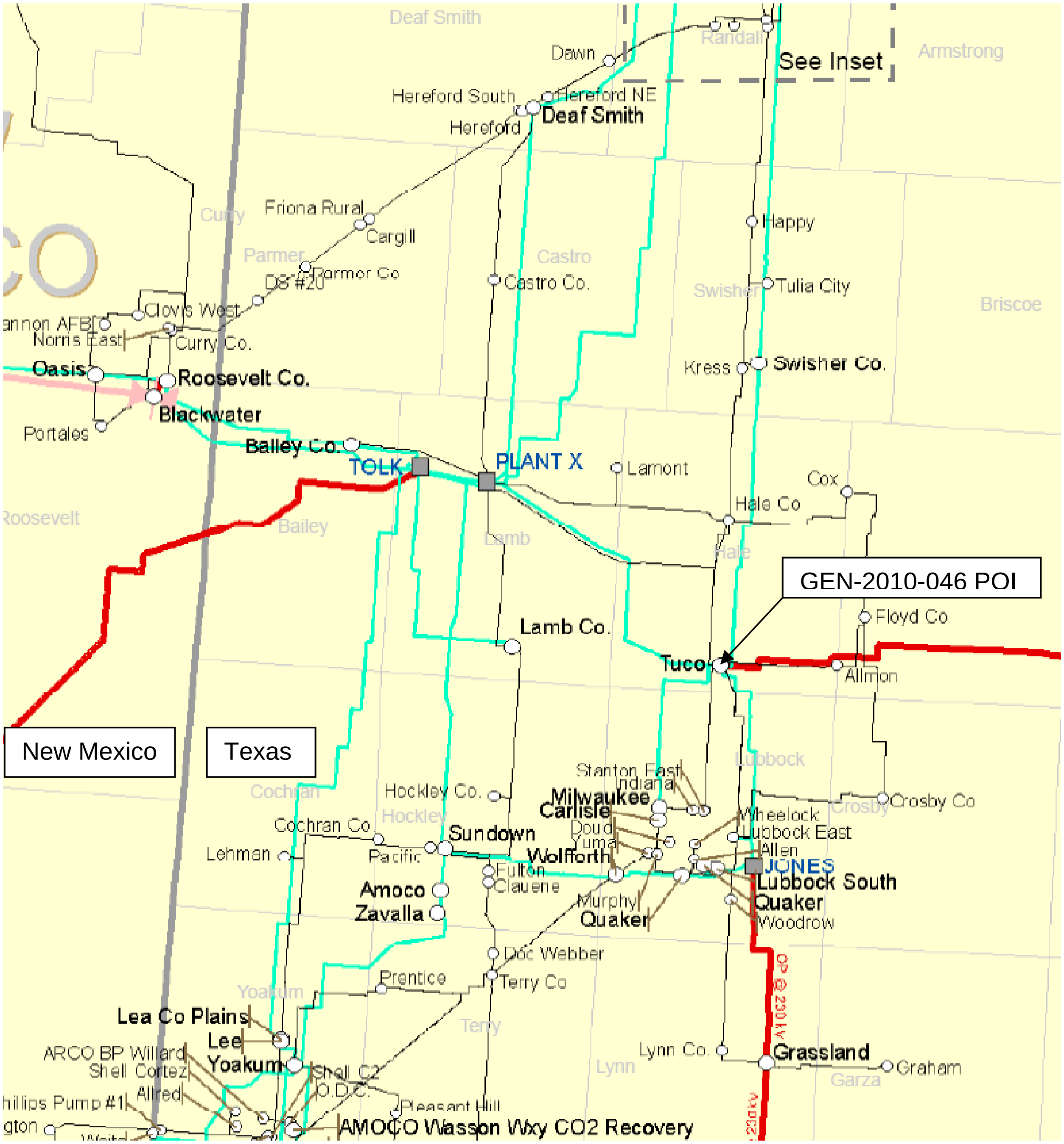
Black **115 kV or lower**
Blue **230 kV**
Red **345 kV**
All voltages and line flows are from the 2011 summer peak base case.

Figure 1: GEN-2010-046 Interconnection One-Line Diagram



As illustrated below, GEN-2010-046 is located in Abernathy, Texas (the Texas panhandle).

Figure 2: Geographical Location of Group 6 Projects



4. TRANSIENT STABILITY RESULTS

Based on the dynamics results, GEN-2010-046 did not cause any new stability problems, and GEN-2010-046 remained stable for all faults studied. Oscillation of GEN-2010-036 and under-voltage tripping of GEN-2001-033 occurred with the surrounding generators on the monitor list, whether GEN-2010-046 is online or offline.

Following are plots of the GEN-2010-046 electric power output for the most severe fault: FLT19-3PH. This fault is for the 230 kV line from the Tuco POI to Swisher at the Tuco end. In both the summer and the winter cases, the rotor angle swings by approximately 85° above the equilibrium for FLT19-3PH. This suggests that, although the machine returns to synchronism with the grid post-fault, the fault clearing time of 5 cycles is near the critical clearing time.

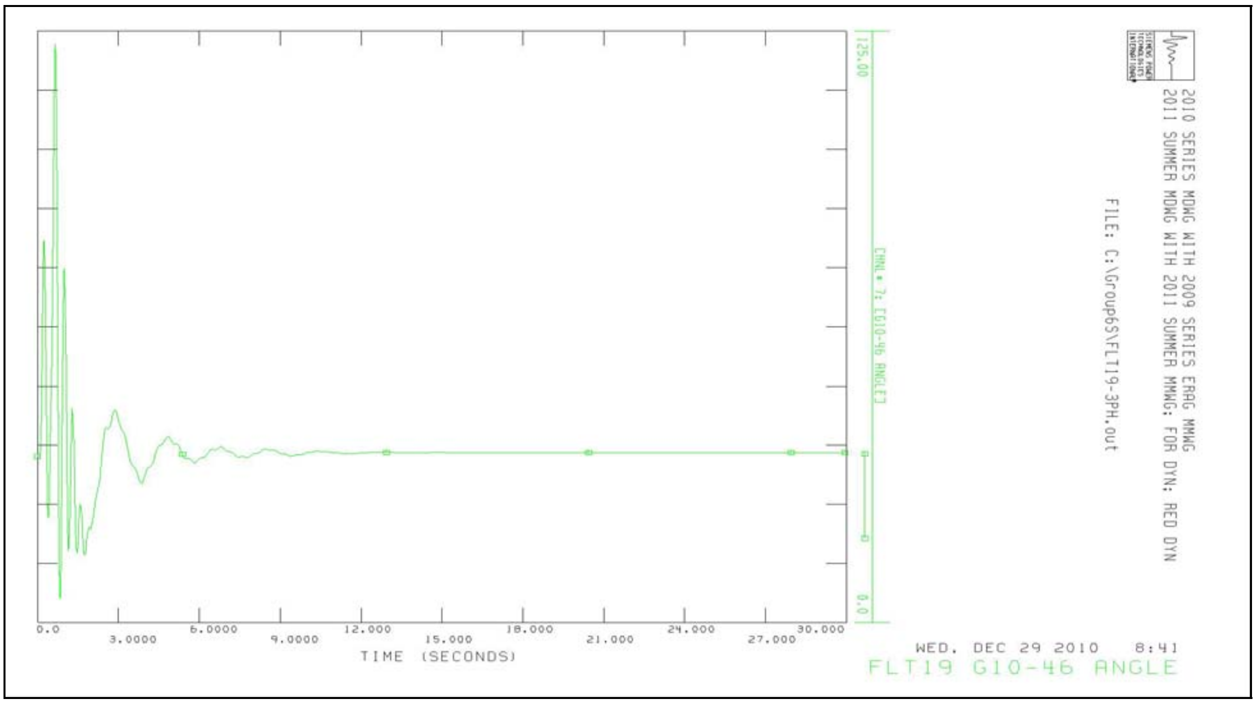


Figure 3: Response of GEN-2010-046 Gas Turbine Generator Rotor Angle to FLT19-3PH, Summer Peak

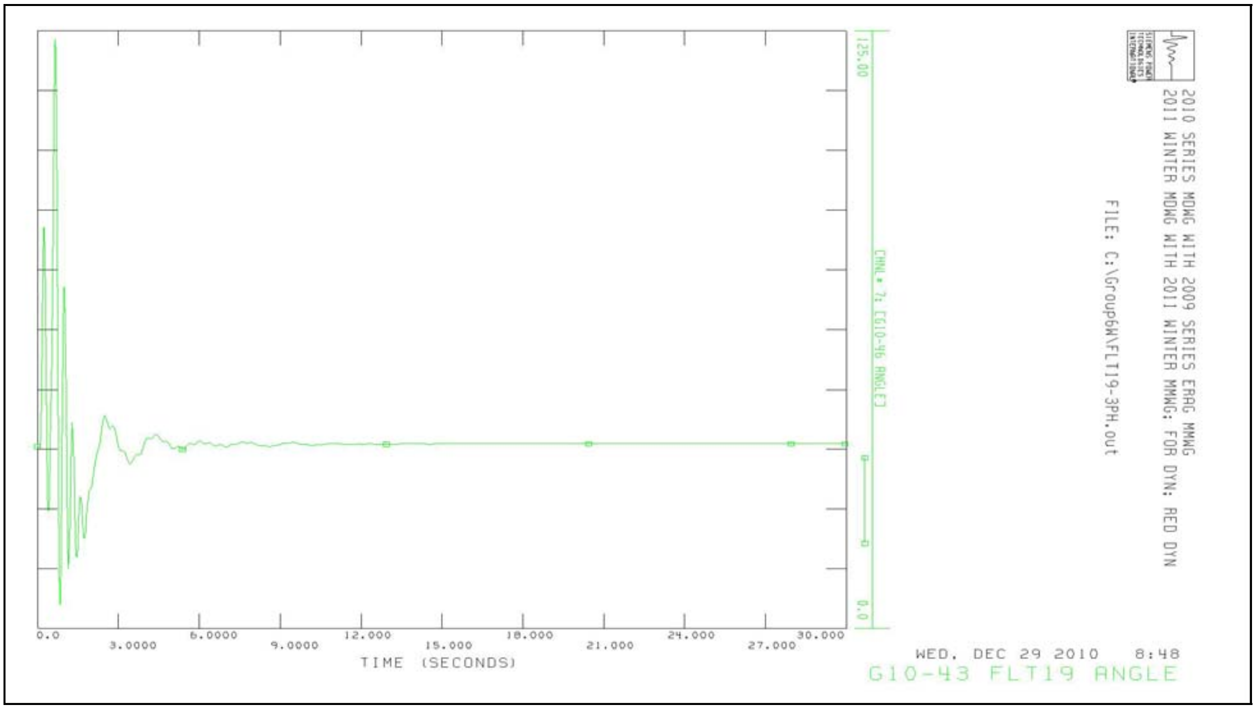


Figure 4: Response of GEN-2010-046 Gas Turbine Generator Rotor Angle to FLT19-3PH, Winter Peak

GEN-2001-033 tripped offline in the summer and winter cases for FLT07-3PH, FLT30-3PH, FLT31-1PH, and FLT44-3PH. This was due to under-voltage at the generator buses at San Juan Wind (below 0.85 pu for 0.5 seconds at the generator buses). Response to FLT07 is depicted below; response was virtually identical for FLT30-3PH, FLT31-1PH, and FLT44-3PH.

GEN-2001-033 trips offline for these faults whether GEN-2010-046 is online or offline. With under-voltage and under-frequency relaying disabled, GEN-2001-033 is stable for the above faults.

In addition, serious oscillation was observed at GEN-2001-036 for FLT07 and FLT44 in both the summer and winter cases, and for FLT28 in the summer case. The real power output for the most part oscillates between -2 and +4 pu (or -200 to +400 MW), but spiked as high as 40 pu, or 4000 MW for an 80 MW wind farm. In reality, such severe oscillation would cause GEN-2001-036 to trip offline.

This oscillation occurred whether GEN-2010-046 was online or offline. The oscillation was reflected in the power outputs of the other generation interconnections, especially GEN-2001-033, GEN-2005-010, GEN-2008-009, GEN-2008-022, GEN-2010-006, ASGI-2010-010, and GEN-2009-067S. With GEN-2001-036 offline (as it would be for oscillation approaching the observed levels), the oscillation at these other generation interconnections went away.

Both GEN-2001-033 and GEN-2001-036 are grandfathered facilities that are not subject to order #661A and the necessary tripping of the wind farms is allowed.

5. CONCLUSIONS

Based on the results of the Group 6 DISIS 2010-002 study, the following findings had been observed:

- GEN-2010-046 remained stable for all faults studied.
- San Juan Wind Farm GEN-2001-033 tripped offline for low generator bus voltage (<0.85 pu for 0.5 seconds) for FLT07-3PH (Tolk E-Tuco 230 kV near Tolk E), FLT30-3PH and FLT31-1PH (San Juan-Oasis 230 kV near Oasis), and FLT44-3PH (Tolk E-Plant X 230 kV near Tolk E). This is a pre-existing condition, not caused by GEN-2010-046.
- GEN-2001-036 went into oscillation for FLT07-3PH and FLT44-3PH in both the winter and summer cases, and for FLT28-3PH (Roosevelt S-Tolk 230 kV near Roosevelt S) in the summer case. This is a pre-existing condition, not caused by GEN-2010-046.
- Both GEN-2001-033 and GEN-2001-036 are grandfathered facilities that are not subject to order #661A and the necessary tripping of the wind farms is allowed.

M: Stability Study for Group 7

POWER SYSTEMS DIVISION
GRID SYSTEMS CONSULTING

System Impact Study for DISIS-2010-002 Group 7

DRAFT REPORT

REPORT NO.: E-00005725-R0
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Prepared for:
Southwest Power Pool, Inc.

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ABB Inc – Grid Systems Consulting

Technical Report

Southwest Power Pool, Inc.	**No.** E-00005725-R0	
System Impact Study for DISIS-2010-002 Group 7	Date: 01/27/11	# Pages 19

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Executive Summary

Southwest Power Pool, Inc. (SPP) commissioned ABB Inc. to perform a Definitive Interconnection System Impact Study (DISIS) for Group 7 generation, which included a wind-based generation of 65 MW (Queue # GEN-2010-012) on the SPP transmission. The proposed wind farm is located in Dewey County, Oklahoma and the POI is at Brantley 138 kV.

Request	Size	Wind Turbine Model	Point of Interconnection	County
GEN-2010-012	65	Clipper C93 2.5MW	Brantley 138kV (bus #520832)	Dewey, Oklahoma

The main objectives of this study were:

1) To determine the power factor requirements for the proposed wind farm
2) To determine the impact of proposed GEN-2010-012 project on the stability of SPP transmission systems and nearby generating stations.
3) To validate the compliance with FERC LVRT requirement for the subject wind farm interconnection.

To achieve these objectives the following analyses were performed on the 2010 Summer Peak and 2009 Winter Peak system conditions with GEN-2010-012 in-service:

- Power factor analysis for selected contingencies.
- Transient stability analysis for several local and regional contingencies.
- LVRT performance evaluation for selected contingencies near the POI.

A summary of the study findings is given below:

Power factor analysis

SPP requires that the Interconnection Customer's wind farm must be able to maintain a specified voltage schedule and be designed to maintain +/- 0.95 power factor at the POI under all system conditions (i.e. system intact and contingencies). An analysis was conducted to determine the power factor requirements for the requested wind farm project. The power factor analysis indicated a power factor requirement of 0.95 lead (absorbing vars) and 1.00 lag (unity) for the requested wind farm. The interconnection

customer will therefore need to design the wind farm to be able to meet the +/-0.95 requirement.

Stability Analysis

A stability analysis was performed to determine the impact, if any, of the proposed project on the stability of SPP system. The system was found to be stable for all the tested 3-phase faults and single-line-to-ground (SLG) faults (with line re-closing, where applicable).

FERC Order 661A Compliance

Selected faults were simulated at the Point of Interconnection (POI) of the proposed DISIS-2010-002 Group 7 wind farm to determine the compliance with FERC 661 – A; post-transition period LVRT standard. The results indicated that the proposed project met the FERC LVRT requirement for wind farm interconnection.

Based on the results of the analysis, it can be concluded that the proposed GEN-2010-012 wind farm does not adversely impact the transmission performance of the SPP system.

The results of this analysis are based on available data and assumptions made at the time of conducting this study. If any of the data and/or assumptions made in developing the study model change, the results provided in this report may not apply.

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ABB

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1 INTRODUCTION

Southwest Power Pool, Inc. (SPP) commissioned ABB Inc. to perform a Preliminary Interconnection System Impact Study (PISIS) for Group 7 generation, which included a wind-based generation of 65 MW (Queue # GEN-2010-012) on the SPP transmission. The proposed wind farm is located in Dewey County, Oklahoma and the POI is at Brantley 138 kV. Figure 1-1 shows the POI of the proposed generation project on a Geographical Transmission Map.

This study evaluated the impact of the Gen-2010-012 project on the SPP Transmission System. The scope of this study was limited to the power factor evaluation and transient stability analysis.

The main objectives of this study were

1) To determine the power factor requirements for the proposed wind farm
2) To determine the impact of the proposed Project (GEN-2010-012, 65 MW) on the stability of SPP transmission system and nearby generating stations.
3) To validate the compliance with FERC LVRT requirement for the wind farm.

To achieve these objectives the following analyses were performed on the 2010-2011 Summer and Winter Peak system conditions with GEN-2010-012 project(s) in-service

- Power factor analysis for selected contingencies.
- Transient stability analysis for various local and regional contingencies.
- LVRT performance under selected contingencies near the POI.

The study was performed on the cases, provided by SPP. This report documents the methods, analysis and results of the system impact study.

Table 1-1: GEN-2010-012 Project

Project	Size (MW)	Wind Turbine Type	Point of Interconnection	Location
GEN-2010-012	65	Clipper C93 2.5MW	Brantley 138kV (bus #520832)	Dewy, Oklahoma

1.1 REPORT ORGANIZATION

This report is organized as follows:

Section 2: Description of project
Section 3: Study methodology
Section 4: Model Development
Section 5: Power Factor Analysis Results
Section 6: Stability Analysis Results
Section 7: Conclusions

The detailed study results are included in separate Appendices.
.

Figure 1-1 Geographical Transmission Map with GEN-2010-012 Project location (approx.)

2 DESCRIPTION OF THE PROJECT

The details of load flow and dynamic data for the GEN-2010-012 wind farm project is included in Appendix A.

- Wind farm size: 65 MW
- Interconnection:

  Voltage: 138 kV

  POI: Brantley 138kV substation. The wind-farm will be connected to the POI via 138 kV line.

  Transformer: One (1) step-up transformer connecting to the 138 kV

  MVA: 78 MVA

  Voltage: 138/34.5 kV

  Z: 9.0 % on 78 MVA

- Wind Turbines:

  Number: Twenty Six (26)

  Manufacturer: Clipper

  Type: Permanent Magnet Synchronous Generator[1]

Machine Terminal voltage: 0.69 kV

  Rated Power: 2.5 MW

  Frequency: 60 Hz

  Generator Step-up Transformer

  MVA: 2.75
  High voltage: 34.5 kV
  Low voltage: 0.69 kV
  Z: 5.75% on 2.75 MVA

Reactive Power Capability: Constant Power Factor (Default Design: Unity PF[1])

- Fault Ride-through: Manufacturer's default ride-through capability was modeled
- PSSE Model Used c93h4v303.obj

[1] Modeling the Clipper Windpower Liberty Series Wind Turbine for Load Flow, Short Circuit and Stability Studies using PSS/E Version 30.3 and 29.5; Specification and Requirements 2.5 MW Wind Turbine Revision C September 3rd, 2009

3 STUDY METHODOLOGY

3.1 POWER FACTOR ANALYSIS

SPP requires that the Interconnection Customer's wind farm maintain a specified voltage schedule and be designed to maintain at least +/- 0.95 power factor at the POI for any system condition. The purpose of the power factor analysis was to determine whether the proposed wind farm project will meet the power factor requirement at the Point of Interconnection (POI) for system intact as well as contingency conditions.

The Power Factor Analysis involved the following Steps:

- A VAR generator with large capacity (e.g. +/- 9999 MVar) was modeled at the POI of the subject wind farm. The VAR generator was set to hold the POI voltage consistent with the voltage schedule in the power flow base cases. The reactive power capability of the wind farm was set to zero.
- A list of selected contingencies in the vicinity of the subject wind farm was simulated. The results were used to identify the most-limiting contingency from steady state voltage and power factor perspective.
- The power factor requirements were determined from this analysis

It is important to note that the reactive power compensation identified in this analysis is primarily needed to meet steady state criteria. The need for dynamic reactive power support, if any, was determined through transient stability analysis.

3.2 TRANSIENT STABILITY ANALYSIS

The purpose of the transient stability analysis is to determine the impact, if any, of the proposed wind farm project on the stability performance of the SPP transmission system and generating stations in the interconnection vicinity.

Stability analysis was performed using Siemens-PTI's PSS/E™ dynamics program V30.3.3. Three-phase and single-line-to-ground (SLG) (with re-closure where applicable) were simulated for the specified duration and synchronous machine rotor angles and wind turbine generator speeds were monitored to check whether the system is stable following the fault clearing. In addition, the voltage at the wind-farm POI and vicinity was also monitored.

For three-phase faults, a fault admittance of –j2E9 was used (essentially infinite admittance representing a bolted fault). The PSS/E dynamics program only simulates the positive sequence network. However, the unbalanced fault current computation (e.g. single-phase-ground) requires the knowledge of positive, negative, and zero sequence impedances. For a single-line-to-ground (SLG) fault, the fault admittance then equals the inverse of the sum of the positive, negative and zero sequence impedances. Typically, a single line to ground fault results in a voltage of roughly 60%. The admittance needed (over and above the positive sequence) to achieve this voltage value was computed using activity TYSL in PSS/E. This additional admittance value is the equivalent of the sum of positive and negative sequence admittances. The admittance value computed in the above step is then inserted at the faulted bus and the single line to ground fault current is computed.

The voltages at all local buses (115 kV and above) were monitored for all tested contingencies.

Another important aspect of the stability analysis was to determine the ability of the wind generators to stay connected to the grid during disturbances. This is primarily determined by their low-voltage ride-through capabilities – or lack thereof – as represented in the models by low-voltage trip settings. The Federal Energy Regulatory Commission (FERC) Post-transition period LVRT standard for Interconnection of Wind generating plants includes a Low Voltage Ride-Through (LVRT) requirement. The key features of LVRT requirements are:

- A wind generating plant must remain in-service during three-phase faults with normal clearing (maximum 9 cycles) and single-line-to-ground faults with delayed clearing, and have subsequent post-fault recovery to pre-fault voltage unless the clearing of the fault effectively disconnects the generator from the system.
- The maximum duration the wind generating plant shall be required to withstand a three-phase fault shall be 9 cycles after which, if the fault remains following the location-specific normal clearing time for three-phase faults, the wind generating plant may disconnect from the transmission system. A wind generating plant shall remain interconnected during such a fault on transmission system for a voltage level as low as zero volts, as measured at the high voltage side of the GSU connected at POI.

These criteria were used to evaluate the LVRT capability of the wind farm.

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4 MODEL DEVELOPMENT

SPP provided two power flow cases for this study – i) "MDWG_2010_2011SP_DISIS-2010-002-G7.sav" and ii) "MDWG_2010_2011WP_DISIS-2010-002-G7.sav" – representing respectively the 2010-2011 Summer Peak and Winter Peak conditions.

Request	Size (MW)	Wind Turbine Model	Point of Interconnection
Blue Canyon I	74	CIMTR	Washita 138kV (521089)
Blue Canyon II (GEN-2003-004)	151	Vestas V80	Washita 138kV (521089)
Weatherford	147	G.E. 1.5MW	Weatherford 138kV (511506)
GEN-2003-005	100	G.E. 1.5MW	Anadarko – Paradise 138kV (560916)
GEN-2006-002	150	Gamesa	Beckham County 230kV (560012)
GEN-2006-035	224	Gamesa	Beckham County 230kV (560012)
GEN-2006-043	99	G.E. 1.5MW	Beckham County 230kV (560012)
GEN-2007-032	150	Acciona 1.5MW	Clinton Jct. – Clinton 138kV (560939)
GEN-2007-043	300	G.E. 1.5MW	Cimarron – Anadarko 345kV (210431)
GEN-2007-052	150	Gas Turbine	Anadarko 138kV (520814)
GEN-2008-023	150	G.E. 1.5MW	Hobart Junction (511463) 138kV
GEN-2009-016	170	Siemens 2.3MW	Falcon Road 138KV (511511)
GEN-2008-037	100.8	Vestas V90 1.8MW	Washita (521089) – Blue Canyon (521103) 138kV (Bus 573570)
GEN-2009-030	100.8	GE 1.6MW	Weatherford 138kV (521092)
GEN-2009-060	85.5	GE 1.5MW	Gotebo 69kV (520925)
GEN-2010-040	300	Suzlon 2.1MW	Cimarron 345kV

4.1 MODEL DEVELOPMENT FOR GEN-2010-012 PROJECT

The models (power flow and dynamics) for the proposed project were included in the data supplied by SPP. A cursory review of the study models was performed to ensure the wind farm and the associated collector system representation is in agreement with the data provided for this study. The subject wind farm which comprises of Clipper WTGs that are operated at constant power factor and therefore do not have a voltage control regime. The default settings corresponded to unity power factor control.

Figure 4-1 and Figure 4-2 show the one-line diagram in the local area of GEN-2010-012 for 2010-2011 summer peak and winter peak conditions respectively.

The dynamic model setup with the "snapshot" for performing stability analysis was provided by SPP. We performed a no-disturbance simulation to verify the models initialized correctly and there is no drift from the respective steady state quantities (e.g. machine angle, speeds, bus voltage etc.) over time.

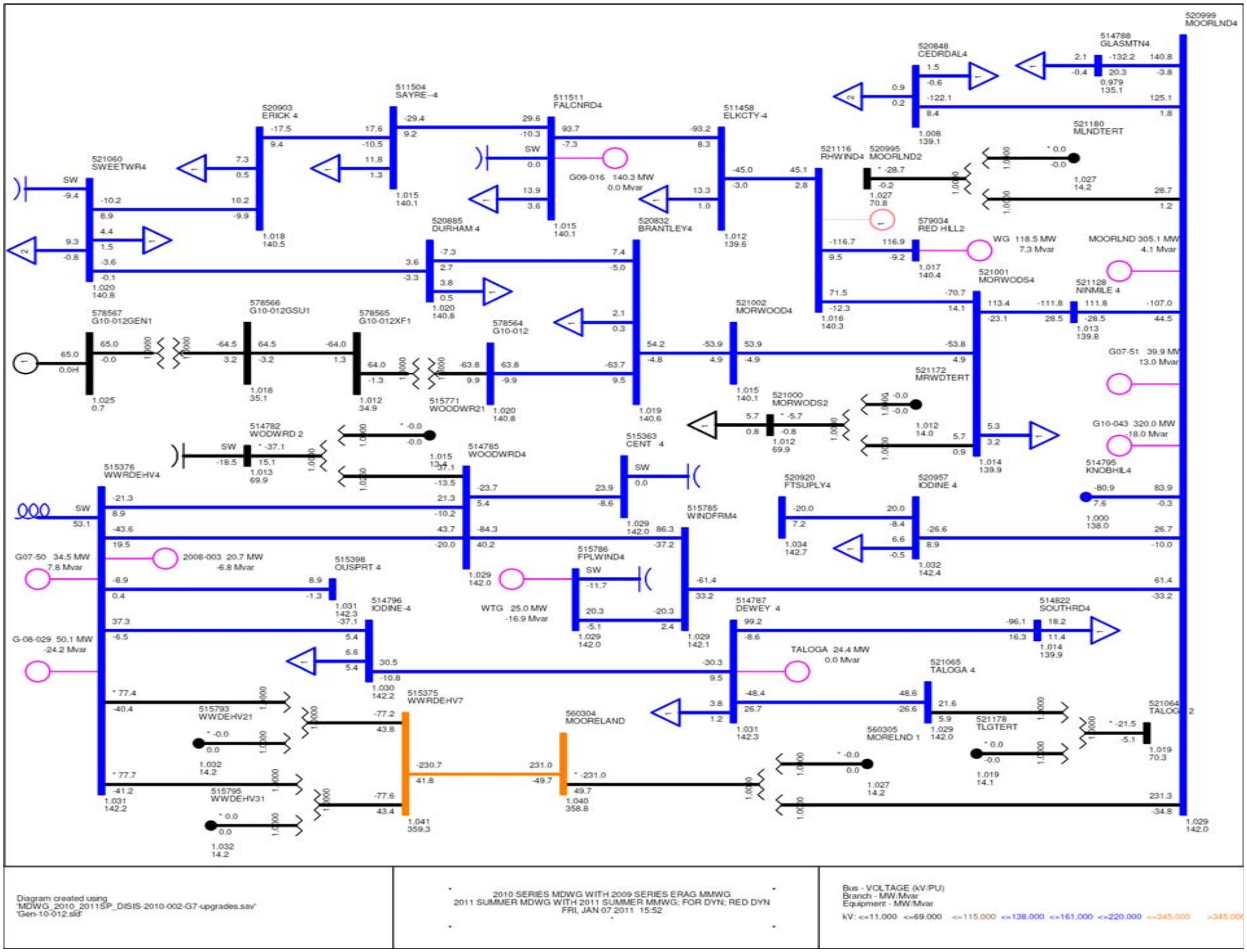

Figure 4-1 One-line Diagram of the local area of GEN-2010-012 (2010-2011 Summer Peak)

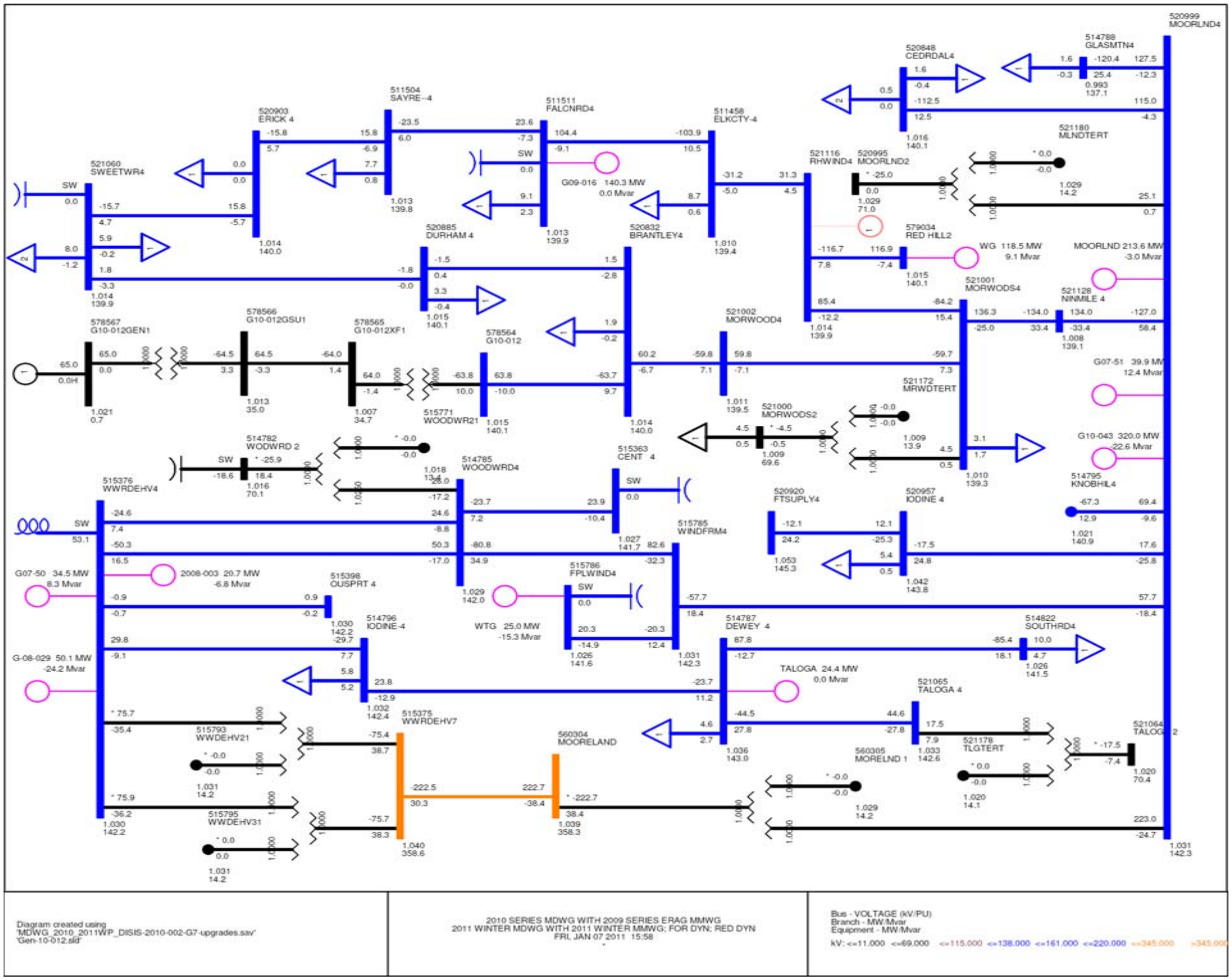

Figure 4-2 One-line Diagram of the local area of GEN-2010-012 (2010-2011 Winter Peak)

5 POWER FACTOR ANALYSIS RESULTS

The Power Factor analysis was performed to verify that the wind-farm interconnection met SPP's standard in terms of power factor and voltage requirements at the POI. Table 5-1 lists the contingencies simulated for Power Factor analysis.

Table 5-1: List of contingencies simulated

Contingency Name	Contingency Description
CONT_00	BASECASE
CONT_01	Loss of Weatherford (521092) to Clinton. (520856) 138kV line
CONT_02	Loss of Clinton Jct. (511485) to CL_NGTP (511534) 138kV line
CONT_03	Loss of Weatherford WFEC (GEN-2009-030) (521092) to Hydro. (520950) 138kV line
CONT_04	Loss of Elk City (511458) to Clinton AFB (511446) 138kV line
CONT_05	Loss of Elk City 138kV (511458) to 230kV (511490) transformer
CONT_06	Loss of Gracemont 138kV (515802) to 345kV (515800) transformer
CONT_07	Loss of Hobart Jct (511463) to Carnegie South (511445) 138kV line
CONT_08	Loss of Hobart Jct. (511463) to CL-AFTP4 (511446) 138kV line
CONT_09	Loss of Hobart Jct. (511463) 138/69kv auto
CONT_10	Loss of Altus (511440) to Snyder (511435) 138kV line
CONT_11	Loss of Morewood (521001) to Mooreland (520999) 138kV line
CONT_12	Loss of Anadarko (520814) to Southwest (511477) 138kV line
CONT_13	Loss of Anadarko (520814) to Gracemont (515802) 138kV line
CONT_14	Loss of Washita (521089) to Gracemont (515802) 138kV line
CONT_15	Loss of GEN-2008-037 (573570) to Gracemont (515802) 138kV line
CONT_16	Loss of Anadarko (520814) to Cornville Tap (520867) 138kV line
CONT_17	Loss of Southwest (511477) to Washita (521089) 138kV line
CONT_18	Loss of Oney (521017) to Washita (521089) 138kV line
CONT_19	Loss of Clinton Jct (511485) to Elk City (511458) 138kV line
CONT_20	Loss of Washita (521089) to GEN-2008-037 (573570) 138kV line
CONT_21	Loss of Brantley (520832) to Durham (520885) 138kV line
CONT_22	Loss of Brantley (520832) to Morwood (521002) 138kV line
CONT_23	Loss of Elk City 138kV (511458) to 69kV (511459) transformer

As described in section 3.1, a VAR generator was modeled at POI. The VAR generator was set to hold the 115 kV POI voltage equal to that in the base case provided by SPP.

The contingencies shown in Table 5-1 were simulated on 2010-2011 summer peak and winter peak load conditions.

Table 5-2 VAR generator output[2] at the GEN-2010-012 POI

Contingency	VOLTAGE OF VAR Gen. Summer Peak (#520832)	VOLTAGE OF VAR Gen. Winter Peak (#520832)	Summer Peak Q (MVAR)	Summer Peak P (MW)	Summer Peak p.f	Winter Peak Q (MVAR)	Winter Peak P (MW)	Winter Peak p.f
CONT_00	1.019	1.014	-9.6	65	0.989	-10.1	65	0.988
CONT_01	1.019	1.014	1.1	65	0.999	3.2	65	0.999
CONT_02	1.019	1.014	-11.3	65	0.985	-11.5	65	0.985
CONT_03	1.019	1.014	-7.1	65	0.994	-6.9	65	0.994
CONT_04	1.019	1.014	1.2	65	0.999	2.9	65	0.999
CONT_05	1.019	1.014	-18.5	65	0.962	-22.3	65	0.946
CONT_06	1.019	1.014	-7.4	65	0.994	-7.4	65	0.994
CONT_07	1.019	1.014	-5.2	65	0.997	-4.2	65	0.998
CONT_08	1.019	1.014	0	65	1.000	2.2	65	0.999
CONT_09	1.019	1.014	-8.3	65	0.992	-9.1	65	0.990
CONT_10	1.019	1.014	-9.4	65	0.990	-9.4	65	0.990
CONT_11	1.019	1.014	-6.7	65	0.995	-11.3	65	0.985
CONT_12	1.019	1.014	-9.4	65	0.990	-9.9	65	0.989
CONT_13	1.019	1.014	-9.3	65	0.990	-9.5	65	0.989
CONT_14	1.019	1.014	-9.4	65	0.990	-9.9	65	0.989
CONT_15	1.019	1.014	-9.3	65	0.990	-9.6	65	0.989
CONT_16	1.019	1.014	-9.1	65	0.990	-9.6	65	0.989
CONT_17	1.019	1.014	-8.2	65	0.992	-9.5	65	0.989
CONT_18	1.019	1.014	-7.4	65	0.994	-7.8	65	0.993
CONT_19	1.019	1.014	-2.6	65	0.999	-1.6	65	1.000
CONT_20	1.019	1.014	-8.8	65	0.991	-8.8	65	0.991
CONT_21	1.019	1.014	-5.9	65	0.996	-7.5	65	0.993
CONT_22	1.019	1.014	-14.9	65	0.975	-14.7	65	0.975
CONT_23	1.019	1.014	-6.4	65	0.995	-7.4	65	0.994

The subject wind farm will be required to maintain the power factor requirements listed above.

2 -ve sign indicates VAR Generator absorbing reactive power from the system and therefore leading power factor

6 STABILITY ANALYSIS

Stability simulations were performed to examine the transient behavior of GEN-2010-012 project and its impact on the SPP system. Several faults, both three-phase and single phase faults (with re-closing where applicable) were simulated. The fault clearing times and re-closing times used for the simulations are shown in Table 6-1.

Table 6-1: Fault Clearing Times

Faulted bus kV level	Normal Clearing	Time before reclosing
69	5 cycles	20 cycles
138	5 cycles	20 cycles
230	5 cycles	20 cycles
345	5 cycles	20 cycles

Twenty seven (27) three phase and twenty five (25) single-line-to-ground faults (with re-closing where applicable) were simulated. For all tested cases the initial disturbance was applied at t = 0.1 seconds. The breaker clearing was initiated at the appropriate time following the fault inception (see Table 6-1). Table 6-2 lists all the faults simulated for transient stability analysis.

Table 6-2 List of Simulated Faults for GEN-2010-012 SIS

Cont. No.	Cont. Name	Description
1	FLT05-3PH	3 phase fault on the Weatherford WFEC (GEN-2009-030) (521092) to Clinton. (520856) 138kV line, near Weatherford. a. Apply fault at the Weatherford 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
2	FLT06-1PH	*Single phase fault and sequence like previous*
3	FLT07-3PH	3 phase fault on the Clinton Jct. (511485) to CL_NGTP (511534) 138kV line, near Clinton Jct. a. Apply fault at the Clinton Jct. 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
4	FLT08-1PH	*Single phase fault and sequence like previous*
5	FLT09-3PH	3 phase fault on the Weatherford WFEC (GEN-2009-030) (521092) to Hydro. (520950) 138kV line, near Weatherford . a. Apply fault at the Weatherford 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
6	FLT10-1PH	*Single phase fault and sequence like previous*
7	FLT11-3PH	3 phase fault on the Elk City (511458) to Clinton AFB (511446) 138kV line, near Elk City. a. Apply fault at the Elk City 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
8	FLT12-1PH	*Single phase fault and sequence like previous*

Cont. No.	Cont. Name	Description
9	FLT13-3PH	3 phase fault on the Elk City 138kV (511458) to 230kV (511490) transformer, near the 138kV bus. a. Apply fault at the Elk City 138kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
10	FLT14-3PH	3 phase fault on the Gracemont 138kV (515802 to 345kV (515800) transformer, near the 138kV bus. a. Apply fault at the Gracemont 138kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
11	FLT15-3PH	3 phase fault on the Hobart Jct (511463) to Carnegie South (511445) 138kV line, near Hobart Jct. a. Apply fault at Hobart Jct. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
12	FLT16-1PH	*Single phase fault and sequence like previous*
13	FLT17-3PH	3 phase fault on the Hobart Jct. (511463) to CL-AFTP4 (511446) 138kV line, near Hobart Jct. a. Apply fault at Hobart Jct. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
14	FLT18-1PH	*Single phase fault and sequence like previous*
15	FLT19-3PH	3 phase fault on the Hobart Jct. (511463) 138/69kv auto. a. Apply fault at Hobart Jct. b. Clear fault after 5 cycles by tripping the faulted auto.
16	FLT20-3PH	3 phase fault on the Altus (511440) to Snyder (511435) 138kV line, near Altus. a. Apply fault at Altus 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
17	FLT21-1PH	*Single phase fault and sequence like previous*
18	FLT22-3PH	3 phase fault on the Morewood (521001) to Mooreland (520999) 138kV line, near Moorewood. a. Apply fault at Morewood 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
19	FLT23-1PH	*Single phase fault and sequence like previous*
20	FLT24-3PH	3 phase fault on the Anadarko (520814) to Southwest (511477) 138kV line, near Anadarko. a. Apply fault at the Anadarko 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
21	FLT25-1PH	*Single phase fault and sequence like previous*
22	FLT26-3PH	3 phase fault on the Anadarko (520814) to Gracemont (515802) 138kV line, near Gracemont. a. Apply fault at the Gracemont 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
23	FLT27-1PH	*Single phase fault and sequence like previous*
24	FLT28-3PH	3 phase fault on the Washita (521089) to Gracemont (515802) 138kV line, near Gracemont. a. Apply fault at the Gracemont 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
25	FLT29-1PH	*Single phase fault and sequence like previous*
26	FLT30-3PH	3 phase fault on the GEN-2008-037 (573570) to Gracemont (515802) 138kV line, near GEN-2008-037. a. Apply fault at the GEN-2008-037 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
27	FLT31-1PH	*Single phase fault and sequence like previous*

Cont. No.	Cont. Name	Description
28	FLT36-3PH	3 phase fault on the Anadarko (520814) to Cornville Tap (520867) 138kV line, near Anadarko. a. Apply fault at the Anadarko 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
29	FLT37-1PH	*Single phase fault and sequence like previous*
30	FLT38-3PH	3 phase fault on the Southwest (511477) to Washita (521089) 138kV line, near Washita. a. Apply fault at the Washita 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
31	FLT39-1PH	*Single phase fault and sequence like previous*
32	FLT40-3PH	3 phase fault on the Oney (521017) to Washita (521089) 138kV line, near Washita. a. Apply fault at the Wahsita 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
33	FLT41-1PH	*Single phase fault and sequence like previous*
34	FLT50-3PH	3 phase fault on the Clinton Jct (511485) to Elk City (511458) 138kV line, near Clinton Jct. a. Apply fault at the Clinton Jct 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
35	FLT51-1PH	*Single phase fault and sequence like previous*
36	FLT58-3PH	3 phase fault on the Washita (521089) to GEN-2008-037 (573570) 138kV line, near GEN-2008-037. a. Apply fault at the GEN-2008-037 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
37	FLT59-1PH	*Single phase fault and sequence like previous*
38	FLT60-3PH	3 phase fault on the Brantley (520832) to Durham (520885) 138kV line, near Brantley. a. Apply fault at the Brantley 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
39	FLT61-1PH	*Single phase fault and sequence like previous*
40	FLT62-3PH	3 phase fault on the Brantley (520832) to Morwood (521002) 138kV line, near Brantley. a. Apply fault at the Brantley 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
41	FLT63-1PH	*Single phase fault and sequence like previous*
42	FLT64-3PH	3 phase fault on the Elk City 138kV (511458) to 69kV (511459) transformer, near the 138kV bus. a. Apply fault at the Elk City 138kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.

The system was stable for all the simulated 3-Phase and single-phase faults. The proposed GEN-2010-012 wind farm stayed on-line throughout the duration of the fault and thereof. The voltage recovery was acceptable, and the oscillations were damped out.
The response of GEN-2010-012 project for FLT_62_3PH is given in Figure 6-1 . This fault is a 3 Phase fault at the POI.

Table 6-3 summarizes the stability analysis results for 2010-2011 summer peak and winter peak system conditions.

The plots from the transient stability analysis are included in Appendix A.

Table 6-3 Results of stability analysis

FAULT	Summer Peak			Winter Peak		
	Pre-Project	Post-Project		Pre-Project	Post-Project	
		Stable?	Acceptable Voltages?		Stable?	Acceptable Voltages?
FLT05-3PH	---	STABLE	YES	---	STABLE	YES
FLT06-1PH	---	STABLE	YES	---	STABLE	YES
FLT07-3PH	---	STABLE	YES	---	STABLE	YES
FLT08-1PH	---	STABLE	YES	---	STABLE	YES
FLT09-3PH	---	STABLE	YES	---	STABLE	YES
FLT10-1PH	---	STABLE	YES	---	STABLE	YES
FLT11-3PH	---	STABLE	YES	---	STABLE	YES
FLT12-1PH	---	STABLE	YES	---	STABLE	YES
FLT13-3PH	---	STABLE	YES	---	STABLE	YES
FLT14-3PH	---	STABLE	YES	---	STABLE	YES
FLT15-3PH	---	STABLE	YES	---	STABLE	YES
FLT16-1PH	---	STABLE	YES	---	STABLE	YES
FLT17-3PH	---	STABLE	YES	---	STABLE	YES
FLT18-1PH	---	STABLE	YES	---	STABLE	YES
FLT19-3PH	---	STABLE	YES	---	STABLE	YES
FLT20-3PH	---	STABLE	YES	---	STABLE	YES
FLT21-1PH	---	STABLE	YES	---	STABLE	YES
FLT22-3PH	---	STABLE	YES	---	STABLE	YES
FLT23-1PH	---	STABLE	YES	---	STABLE	YES
FLT24-3PH	---	STABLE	YES	---	STABLE	YES
FLT25-1PH	---	STABLE	YES	---	STABLE	YES
FLT26-3PH	---	STABLE	YES	---	STABLE	YES
FLT27-1PH	---	STABLE	YES	---	STABLE	YES
FLT28-3PH	---	STABLE	YES	---	STABLE	YES
FLT29-1PH	---	STABLE	YES	---	STABLE	YES
FLT30-3PH	---	STABLE	YES	---	STABLE	YES
FLT31-1PH	---	STABLE	YES	---	STABLE	YES
FLT36-3PH	---	STABLE	YES	---	STABLE	YES
FLT37-1PH	---	STABLE	YES	---	STABLE	YES
FLT38-3PH	---	STABLE	YES	---	STABLE	YES

FAULT	Summer Peak			Winter Peak		
	Pre-Project	Post-Project		Pre-Project	Post-Project	
		Stable?	Acceptable Voltages?		Stable?	Acceptable Voltages?
FLT39-1PH	---	STABLE	YES	---	STABLE	YES
FLT40-3PH	---	STABLE	YES	---	STABLE	YES
FLT41-1PH	---	STABLE	YES	---	STABLE	YES
FLT50-3PH	---	STABLE	YES	---	STABLE	YES
FLT51-1PH	---	STABLE	YES	---	STABLE	YES
FLT58-3PH	---	STABLE	YES	---	STABLE	YES
FLT59-1PH	---	STABLE	YES	---	STABLE	YES
FLT60-3PH	---	STABLE	YES	---	STABLE	YES
FLT61-1PH	---	STABLE	YES	---	STABLE	YES
FLT62-3PH	---	STABLE	YES	---	STABLE	YES
FLT63-1PH	---	STABLE	YES	---	STABLE	YES
FLT64-3PH	---	STABLE	YES	---	STABLE	YES

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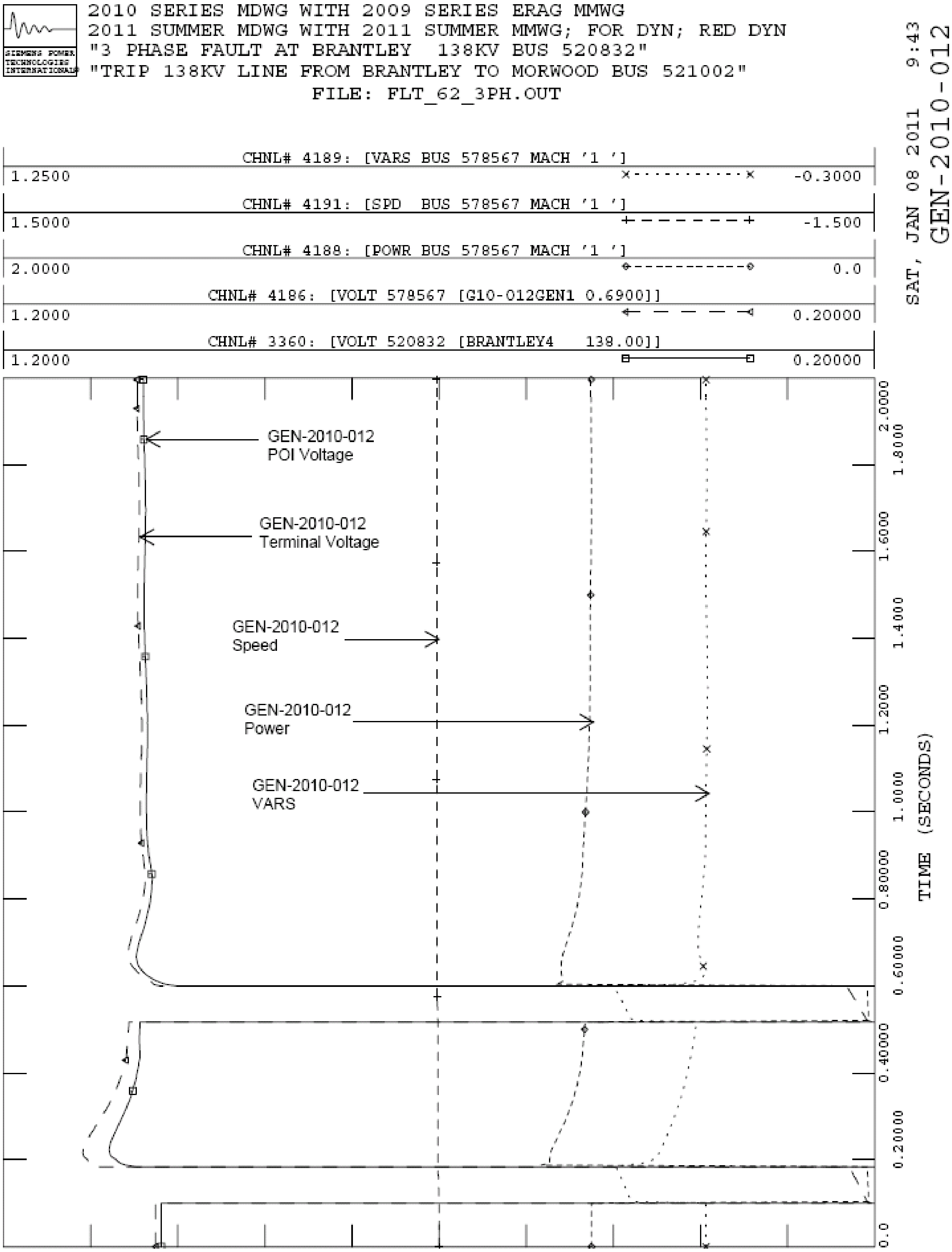

Figure 6-1 Response of GEN-2010-012 project for FLT_62_3PH (summer peak)

6.1 FERC LVRT Compliance

This section discusses the FERC mandated LVRT compliance verification for GEN-2010-012 project. As explained in section 2, the proposed project was modeled with manufacturer's default settings. To determine the compliance of the subject wind farm project Four (4) faults were simulated. These faults were simulated at the POI of wind farm project and cleared after 9 cycles for 3-phase and 15 cycles for 1-phase faults (i.e. 9 cycle primary clearing followed by a 6 cycle back-up clearing due to a breaker stuck event). Table 6-4 gives the description of faults simulated for LVRT analysis.

Table 6-4: List of faults for FERC LVRT compliance

Fault Name	Description
FLT_01_3PH_LVRT	3 phase fault on the Brantley (520832) to Durham (520885) 138kV line, near Brantley.
	a. Apply Fault at the Brantley 138kV bus.
	b. Clear fault after 9.0 cycles by tripping the faulted line.
FLT_02_1PH_LVRT	*Single Phase fault Delayed Clearing (9 Cycles + 6 Cycles) and sequence like previous*
FLT_03_3PH_LVRT	3 phase fault on the Brantley (520832) to Morwood (521002) 138kV line, near Brantley
	a. Apply Fault at the Brantley 138kV bus.
	b. Clear fault after 9.0 cycles by tripping the faulted line.
FLT_04_1PH_LVRT	*Single Phase fault Delayed Clearing (9 Cycles + 6 Cycles) and sequence like previous*

The results of the simulations indicated that the GEN-2010-012 wind farm project stayed online through the fault duration and recovered to acceptable speed and voltage post-fault clearing. Therefore the subject wind farm meets the FERC LVRT criteria for the interconnection (FERC Order 661 – A). The response of GEN-2010-012 project for FLT_03 _3PH_LVRT is given in Fig. 6-2. This fault is a 3 Phase fault at the POI.

The results from the FERC LVRT compliance evaluation are included in Appendix C.

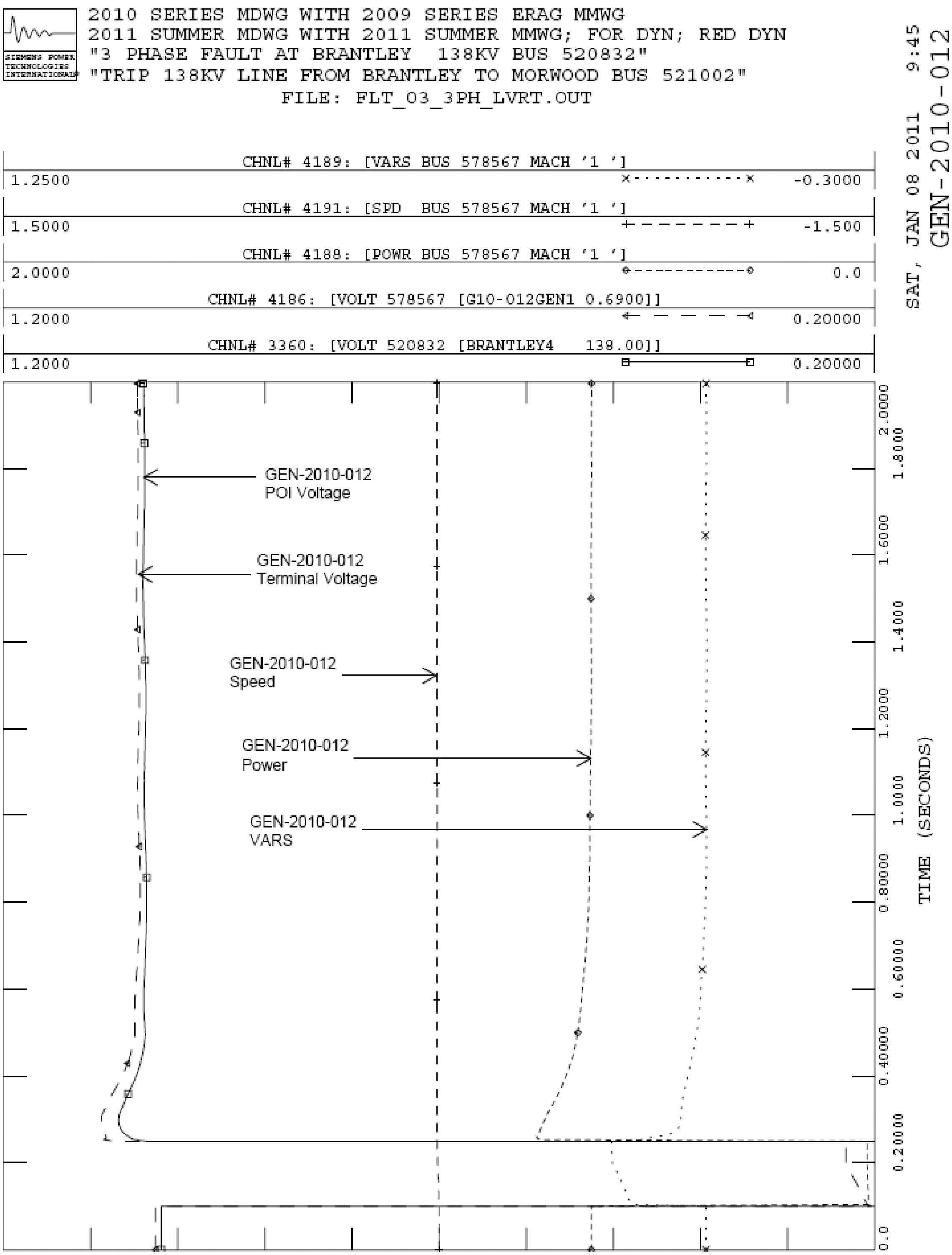

Figure 6-2 GEN-2010-012 response for FLT_03_3PH_LVRT (Summer Peak)

7 CONCLUSIONS

The main objectives of this study were

1) To determine the need for added reactive power compensation, if any, for the proposed wind farm in order to meet SPP's interconnection standards
2) To determine the impact of the proposed Project (GEN-2010-012, 65 MW) on the stability of SPP transmission system and nearby generating stations.
3) To validate the compliance with FERC LVRT requirement for the subject wind farm interconnection.

To achieve these objectives the following analyses were performed on the 2010-2011 Summer Peak and Winter Peak system conditions with GEN-2010-012 in-service

- Power factor analysis for selected contingencies.
- Transient stability analysis for various local and regional contingencies
- LVRT performance for selected contingencies near the POI.

A summary of the study findings is given below:

Power factor analysis

SPP requires that the Interconnection Customer's wind farm maintain a specified voltage schedule and be designed to maintain a +/- 0.95 power factor at the POI under all system conditions (i.e. system intact and contingencies). An analysis was conducted to determine whether the power factor range needed to hold the voltage schedule. The wind farm is required to maintain a 0.95 lead (absorbing vars) and a 1.00 lag (unity) power factor at the point of interconnection.

Stability Analysis

A stability analysis was performed to determine the impact, if any, of the proposed project on the stability of SPP system. The system was found to be stable for all the tested 3-phase faults and single-line-to-ground (SLG) faults (with line re-closing, where applicable).

FERC Order 661A Compliance

Selected faults were simulated at the Point of Interconnection (POI) of the proposed DISIS-2010-002 Group 7 wind farm to determine the compliance with FERC 661 – A; post-transition period LVRT standard. The results indicated that the proposed project met the FERC LVRT requirement for wind farm interconnection.

Based on the results of the analysis, it can be concluded that the proposed GEN-2010-012 wind farm does not adversely impact the transmission performance of the SPP system.

The results of this analysis are based on available data and assumptions made at the time of conducting this study. If any of the data and/or assumptions made in developing the study model change, the results provided in this report may not apply and additional analysis may be required.

N: Stability Study for Group 9

DISIS 2010-002 Group 9/Group 10 Study

January 27, 2011





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EXECUTIVE SUMMARY

The Southwest Power Pool (SPP), on behalf of generation interconnection customers, desires a definitive interconnection system impact study for a generator grouping in Central and Northeast Nebraska collectively referred to as Group 9/Group 10. Group 9/Group 10 consists of only two generators:

Request	Size (MW)	Wind Turbine Model	Point of Interconnection
GEN-2010-038	74.9	GE 1.5MW	Broken Bow 115kV (640089)
GEN-2010-051	200	GE 1.6MW	Tap Twin Church – Hoskins 230kV (580010)

The case will contain the following previous queued and later queued requests. These projects will be monitored and their generating status shall be reported for each contingency. The projects are as follows:

Request	Size (MW)	Wind Turbine Model	Point of Interconnection
GEN-2006-020N	42	Vestas 3.0MW	Bloomfield 115kV (640084)
GEN-2006-038N019	80	GE 1.5MW	Petersburg 115kV (640318)
GEN-2007-011N08	81	Vestas 3.0MW	Bloomfield 115kV (640084)
GEN-2006-037N1	75	GE 1.5MW	Broken Bow 115kV (640089)
GEN-2003-021N	75	Vestas V82 1.65 MW	Ainsworth 115kV (640050)
GEN-2004-005N	30	GE 1.5MW	St Francis 115kV (640351)
GEN-2006-038N005	80	CIMTR	Broken Bow (640089)
GEN-2006-044N	40.5	GE 1.5MW	Tap Neligh (640293) – Petersburg (640318) 115kV. (Bus 570644)
GEN-2007-011N06	75	G.E. 1.5MW	Petersburg 115kV (640318)
GEN-2007-	75	GE 1.5MW	Bloomfield 115kV (640084)

Request	Size (MW)	Wind Turbine Model	Point of Interconnection
011N09			
GEN-2008-086N02	200	GE 1.5MW	Columbus (640133) – Ft Randall (652509) 230kV. Same POI as GEN-2010-010
GEN-2006-044N02	100.5	GE 1.5MW	Columbus (640133) – Ft Randall (652509) 230kV. Same POI as GEN-2010-010
GEN-2010-010	100.5	GE 1.5MW	Columbus (640133) – Ft Randall (652509) 230kV. (Bus 570886)

The case shall also include several adjacent generating units in the WAPA system at 100% of PMAX. These generating units are listed below:

Bus #	Bus Name	Pmax (MW)	kV	Unit ID
652546	FTRDL12G	43.0	13.800	1
652546	FTRDL12G	43.0	13.800	2
652547	FTRDL34G	43.0	13.800	3
652547	FTRDL34G	43.0	13.800	4
652548	FTRDL56G	43.0	13.800	5
652548	FTRDL56G	44.0	13.800	6
652549	FTRDL78G	44.0	13.800	7
652549	FTRDL78G	44.0	13.800	8
652575	GAVINS1G	31.0	13.800	1
652576	GAVINS2G	31.0	13.800	2
652577	GAVINS3G	30.0	13.800	3
659116	SPIRI71G	52.0	13.800	1
659117	SPIRI72G	52.0	13.800	2

SPP requested a stability analysis and a power factor analysis as part of the study of the generators in DISIS 2010-002 Group 9/Group 10. SPP did not request an Available Transfer Capability (ATC) study as part of this study.

Transient stability analysis shows no new problems with the dynamic response of study generation in the region of interest for the faults and clearing times studied. GEN-2007-011N06 tripped offline in the summer cases for FLT31 due to overvoltage, but this also occurred with GEN-2010-038 and GEN-2010-051 both offline.

Outages of either leg of the Fort Randall-Columbus 230 kV line had little effect on dynamic performance of either of the studied generation interconnections.

GEN-2010-038 has the capability of holding the POI voltage constant at the pre-contingency pre-interconnection value for all studied contingencies, but transformer tap changing will probably be necessary to avoid generation overvoltage.

GEN-2010-051 also has the ability to regulate its POI voltage to the pre-contingency pre-interconnection level, but again transformer tap changing will probably be needed to avoid generation overvoltage.

Low Voltage Ride Through (LVRT) analysis shows no generators tripping due to low voltage.

The power factor analysis indicated that no supplemental reactive capability would be necessary for either of the interconnection customers in order to meet the study requirements.

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1. INTRODUCTION

The Southwest Power Pool (hereafter referred to as SPP) commissioned AMEC Earth and Environmental (hereafter referred to as AMEC) to perform a Definitive Interconnection System Impact Study of a group of generators in the SPP interconnection queue referred to as Group 9/Group 10. The generators studied are in the central and northeast Nebraska.

SPP did not request an Available Transfer Capability (ATC) study. The ATC study will be required when the generation companies request transmission service.

SPP requested a power factor analysis and stability analysis based on a list of faults provided by SPP. The results of this study

a. Determined the equivalent amount of reactive compensation required at the transmission system voltage bus at the POI to maintain adequate post contingency voltages with GEN-2010-038 modeled at the 115kV POI bus with 74.9 MW and 0 Var output and GEN-2010-051 modeled at the 230 kV POI bus with 200 MW and 0 Mvar.

b. Determine the ability of the wind farm to meet FERC Order 661A (low voltage ride through and wind farm recovery to pre-fault voltage) with and without additional reactive power support.

c. Determine the ability of the generators to remain in synchronism following three-phase and single-line-to-ground faults.

2. STUDY METHODOLOGY

SPP provided 2010 summer peak and 2011 winter peak load flow cases in PSS/E format. Table 1 below shows the total demand and generation in the monitored areas.

Table 1: Description of Study Areas

Area No.	Area Name	2011 Summer Peak		2011 Winter Peak	
		Load (MW)	Generation (MW)	Load (MW)	Generation (MW)
531	MIDW	261.3	290.7	199.8	239.6
534	SUNC	566.7	1195.1	466.7	1145.2
536	WERE	5945	5548.4	3967.3	3940
540	MIPU	1942.8	1786.4	2604.1	2757.1
541	KACP	3494.6	3662.7	2774.8	3735.1
640	NPPD	3438.2	3996.8	2006.9	1838.9
645	OPPD	2668.1	2499.8	576.7	80.2
650	LES	784.2	205.9	3821.4	4531.3
652	WAPA	3755.9	5022	199.8	239.6

- **POWER FACTOR ANALYSIS**

A power factor analysis was performed to determine if additional reactive compensation was required to hold the voltage at the point of interconnection consistent with the voltage schedule in the base case or 1.0 PU, whichever is higher. (In practice, this meant holding the voltage schedule to the pre-contingency value). The equivalent wind farm models of GEN-2010-038 and GEN-2010-051 were disconnected from their respective points of interconnection and replaced with negative loads serving as equivalent generators

The following contingencies were studied:

Table 2: Steady-State Contingency Descriptions for Power Factor Analysis

Cont No.	Description
FLT03	Albion (640054) to Petersburg (640318) 115kV line
FLT04	Albion (640054) to Genoa (640181) 115kV line
FLT05	Albion (640054) to Spalding (640347) 115kV line
FLT06	Clearwater (640113) to Neligh (640293) 115kV line
FLT07	County Line (640115) to Neligh (640293) 115kV line
FLT08	Creighton (640149) to Neligh (640293) 115kV line
FLT11	Q_Ryton_Tp (523478) -Blackhawk (523344)115kV line
FLT12	Pringle (523267) -Harrington (523979) 230kV line
FLT14	Shell Creek (640343) to Columbus (640133) 230kV line
FLT15	Columbus West (640131) to Columbus (640133) 230kV line
FLT16	East Columbus (640126) to Columbus (640133) 230kV line
FLT17	GEN-2010-010 (570886) to Columbus (640133) 230kV line
FLT20	Fort Randall (652509) to Utica Jct (652526) 230kV line
FLT21	Fort Randall (652509) to Lake Platt (652516) 230kV line
FLT22	Fort Randall (652509) to Sioux City (652565) 230kV line
FLT23	Kelly 230/115 kV auto
FLT24	Bloomfield (640084) – Gavins Point (652511) 115 kV line
FLT25	Creighton (640149) – Neligh (640293) 115 kV line
FLT30	Gavins Point (652511) – Bloomfield (640084) 115 kV line
FLT31	Albion (640054) – Petersburg (640318) 115 kV line
FLT32	Hoskins 230/115 kV autotransformer
FLT33	Hoskins 345/115 kV autotransformer
FLT34	Ft. Randall 230/115 kV autotransformer
FLT35	Madison County 230/115 kV autotransformer
FLT36	Shell Creek (640342) to Hoskins (640226) 345kV line

Cont No.	Description
FLT37	Raun (635200) to Hoskins (640226) 345kV line
FLT38	Belden (640080) to Bloomfield (640084) 115kV line
FLT39	Madison (640263) to Creston (640151) 115kV line
FLT41	Madison County (578001) to Petersburg (640318) 115kV line
FLT43	Broken Bow (640089) to C. Creek (640094) 115kV line
FLT44	Broken Bow (640089) to Calaway (640098) 115kV line
FLT45	Broken Bow (640089) to Loup City (640259) 115kV line
FLT46	Belden (640080) to Hoskins (640228) 115kV line
FLT47	Belden (640080) to Twin Church (640387) 115kV line
FLT48	Twin Church (640386) to Sioux City (652565) 230kv line
FLT49	Hoskins (640227) to G10-051 Tap (580010) 230kV
FLT50	G10-051 Tap (580010 to Twin Church (640386) 230kV line
FLT51	Hoskins (640226/640227) 345/230kV transformer
FLT52	Crooked Creek (640093/640094) 230/115kV transformer
FLT53	N.Platte (640287/640286) 115/230kV transformer

There are two previously queued generator interconnection requests at the POI for GEN-2010-038: GEN-2006-037N1 and GEN-2006-038N005. In addition, there is a switched shunt capacitor bank modeled at the POI. This capacitor bank at Broken Bow 115 kV was left at the same state in the power factor analysis as in the base case (online at 19.3 MVAR in the summer case, offline in the winter case).

The power factor analysis was performed by modeling the previously queued generators as constant loads at the POI, at the same real and reactive injection levels as in the base case without the study generators. (The injections at the POI took collector and GSU losses into account, and are therefore 4.3 MW less than the generator outputs.)

Table 3: Real and reactive power injections at GEN-2010-038 POI

Generators	Summer (V=1.035)		Winter (V=1.0308)	
	MW	MVAR	MW	MVAR
GEN-2006-037N1	73.6	-12.3	73.6	-10.3
GEN-2006-038N005	79.7	-22.8	79.7	-9.6
GEN-2010-038	72.3	0	72.3	0
Broken Bow 115 kV Shunt	0	19.3	0	0
Total at Broken Bow 115 kV	225.6	-15.8	225.6	-19.9

After modeling the generators as fixed negative loads as shown above, continuous switched shunts with a range of ±9999 MVAR were added to the POI. The shunts were set to hold the POI voltage to what would have been the pre-contingency value without the GEN-2010-038 generation interconnection (1.035 pu summer, 1.0308 winter).

The results for GEN-2010-038 are shown below in Tables 4 & 5.

Table 4: GEN-2010-038 Reactive power requirements at POI, Summer case

	Broken Bow 115 kV POI Injection, Summer Case, 1.035 pu V Schedule					
	GEN-2010-038 only			Total Injection At POI		
Cont. No.	P (MW)	Q (MVAR)	PF (Leading unless noted)	P (MW)	Q (MVAR)	PF (Leading in all cases)
Base Case	72.3	-9.2	0.992	225.6	-35.1	0.988
FLT03	72.3	-2.2	1.000	225.6	-28.1	0.992
FLT04	72.3	-10.1	0.990	225.6	-36	0.988
FLT05	72.3	-2.9	0.999	225.6	-28.8	0.992
FLT06	72.3	-9.2	0.992	225.6	-35.1	0.988
FLT07	72.3	-9.3	0.992	225.6	-35.2	0.988
FLT08	72.3	-9.2	0.992	225.6	-35.1	0.988
FLT11	72.3	-9.1	0.992	225.6	-35	0.988
FLT12	72.3	-9	0.992	225.6	-34.9	0.988
FLT14	72.3	-8.9	0.993	225.6	-34.8	0.988
FLT15	72.3	-8.7	0.993	225.6	-34.6	0.988
FLT16	72.3	-9	0.992	225.6	-34.9	0.988
FLT17	72.3	-8.8	0.993	225.6	-34.7	0.988
FLT20	72.3	-8.6	0.993	225.6	-34.5	0.989
FLT21	72.3	-9.1	0.992	225.6	-35	0.988
FLT22	72.3	-8.7	0.993	225.6	-34.6	0.988
FLT23	72.3	-9	0.992	225.6	-34.9	0.988
FLT30	72.3	-9.1	0.992	225.6	-35	0.988
FLT31	72.3	-1.9	1.000	225.6	-27.8	0.992
FLT32	72.3	-9.1	0.992	225.6	-35	0.988
FLT33	72.3	-9	0.992	225.6	-34.9	0.988
FLT34	72.3	-9.2	0.992	225.6	-35.1	0.988
FLT35	72.3	-8.2	0.994	225.6	-34.1	0.989
FLT36	72.3	-8.9	0.993	225.6	-34.8	0.988
FLT37	72.3	-8.6	0.993	225.6	-34.5	0.989
FLT38	72.3	-9	0.992	225.6	-34.9	0.988

Cont. No.	Broken Bow 115 kV POI Injection, Summer Case, 1.035 pu V Schedule					
	GEN-2010-038 only			Total Injection At POI		
	P (MW)	Q (MVAR)	PF (Leading unless noted)	P (MW)	Q (MVAR)	PF (Leading in all cases)
FLT39	72.3	-9	0.992	225.6	-34.9	0.988
FLT41	72.3	-9.6	0.991	225.6	-35.5	0.988
FLT43	72.3	-5.6	0.997	225.6	-31.5	0.990
FLT44	72.3	-4.2	0.998	225.6	-30.1	0.991
FLT45	72.3	5.3	0.997 Lagging	225.6	-20.6	0.996
FLT46	72.3	-9.1	0.992	225.6	-35	0.988
FLT47	72.3	-9.1	0.992	225.6	-35	0.988
FLT48	72.3	-9.2	0.992	225.6	-35.1	0.988
FLT49	72.3	-9.1	0.992	225.6	-35	0.988
FLT50	72.3	-9.4	0.992	225.6	-35.3	0.988
FLT51	72.3	-9.3	0.992	225.6	-35.2	0.988
FLT52	72.3	-8.7	0.993	225.6	-34.6	0.988
FLT53	72.3	-9.5	0.991	225.6	-35.4	0.988

FLT45 is the only fault that requires a lagging power factor from GEN-2010-038 to the POI (assuming the other queued projects' VAR outputs remain constant). For FLT45, GEN-2010-038 is capable of regulating the POI voltage to the pre-fault value of 1.035 pu. With the reactive output of the other generation at this POI held constant as described above, delivering 5.3 MVAR to the POI requires generating 15.6 MVAR at the generator (out of a Q_{max} of 36.3 MVAR), but the generator bus voltage rises to 1.111 pu. Transformer tap changing would be necessary to make that reactive power available to the POI.

FLT04 requires the most leading power factor at the POI. For this fault, GEN-2010-038 generates 1.4 MVAR, and the generator bus voltage reaches 1.056 pu.

The reactive analysis was repeated for the winter case, and the results are shown below in Table 5.

Table 5: GEN-2010-038 Reactive power requirements at POI, Winter case

Cont. No.	Broken Bow 115 kV POI Injection, Winter Case, 1.0308 pu V Schedule					
	GEN-2010-038 only			Total Injection At POI		
	P (MW)	Q (MVAR)	PF (Leading in all cases)	P (MW)	Q (MVAR)	PF (Leading in all cases)
Base Case	72.3	-19.1	0.967	225.6	-39	0.985
FLT03	72.3	-13.6	0.983	225.6	-33.5	0.989
FLT04	72.3	-20.7	0.961	225.6	-40.6	0.984
FLT05	72.3	-21.4	0.959	225.6	-41.3	0.984
FLT06	72.3	-19.2	0.967	225.6	-39.1	0.985
FLT07	72.3	-19.1	0.967	225.6	-39	0.985
FLT08	72.3	-19.1	0.967	225.6	-39	0.985
FLT11	72.3	-19.2	0.967	225.6	-39.1	0.985
FLT12	72.3	-19	0.967	225.6	-38.9	0.985
FLT14	72.3	-18.9	0.967	225.6	-38.8	0.986
FLT15	72.3	-19.1	0.967	225.6	-39	0.985
FLT16	72.3	-19	0.967	225.6	-38.9	0.985
FLT17	72.3	-18.9	0.967	225.6	-38.8	0.986
FLT20	72.3	-18.8	0.968	225.6	-38.7	0.986
FLT21	72.3	-19	0.967	225.6	-38.9	0.985
FLT22	72.3	-18.8	0.968	225.6	-38.7	0.986
FLT23	72.3	-18.9	0.967	225.6	-38.8	0.986
FLT30	72.3	-19.2	0.967	225.6	-39.1	0.985
FLT31	72.3	-13.4	0.983	225.6	-33.3	0.989
FLT32	72.3	-19.1	0.967	225.6	-39	0.985
FLT33	72.3	-19.2	0.967	225.6	-39.1	0.985
FLT34	72.3	-19.1	0.967	225.6	-39	0.985
FLT35	72.3	-18.3	0.969	225.6	-38.2	0.986
FLT36	72.3	-19.4	0.966	225.6	-39.3	0.985
FLT37	72.3	-19.1	0.967	225.6	-39	0.985
FLT38	72.3	-19	0.967	225.6	-38.9	0.985
FLT39	72.3	-18.9	0.967	225.6	-38.8	0.986
FLT41	72.3	-19.2	0.967	225.6	-39.1	0.985
FLT43	72.3	-9.8	0.991	225.6	-29.7	0.991

	Broken Bow 115 kV POI Injection, Winter Case, 1.0308 pu V Schedule					
	GEN-2010-038 only			Total Injection At POI		
Cont. No.	P (MW)	Q (MVAR)	PF (Leading in all cases)	P (MW)	Q (MVAR)	PF (Leading in all cases)
FLT44	72.3	-4.4	0.998	225.6	-24.3	0.994
FLT45	72.3	-4.7	0.998	225.6	-24.6	0.994
FLT46	72.3	-19.1	0.967	225.6	-39	0.985
FLT47	72.3	-19.1	0.967	225.6	-39	0.985
FLT48	72.3	-19.2	0.967	225.6	-39.1	0.985
FLT49	72.3	-19	0.967	225.6	-38.9	0.985
FLT50	72.3	-19.4	0.966	225.6	-39.3	0.985
FLT51	72.3	-19.2	0.967	225.6	-39.1	0.985
FLT52	72.3	-12.9	0.984	225.6	-32.8	0.990
FLT53	72.3	-19.6	0.965	225.6	-39.5	0.985

In the winter case, the power factor at the POI is leading in all cases. The least-leading power factor occurred for FLT44, and GEN-2010-038 regulates the POI voltage to the pre-fault level of 1.038 pu. For FLT44, when the POI delivers 4.4 MVAR to the GSU and collector, the wind turbines at GEN-2010-038 generate 6.6 MVAR and the generator bus voltage reaches 1.072 pu.

The most-leading power factor occurred for FLT05, and GEN-2010-038 holds the POI voltage at 1.038 pu post-fault. GEN-2010-038 absorbs 7.9 MVAR (well within capability because Q_{min} = -36.3 MVAR), and the generator bus voltage is 1.011 pu.

In summary, GEN-2010-038 is capable of holding the POI voltage at pre-fault levels for all studied faults, but transformer tap changing is necessary to deliver the VARs to the POI without excessive voltages at the generator or collector.

A similar approach was used to find the reactive requirements for GEN-2010-051. However, there are no other queued interconnections at this POI, so no other generators needed to be converted to loads. Collector and GSU losses consume 3.8 MW of the 200 MW rated output of GEN-2010-051, so the generator was modeled as a constant 196.2 MW, 0 MVAR injection, and variable shunts were used to regulate the POI voltage to the pre-fault levels that would have occurred without GEN-2010-051 (1.0109 pu summer, 1.0114 pu winter.)

The same contingencies were used for GEN-2010-051 as with GEN-2010-038.

Tables 6 and 7 contain the results of the powerflow analysis for each of the fault conditions specified in Table 2 for the summer and winter conditions.

Table 6: GEN-2010-051 Voltage at POI and Supplemental Reactive

	GEN-2010-051					
	Summer (V=1.0109 pu)			Winter (V=1.0114 pu)		
Cont. No.	P (MW)	Q (MVAR)	PF leading unless noted	P (MW)	Q (MVAR)	PF leading
Base Case	196.2	-19.8	0.995	196.2	-20.2	0.995
FLT03	196.2	-15.5	0.997	196.2	-17.8	0.996
FLT04	196.2	-18.9	0.995	196.2	-19.2	0.995
FLT05	196.2	-19.3	0.995	196.2	-20.5	0.995
FLT06	196.2	-20.7	0.994	196.2	-20.1	0.995
FLT07	196.2	-19	0.995	196.2	-22.1	0.994
FLT08	196.2	-18.9	0.995	196.2	-19.9	0.995
FLT11	196.2	-18	0.996	196.2	-16.2	0.997
FLT12	196.2	-19.1	0.995	196.2	-19.7	0.995
FLT14	196.2	-21.6	0.994	196.2	-22.9	0.993
FLT15	196.2	-21	0.994	196.2	-20.7	0.994
FLT16	196.2	-19.3	0.995	196.2	-19.8	0.995
FLT17	196.2	-14.2	0.997	196.2	-15.6	0.997
FLT20	196.2	-15.2	0.997	196.2	-15.2	0.997
FLT21	196.2	-20.7	0.994	196.2	-20.9	0.994
FLT22	196.2	-13	0.998	196.2	-20.1	0.995
FLT23	196.2	-19.6	0.995	196.2	-20.4	0.995
FLT30	196.2	-17	0.996	196.2	-17.9	0.996
FLT31	196.2	-14.9	0.997	196.2	-19.2	0.995
FLT32	196.2	-21.6	0.994	196.2	-24.2	0.992
FLT33	196.2	-17.3	0.996	196.2	-17.8	0.996
FLT34	196.2	-19.8	0.995	196.2	-20.2	0.995
FLT35	196.2	-20.9	0.994	196.2	-21.2	0.994
FLT36	196.2	-11.2	0.998	196.2	-11.9	0.998
FLT37	196.2	-7.9	0.999	196.2	-5.5	1.000
FLT38	196.2	-19.6	0.995	196.2	-20.4	0.995
FLT39	196.2	-17.3	0.996	196.2	-17.8	0.996
FLT41	196.2	-19.4	0.995	196.2	-19.3	0.995
FLT43	196.2	-19.3	0.995	196.2	-19.8	0.995
FLT44	196.2	-19.7	0.995	196.2	-20.1	0.995

	GEN-2010-051					
	Summer (V=1.0109 pu)			Winter (V=1.0114 pu)		
Cont. No.	**P (MW)**	**Q (MVAR)**	**PF leading unless noted**	**P (MW)**	**Q (MVAR)**	**PF leading**
FLT45	196.2	-20.3	0.995	196.2	-21.2	0.994
FLT46	196.2	-19	0.995	196.2	-19.8	0.995
FLT47	196.2	-21.7	0.994	196.2	-21.6	0.994
FLT48	196.2	8.1	0.999 lagging	196.2	-4.3	1.000
FLT49	196.2	4.8	1.000 lagging	196.2	-4.3	1.000
FLT50	196.2	-29.5	0.989	196.2	-21	0.994
FLT51	196.2	-0.1	1.000	196.2	-2.5	1.000
FLT52	196.2	-19.3	0.995	196.2	-19.8	0.995
FLT53	196.2	-19.8	0.995	196.2	-20.2	0.995

Checking FLT48 in the summer case (most lagging power factor) shows GEN-2010-051 capable of holding the post-contingency voltage of the POI at pre-fault level of 1.0109 pu. Supplying 8.1 MVAR to the POI requires 49.9 MVAR at the generation (out of a Q_{max} of 65.7 MVAR), but it also requires a generator bus voltage of 1.073 pu. Making the reactive power available to the POI may require transformer tap changing.

For FLT50 in the summer case (most leading power factor), GEN-2010-051 is capable of regulating the POI voltage to pre-fault level. In this case, GEN-2010-051 generates 14.4 MVAR and has a generator bus voltage of 1.023 pu.

FLT51 causes the least leading power factor in the winter case, and GEN-2010-051 supplies enough reactive power to regulate the POI to the pre-fault level of 1.0114 pu. Supplying 2.5 MVAR to the POI requires GEN-2010-051 to generate 39.4 MVAR, but generator voltage reaches 1.059 pu in that case.

In the winter case, the most leading power factor occurs for FLT32, and GEN-2010-051 successfully regulates the POI voltage to the pre-fault level. For FLT32, GEN-2010-051 generates 19.2 MVAR, and the generator bus voltage is 1.031 pu.

In conclusion, GEN-2010-051 is capable of generating enough VARs (14.4 MVAR lagging to 49.9 MVAR lagging) to support the POI voltage to the pre-fault levels. However, transformer tap changing may be needed to get the VARs to the POI without unacceptable voltages at the generator or collector.

- **DYNAMIC ANALYSIS**

The study areas shown in Table 1 were monitored in the dynamic analysis. The transmission line and transformer faults were simulated and synchronous machine rotor angles and wind turbine generator speeds were monitored to check whether synchronism of the synchronous machines is maintained and whether the wind turbine generators trip offline during the disturbance.

Following is a summary of the faults simulated in this analysis.

Table 7: Fault Descriptions

Cont. No.	Cont. Name	Description
1	FLT03-3PH	3 phase fault on the Albion (640054) to Petersburg (640318) 115kV line, near Petersburg. a. Apply fault at the Petersburg 115kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.
2	FLT04-3PH	3 phase fault on the Albion (640054) to Genoa (640181) 115kV line, near Albion. a. Apply fault at the Albion 115kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.
3	FLT05-3PH	3 phase fault on the Albion (640054) to Spalding (640347) 115kV line, near Albion. a. Apply fault at the Albion 115kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.
4	FLT06-3PH	3 phase fault on the Clearwater (640113) to Neligh (640293) 115kV line, near Neligh. a. Apply fault at the Neligh 115kVbus. b. Clear fault after 6.5 cycles by tripping the faulted lines (Neligh-Clearwater-O'Neill 115 kV).
5	FLT07-3PH	3 phase fault on the County Line (640115) to Neligh (640293) 115kV line, near Neligh. a. Apply fault at the Neligh 115kVbus. b. Clear fault after 6.5 cycles by tripping the faulted lines (Neligh-CountyLine-Battle Creek-North Norfolk 115 kV).
6	FLT08-3PH	3 phase fault on the Creighton (640149) to Neligh (640293) 115kV line, near Neligh. a. Apply fault at the Neligh 115kVbus. b. Clear fault after 6.5 cycles by tripping the faulted line.
7	FLT11-3PH	3 phase fault on the Bloomfield (640084) to Gavins (652511) 115kV line, near Bloomfield. a. Apply fault at the Bloomfield 115kV bus.

Cont. No.	Cont. Name	Description
		b. Clear fault after 6.5 cycles by tripping the faulted line.
8	FLT12-3PH	3 phase fault on the Hartington (640212) to Gavins (652511) 115kV line, near Hartington. a. Apply fault at the Gavins Point 115kV bus. *b. Clear fault after 6.5 cycles by tripping the faulted line.*
9	FLT14-3PH	3 phase fault on the Shell Creek (640343) to Columbus (640133) 230kV line, near Columbus a. Apply fault at the Columbus 230kV bus. b. Clear fault after 6.0 cycles by tripping the faulted line.
10	FLT15-3PH	3 phase fault on the Columbus West (640131) to Columbus (640133) 230kV line, near Columbus a. Apply fault at the Columbus 230kV bus. b. Clear fault after 6.0 cycles by tripping the faulted line.
11	FLT16-3PH	3 phase fault on the East Columbus (640126) to Columbus (640133) 230kV line, near Columbus a. Apply fault at the Columbus 230kV bus. b. Clear fault after 6.0 cycles by tripping the faulted line.
12	FLT17-3PH	3 phase fault on the GEN-2010-010 (570886) to Columbus (640133) 230kV line, near GEN-2010-010 a. Apply fault at the GEN-2010-010 230V bus. b. Clear fault after 6.0 cycles by tripping the faulted line.
13	FLT20-3PH	3 phase fault on the Fort Randall (652509) to Utica Jct (652526) 230kV line, near Fort Randall a. Apply fault at the Fort Randall 230V bus. b. Clear fault after 6.0 cycles by tripping the faulted line.
14	FLT21-3PH	3 phase fault on the Fort Randall (652509) to Lake Platt (652516) 230kV line, near Fort Randall a. Apply fault at the Fort Randal 230V bus. b. Clear fault after 6.0 cycles by tripping the faulted line.
15	FLT22-3PH	3 phase fault on the Fort Randall (652509) to Sioux City (652565) 230kV line, near Fort Randall a. Apply fault at the Fort Randal 230V bus. b. Clear fault after 6.0 cycles by tripping the faulted line.
16	FLT23-3PH	3 phase fault on the Kelly 230/115 kV auto at the 115kV (640134) a. Apply fault at the Kelly 115kV bus. b. Clear fault after 5.5 cycles by tripping autotransformer.
17	FLT24-1PH	SLG fault on Bloomfield (640084) – Gavins Point (652511) 115 kV line, near Bloomfield. Stuck breaker at Gavins. a. Apply fault at Bloomfield 115 kV bus.

Cont. No.	Cont. Name	Description
		b. Clear Bloomfield end of line at 5.5 cycles. Leave fault on end of open-ended line from Gavins Point. c. Clear Gavins Point 115 kV bus and fault at 18.0 cycles.
18	FLT25-1PH	SLG fault on Creighton (640149) – Neligh (640293) 115 kV line, near Creighton. Stuck breaker at Creighton. a. Apply fault at Creighton 115 kV bus. b. Clear Neligh end of line at 6.5 cycles. Leave fault on open-ended line from Creighton. c. Clear Creighton 115 kV bus and fault at 18.0 cycles.
19	FLT26-1PH	SLG fault on Gavins Point (652511) – Hartington (640212) 115 kV line, near Gavins Point. Stuck breaker at Gavins Point. a. Apply fault at Gavins Point 115 kV bus. b. Clear Hartington end of line at 6.5 cycles. Leave fault on open-ended line from Gavins Point. c. Clear Gavins Point 115 kV bus and fault at 18.0 cycles.
20	FLT27-1PH	SLG fault on Neligh (640293) - County Line (640115), near Neligh. Stuck PCB at Neligh. a. Apply fault at Neligh 115 kV bus. b. Clear North Norfolk end of Neligh-County Line-Battle Creek (640072)-North Norfolk (640296) 115 kV line at 6.5 cycles. Leave fault on open-ended line. c. Clear Neligh 115 kV bus and fault at 18.0 cycles.
21	FLT28-1PH	SLG fault on Albion (640054) – Genoa (640181) 115 kV line near Albion. Stuck PCB at Albion. a. Apply fault on Albion 115 kV bus. b. Clear Genoa end of Albion-Genoa 115 kV line at 6.5 cycles. Leave fault on open-ended line. c. Clear Albion 115 kV bus and fault at 18.0 cycles.
22	FLT29-1PH	SLG fault on Columbus (640133) – Columbus West (640131) 230 kV line. Stuck PCB at Columbus. a. Apply fault on Columbus 230 kV bus. b. Clear Columbus West end of line at 6.0 cycles. Leave fault on open-ended line. c. Clear Columbus 230 kV bus and fault at 14.5 cycles.
23	FLT30-3PH	3PH fault on Gavins Point (652511) – Bloomfield (640084) 115 kV line with prior outage of Neligh (640293) – County Line (640115) 115 kV. a. Prior Outage: Neligh – County Line 115 kV b. Apply 3PH fault on Bloomfield 115 kV bus. c. Clear fault after 6.5 cycles and trip faulted Gavins Point – Bloomfield 115 kV line.
24	FLT31-3PH	3PH fault on Albion (640054) – Petersburg (640318) 115 kV line with prior outage of Neligh (640293) – County Line (640115) 115 kV. a. Prior Outage: Neligh – County Line 115 kV b. Apply 3PH fault on Petersburg 115 kV bus c. Clear fault after 6.5 cycles and trip faulted Albion-Petersburg 115 kV line.

Cont. No.	Cont. Name	Description
25	FLT32-3PH	3 phase fault on the Hoskins 230/115 kV autotransformer at the 115kV (640228) a. Apply fault at the Hoskins 115kV bus. b. Clear fault after 5.5 cycles by tripping the autotransformer
26	FLT33-3PH	3 phase fault on the Hoskins 345/115 kV autotransformer at the 115kV (640228) a. Apply fault at the Hoskins 115kV bus. b. Clear fault after 5.5 cycles by tripping the autotransformer
27	FLT34-3PH	3 phase fault on the Ft. Randall 230/115 kV autotransformer at the 115kV (652510) a. Apply fault at the Ft. Randall 115kV bus. b. Clear fault after 5.5 cycles by tripping the autotransformer
28	FLT35-3PH	3 phase fault on the Madison County 230/115 kV autotransformer at the 115kV (578001) a. Apply fault at the Madison County 115kV bus. b. Clear fault after 5.5 cycles by tripping the autotransformer
29	FLT36-3PH	3 phase fault on the Shell Creek (640342) to Hoskins (640226) 345kV line, near Hoskins. a. Apply fault at the Hoskins 345kV bus. b. Clear fault after 4.5 cycles by tripping the faulted line.
30	FLT37-3PH	3 phase fault on the Raun (635200) to Hoskins (640226) 345kV line, near Hoskins. a. Apply fault at the Hoskins 345kV bus. b. Clear fault after 4.5 cycles by tripping the faulted line.
31	FLT38-3PH	3 phase fault on the Belden (640080) to Bloomfield (640084) 115kV line, near Belden. a. Apply fault at the Belden 115kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.
32	FLT39-3PH	3 phase fault on the Madison (640263) to Creston (640151) 115kV line, near Madison. a. Apply fault at the Madison 115kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.
33	FLT41-3PH	3 phase fault on the Madison County (578001) to Petersburg (640318) 115kV line, near Madison County. a. Apply fault at the Madison County 115kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.
34	FLT43-3PH	3 phase fault on the Broken Bow (640089) to C. Creek (640094) 115kV line, near Broken Bow. a. Apply fault at the Broken Bow 115kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.
35	FLT44-3PH	3 phase fault on the Broken Bow (640089) to Calaway (640098) 115kV line, near Broken Bow. a. Apply fault at the Broken Bow 115kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.
36	FLT45-3PH	3 phase fault on the Broken Bow (640089) to Loup City (640259) 115kV line, near Broken Bow. a. Apply fault at the Broken Bow 115kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.
37	FLT46-3PH	3 phase fault on the Belden (640080) to Hoskins (640228) 115kV line, near Belden a. Apply fault at the Belden 115kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.
38	FLT47-3PH	3 phase fault on the Belden (640080) to Twin Church (640387) 115kV line, near Belden a. Apply fault at the Belden 115kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.

Cont. No.	Cont. Name	Description
39	FLT48-3PH	3 phase fault on the Twin Church (640386) to Sioux City (652565) 230kv line near Twin Church a. Apply fault at Twin Church 230kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.
40	FLT49-3PH	3 phase fault on the Hoskins (640227) to G10-051 Tap (580010) 230kV near Hoskins a. Apply fault at Hoskins 230kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.
41	FLT50-3PH	3 phase fault on the G10-051 Tap (580010 to Twin Church (640386) 230kV line near Twin Church a. Apply fault at Twin Church 230kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.
42	FLT51-3PH	3 phase fault on Hoskins (640226/640227) 345/230kV transformer a. Apply fault at the 230kV bus. b. Clear fault after 5.5 cycles by tripping transformer.
43	FLT52-3PH	3 phase fault on Crooked Creek (640093/640094) 230/115kV transformer a. Apply fault at the 115kV bus. b. Clear fault after 5.5 cycles by tripping the transfomer
44	FLT53-3PH	3 phase fault on N.Platt (640287/640286) 115/230kV transformer a. Apply fault at the 115kV bus. b. Clear fault after 5.5 cycles by tripping transformer

In order to simulate 1PH faults, equivalent shunt Mvar[1] were determined to be applied at the faulted buses. Table 8 presents equivalent reactors used in the transient stability study.

Table 8: Equivalent Shunt Mvar at Faulted Bus for Single-Line-to-Ground Faults

Fault No.	Faulted Bus No.	2011 Summer Peak (Mvar)	2011 Winter Peak (Mvar)
FLT24-1PH	640084	-1037.8	-1030.9
FLT25-1PH	640149	-635.5	-627.8
FLT26-1PH	652511	-1493.8	-1363.6
FLT27-1PH	640293	-987.0	-978.6
FLT28-1PH	640054	-862.5	-858.7
FLT29-1PH	640133	-2891.5	-2790.1

Another important aspect of the dynamic analysis was to check FERC Order 661A compliance. The turbine generators were monitored to determine whether they stayed connected to the grid (Low Voltage Ride Through - LVRT) following the faults defined in Table 7. The wind farm capability of post-fault voltage recovery at the POI was also checked.

[1] The equivalent shunt Mvar causes the voltage at the faulted bus to drop to 0.60 PU.

3. PROJECT DESCRIPTION

Following is a table of the proposed wind farms in Group 9/Group 10.

Table 9: Points of Interconnection GEN-2010-038 & GEN-2010-051

Request	Size (MW)	Turbine Model	Point Of Interconnection	
			Bus No.	Bus Name in model
GEN-2010-038	74.9	GE 1.5MW	640089	Broken Bow 115 kV
GEN-2010-051	200	GE 1.6MW	580010	Tap Twin Church – Hoskins 230kV

The one-line diagrams of GEN-2010-038 and GEN-2010-051 in Figures 1 and 2 uses the following color codes for nominal voltages:

Black **Less than 34.5kV**
Red **34.5 kV**
Blue **115 kV**
All voltages and line flows are from the 2011 summer peak base case.

Figure 1: GEN-2010-038 Interconnection One-Line Diagram

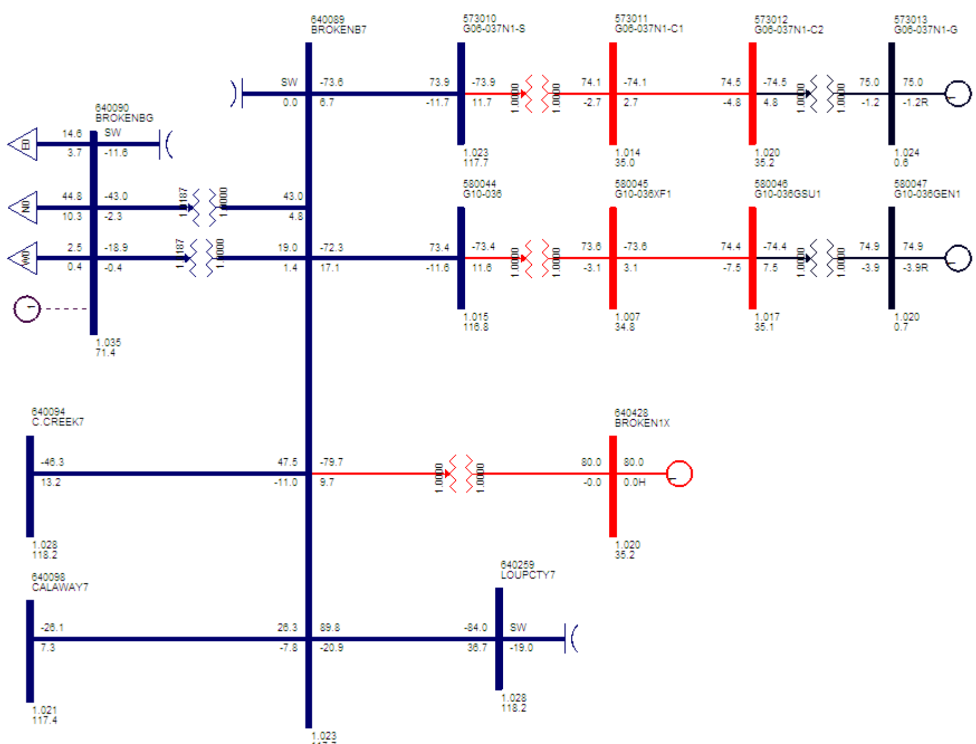
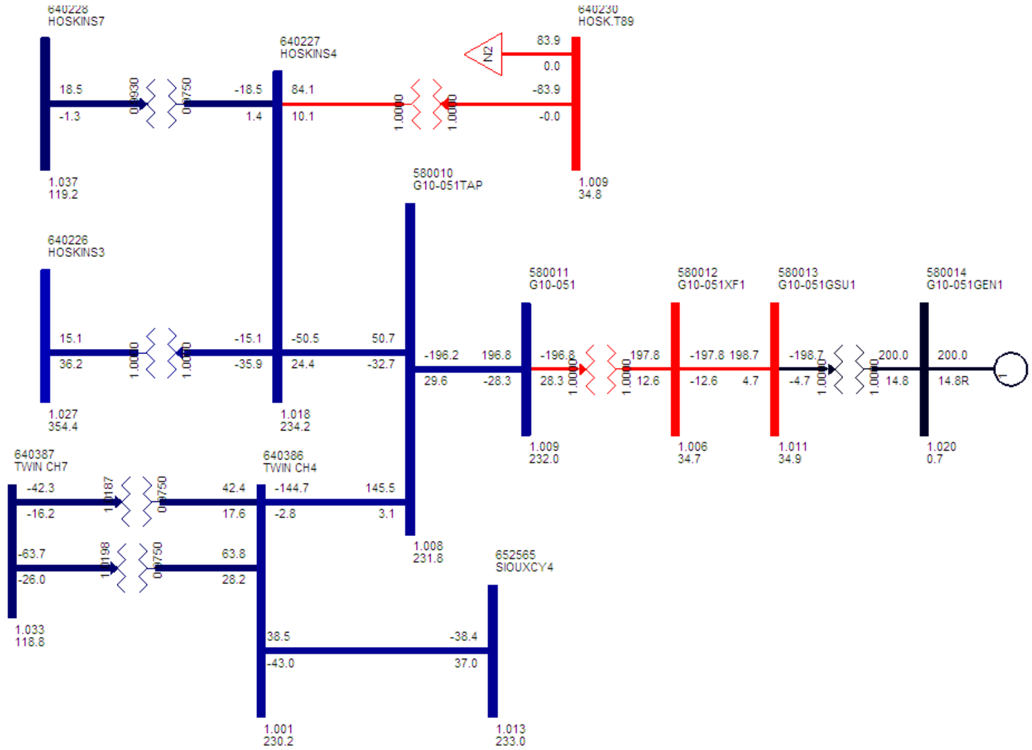
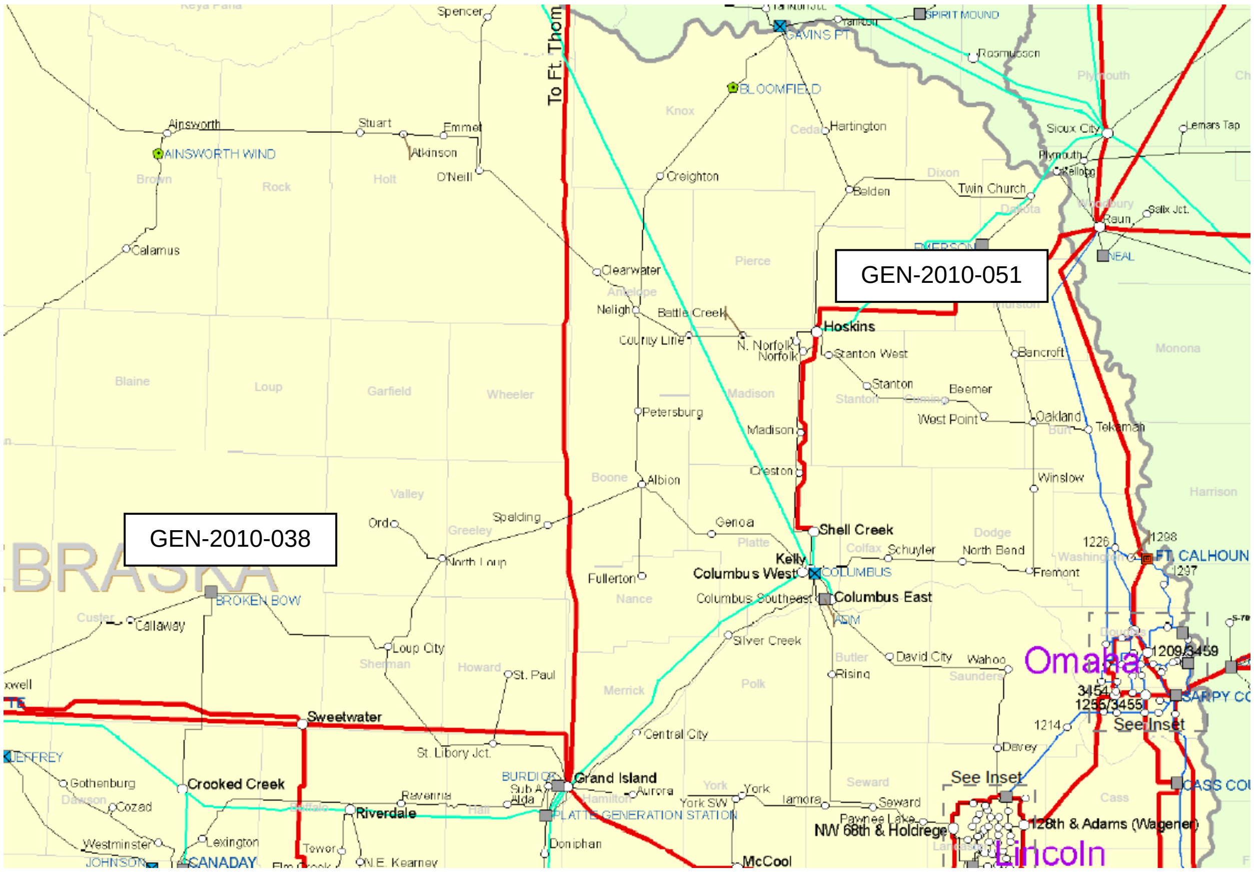


Figure 2: GEN-2010-051 Interconnection One-Line Diagram



As illustrated below, GEN-2010-038 is located in central Nebraska and GEN-2010-051 is located in north-east Nebraska.

Figure 3: Geographical Location of Group 9/Group 10 Projects



The following is the detailed description of the wind projects in GEN-2010-038 and GEN-2010-051.

GEN-2010-038

- Wind farm rating
  - Active power capability: 74.9 MW
  - Reactive power capability: 36.3 MVAR
- Interconnection:
  - Voltage: 115 kV
  - Location: Existing Broken Bow substation (NPPD)
  - Transformer: One step-up transformer connecting to the 115 kV
    - MVA: Rate A - 84, Rate B - 84, Rate C - 84
    - Voltage: 115/34.5 kV
    - R: 0.25% on a 50 MVA base
    - X: 8.0% on a 50 MVA base
- Wind turbine:
  - Number: 50
  - Manufacturer: GE
  - Type: Doubly Fed Induction Generator
  - Machine terminal voltage: 690 kV
  - Rated power: 1.5 MW
  - Frequency: 60Hz
  - Generator step-up transformer
    - MVA: 1.75
    - Voltage: 34.5/0.69 kV
    - R: 0.76% on a 1.75 MVA base
    - X: 5.70% on a 1.75 MVA base
- Generator protection
  - Undervoltage
    - Relay trips when V_{bus} = 0.15 pu for t = 0.2 s
      V_{bus} < 0.30 pu for t = 0.7 s
      V_{bus} < 0.50 pu for t = 1.2 s
      V_{bus} < 0.75 pu for t = 1.9 s
      V_{bus} < 0.90 pu for t = 10 s
  - Overvoltage
    - Relay trips when V_{bus} > 1.10 pu for t = 1.0 s
      V_{bus} > 1.15 pu for t = 0.1 s
      V_{bus} > 1.30 pu for t = 0.02 s
  - Underfrequency
    - Relay trips when F_{bus} < 56.5 Hz for t = 0.00 s
      F_{bus} < 57.5 Hz for t = 10 s
  - Overfrequency

Relay trips when F_{bus} > 61.5 Hz for t = 30.0 s
F_{bus} > 62.5 Hz for t = 0.00 s

GEN-2010-051

- Wind farm rating
  - Active power capability: 200 MW
  - Reactive power capability: 65.7 MVAR
- Interconnection:
  - Voltage: 230 kV
  - Location: Tap Twin Church-Hoskins 230 kV line (NPPD)
  - Transformer: One step-up transformer connecting to the 230 kV
    - MVA: Rate A - 222, Rate B - 222, Rate C - 222
    - Voltage: 230/34.5 kV
    - R: 0.35% on a 133 MVA base
    - X: 14.0% on a 133 MVA base
- Wind turbine:
  - Number: 125
  - Manufacturer: GE
  - Type: Doubly Fed Induction Generator
  - Machine terminal voltage: 690 kV
  - Rated power: 1.6 MW
  - Frequency: 60Hz
  - Generator step-up transformer
    - MVA: 1.75
    - Voltage: 34.5/0.69 kV
    - R: 0.76% on a 1.75 MVA base
    - X: 5.70% on a 1.75 MVA base
- Generator protection
  - Undervoltage
    - Relay trips when V_{bus} = 0.15 pu for t = 0.2 s
      V_{bus} < 0.30 pu for t = 0.7 s
      V_{bus} < 0.50 pu for t = 1.2 s
      V_{bus} < 0.75 pu for t = 1.9 s
      V_{bus} < 0.90 pu for t = 10 s
  - Overvoltage
    - Relay trips when V_{bus} > 1.10 pu for t = 1.0 s
      V_{bus} > 1.15 pu for t = 0.1 s
      V_{bus} > 1.30 pu for t = 0.02 s
  - Underfrequency
    - Relay trips when F_{bus} < 56.5 Hz for t = 0.02 s
      F_{bus} < 57.5 Hz for t = 10 s
  - Overfrequency
    - Relay trips when F_{bus} > 61.5 Hz for t = 30.0 s

$F_{bus} > 62.5$ Hz for $t = 0.02$ s

4. POWER FACTOR RESULTS

The proposed GEN-2010-038 wind farm (74.9 MW) will be comprised of 50 1.5 MW GE wind turbine generators. GEN-2010-038 and the other 2 projects with the same POI (GEN-2006-037N1 and GEN-2006-038N005) were replaced with negative loads, and switching of the Broken Bow shunt was disabled, to hold the MW and MVAR injection constant at the POI (225.6 MW, -15.8 MVAR summer; 225.6 MW, -19.9 MVAR winter.) Continuously variable shunts were used to hold the post-fault voltage at the pre-contingency level that would have been realized without GEN-2010-038 (1.035 pu summer, 1.0308 pu winter.)

The proposed GEN-2010-051 wind farm (200 MW) will be comprised of 125 1.6 MW GE wind turbine generators (200 MW at the generator, 196.2 MW at the POI due to collector and GSU losses.) GEN-2010-051 was modeled as an equivalent 196.2 MW generator with 0 var capability at the 230 kV POI at a tap of the Twin Church-Hoskins 230kV line (taking into account collector and GSU losses). A continuously variable var generator was modeled at the 230kV POI and scheduled to maintain POI voltage at the pre-contingency level that would have occurred without GEN-2010-051 (1.0109 pu summer, 1.0114 pu winter.)

To check the ability of the wind farms to meet the power factor requirements, the wind farms were set to regulate the POI directly at the pre-contingency pre-interconnection levels for the worst-case contingencies in Tables 4, 5, and 6. The Q was verified to be between Q_{min} and Q_{max}, and the injections at the POI were verified to be consistent with those in Tables 4, 5, and 6.

For all studied faults, both GEN-2010-038 and GEN-2010-051 were “voltage-neutral”; that is, had the reactive capability to hold voltage to the pre-contingency level that would have been observed without the generation interconnections.

For GEN-2010-038, meeting this voltage schedule at the POI requires a reactive power range from the generation of +15.6 MVAR (FLT45 Summer) to -7.9 MVAR (FLT05 Winter), or a power factor range of **0.979 lagging – 0.994 leading from the generation side.** The Q range is ±36.3 MVAR, so GEN-2010-038 is capable of meeting the power factor requirement. Note that this assumes the other queued generation at Broken Bow 115 kV does not adjust its reactive output. Also, transformer tap changing will probably be necessary to avoid overvoltage when GEN-2010-038 is generating in the lag.

For GEN-2010-051, meeting the voltage schedule requires a reactive power range from the generation of +49.9 MVAR (FLT48 Summer) to +14.4 MVAR (FLT50 Summer), or a power factor range of **0.970 lagging – 0.997 lagging from the generation side.** The Q range is ±65.7 MVAR, so GEN-2010-051 is capable of meeting the reactive requirement, but again transformer tap changing will probably be needed to avoid overvoltage when generating with a lagging power factor.

5. VOLTAGE RECOVERY RESULTS

Dynamic simulations were performed using each fault Included in Table 7. Voltage recovery as determined via dynamic simulation was checked against all contingencies. If the post-fault voltage recovers to a steady-state level consistent with the steady-state simulation, the generator interconnection is considered acceptable from a voltage recovery standpoint.

In these dynamic simulations, real loads are modeled as constant current and reactive loads are modeled as constant admittance; i.e. MW loads are proportional to voltage and Mvar loads are proportional to voltage squared. In contrast, loads are modeled as constant MW and constant Mvar in steady-state simulations. Therefore, due to differences in load modeling, minor differences in voltages are to be expected between dynamic and steady-state simulations.

The dynamic simulation showed that GEN-2010-038 and GEN-2010-051 generators did not trip during any of the contingencies tested. That is, the wind farms GEN-2010-038 and GEN-2010-051 meet FERC Order 661A (low voltage ride through and wind farm recovery to pre-fault voltage). Tables 10 & 11 list the post-fault voltages at POI calculated with no reactive compensation on either side of the POI. Yellow highlighting indicates the highest voltage for a given season and POI, and blue indicates the lowest voltage.

Table 10: GEN-2010-038 Post-Fault Voltage Recovery by Dynamic Simulation

Fault Name	Voltage @ GEN-2010-038 POI (Broken Bow 115 kV bus) (pu)	
	Summer Peak	Winter Peak
Base Case	1.0350	1.0308
FLT03-3PH	1.0294	1.0264
FLT04-3PH	1.0354	1.0315
FLT05-3PH	1.0299	1.0325
FLT06-3PH	1.0347	1.0306
FLT07-3PH	1.0348	1.0305
FLT08-3PH	1.0347	1.0305
FLT11-3PH	1.0346	1.0304
FLT12-3PH	1.0346	1.0305
FLT14-3PH	1.0345	1.0305
FLT15-3PH	1.0343	1.0307
FLT16-3PH	1.0346	1.0306
FLT17-3PH	1.0343	1.0302
FLT20-3PH	1.0345	1.0304
FLT21-3PH	1.0347	1.0306
FLT22-3PH	1.0344	1.0304

Fault Name	Voltage @ GEN-2010-038 POI (Broken Bow 115 kV bus) (pu)	
	Summer Peak	Winter Peak
FLT23-3PH	1.0346	1.0303
FLT24-1PH	1.0346	1.0303
FLT25-1PH	1.0347	1.0306
FLT26-1PH	1.0343	1.0300
FLT27-1PH	1.0345	1.0306
FLT28-1PH	1.0297	1.0324
FLT29-1PH	1.0336	1.0297
FLT30-3PH	1.0345	1.0303
FLT31-3PH	1.0290	1.0262
FLT32-3PH	1.0349	1.0307
FLT33-3PH	1.0348	1.0306
FLT34-3PH	1.0349	1.0307
FLT35-3PH	1.0340	1.0299
FLT36-3PH	1.0347	1.0308
FLT37-3PH	1.0344	1.0305
FLT38-3PH	1.0346	1.0306
FLT39-3PH	1.0346	1.0304
FLT41-3PH	1.0349	1.0311
FLT43-3PH	1.0313	1.0212
FLT44-3PH	1.0301	1.0169
FLT45-3PH	1.0215	1.0086
FLT46-3PH	1.0347	1.0307
FLT47-3PH	1.0347	1.0307
FLT48-3PH	1.0348	1.0307
FLT49-3PH	1.0348	1.0307
FLT50-3PH	1.0350	1.0309
FLT51-3PH	1.0349	1.0308
FLT52-3PH	1.0344	1.0243
FLT53-3PH	1.0350	1.0309

Table 11: GEN-2010-051 Post-Fault Voltage Recovery by Dynamic Simulation

Fault Name	Voltage @ GEN-2010-051 POI (Twin Church-Hoskins 230 kV) (pu)

	Summer Peak	Winter Peak
Base Case	1.0083	1.0089
FLT03-3PH	1.0060	1.0072
FLT04-3PH	1.0075	1.0078
FLT05-3PH	1.0076	1.0085
FLT06-3PH	1.0080	1.0083
FLT07-3PH	1.0075	1.0087
FLT08-3PH	1.0076	1.0082
FLT11-3PH	1.0069	1.0067
FLT12-3PH	1.0077	1.0082
FLT14-3PH	1.0082	1.0116
FLT15-3PH	1.0081	1.0111
FLT16-3PH	1.0076	1.0107
FLT17-3PH	1.0058	1.0090
FLT20-3PH	1.0083	1.0094
FLT21-3PH	1.0097	1.0110
FLT22-3PH	1.0073	1.0084
FLT23-3PH	1.0078	1.0083
FLT24-1PH	1.0069	1.0066
FLT25-1PH	1.0066	1.0077
FLT26-1PH	1.0060	1.0042
FLT27-1PH	1.0075	1.0083
FLT28-1PH	1.0057	1.0072
FLT29-1PH	1.0063	1.0069
FLT30-3PH	1.0068	1.0073
FLT31-3PH	1.0069	1.0078
FLT32-3PH	1.0100	1.0119
FLT33-3PH	1.0090	1.0102
FLT34-3PH	1.0095	1.0109
FLT35-3PH	1.0080	1.0108
FLT36-3PH	1.0067	1.0081
FLT37-3PH	1.0056	1.0058
FLT38-3PH	1.0078	1.0108
FLT39-3PH	1.0071	1.0074
FLT41-3PH	1.0075	1.0107

Fault Name	Voltage @ GEN-2010-051 POI (Twin Church-Hoskins 230 kV) (pu)	
	Summer Peak	**Winter Peak**
FLT43-3PH	1.0077	1.0080
FLT44-3PH	1.0078	1.0082
FLT45-3PH	1.0079	1.0087
FLT46-3PH	1.0077	1.0107
FLT47-3PH	1.0083	1.0111
FLT48-3PH	0.9966	1.0021
FLT49-3PH	0.9976	1.0027
FLT50-3PH	1.0106	1.0072
FLT51-3PH	1.0028	1.0048
FLT52-3PH	1.0077	1.0080
FLT53-3PH	1.0078	1.0083

FLT48-3PH and FLT49-3PH in the summer case caused GEN-2010-051 post-contingency POI voltage to fall approximately 0.3% short of unity. This is because the voltage schedule of 1.02 pu at the generator bus 580014 prevents the full VAR capability of the GE 1.6 MW turbine from being used.

Figure 4 below shows the highest and lowest post-fault voltage at the GEN-2010-038 POI resulting from FLT04-3PH (highest) and FLT45-3PH (lowest) for the summer case.

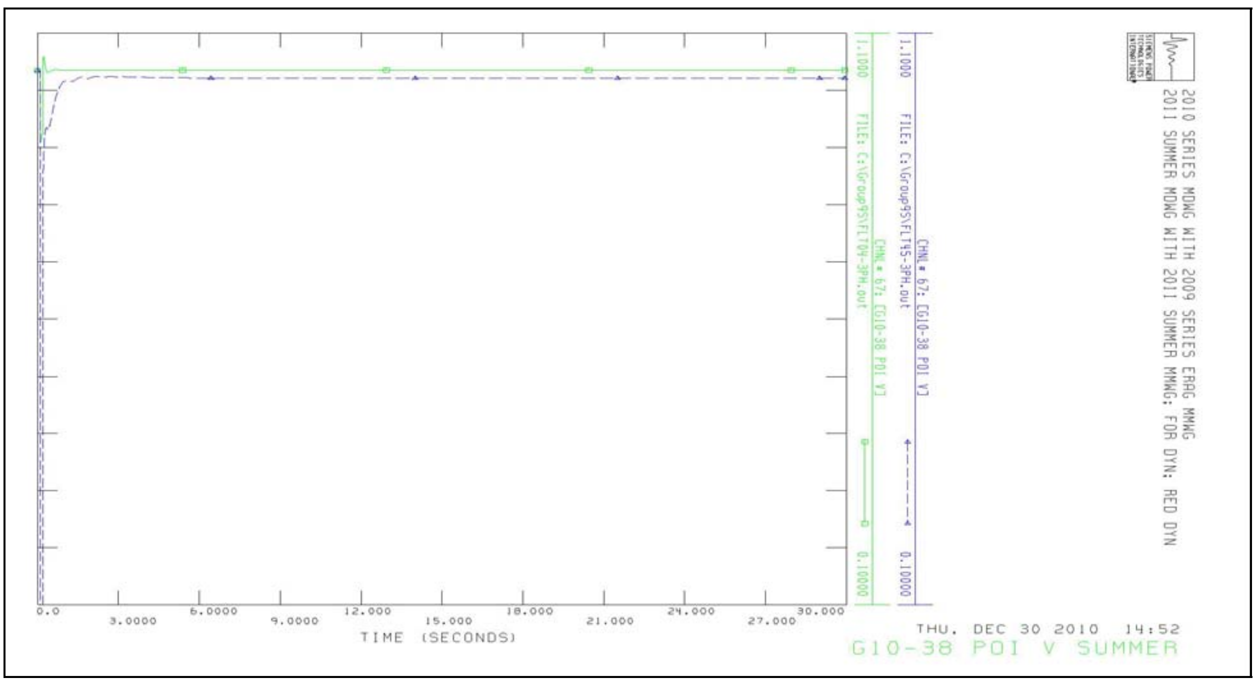


Figure 4: GEN-2010-038 POI Voltage Recovery for FLT04 and FLT45, Summer Peak

Figure 5 below shows the highest and lowest post-fault voltage at the GEN-2010-038 POI resulting from FLT05-3PH (highest) and FLT45-3PH (lowest) for the winter case.

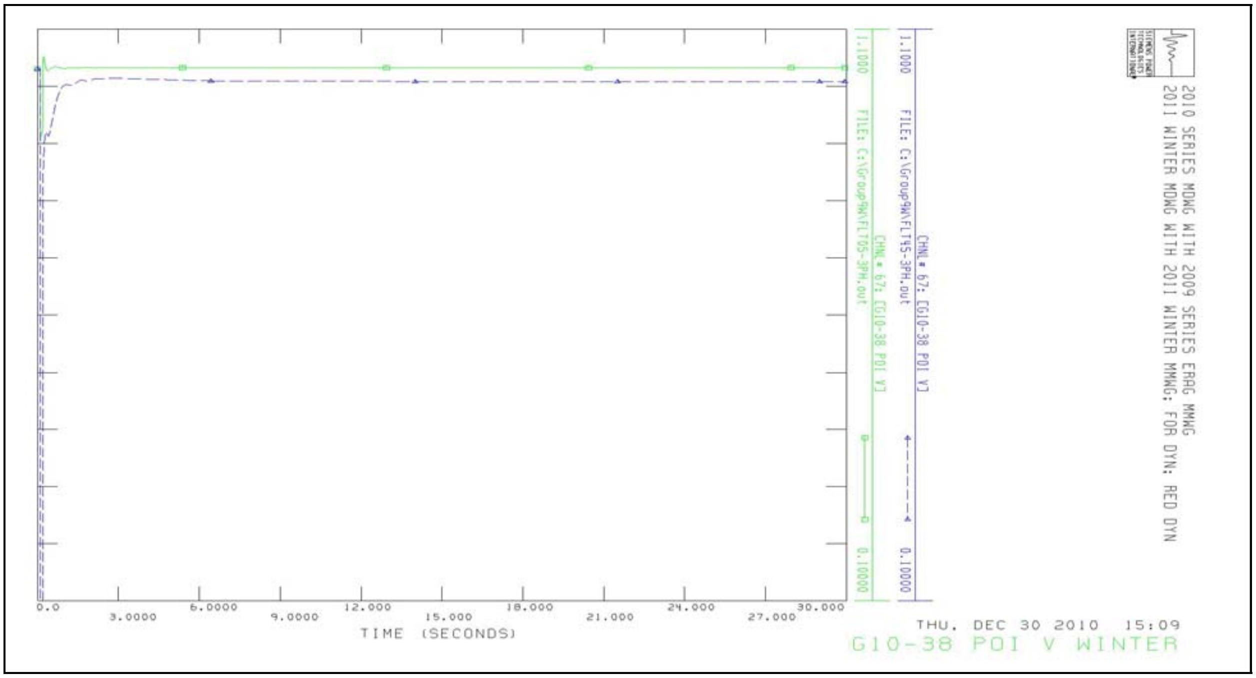


Figure 5: GEN-2010-038 POI Voltage Recovery for FLT05 and FLT45, Winter Peak

Figure 6 below shows the highest and lowest post-fault voltage at the GEN-2010-051 POI resulting from FLT50-3PH (highest) and FLT48-3PH (lowest) for the summer case.

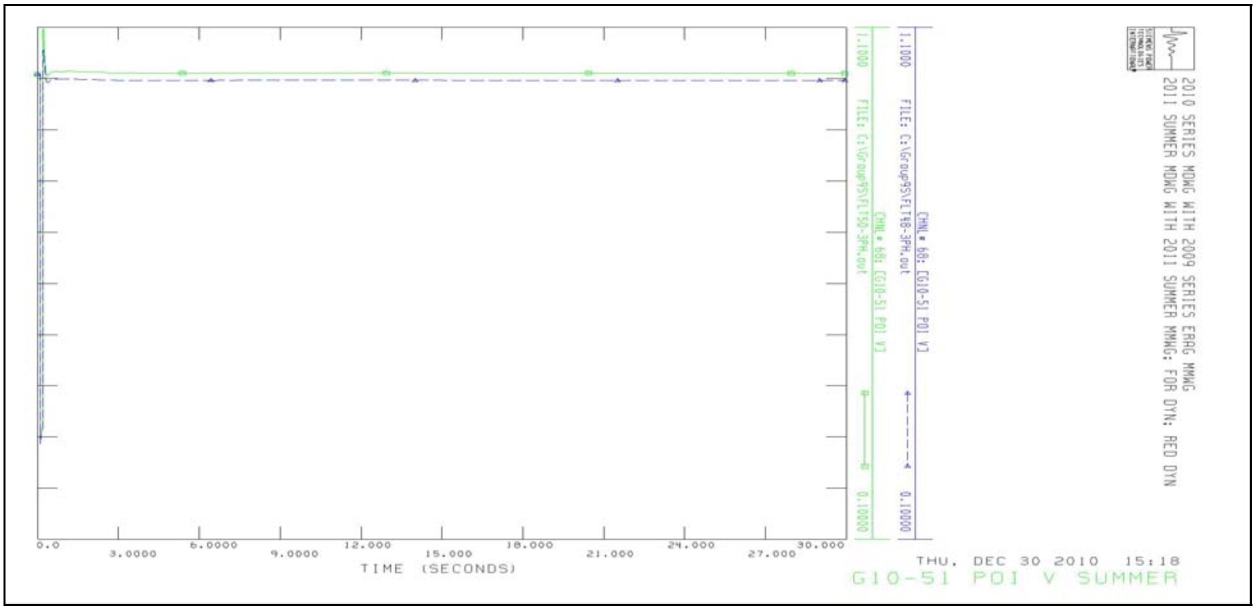


Figure 6: GEN-2010-051 POI voltage recovery for FLT50-3PH and FLT48-3PH, Summer peak

Figure 7 below shows the highest and lowest post-fault voltage at the GEN-2010-051 POI resulting from FLT32-3PH (highest) and FLT48-3PH (lowest) for the summer case.

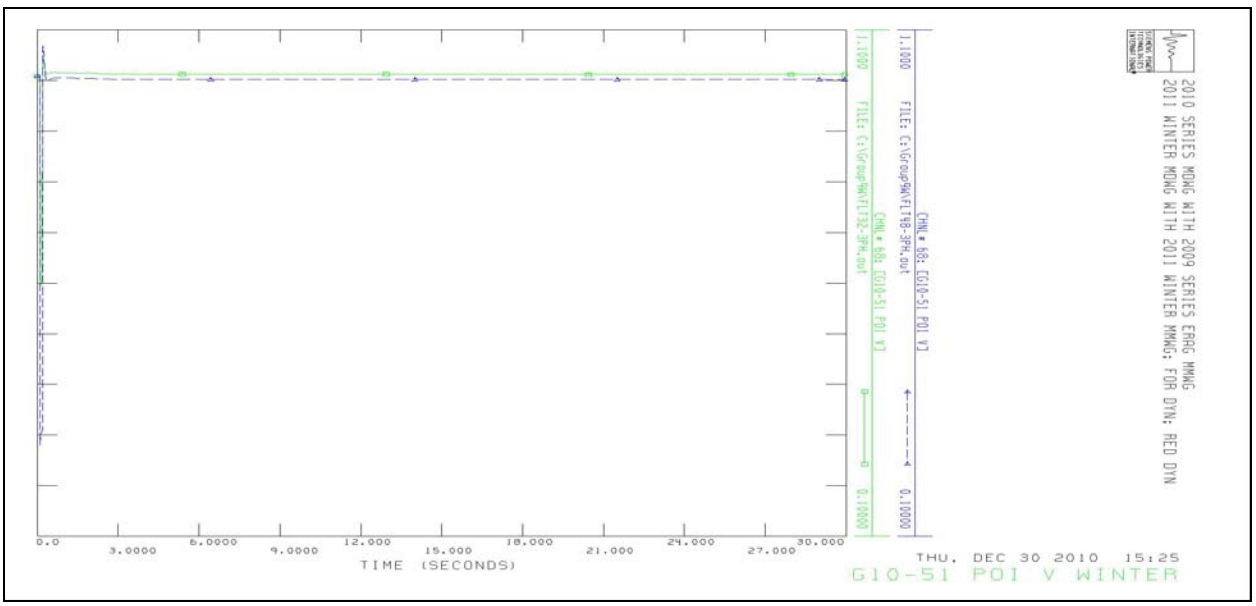


Figure 7: GEN-2010-051 POI voltage recovery for FLT32-3PH and FLT48-3PH, Winter peak

6. TRANSIENT STABILITY RESULTS

Based on the dynamics results, GEN-2010-038 and GEN-2010-051 did not cause any new stability problems. However, for all summer cases studied, GEN-2007-011N06 trips offline for overvoltage for FLT31-3PH (Albion-Petersburg 115 kV with prior outage of Neligh-County Line 115 kV.) This overvoltage trip occurs even with GEN-2010-038 and GEN-2010-051 offline.

All faults were studied for 3 different circuit topologies:

a. System intact

b. Fort Randall-GEN-2008-086N02 segment of Fort Randall-Columbus 230 kV line out of service

c. GEN-2008-086N02-Columbus segment of Fort Randall-Columbus 230 kV line out of service

For the faults studied, the single-phase faults were stuck breaker faults cleared via delayed bus clearing, whereas all three-phase faults were cleared normally. No synchronous generators pulled out of synchronism with the grid, and no generators tripped due to over/under voltage or over/under frequency.

Following are plots of the power output of the study wind farms for the worst-case faults. For GEN-2010-038, the worst-case faults were FLT43-3PH, FLT44-3PH, and FLT45-3PH (Broken Bow-Crooked Creek, Broken Bow-Callaway, and Broken Bow-Loup City 115 kV, respectively, with fault at the Broken Bow end and normal clearing after 6.5 cycles in all cases.) Response to those three faults was very similar, so only FLT43 is shown below. Three traces are shown on the same graph: green for the system intact case, light blue for Fort Randall-GEN-2008-086N02 230 kV out of service, and dark blue for GEN-2008-086N02-Columbus 230 kV out of service. As shown in the plots below, the status of Fort Randall-Columbus 230 kV had little effect on the response of GEN-2010-038 or GEN-2010-051.

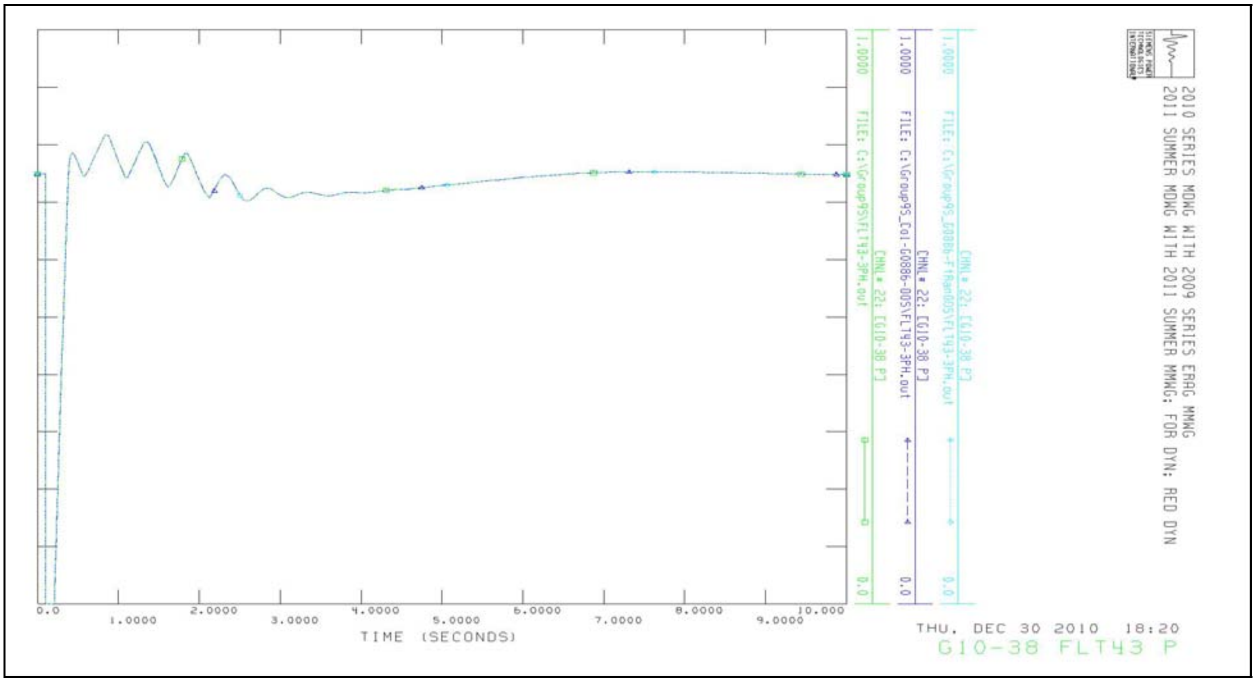


Figure 8: GEN-2010-038 Power Output for FLT43, Summer Peak

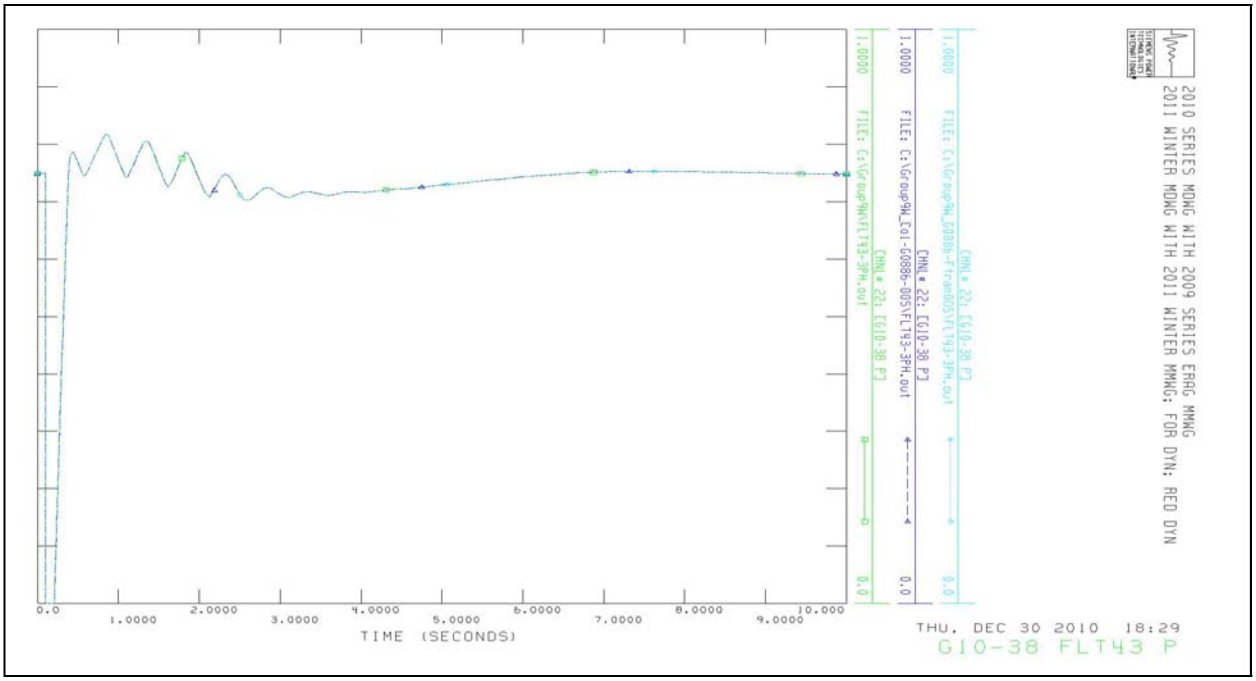


Figure 9: GEN-2010-038 Power Output for FLT43, Winter Peak

For GEN-2010-051, the worst-case faults were FLT48-3PH and FLT50-3PH (Twin Church-Sioux City 230 kV and GEN-2010-051 POI-Twin Church 230 kV, respectively, with faults at the Twin Church end and 6.5 cycle clearing times in both cases.) The response to each fault was so similar that only FLT48 is shown. The same color code as with GEN-2010-038 is used to indicate the system intact cases and the cases with Fort Randall-Columbus 230 kV outages.

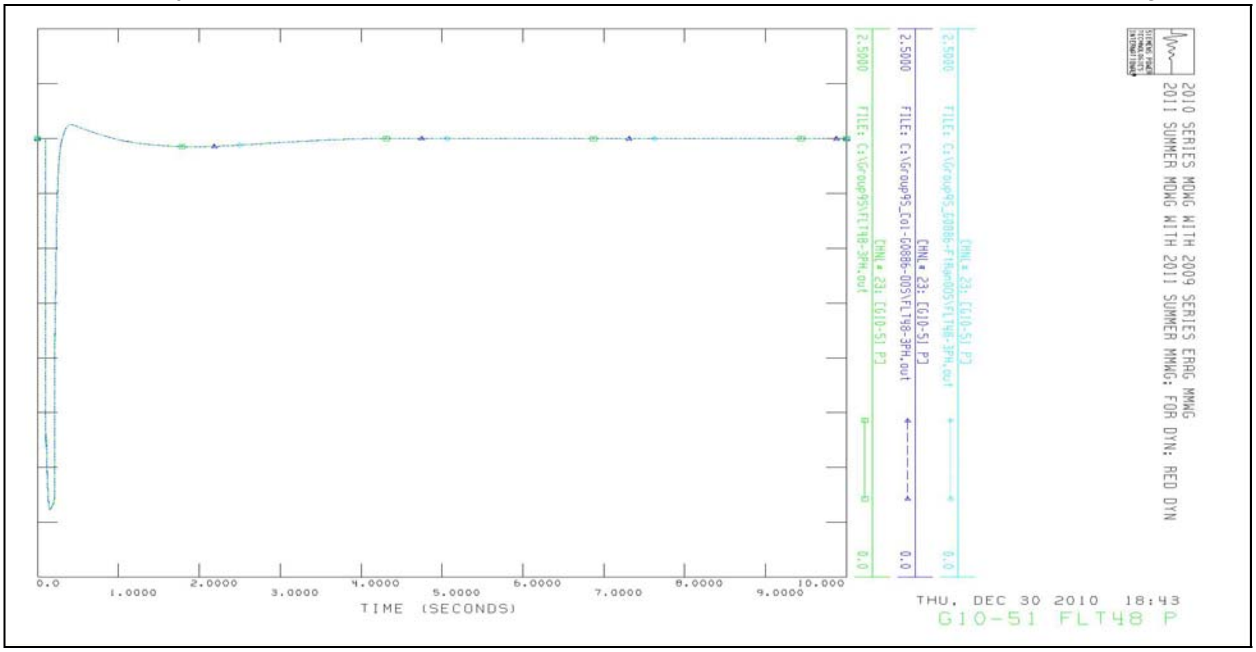


Figure 10: GEN-2010-051 Power Output for FLT48, Summer peak

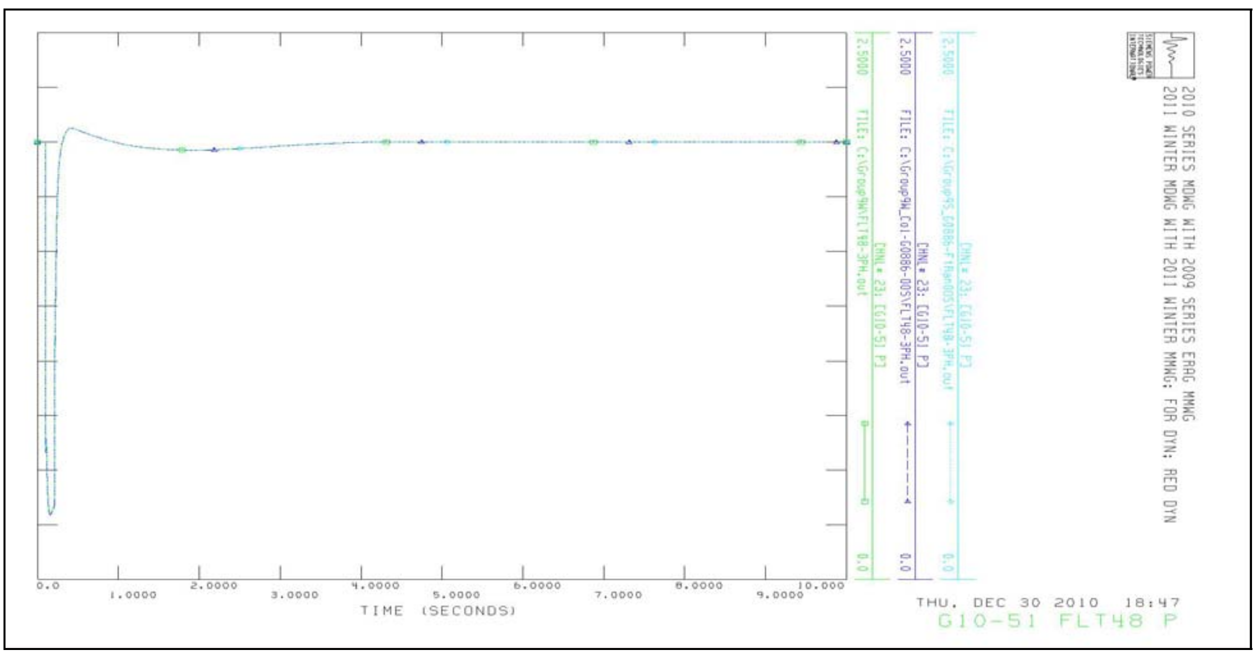


Figure 11: GEN-2010-051 Power Output for FLT48, Winter peak

In all summer cases, GEN-2007-011N06 tripped offline for FLT31 (Albion-Petersburg 115 kV line at Petersburg, prior outage of Neligh-County Line 115 kV line) for high voltage at the generation bus (over 1.05 pu for 10 seconds). This occurred even with GEN-2010-038 and GEN-2010-051 offline; therefore, it is a pre-existing condition not caused by the generation interconnections under study.

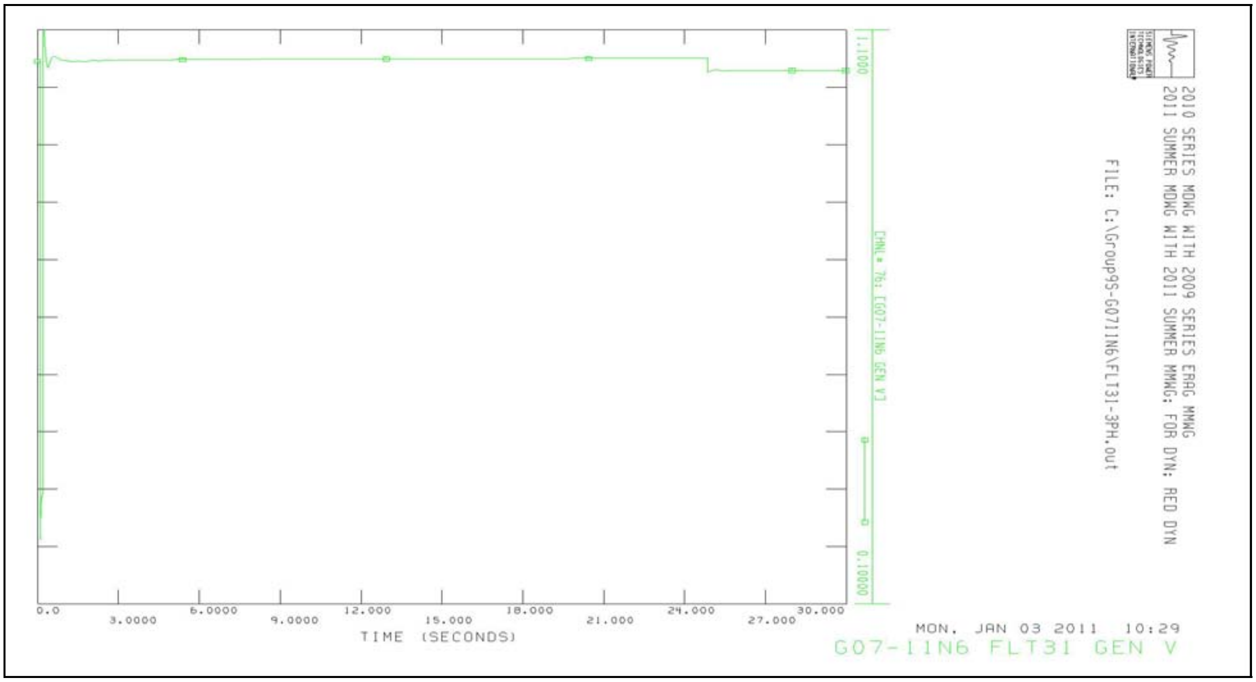


Figure 12: GEN-2007-011N06 Generation Voltage, FLT31

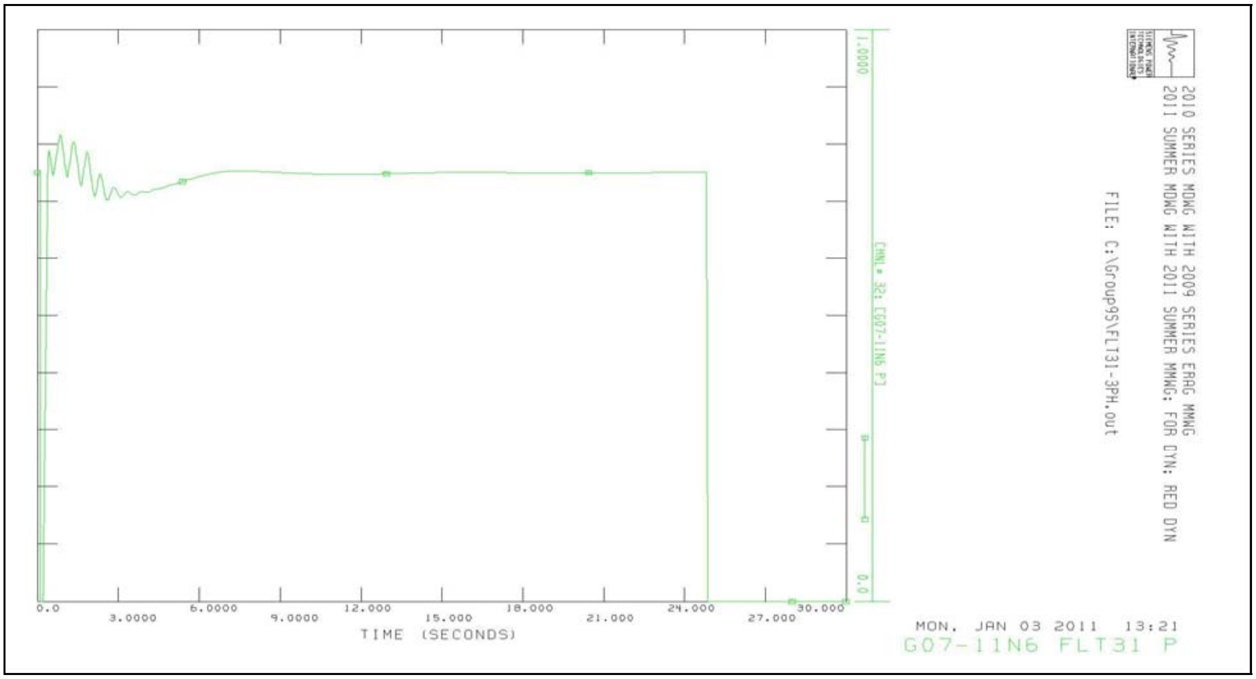


Figure 13: GEN-2007-011N06 Power Output, FLT31

7. CONCLUSIONS

Based on the results of the Group 9/Group 10 DISIS 2010-002 study, the following findings had been observed:

- GEN-2010-038 or GEN-2010-051 are both capable of maintaining the POI voltage for all studied faults without additional reactive support.
- GEN-2010-038 and GEN-2010-051 meet LVRT requirements. The studied wind turbine generators did not trip off line under the fault conditions.
- GEN-2010-038 and GEN-2010-051 had the capability of recovering to the pre-contingency voltage following the fault disturbance if the generator bus voltage is allowed to rise as above.
- There were no new stability problems due to the GEN-2010-038 and GEN-2010-051 interconnections. GEN-2007-011N06 tripped offline for overvoltage for FLT31 in the summer case, with or without the studied wind farm interconnections.
- Outages of either leg of the Fort Randall-Columbus 230 kV line had little effect on the dynamic performance of either studied generation interconnection.

O: Stability Study for Group 11

POWER SYSTEMS DIVISION
GRID SYSTEMS CONSULTING

System Impact Study for DISIS-2010-002 Group 11

DRAFT REPORT

REPORT NO.: 2010-E5724-R1
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System Impact Study for DISIS-2010-002 Group 11	Date: 01/27/2011	# Pages 19

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Executive Summary

Southwest Power Pool, Inc. (SPP) commissioned ABB Inc. to perform a Definitive Interconnection System Impact Study (DISIS) for Group 11 generation, which included a wind-based generation of 70 MW (Queue # GEN-2010-048) on the SPP transmission. The proposed wind farm is located in Graham County, Kansas and the POI is on the Beach Station – Redline 115kV transmission line.

Request	Size	Wind Turbine Model	Point of Interconnection	County
GEN-2010-048	70	Nordex 2.5MW	Tap Beach Station – Redline 115kV(bus # 580061)	Graham County, Kansas

The main objectives of this study were:

1) To determine the power factor requirements for the proposed wind farm
2) To determine the impact of proposed GEN-2010-048 project on the stability of SPP transmission systems and nearby generating stations.
3) To validate the compliance with FERC LVRT requirement for the subject wind farm interconnection.

To achieve these objectives the following analyses were performed on the Summer Peak and Winter Peak system conditions with GEN-2010-048 project(s) in-service:

- Power factor analysis for selected contingencies.
- Transient stability analysis for several local and regional contingencies.
- LVRT performance evaluation for selected contingencies near the POI.

Following is the summary of study findings:

Power factor analysis

SPP requires that the Interconnection Customer's wind farm must be able to maintain a specified voltage schedule and be designed to maintain +/- 0.95 power factor at the POI under all system conditions (i.e. system intact and contingencies). An analysis was conducted to determine the power factor requirements for the requested wind farm project. The power factor analysis indicated a power factor requirement of 0.96 lead (absorbing vars) and 1.00 lag (unity) for the requested wind farm. The interconnection customer will therefore need to design the wind farm to be able to meet the +/-0.95 requirement

Stability Analysis
A stability analysis was performed to determine the impact, if any, of the proposed project on the stability of SPP system. The system was found to be stable for all the tested 3-phase faults and single-line-to-ground (SLG) faults (with line re-closing, where applicable).

FERC Order 661A Compliance
Selected faults were simulated at the Point of Interconnection (POI) of the proposed DISIS-2010-002 Group 11 wind farm to determine the compliance with FERC 661 – A post-transition period LVRT standard. The results indicated that the proposed project met the FERC LVRT requirement for wind farm interconnection.

The results of this analysis are based on available data and assumptions made at the time of conducting this study. If any of the data and/or assumptions made in developing the study model change, the results provided in this report may not apply.

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1 INTRODUCTION

Southwest Power Pool, Inc. (SPP) commissioned ABB Inc. to perform a System Impact Study for DISIS Group 11 generation, which included a wind-based generation of 70 MW (Queue # GEN-2010-048) on the SPP transmission. The proposed wind farm is located in Graham County, Kansas and the POI is on the Beach Station – Redline 115kV transmission line. Figure 1-1 shows the approximate POI of the proposed generation project on a Geographical Transmission Map.

This study evaluated the impact of the Gen-2010-048 project on the SPP Transmission System. The scope of this study was limited to the power factor evaluation and transient stability analysis.

The main objectives of this study were

1) To determine the power factor requirements for the proposed wind farm
2) To determine the impact of the proposed Project (GEN-2010-048, 70 MW) on the stability of SPP transmission system and nearby generating stations.
3) To validate the compliance with FERC LVRT requirement for the wind farm.

To achieve these objectives the following analyses were performed on the 2010-2011 Summer Peak and Winter Peak system conditions with GEN-2010-048 project(s) in-service

- Power factor analysis for selected contingencies.
- Transient stability analysis for various local and regional contingencies.
- LVRT performance under selected contingencies near the POI.

The study was performed on Summer Peak and Winter Peak cases, provided by SPP. This report documents the methods, analysis and results of the system impact study.

Table 1-1: GEN-2010-048 Project

Project	Size (MW)	Wind Turbine Type	Point of Interconnection	Location
GEN-2010-048	70	Nordex 2.5MW	Tap Beach Station – Redline 115kV(bus # 580061)	Graham County, Kansas

1.1 REPORT ORGANIZATION

This report is organized as follows:

Section 2: Description of project
Section 3: Study methodology
Section 4: Model Development
Section 5: Power Factor Analysis Results
Section 6: Stability Analysis Results
Section 7: Conclusions

The detailed study results are included in separate Appendices.

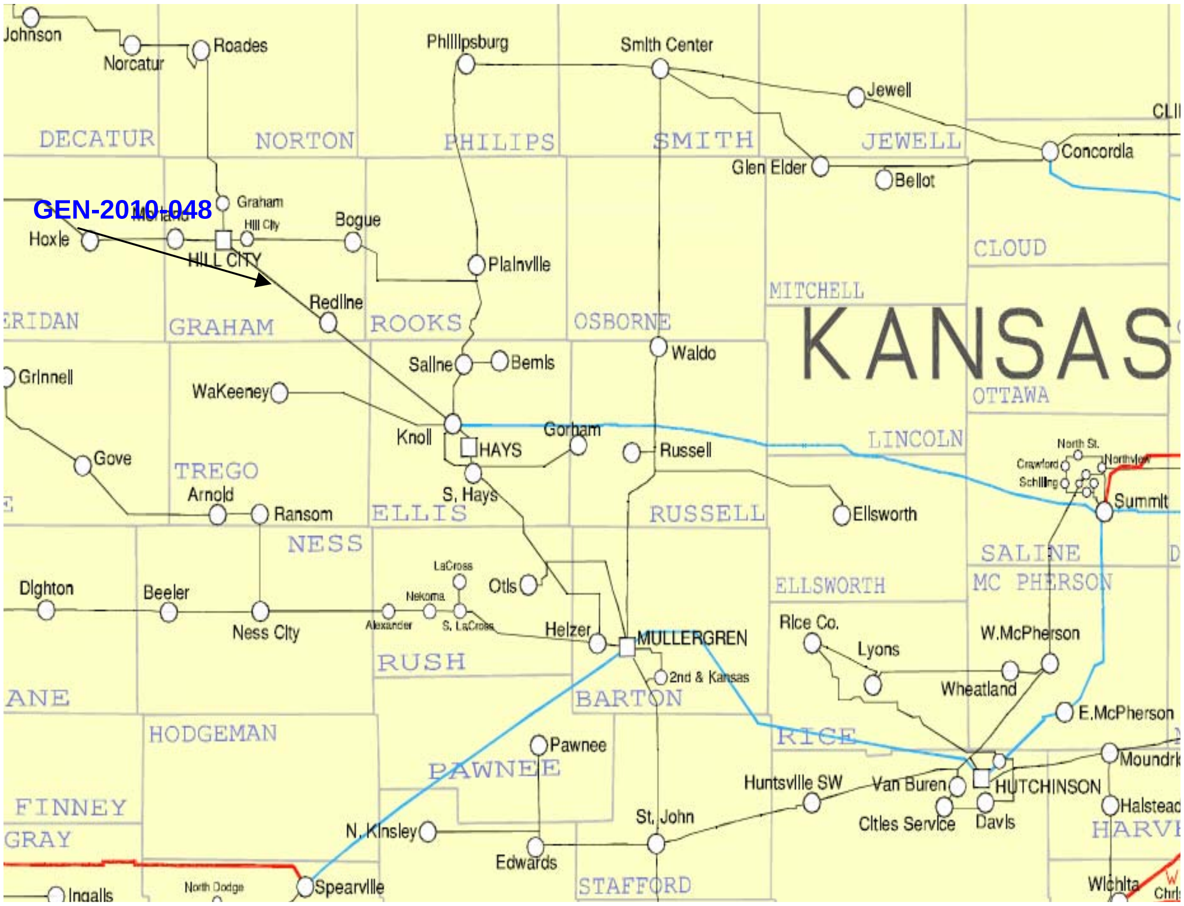

Figure 1-1 Geographical Transmission Map with GEN-2010-048 Approximate Project Location

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1.2 DESCRIPTION OF GROUP 11 PROJECT

The details of load flow and dynamic data for the GEN-2010-048 wind farm project is included in Appendix A.

- Wind farm size: 70 MW
- Interconnection:

  Voltage: 115 kV

  POI: Tap Beach Station – Redline 115kV

  Transformer: One (1) step-up transformer connecting to the 115 kV

  MVA: 45 MVA

  Voltage: 115/34.5 kV

  Z: 8.0 % on 100 MVA
- Wind Turbines:

  Number: Twenty eight (28)

  Manufacturer: Nordex

  Type: Doubly Fed Induction Generator (DFIG)

Machine Terminal voltage: 0.66 kV

Rated Power: 2.5 MW

Frequency: 60 Hz

Generator Step-up Transformer

MVA: 3.0
High voltage: 34.5 kV
Low voltage: 0.66 kV
Z: 7.32% on 3.0 MVA

Reactive Power Capability: 0.957 (lag/lead) (100% Power rating)

- PSSE Model Used NX00CB_V2_r30-3-3_CVF.OBJ

2 STUDY METHODOLOGY

2.1 POWER FACTOR ANALYSIS

SPP requires that the Interconnection Customer's wind farm maintain a specified voltage schedule and be designed to maintain a +/- 0.95 power factor at the POI for any system condition. The purpose of the power factor analysis was to determine whether the proposed wind farm project will meet the power factor requirement at the Point of Interconnection (POI) for system intact as well as contingency conditions.

The Power Factor Analysis involved the following Steps:

- A VAR generator with large capacity (e.g. +/- 9999 MVar) was modeled at the POI of the subject wind farm. The VAR generator was set to hold the POI voltage consistent with the voltage schedule in the power flow base cases. The reactive power capability of the wind farm was set to zero.
- A list of selected contingencies in the vicinity of the subject wind farm was simulated. The results were used to identify the most-limiting contingency from steady state voltage and power factor perspective.
- The power factor requirements were determined from this analysis

It is important to note that the reactive power compensation identified in this analysis was primarily needed to meet steady state criteria. The need for dynamic reactive power support, if any, was determined through transient stability analysis.

2.2 TRANSIENT STABILITY ANALYSIS

The purpose of the transient stability analysis is to determine the impact, if any, of the proposed wind farm project on the stability performance of the SPP transmission system and generating stations in the interconnection vicinity.

Stability analysis was performed using Siemens-PTI's PSS/E™ dynamics program V30.3.3. Three-phase and single-line-to-ground (SLG) (with re-closure where applicable) were simulated for the specified duration and synchronous machine rotor angles and wind turbine generator speeds were monitored to check whether the system is stable following the fault clearing. In addition, the voltage at the wind-farm POI and vicinity was also monitored.

For three-phase faults, a fault admittance of –j2E9 was used (essentially infinite admittance representing a bolted fault). The PSS/E dynamics program only simulates the positive sequence network. However, the unbalanced fault current computation (e.g. single-phase-ground) requires the knowledge of positive, negative, and zero sequence impedances. For a single-line-to-ground (SLG) fault, the fault admittance then equals the inverse of the sum of the positive, negative and zero sequence impedances. Typically, a single line to ground fault results in a voltage of roughly 60%. The admittance needed (over and above the positive sequence) to achieve this voltage value was computed using activity TYSL in PSS/E. This additional admittance value is the equivalent of the sum of positive and negative sequence admittances. The admittance value computed in the above step is then inserted at the faulted bus and the single line to ground fault current is computed.

The voltages at all local buses (115 kV and above) were monitored for all tested contingencies.

Another important aspect of the stability analysis was to determine the ability of the wind generators to stay connected to the grid during disturbances. This is primarily determined by their low-voltage ride-through capabilities – or lack thereof – as represented in the models by low-voltage trip settings. The Federal Energy Regulatory Commission (FERC) Post-transition period LVRT standard for Interconnection of Wind generating plants includes a Low Voltage Ride-Through (LVRT) requirement. The key features of LVRT requirements are:

- A wind generating plant must remain in-service during three-phase faults with normal clearing (maximum 9 cycles) and single-line-to-ground faults with delayed clearing, and have subsequent post-fault recovery to pre-fault voltage unless the clearing of the fault effectively disconnects the generator from the system.
- The maximum duration the wind generating plant shall be required to withstand a three-phase fault shall be 9 cycles after which, if the fault remains following the location-specific normal clearing time for three-phase faults, the wind generating plant may disconnect from the transmission system. A wind generating plant shall remain interconnected during such a fault on transmission system for a voltage level as low as zero volts, as measured at the high voltage side of the GSU connected at POI.

These criteria were used to evaluate the LVRT capability of the wind farm.

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3 MODEL DEVELOPMENT

SPP provided two power flow cases for this study – i) "MDWG_2010_2011SP_DISIS-2010-002-G11.sav" and ii) "MDWG_2010_2011WP_DISIS-2010-002-G11.sav" – representing respectively the 2010-2011 Summer Peak and Winter Peak conditions. The study cases included the following prior-queued projects:

#	Prior Queued Generator	Size (MW)	Wind Turbine Model	Point of Interconnection
1	GEN-2003-006A	200	Vestas V90 3.0MW	Elm Creek 230kV (539639)
2	GEN-2003-019	250	GE 1.5MW	Smoky Hills 230kV (530592)
3	GEN-2006-031	75	Gas	Knoll 115kV (530561)
4	GEN-2006-032	200	Gamesa 2.0MW	South Hays 230kV (530582)
5	GEN-2008-092	200	GE 1.5MW	Knoll 230kV (530558)
6	GEN-2009-011	50	Gamesa 2.0MW	Tap Plainville (539686) – Phillipsburg (539685) 115kV. (Bus 570911)
7	GEN-2009-008	199.5	GE 1.5MW	South Hays (530582) 230kV
8	GEN-2009-020	48.6	Vestas V90 1.8MW	Balzine (530585) – Nekoma (530564) 69kV (Bus 575041)
9	GEN-2009-040	73.8	Vestas V90 1.8MW	Smittyville (533338) – Knob Hill (533332) 115kV (Bus 560287)

3.1 MODEL DEVELOPMENT FOR GEN-2010-048 PROJECT

The models (power flow and dynamics) for the proposed project were included in the data supplied by SPP. A cursory review of the study models was performed to ensure the wind farm and the associated collector system representation is in agreement with the data provided for this study. The subject wind farm comprised of Nordex WTGs that are operated at +/- 0.957 power factor.

Figure 3-1 and Figure 3-2 show the one-line diagram in the local area of GEN-2010-048 for 2010-2011 summer peak and winter peak conditions respectively.

The dynamic model setup with the "snapshot" for performing stability analysis was provided by SPP. We performed a no-disturbance simulation to verify the models initialized correctly and there is no drift from the respective steady state quantities (e.g. machine angle, speeds, bus voltage etc.) over time.

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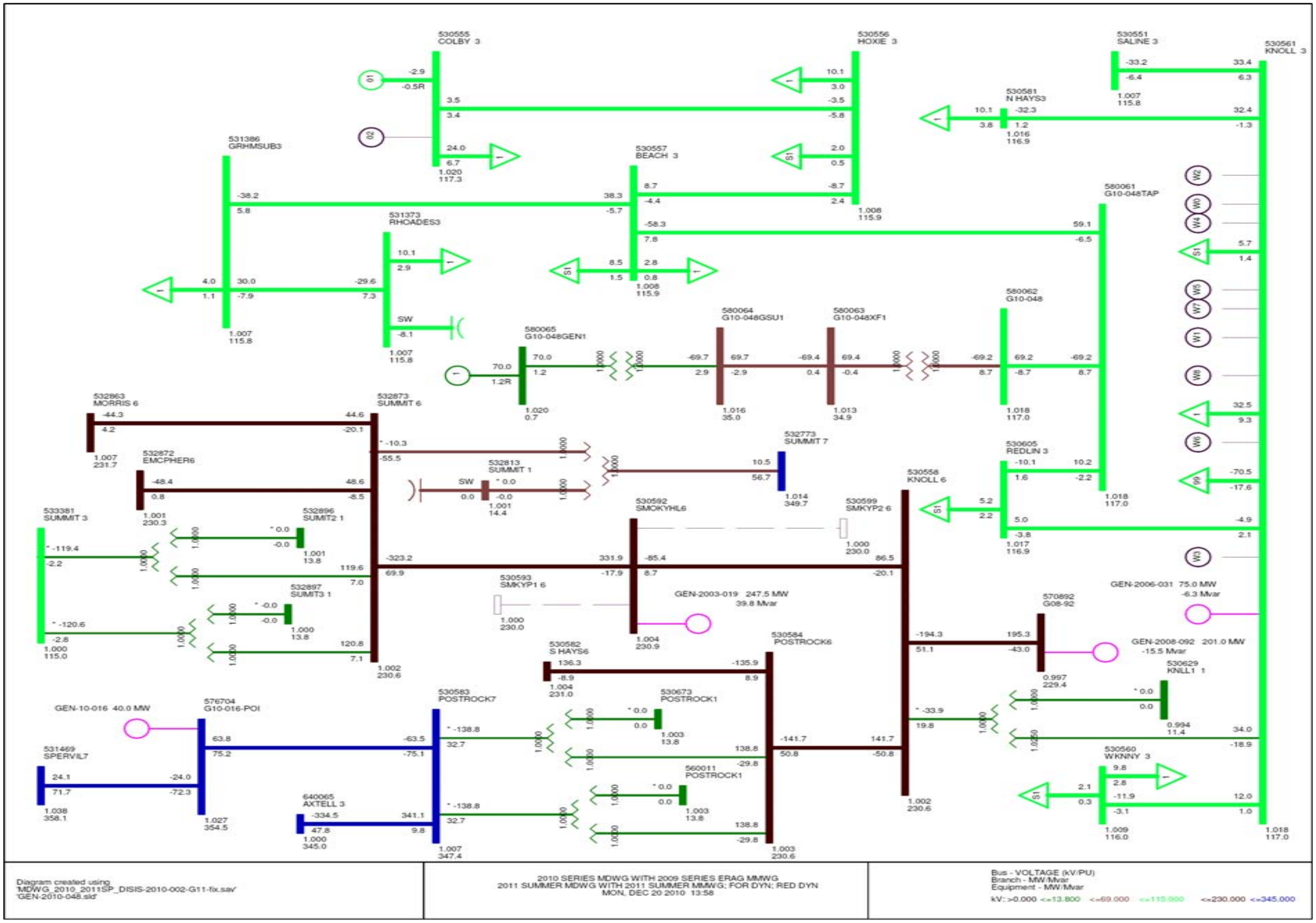

Figure 3-1 One-line Diagram of the local area of GEN-2010-048 (Summer Peak)

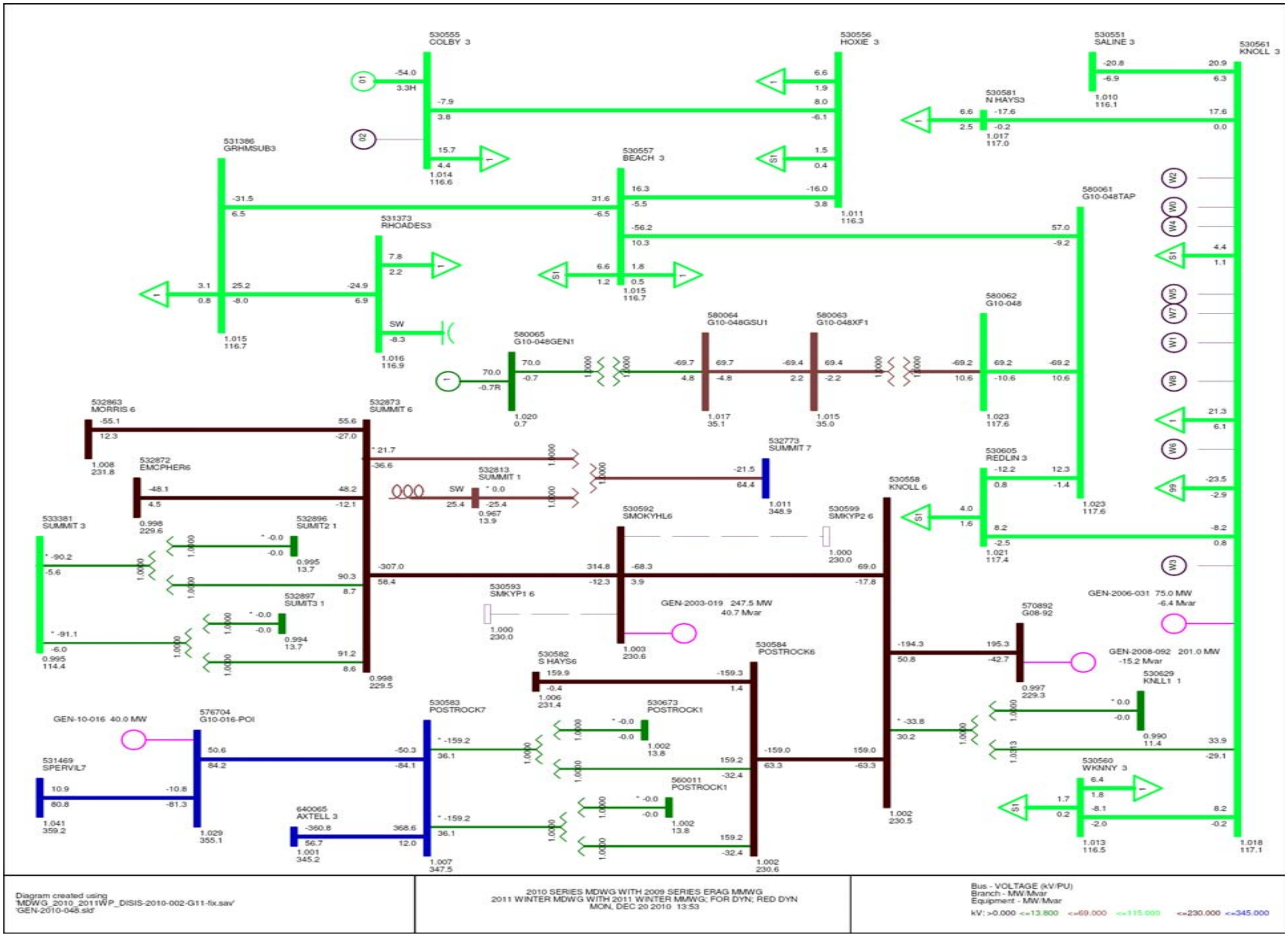

Figure 3-2 One-line Diagram of the local area of GEN-2010-048 (Winter Peak)

ABB

4 POWER FACTOR ANALYSIS RESULTS

The Power Factor analysis was performed to verify that the wind-farm interconnection met SPP's standard in terms of power factor and voltage requirements at the POI. **Table 4-1** lists the contingencies simulated for Power Factor analysis.

Table 4-1: List of contingencies simulated for Power Factor Analysis

Contingency Name	Contingency Description
CONT_00	BASECASE
CONT_01	Loss of Setab 345kV (531465) to 115kV (531464) transformer
CONT_02	Loss of Mingo (531451) to Red Willow (640325) 345kV line
CONT_03	Loss of Mingo 345kV (531451) to 115kV (531429) transformer
CONT_04	Loss of Post Rock (530583) to Gen-2010-016 (576704) 345kV line
CONT_05	Loss of Post Rock (530583) to Axtell (640065) 345kV line
CONT_06	Loss of Knoll (530558) to Smoky Hills (530592) 230kV line
CONT_07	Loss of Post Rock (530584) to South Hays (530582) 230kV line
CONT_08	Loss of Post Rock (530584) to Knoll (530558) 230kV line
CONT_09	Loss of Post Rock 345KV (530583) 230KV (530584) transformer
CONT_10	Loss of Knoll 230kV (530558) to 115kV (530561) transformer
CONT_11	Loss of Knoll (530561) to Saline (530551) 115kV line
CONT_12	Loss of Knoll (530561) to Redline (530605) 115kV line
CONT_13	Loss of South Hays (530582) to Mullergren (539679) 230kV line
CONT_14	Loss of Knoll (530561) to N Hays (530581) 115kV line
CONT_15	Loss of Pioneer Tap (539642) to Mullergren (539678) 115kV line
CONT_16	Loss of Nekoma (530564) 69kV to 115kV (530608) autotransformer
CONT_17	Loss of Heizer (530563) 69kV to 115kV (530601) transformer
CONT_18	Loss of Heizer (530601) 115kV to Mullergren (539679) 230kV transformer
CONT_19	Loss of Mullergren (539679) 230kV to Grtbend (539678) 115kV transformer
CONT_20	Loss of S. Hays (530582) 230kV to S. Hays (530553) 115kV transformer
CONT_21	Loss of Concordia (539657) 115kV to (539658) 230kV transformer
CONT_22	Loss of Mullergren (539679) to Circle (532871) 230kV line
CONT_23	Loss of Mullergren (539679) to Spearville (539695) 230kV line
CONT_24	Loss of GEN-2010-048(580061) to Redline (530605) 115kV line
CONT_25	Loss of GEN-2010-048 (580061) to Beach Station (530557) 115kV line
CONT_26	Loss of Graham (531386) to Beach Station (530557) 115kV line
CONT_27	Loss of Hoxie (530556) to Beach Station (530557) 115kV line

As described in section 2.1, a VAR generator was modeled at POI. The VAR generator was set to hold the 115 kV POI voltage equal to that in the base case provided by SPP.

The contingencies shown in **Table 4-1** were simulated on 2010-2011 summer peak and winter peak load conditions. For the system intact as well as contingencies, the VAR generator was found to absorb reactive power to maintain the base case voltage. The subject wind farm will be required to maintain the power factor requirements listed in Table 4-2.

Table 4-2 VAR generator output[1] at the GEN-2010-048 POI

Contingency	VOLTAGE OF VAR Gen.							
	Summer Peak	Winter Peak	Summer Peak			Winter Peak		
	(#580061)		Q (MVAR)	P (MW)	p.f (POI)	Q (MVAR)	P (MW)	p.f (POI)
CONT_00	1.018	1.023	-8.8	70	0.992	-10.7	70	0.989
CONT_01	1.018	1.023	-8.8	70	0.992	-10.6	70	0.989
CONT_02	1.018	1.023	-7	70	0.995	-8.2	70	0.993
CONT_03	1.018	1.023	-4.3	70	0.998	-4.7	70	0.998
CONT_04	1.018	1.023	-7.7	70	0.994	-9.1	70	0.992
CONT_05	1.018	1.023	-6.8	70	0.995	-7.2	70	0.995
CONT_06	1.018	1.023	-7.1	70	0.995	-9.1	70	0.992
CONT_07	1.018	1.023	-7.7	70	0.994	-8.9	70	0.992
CONT_08	1.018	1.023	-6.3	70	0.996	-7.1	70	0.995
CONT_09	1.018	1.023	-8	70	0.994	-9.7	70	0.991
CONT_10	1.018	1.023	-6.6	70	0.996	-6.2	70	0.996
CONT_11	1.018	1.023	-6.6	70	0.996	-10.2	70	0.990
CONT_12	1.018	1.023	-6.1	70	0.996	-9.7	70	0.991
CONT_13	1.018	1.023	-5.2	70	0.997	-6.7	70	0.995
CONT_14	1.018	1.023	-8.5	70	0.993	-10.6	70	0.989
CONT_15	1.018	1.023	-7	70	0.995	-9.4	70	0.991
CONT_16	1.018	1.023	-8.8	70	0.992	-10.6	70	0.989
CONT_17	1.018	1.023	-8.8	70	0.992	-10.6	70	0.989
CONT_18	1.018	1.023	-9.1	70	0.992	-10.6	70	0.989
CONT_19	1.018	1.023	-7.8	70	0.994	-10.1	70	0.990
CONT_20	1.018	1.023	-8.1	70	0.993	-9.5	70	0.991
CONT_21	1.018	1.023	-5.6	70	0.997	-7.4	70	0.994
CONT_22	1.018	1.023	-8.1	70	0.993	-9.9	70	0.990
CONT_23	1.018	1.023	-7.5	70	0.994	-9.5	70	0.991
CONT_24	1.018	1.023	-8.6	70	0.993	-11.3	70	0.987
CONT_25	1.018	1.023	-20.5	70	0.960	-19	70	0.965
CONT_26	1.018	1.023	-16	70	0.975	-14.2	70	0.980
CONT_27	1.018	1.023	-6.9	70	0.995	-9.4	70	0.991

[1] VAR Generator absorbing reactive power from the system in all the cases; i.e. leading power factor

5 STABILITY ANALYSIS

Stability simulations were performed to examine the transient behavior of GEN-2010-048 project and its impact on the SPP system. Several faults, both three-phase and single phase faults (with re-closing where applicable) were simulated. The fault clearing times and re-closing times used for the simulations are shown inTable 5-1.

Table 5-1: Fault Clearing Times

Faulted bus kV level	Normal Clearing	Time before reclosing
69	5 cycles	20 cycles
115	5 cycles	20 cycles
230	5 cycles	20 cycles

Twenty seven (27) three phase and seventeen (17) single-line-to-ground faults (with re-closing where applicable) were simulated. For all tested cases the initial disturbance was applied at t = 0.1 seconds. The breaker clearing was applied at the appropriate time following the fault inception. Table 5-2 lists all the faults simulated for transient stability analysis.

Table 5-2 List of Simulated Faults for GEN-2010-048 SIS

Cont. No.	Cont. Name	Description
1	FLT01-3PH	3 phase fault on the Setab 345kV (531465) to 115kV (531464) transformer, near the 345 kV bus. a. Apply fault at the Setab 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
2	FLT02-3PH	3 phase fault on the Mingo (531451) to Red Willow (640325) 345kV line, near Mingo. a. Apply fault at the Mingo 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
3	FLT03-1PH	Single phase fault on the line in previous fault. a. Apply fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
4	FLT04-3PH	3 phase fault on the Mingo 345kV (531451) to 115kV (531429) transformer, near the 345 kV bus. a. Apply fault at the Mingo 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
5	FLT07-3PH	3 phase fault on the Post Rock (530583) to Gen-2010-016 (576704) 345kV line, near Post Rock. a. Apply fault at the Post Rock 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
6	FLT08-1PH	Single phase fault on the line in previous fault. a. Apply fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
7	FLT09-3PH	3 phase fault on the Post Rock (530583) to Axtell (640065) 345kV line, near Post Rock. a. Apply fault at the Post Rock 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.

Cont. No.	Cont. Name	Description
8	FLT10-1PH	Single phase fault on the line in previous fault. a. Apply fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
9	FLT11-3PH	3 phase fault on the Knoll (530558) to Smoky Hills (530592) 230kV line, near Smoky Hills. a. Apply fault at the Smoky Hills 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
10	FLT12-1PH	*Single phase fault and sequence like previous*
11	FLT13-3PH	3 phase fault on the Post Rock (530584) to South Hays (530582) 230kV line, near Post Rock. a. Apply fault at the Post Rock 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
12	FLT14-1PH	*Single phase fault and sequence like previous*
13	FLT15-3PH	3 phase fault on the Post Rock (530584) to Knoll (530558) 230kV line, near Post Rock. a. Apply fault at the Post Rock 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
14	FLT16-1PH	*Single phase fault and sequence like previous*
15	FLT17-3PH	3 phase fault on the Post Rock 345KV (530583) to Post Rock 230KV (530584) transformer, near the 230kV bus. a. Apply fault at the Knoll 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
16	FLT18-3PH	3 phase fault on one circuit of the Knoll 230kV (530558) to 115kV (530561) transformer, near the 230kV bus. a. Apply fault at the Knoll 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
17	FLT19-3PH	3 phase fault on the Knoll (530561) to Saline (530551) 115kV line, near Knoll. a. Apply fault at the Knoll 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
18	FLT20-1PH	*Single phase fault and sequence like previous*
19	FLT21-3PH	3 phase fault on the Knoll (530561) to Redline (530605) 115kV line, near Knoll. a. Apply fault at the Knoll 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
20	FLT22-1PH	*Single phase fault and sequence like previous*
21	FLT23-3PH	3 phase fault on the South Hays (530582) to Mullergren (539679) 230kV line, near South Hays. a. Apply fault at the South Hays 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
22	FLT24-1PH	*Single phase fault and sequence like previous*
23	FLT25-3PH	3 phase fault on the Knoll (530561) to N Hays (530581) 115kV line, near Knoll. a. Apply fault at the Knoll 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
24	FLT26-1PH	*Single phase fault and sequence like previous*
25	FLT27-3PH	3 phase fault on the Pioneer Tap (539642) to Mullergren (539678) 115kV line, near Pioneer Tap. a. Apply fault at the Pioneer Tap 115kV bus b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
26	FLT28-1PH	*Single phase fault and sequence like previous*

Cont. No.	Cont. Name	Description
27	FLT29-3PH	3 phase fault on the Smoky Hills 345/230kV autotransformer on the 230kV bus (530592) a. Apply fault at the Smoky Hills 230kV bus b. Clear fault after 5 cycles by tripping the faulted line.
28	FLT38-3PH	3 phase fault on the Nekoma (530564) 69kV – Nekoma (530608) 115kV autotransformer on the 115kV bus a. Apply fault at the Nekoma 115 kV bus b. Clear fault after 5 cycles by tripping the faulted line.
29	FLT39-3PH	3 phase fault on the Heizer (530563) 69kV – Heizer (530601) 115kV transformer on the 115kV bus a. Apply fault at the Heizer 115 kV bus b. Clear fault after 5 cycles by tripping the faulted line.
30	FLT40-3PH	3 phase fault on one circuit of the Heizer (530601) 115kV – Mullergren (539679) 230kV transformer on the 115kV bus a. Apply fault at the Heizer 115 kV bus b. Clear fault after 5 cycles by tripping the faulted line.
31	FLT41-3PH	3 phase fault on the Mullergren (539679) 230kV – Grtbend (539678)) 115kV transformer on the 230kV bus a. Apply fault at the Mullergren 115 kV bus b. Clear fault after 5 cycles by tripping the faulted line.
32	FLT42-3PH	3 phase fault on the S. Hays (530582) 230kV – S. Hays (530553) 115kV transformer on the 115kV bus a. Apply fault at the S. Hays 115 kV bus b. Clear fault after 5 cycles by tripping the faulted line.
33	FLT44-3PH	3 phase fault on the Concordia (539657) 115kV – Concordia 539658) 230kV transformer on the 230kV bus a. Apply fault at the Concordia 230kV bus b. Clear fault after 5 cycles by tripping the faulted line.
34	FLT55-3PH	3 phase fault on the Mullergren (539679) – Circle (532871) 230kV line, near Mullergren. a. Apply fault at the Mullergren 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
35	FLT56-1PH	*Single phase fault and sequence like previous*
36	FLT57-3PH	3 phase fault on the Mullergren (539679) – Spearville (539695) 230kV line, near Mullergren. a. Apply fault at the Mullergren 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
37	FLT58-1PH	*Single phase fault and sequence like previous*
38	FLT59-3PH	3 phase fault on the GEN-2010-048(580061) – Redline (530605) 115kV line, near GEN-2010-048. a. Apply fault at the GEN-2010-048 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
39	FLT60-1PH	*Single phase fault and sequence like previous*
40	FLT61-3PH	3 phase fault on the GEN-2010-048 – Beach Station (530557) 115kV line, near GEN-2010-048. a. Apply fault at the GEN-2010-048 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
41	FLT62-1PH	*Single phase fault and sequence like previous*
42	FLT65-3PH	3 phase fault on the Graham (531386) – Beach Station (530557) 115kV line, near Graham. a. Apply fault at the Graham 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
43	FLT66-1PH	*Single phase fault and sequence like previous*
44	FLT67-3PH	3 phase fault on the Hoxie (530556) – Beach Station (530557) 115kV line, near Hoxie. a. Apply fault at the Hoxie 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
45	FLT68-1PH	*Single phase fault and sequence like previous*

The system was stable for all the simulated 3-Phase and single-phase faults. The proposed GEN-2010-048 wind farm stayed on-line throughout the duration of the fault and thereof. The voltage recovery was acceptable, and the oscillations were damped out. A sample response of GEN-2010-048 project is shown in Figure 5-1 from the simulation of FLT_59_3PH. This fault is a 3 Phase fault at the POI.

Table 5-3 summarizes the stability analysis results for 2010-2011 summer peak and winter peak system conditions.

The plots from the transient stability analysis are included in Appendix C.

Table 5-3 Results of stability analysis

FAULT	Summer Peak			Winter Peak		
	Pre-Project	Post-Project		Pre-Project	Post-Project	
		Stable?	Acceptable Voltages?		Stable?	Acceptable Voltages?
FLT01-3PH	---	STABLE	YES	---	STABLE	YES
FLT02-3PH	---	STABLE	YES	---	STABLE	YES
FLT03-1PH	---	STABLE	YES	---	STABLE	YES
FLT04-3PH	---	STABLE	YES	---	STABLE	YES
FLT07-3PH	---	STABLE	YES	---	STABLE	YES
FLT08-1PH	---	STABLE	YES	---	STABLE	YES
FLT09-3PH	---	STABLE	YES	---	STABLE	YES
FLT10-1PH	---	STABLE	YES	---	STABLE	YES
FLT11-3PH	---	STABLE	YES	---	STABLE	YES
FLT12-1PH	---	STABLE	YES	---	STABLE	YES
FLT13-3PH	---	STABLE	YES	---	STABLE	YES
FLT14-1PH	---	STABLE	YES	---	STABLE	YES
FLT15-3PH	---	STABLE	YES	---	STABLE	YES
FLT16-1PH	---	STABLE	YES	---	STABLE	YES
FLT17-3PH	---	STABLE	YES	---	STABLE	YES
FLT18-3PH	---	STABLE	YES	---	STABLE	YES
FLT19-3PH	---	STABLE	YES	---	STABLE	YES
FLT20-1PH	---	STABLE	YES	---	STABLE	YES
FLT21-3PH	---	STABLE	YES	---	STABLE	YES
FLT22-1PH	---	STABLE	YES	---	STABLE	YES
FLT23-3PH	---	STABLE	YES	---	STABLE	YES
FLT24-1PH	---	STABLE	YES	---	STABLE	YES
FLT25-3PH	---	STABLE	YES	---	STABLE	YES

FAULT	Summer Peak			Winter Peak		
	Pre-Project	Post-Project		Pre-Project	Post-Project	
		Stable?	Acceptable Voltages?		Stable?	Acceptable Voltages?
FLT26-1PH	---	STABLE	YES	---	STABLE	YES
FLT27-3PH	---	STABLE	YES	---	STABLE	YES
FLT28-1PH	---	STABLE	YES	---	STABLE	YES
FLT38-3PH	---	STABLE	YES	---	STABLE	YES
FLT39-3PH	---	STABLE	YES	---	STABLE	YES
FLT40-3PH	---	STABLE	YES	---	STABLE	YES
FLT41-3PH	---	STABLE	YES	---	STABLE	YES
FLT42-3PH	---	STABLE	YES	---	STABLE	YES
FLT44-3PH	---	STABLE	YES	---	STABLE	YES
FLT55-3PH	---	STABLE	YES	---	STABLE	YES
FLT56-1PH	---	STABLE	YES	---	STABLE	YES
FLT57-3PH	---	STABLE	YES	---	STABLE	YES
FLT58-1PH	---	STABLE	YES	---	STABLE	YES
FLT59-3PH	---	STABLE	YES	---	STABLE	YES
FLT60-1PH	---	STABLE	YES	---	STABLE	YES
FLT61-3PH	---	STABLE	YES	---	STABLE	YES
FLT62-1PH	---	STABLE	YES	---	STABLE	YES
FLT65-3PH	---	STABLE	YES	---	STABLE	YES
FLT66-1PH	---	STABLE	YES	---	STABLE	YES
FLT67-3PH	---	STABLE	YES	---	STABLE	YES
FLT68-1PH	---	STABLE	YES	---	STABLE	YES

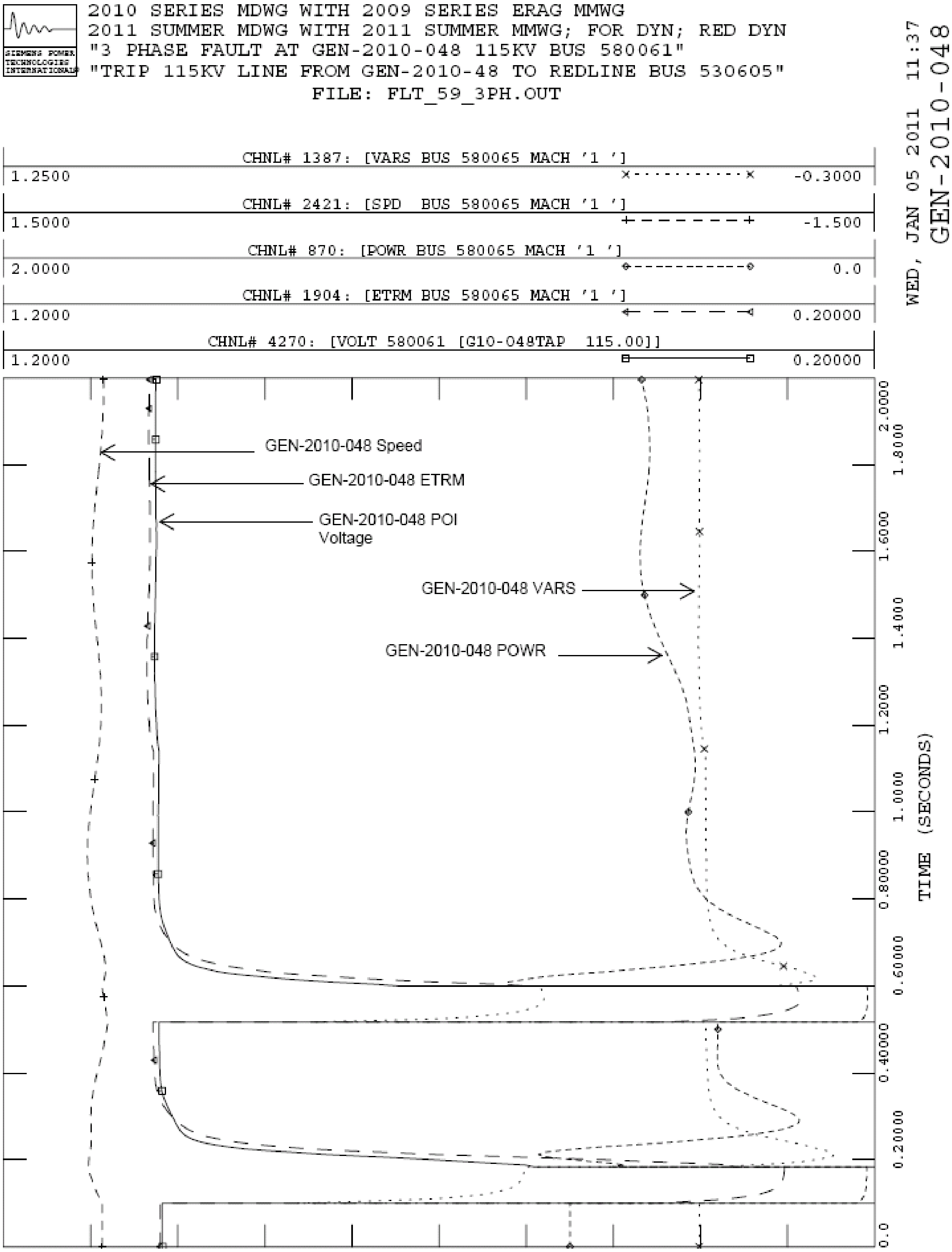

Figure 5-1 Response of GEN-2010-048 project for FLT_59_3PH (summer peak)

5.1 FERC LVRT Compliance

The proposed Group 11 wind farm was modeled with the low voltage ride through capacity. To determine the LVRT compliance of the Group 11 wind farm, a total of four (4) faults were simulated. These faults were simulated at the POI of Group 11 wind farm project and cleared by tripping one transmission element. Table 5-4 lists the faults simulated for LVRT analysis.

Table 5-4: List of faults for FERC LVRT compliance

Fault Name	Description
FLT01-3PH_LVRT	3 phase fault on the GEN-2010-048(580061) – Redline (530605) 115kV line, near GEN-2010-048.
	a. Apply fault at the GEN-2010-048 115kV bus.
	b. Clear fault after 9.0 cycles by tripping the faulted line.
FLT02-1PH_LVRT	*Single Phase fault Delayed Clearing (9 Cycles + 6 Cycles) and sequence like previous*
FLT03-3PH_LVRT	3 phase fault on the GEN-2010-048 – Beach Station (530557) 115kV line, near GEN-2010-048.
	a. Apply fault at the GEN-2010-048115kV bus.
	b. Clear fault after 9.0 cycles by tripping the faulted line and the Callaway 115 kV bus
FLT04-1PH_LVRT	*Single Phase fault Delayed Clearing (9 Cycles + 6 Cycles) and sequence like previous*

The results of the simulations indicated that the GEN-2010-048 wind farm project tripped on over frequency for 3- phase fault at the POI in summer and winter peak cases. However, the voltage recovery was acceptable at POI and therefore the tripping of the wind farm is <u>not due to a lack of voltage recovery</u>. In fact, the subject wind farm tripped on over-frequency. The over-frequency protection relay for the GEN-2010-048 wind farm was originally set as follows:

Relay acts if frequency > 61.8 Hz for 0.2sec.

Further simulations were performed to determine the minimum time delay for over-frequency that would not trip the wind-farm. This was determined to be 0.25 sec. Next, the LVRT fault cases were re-simulated by revising the frequency trip time delay from the proposed value of 0.2 sec to 0.25 sec. The results of the simulations indicated that the GEN-2010-048 wind farm stayed online through the fault duration and recovered to acceptable speed and voltage post-fault clearing. Therefore the subject wind farm is expected to meet the FERC LVRT criteria for the interconnection (FERC Order 661 – A). The response of GEN-2010-048 project for FLT_01_LVRT_3PH is given in Figure 5-2. It is suggested that manufacturer of the wind farm be consulted to verify if the time delay for over-frequency setting may be revised to 0.25 sec.

The results from the FERC LVRT compliance evaluation are included in Appendix D.

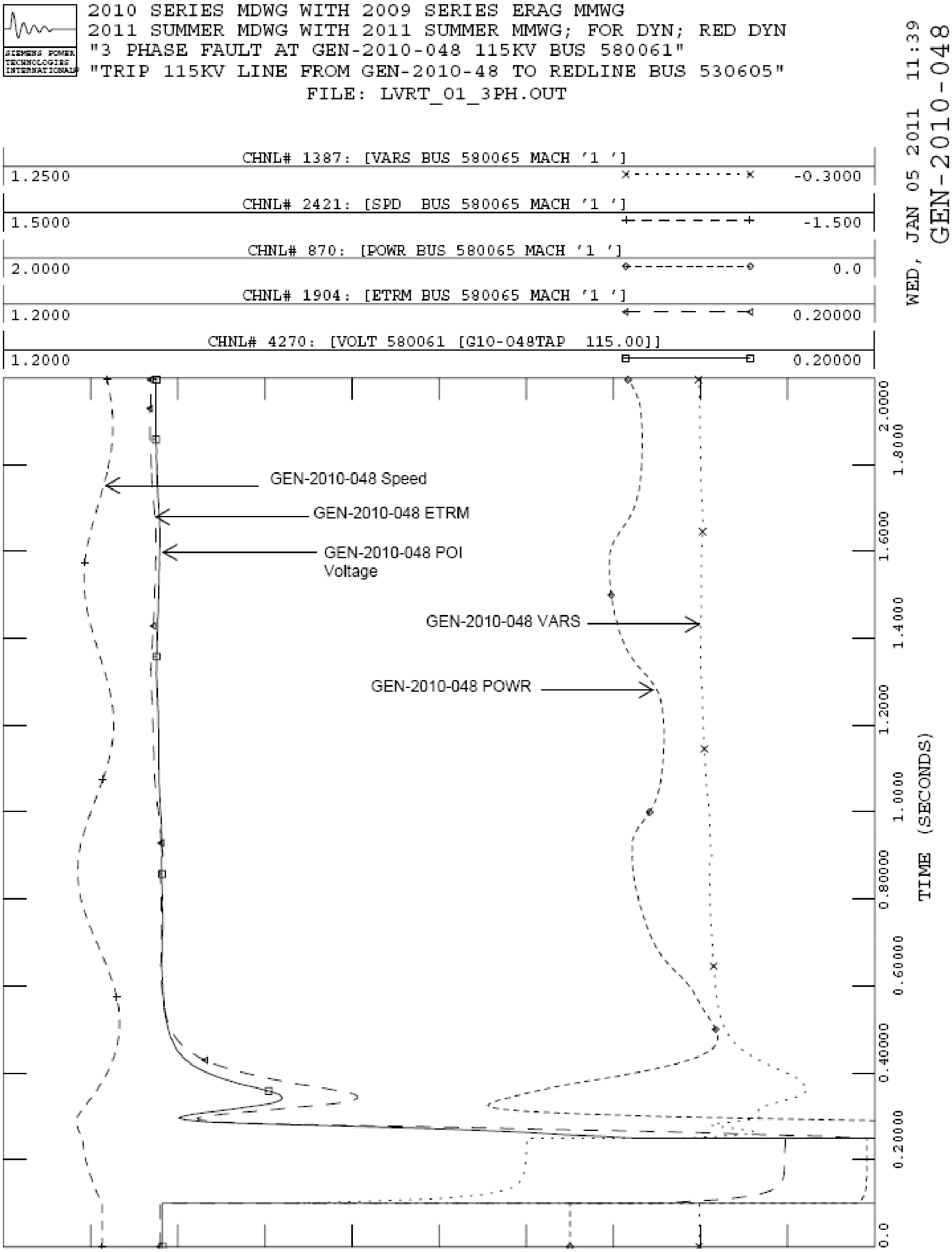

Figure 5-2 Response of GEN-2010-048 project for FLT_01_LVRT_3PH (summer peak)

6 CONCLUSIONS

The main objectives of this study were

1) To determine the need for added reactive power compensation, if any, for the proposed wind farm in order to meet SPP's interconnection standards
2) To determine the impact of the proposed Project (GEN-2010-048, 70 MW) on the stability of SPP transmission system and nearby generating stations.
3) To validate the compliance with FERC LVRT requirement for the subject wind farm interconnection.

To achieve these objectives the following analyses were performed on the 2010-2011 Summer Peak and Winter Peak system conditions with GEN-2010-048 in-service

- Power factor analysis for selected contingencies.
- Transient stability analysis for various local and regional contingencies
- LVRT performance for selected contingencies near the POI.

A summary of the study findings is given below:

Power factor analysis

SPP requires that the Interconnection Customer's wind farm maintain a specified voltage schedule and be designed to maintain a +/- 0.95 power factor at the POI under all system conditions (i.e. system intact and contingencies). An analysis was conducted to determine whether the power factor range needed to hold the voltage schedule. The wind farm is required to maintain a 0.96 lead (absorbing vars) and a 1.00 lag (unity) power factor at the point of interconnection.

Stability Analysis

A stability analysis was performed to determine the impact, if any, of the proposed project on the stability of SPP system. The system was found to be stable for all the tested 3-phase faults and single-line-to-ground (SLG) faults (with line re-closing, where applicable).

FERC Order 661A Compliance

Selected faults were simulated at the Point of Interconnection (POI) of the proposed DISIS-2010-002 Group 11 wind farm to determine the compliance with FERC 661 – A; post-transition period LVRT standard. The results indicated that the proposed project met the FERC LVRT requirement for wind farm interconnection.

Based on the results of the analysis, it can be concluded that the proposed GEN-2010-048 wind farm does not adversely impact the transmission performance of the SPP system.

The results of this analysis are based on available data and assumptions made at the time of conducting this study. If any of the data and/or assumptions made in developing the study model change, the results provided in this report may not apply and additional analysis may be required.

P: Stability Study for Group 13

INTERCONNECTION IMPACT STUDY
DISIS-2010-002 (Group 13)

SOUTHWEST POWER POOL (SPP)
January 26, 2011

By

BLACK & VEATCH

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EXECUTIVE SUMMARY

A transient stability study has been performed for Southwest Power Pool (SPP) Preliminary Impact Study Interconnection Customers Group 13 (DISIS-2010-002 Group 13).

The Group 13 has four Interconnection Requests, GEN-2010-036, GEN-2010-041, GEN-2010-047 and GEN-2010-050.

The 2011 summer load flow case and 2011 winter load flow case together with the SPP SDDWG 2006 stability model were used as the basis for the transient stability analysis. The study was performed using PTI’s PSS/E program, which is an industry-wide accepted power system simulation program.

The study has not indicated any transient stability issues and the Group 13 projects were found to stay connected during the contingencies that were studied.

Should any previously queued projects that were included in this study drop out then this System Impact Study may have to be revised to determine the impacts of this Interconnection Customer’s project on transmission facilities.

1. Introduction

This report discusses the results of a transient stability study performed for Southwest Power Pool (SPP) Definitive Impact Study Interconnection Customers Group 13 (DISIS-2010-002 Group 13).

Group 13 has four Interconnection Requests as noted in Table 1.

Table 1: Group 13 Projects

Request	Size (MW)	Wind Turbine Model	Point of Interconnection
GEN-2010-036	4.6	GENROU	6th Street 115kV (533264)
GEN-2010-041	10.5	GE 1.5MW	S1399 161kV (646399)
GEN-2010-047	72	GE 1.6MW	Tap Beatrice – Harbine 115kV (580056)
GEN-2010-050	150.4	GE 1.6MW	Tap Centerville – Marmaton 161kV (580005)

The Interconnection Queue Position GEN-2010-041, GEN-2010-047 and GEN-2010-050 are wind farms and the Interconnection Queue Position GEN-2010-036 is a hydro plant.

The study included seven prior queued projects as well and they are listed in Table 2.

Table 2: Prior Queued Projects

Request	Size	Wind Turbine Model	Point of Interconnection
GEN-2006-014	300	G.E. 1.5MW	WFarms 161kV (89572)
GEN-2006-017	300	Clipper 2.5MW	WFarms 161kV (89572)
GEN-2007-015	135	GE 1.5MW	Humboldt-Kelley 161kV. Bus # 540007
GEN-2007-017	100	G.E. 1.5 MW	WFarms 161kV (89572)
GEN-2007-053	110	Gamesa 2.0MW	WFarms 161kV (89572)
GEN-2008-119O	60	G.E. 1.5MW	Humboldt-Kelley 161kV. Bus # 640500
GEN-2008-129	641/675 MW	Combined Cycle	Pleasant Hill 161kV

Transient Stability studies were conducted with the full outputs (100%) for the Group 13 and the prior queued projects.

2. Stability Study Criteria

The 2011 summer load flow and 2011 winter load flow cases together with the SPP SDDWG 2006 stability model were used as the base case for the transient stability analysis. These models were provided by SPP.

Using Planning Standards approved by NERC, the following stability definition was applied in the Transient Stability Analysis:

"Power system stability is defined as that condition in which the difference of the angular positions of synchronous machine rotor becomes constant following an aperiodic system disturbance."

Disturbances such as three phase and single phase line faults were simulated for a specified duration and the synchronous machine rotor angles were monitored for their synchronism following the fault removal.

The ability of the wind generators to stay connected to the grid during the disturbances and during the fault recovery was also monitored.

3. Simulation Cases

Transient Stability studies were conducted for (i) 2011 summer and (ii) 2011 winter load flow cases.

Table 3 indicates the contingencies that were studied for each of the two cases.

Table 3: Study Cases

Cont. No.	Contingency Name	Description
3	FLT03-3PH	3 phase fault on the Fairport (300039) to St Joseph (541199) 345kV line, near Fairport. a. Apply fault at the Fairport 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
4	FLT04-1PH	*Single phase fault and sequence like previous*
5	FLT05-3PH	3 phase fault on the Iatan (542982) to St Joseph (541199) 345kV line, near St Joseph. a. Apply fault at the St. Joseph 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
6	FLT06-1PH	*Single phase fault and sequence like previous*
7	FLT07-3PH	3 phase fault on the Nashua (542980) to St Joseph (541199) 345kV line, near St Joseph. a. Apply fault at the St. Joseph 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
8	FLT08-1PH	*Single phase fault and sequence like previous*
9	FLT09-3PH	3 phase fault on the Fairport 345/161kV autotransformer on the 345kV bus (300039). a. Apply fault at the Fairport 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.

Cont. No.	Contingency Name	Description
11	FLT11-3PH	3 phase fault on the St. Joseph 345/161kV autotransformer on the 345kV bus (541199). a. Apply fault at the St Joseph 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
13	FLT13-3PH	3 phase fault on the Boonville (635630) to Cooper (640139) 345kV line, near Cooper. a. Apply fault at the Cooper 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
14	FLT14-1PH	*Single phase fault and sequence like previous*
15	FLT15-3PH	3 phase fault on the Moore (640277) to Cooper (640139) 345kV line, near Moore. a. Apply fault at the Moore 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
16	FLT16-1PH	*Single phase fault and sequence like previous*
17	FLT17-3PH	3 phase fault on the Nebraska City (645458) to Cooper (640139) 345kV line, near Cooper. a. Apply fault at the Cooper 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
18	FLT18-1PH	*Single phase fault and sequence like previous*
19	FLT19-3PH	3 phase fault on the Pleasant Hill (541200) to Sibley (541201) 345kV line, near Pleasant Hill. a. Apply fault at the Pleasant Hill 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
20	FLT20-1PH	*Single phase fault and sequence like previous*
21	FLT21-3PH	3 phase fault on the Pleasant Hill (541200) to Peculiar (541198) 345kV line, near Pleasant Hill. a. Apply fault at the Pleasant Hill 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
22	FLT22-1PH	*Single phase fault and sequence like previous*
23	FLT23-3PH	3 phase fault on the Sibley (541201) to Hawthorn (542972) 345kV line, near Sibley. a. Apply fault at the Sibley 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
24	FLT24-1PH	*Single phase fault and sequence like previous*
25	FLT25-3PH	3 phase fault on the Hawthorn (542972) to Nashua (542980) 345kV line, near Hawthorn. a. Apply fault at the Hawthorn 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
26	FLT26-1PH	*Single phase fault and sequence like previous*
27	FLT27-3PH	3 phase fault on the Iatan (542982) to Nashua (542980) 345kV line, near Iatan. a. Apply fault at the Iatan 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
28	FLT28-1PH	*Single phase fault and sequence like previous*

Cont. No.	Contingency Name	Description
29	FLT29-3PH	3 phase fault on the Iatan (542982) to Stranger Creek (532772) 345kV line, near Iatan. a. Apply fault at the Iatan 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
30	FLT30-1PH	*Single phase fault and sequence like previous*
31	FLT31-3PH	3 phase fault on the Stranger Creek (532772) to Hoyt (532765) 345kV line, near Stranger Creek. a. Apply fault at the Stranger Creek 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
32	FLT32-1PH	*Single phase fault and sequence like previous*
33	FLT33-3PH	3 phase fault on the Craig (542977) to Stranger Creek (532772) 345kV line, near Craig. a. Apply fault at the Craig 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
34	FLT34-1PH	*Single phase fault and sequence like previous*
35	FLT35-3PH	3 phase fault on the West Gardner (542965) to Craig (542977) 345kV line, near West Gardner. a. Apply fault at the West Gardner 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
36	FLT36-1PH	*Single phase fault and sequence like previous*
37	FLT37-3PH	3 phase fault on the West Gardner (542965) to Swissvale (532774) 345kV line, near West Gardner. a. Apply fault at the West Gardner 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
38	FLT38-1PH	*Single phase fault and sequence like previous*
39	FLT39-3PH	3 phase fault on the Stilwell (542968) to West Gardner (542965) 345kV line, near Stilwell. a. Apply fault at the Stilwell 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
40	FLT40-1PH	*Single phase fault and sequence like previous*
41	FLT41-3PH	3 phase fault on the Stilwell (542968) to Lacygne (542981) 345kV line, near Stilwell. a. Apply fault at the Stilwell 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
42	FLT42-1PH	*Single phase fault and sequence like previous*
43	FLT43-3PH	3 phase fault on the Lacygne (542981) to West Gardner (542965) 345kV line, near Lacygne. a. Apply fault at the Lacygne 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
44	FLT44-1PH	*Single phase fault and sequence like previous*

Cont. No.	Contingency Name	Description
45	FLT45-3PH	3 phase fault on the 6th Street (533264) to FMC (533241) 115kV line, near 6th Street. a. Apply fault at the 6th Street 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
46	FLT46-1PH	*Single phase fault and sequence like previous*
47	FLT47-3PH	3 phase fault on the 6th Street (533264) to LWRNHL (533250) 115kV line, near 6th Street. a. Apply fault at the 6th Street 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
48	FLT48-1PH	*Single phase fault and sequence like previous*
49	FLT49-3PH	3 phase fault on the S1399 (646399) to GEN-2007-015 (579244) 161kV line, near S1399. a. Apply fault at the S1399 161kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
50	FLT50-1PH	*Single phase fault and sequence like previous*
51	FLT51-3PH	3 phase fault on the S1399 (646399) to Humbolt (640234) 161kV line, near S1399. a. Apply fault at the S1399 161kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
52	FLT52-1PH	*Single phase fault and sequence like previous*
53	FLT53-3PH	3 phase fault on the GEN-2010-047 to Beatrice (640076) 115kV line, near GEN-2010-047. a. Apply fault at the GEN-2010-047 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
54	FLT54-1PH	*Single phase fault and sequence like previous*
55	FLT55-3PH	3 phase fault on the GEN-2010-047 to Harbine (640208) 115kV line, near GEN-2010-047. a. Apply fault at the GEN-2010-047 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
56	FLT56-1PH	*Single phase fault and sequence like previous*
57	FLT57-3PH	3 phase fault on the GEN-2010-050 to Marmatone (532934) 161kV line, near GEN-2010-050. a. Apply fault at the GEN-2010-050 161kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
58	FLT58-1PH	*Single phase fault and sequence like previous*

Cont. No.	Contingency Name	Description
59	FLT59-3PH	3 phase fault on the GEN-2010-050 to Center Ville (543065) 161kV line, near GEN-2010-050. a. Apply fault at the GEN-2010-050 161kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
60	FLT60-1PH	*Single phase fault and sequence like previous*
61	FLT61_3PH	3 phase fault on the Marmatone (532934) to Neosho (532937) 161kV line, near Neosho. a. Apply fault at the Neosho 161kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
62	FLT62-1PH	*Single phase fault and sequence like previous*

4. System Modeling

The power flow and the dynamic data provided by SPP had already contained the Group 13 and prior queued projects models.

The PSS/E power flow one line drawings of the Group 13 projects are shown in Figures 1 to 4.

5. Power Factor Analysis

A power factor analysis was performed for GEN-2010-041, GEN-2010-047 and GEN-2010-050 projects. The analysis essentially calculated the power factor that needs to be maintained at the point of interconnection in order meet the required voltage schedule. The required power factors were calculated for the Base Case and the contingencies. Table 4 and 5 indicate the calculated reactive powers of the VAR generator at the point of interconnection in Summer and Winter cases

Table 4: Calculated Reactive Power at the POI (Summer Case)

	VAR Generator Reactive Power Output (MVAR)		
	Gen-2010-041	Gen-2010-047	Gen-2010-050
	VAR Gen P = 70.5 MW (includes prior queued project as well)	VAR Gen P = 72	VAR Gen P = 150.4
	Vsched = 1.0329 pu	Vsched = 1.038 pu	Vsched = 1.0115 pu
Basecase	30.8 Lead	19.1 Lead	21.7 Lead
FLT03-3PH	28.8 Lead	19 Lead	21.4 Lead
FLT05-3PH	32.4 Lead	19.1 Lead	21.2 Lead
FLT07-3PH	31.1 Lead	18.9 Lead	20.7 Lead

	VAR Generator Reactive Power Output (MVAR)		
	Gen-2010-041	Gen-2010-047	Gen-2010-050
FLT09-3PH	40 Lead	19.3 Lead	21.7 Lead
FLT11-3PH	30.4 Lead	19 Lead	21.7 Lead
FLT13-3PH	30.8 Lead	19 Lead	21.7 Lead
FLT15-3PH	32 Lead	18.7 Lead	21.7 Lead
FLT17-3PH	28.5 Lead	18.8 Lead	21.7 Lead
FLT19-3PH	31 Lead	19 Lead	21 Lead
FLT21-3PH	31 Lead	19 Lead	19.5 Lead
FLT23-3PH	29.7 Lead	19 Lead	22 Lead
FLT25-3PH	30.5 Lead	18.9 Lead	19.5 Lead
FLT27-3PH	29.9 Lead	19.1 Lead	20 Lead
FLT29-3PH	24.3 Lead	18.4 Lead	20.5 Lead
FLT31-3PH	35 Lead	19.5 Lead	19.6 Lead
FLT33-3PH	30.5 Lead	19.1 Lead	16.2 Lead
FLT35-3PH	30.7 Lead	19 Lead	21.6 Lead
FLT37-3PH	34.1 Lead	19.4 Lead	19.6 Lead
FLT39-3PH	30.8 Lead	19 Lead	21.3 Lead
FLT41-3PH	29.6 Lead	18.9 Lead	13.1 Lead
FLT43-3PH	28.7 Lead	18.8 Lead	17.2 Lead
FLT45-3PH	30.7 Lead	19 Lead	21.6 Lead
FLT47-3PH	30.6 Lead	19 Lead	21.6 Lead
FLT49-3PH	30.5 Lead	19.1 Lead	21.7 Lead
FLT51-3PH	50.9 Lead	21.6 Lead	21.5 Lead
FLT53-3PH	30.7 Lead	16.6 Lead	21.7 Lead
FLT55-3PH	25.7 Lead	23.9 Lead	21.7 Lead
FLT57-3PH	30.8 Lead	19.1 Lead	17.7 Lead
FLT59-3PH	30.8 Lead	19 Lead	11.3 Lead
FLT61-3PH	30.7 Lead	19 Lead	12.5 Lead

Table 5: Calculated Reactive Power at the POI (Winter Case)

	VAR Generator Reactive Power Output (MVAR)		
	Gen-2010-041	Gen-2010-047	Gen-2010-050
	VAR Gen P = 70.5 MW (includes prior queued project as well)	VAR Gen P = 72	VAR Gen P = 150.4
	Vsched = 1.0343 pu	Vsched = 1.0385 pu	Vsched = 1.012 pu
Basecase	34.5 Lead	19 Lead	22.2 Lead
FLT03-3PH	34.4 Lead	19 Lead	21.6 Lead
FLT05-3PH	36.6 Lead	19.1 Lead	21.2 Lead
FLT07-3PH	36.5 Lead	19.1 Lead	21.1 Lead
FLT09-3PH	19.2 Lead	18.4 Lead	21.8 Lead
FLT11-3PH	33.4 Lead	19 Lead	21.9 Lead
FLT13-3PH	34.4 Lead	19 Lead	21.9 Lead
FLT15-3PH	36.4 Lead	18.6 Lead	22 Lead
FLT17-3PH	31.8 Lead	18.9 Lead	21.8 Lead

	VAR Generator Reactive Power Output (MVAR)		
	Gen-2010-041	Gen-2010-047	Gen-2010-050
FLT19-3PH	34 Lead	19 Lead	21.1 Lead
FLT21-3PH	34.4 Lead	19 Lead	20.3 Lead
FLT23-3PH	33 Lead	19 Lead	21.8 Lead
FLT25-3PH	34.5 Lead	19 Lead	20.4 Lead
FLT27-3PH	31.2 Lead	18.8 Lead	20.6 Lead
FLT29-3PH	34 Lead	18.9 Lead	21.2 Lead
FLT31-3PH	30.5 Lead	18.5 Lead	19.8 Lead
FLT33-3PH	33 Lead	19 Lead	19.5 Lead
FLT35-3PH	33.4 Lead	18.9 Lead	21.3 Lead
FLT37-3PH	33.3 Lead	19 Lead	20.5 Lead
FLT39-3PH	34 Lead	19 Lead	21.3 Lead
FLT41-3PH	31.8 Lead	18.7 Lead	14.7 Lead
FLT43-3PH	32.7 Lead	18.8 Lead	18.3 Lead
FLT45-3PH	34.4 Lead	19 Lead	21.9 Lead
FLT47-3PH	34.3 Lead	19 Lead	21.8 Lead
FLT49-3PH	24.3 Lead	20.5 Lead	21.8 Lead
FLT51-3PH	45.7 Lead	20.5 Lead	21.5 Lead
FLT53-3PH	34.3 Lead	14.7 Lead	21.9 Lead
FLT55-3PH	32.4 Lead	22.9 Lead	21.9 Lead
FLT57-3PH	34.3 Lead	19.1 Lead	18.7 Lead
FLT59-3PH	34.5 Lead	19 Lead	8.8 Lead
FLT61-3PH	34.4 Lead	19 Lead	12.3 Lead

Based on the above analysis, the following are summarized:

Gen-2010-041

The lowest power factor to be maintained at POI : 0.8108 lead

Gen-2010-047

The lowest power factor to be maintained at POI : 0.9491 lead

Gen-2010-050

The lowest power factor to be maintained at POI : 0.9893 lead

6. Simulation Results

Initial simulation was carried out without any disturbance to verify the numerical stability of the model and was confirmed to be stable. Table 4 provides the summary of the study results for the contingencies that were studied.

Table 4: Stability Study Results Summary

Fault Case	Summer Case	Winter Case
FLT03-3PH	- -	- -
FLT04-1PH	- -	- -
FLT05-3PH	- -	- -
FLT06-1PH	- -	- -
FLT07-3PH	- -	- -
FLT08-1PH	- -	- -
FLT09-3PH	- -	- -
FLT11-3PH	- -	- -
FLT13-3PH	- -	- -
FLT14-1PH	- -	- -
FLT15-3PH	- -	- -
FLT16-1PH	- -	- -
FLT17-3PH	- -	- -
FLT18-1PH	- -	- -
FLT19-3PH	- -	- -
FLT20-1PH	- -	- -
FLT21-3PH	- -	- -
FLT22-1PH	- -	- -
FLT23-3PH	- -	- -
FLT24-1PH	- -	- -
FLT25-3PH	- -	- -
FLT26-1PH	- -	- -
FLT27-3PH	- -	- -
FLT28-1PH	- -	- -
FLT29-3PH	- -	- -
FLT30-1PH	- -	- -
FLT31-3PH	- -	- -
FLT32-1PH	- -	- -
FLT33-3PH	- -	- -
FLT34-1PH	- -	- -
FLT35-3PH	- -	- -
FLT36-1PH	- -	- -
FLT37-3PH	- -	- -
FLT38-1PH	- -	- -
FLT39-3PH	- -	- -
FLT40-1PH	- -	- -
FLT41-3PH	- -	- -

Fault Case	Summer Case	Winter Case
FLT42-1PH	- -	- -
FLT43-3PH	- -	- -
FLT44-1PH	- -	- -
FLT45-3PH	- -	- -
FLT46-1PH	- -	- -
FLT47-3PH	- -	- -
FLT48-1PH	- -	- -
FLT49-3PH	- -	- -
FLT50-1PH	- -	- -
FLT51-3PH	- -	- -
FLT52-1PH	- -	- -
FLT53-3PH	- -	- -
FLT54-1PH	- -	- -
FLT55-3PH	- -	- -
FLT56-1PH	- -	- -
FLT57-3PH	- -	- -
FLT58-1PH	- -	- -
FLT59-3PH	- -	- -
FLT60-1PH	- -	- -
FLT61_3PH	- -	- -
FLT62-1PH	- -	- -

T : Tripped due to angle deviation
UV : Tripped due to under voltage
PT : Post-Transient voltage issues encountered
S : Stability issues encountered
PQ : Prior queued project tripped
- - : No generator trip

All the Group 13 projects were found to be stable and stay connected to the grid for all the faults that were studied. Also there was no system instability found. Figure 5 shows the system response for FLT03-3PH using the summer case.

7. Summary

A transient stability analysis was conducted for Southwest Power Pool (SPP) Definitive Impact Study Interconnection Customers Group 13 (DISIS-2010-002 Group 13). The study was conducted for two different power flow scenarios, i.e., one for summer peak and one for winter peak.

The study has not indicated any stability issues and the Group 13 projects were found to stay connected to the grid during the contingencies studied.

Disclaimer

If any previously queued projects that were included in this study drop out, then this System Impact Study may have to be revised to determine the impacts of this Interconnection Customer's project on transmission facilities. Since this is also a preliminary System Impact Study, not all previously queued projects were assumed to be in service in this System Impact Study. If any of those projects are constructed, then this System Impact Study may have to be revised to determine the impacts of this Interconnection Customer's project on transmission facilities. In accordance with FERC and SPP procedures, the study cost for restudy shall be borne by the Interconnection Customer.

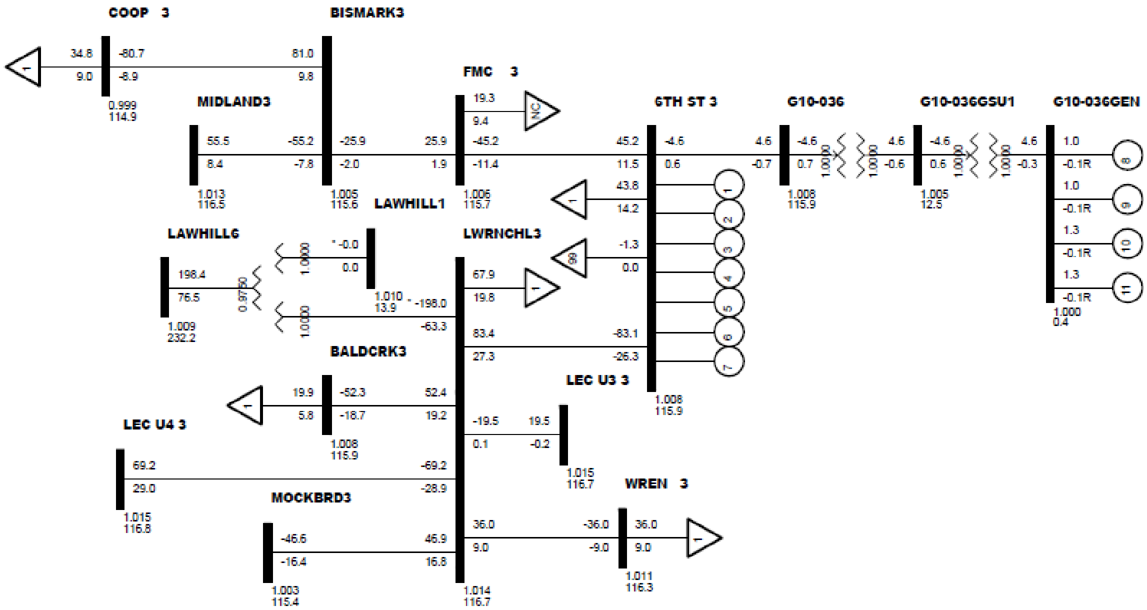


Fig 1: Gen-2010-036

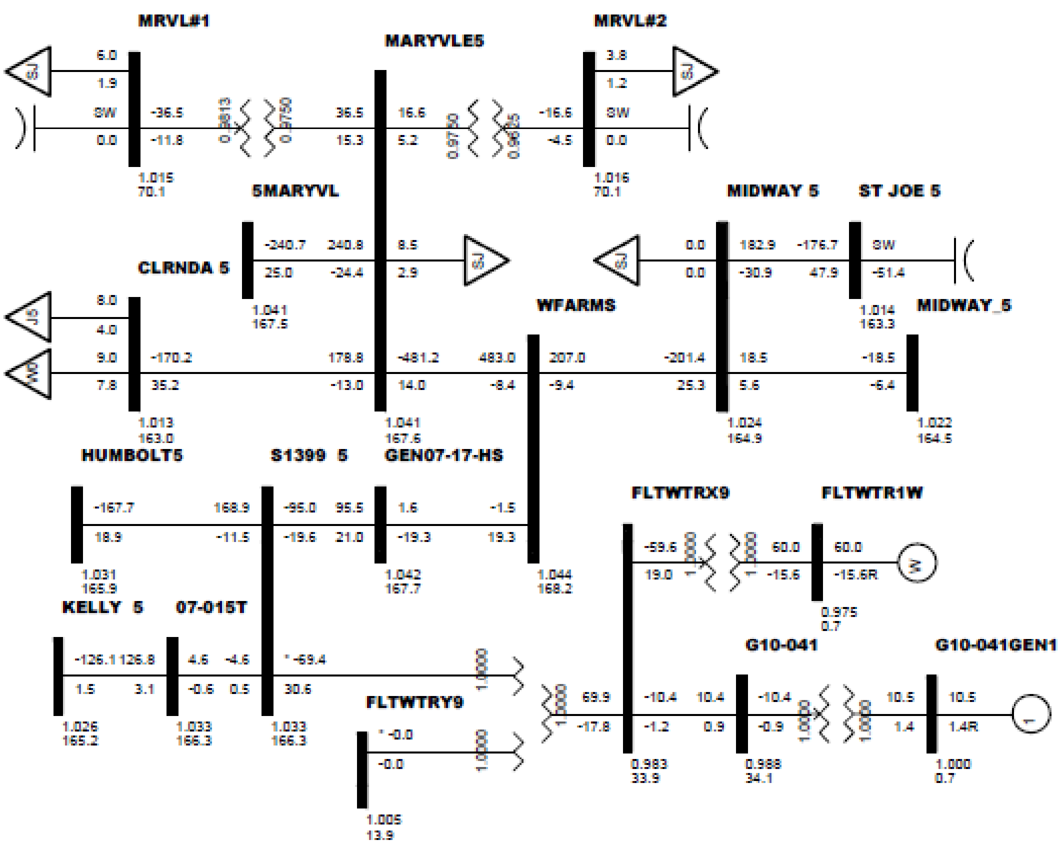


Fig 2: Gen-2010-041

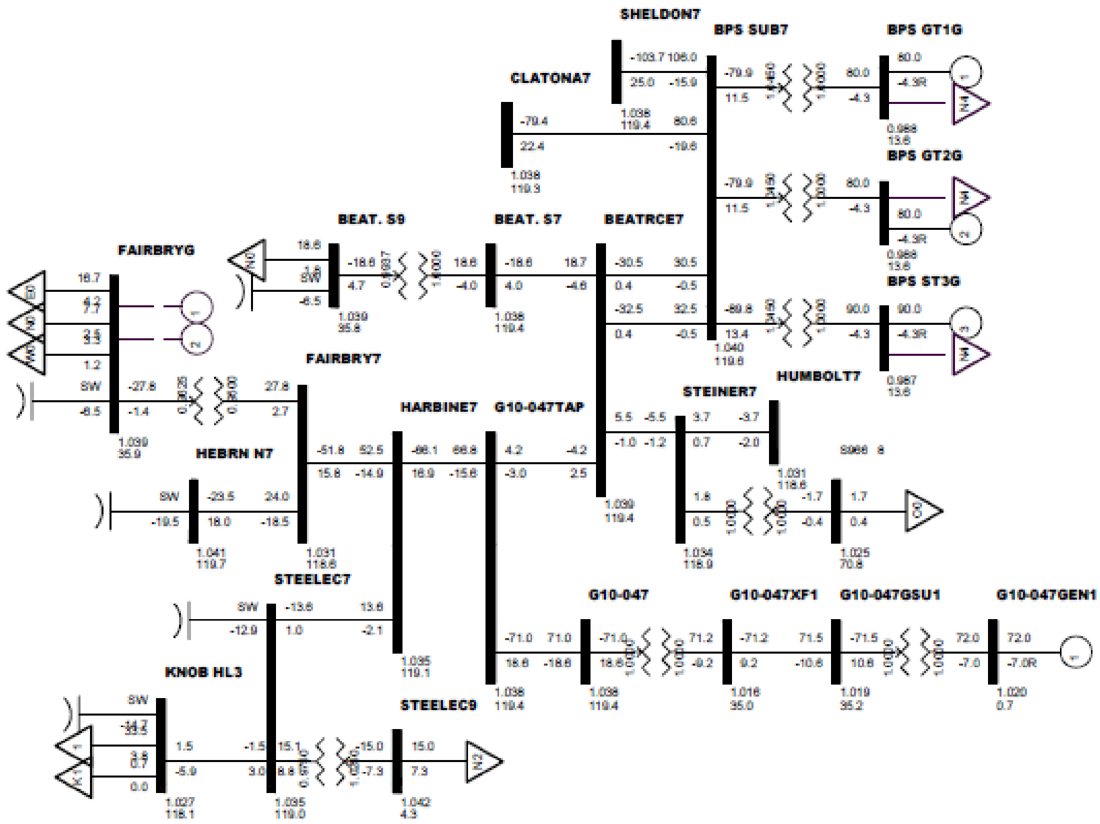


Fig 3: Gen-2010-047

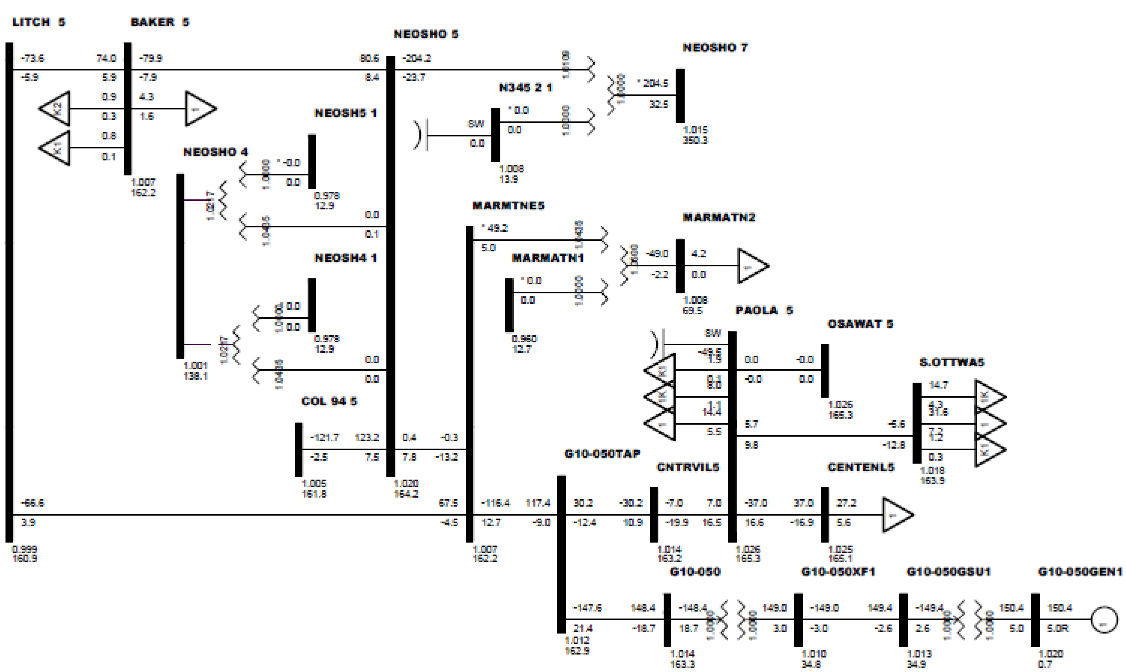


Fig 4: Gen-2010-050

Figure 5: System Responses for FLT03-3PH

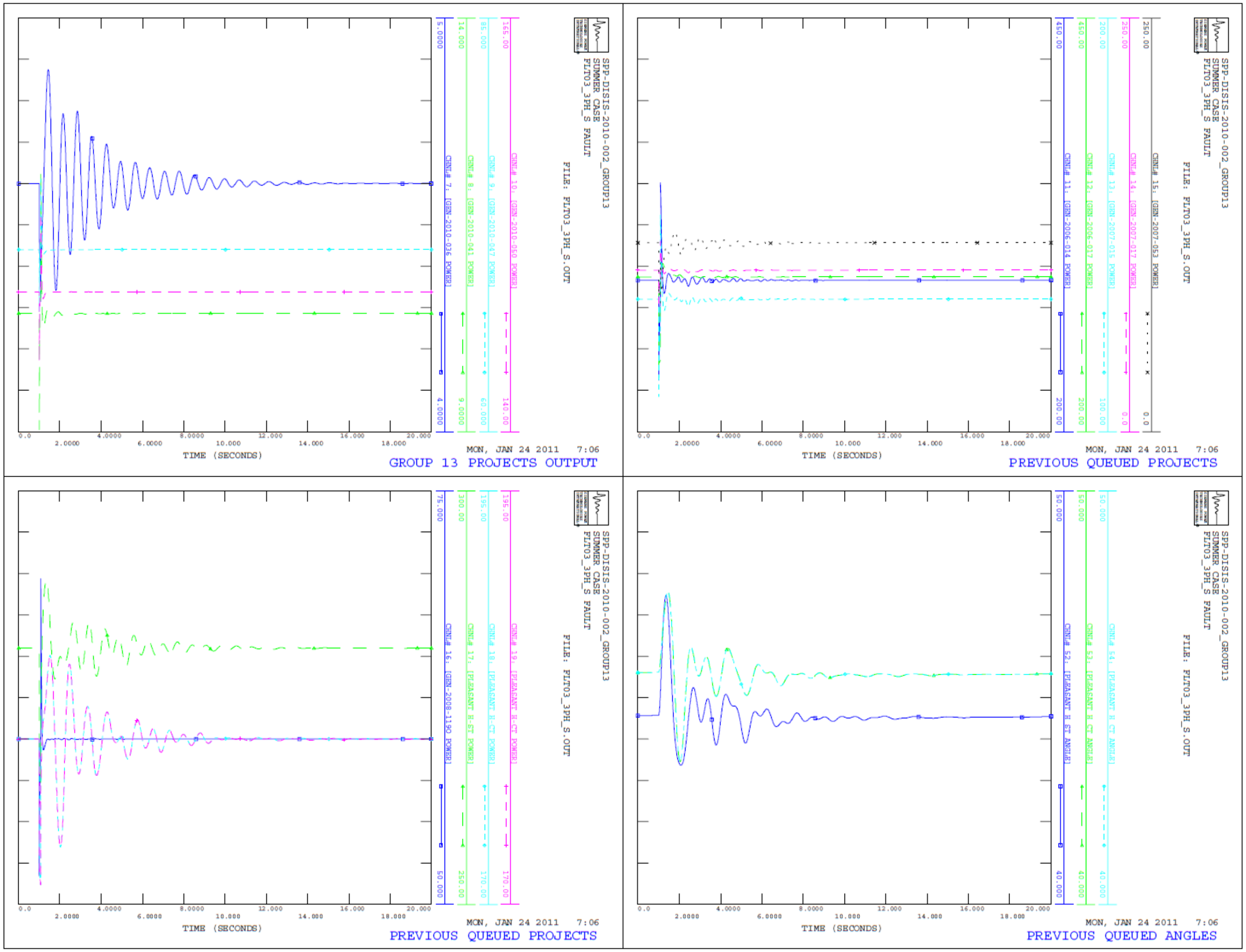


Figure 5: System Responses for FLT03-3PH (cont'd)

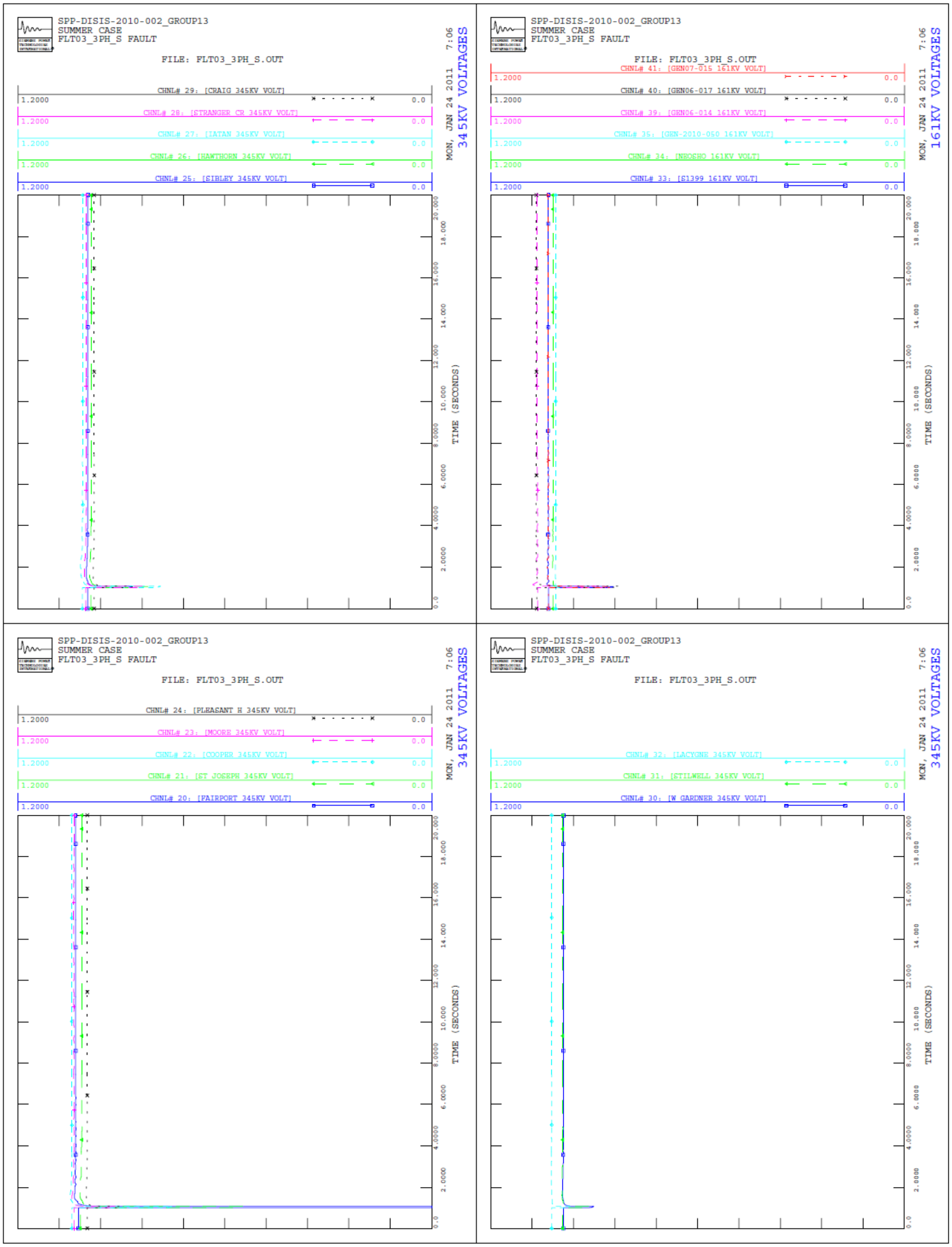


Figure 5: System Responses for FLT03-3PH (cont'd)

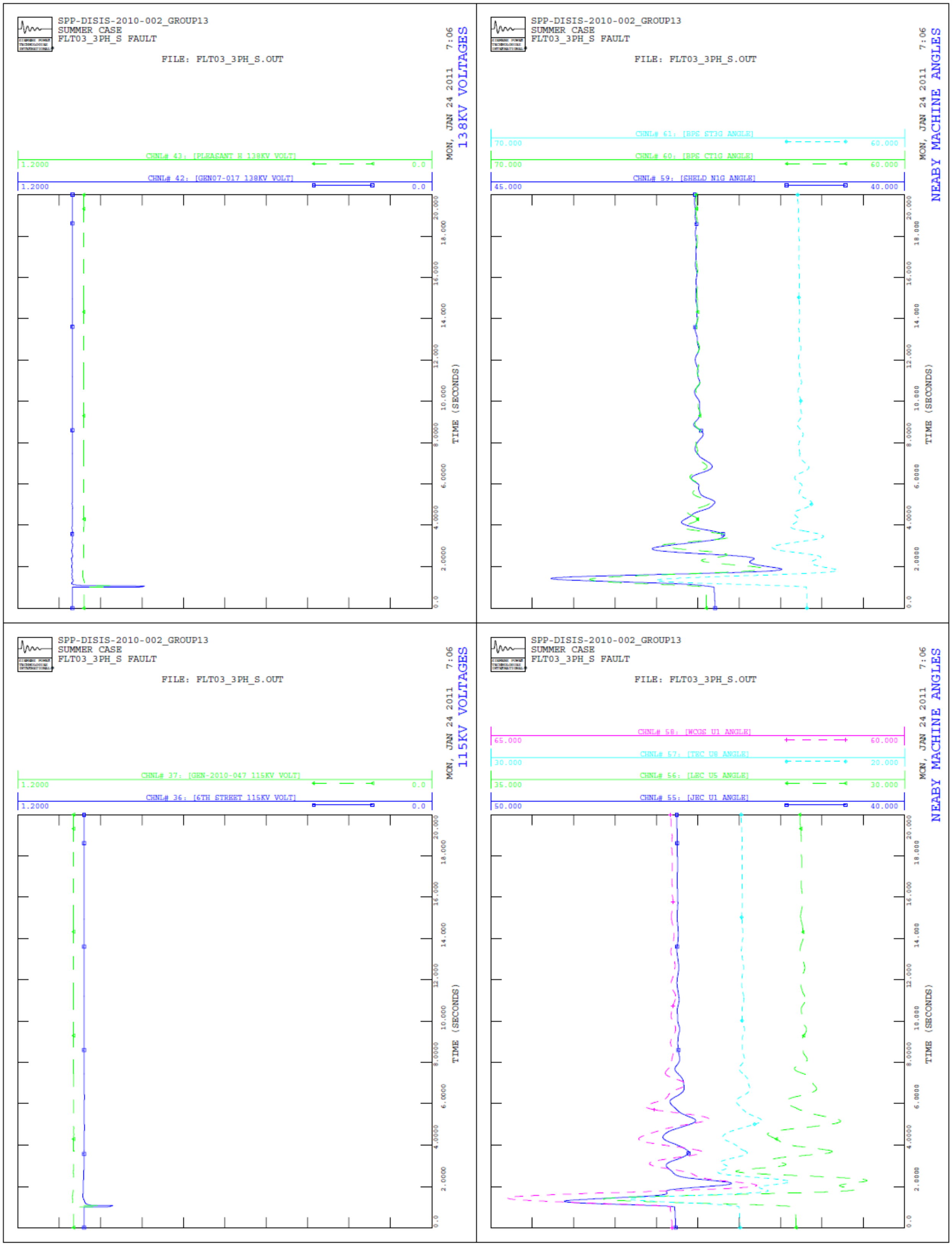
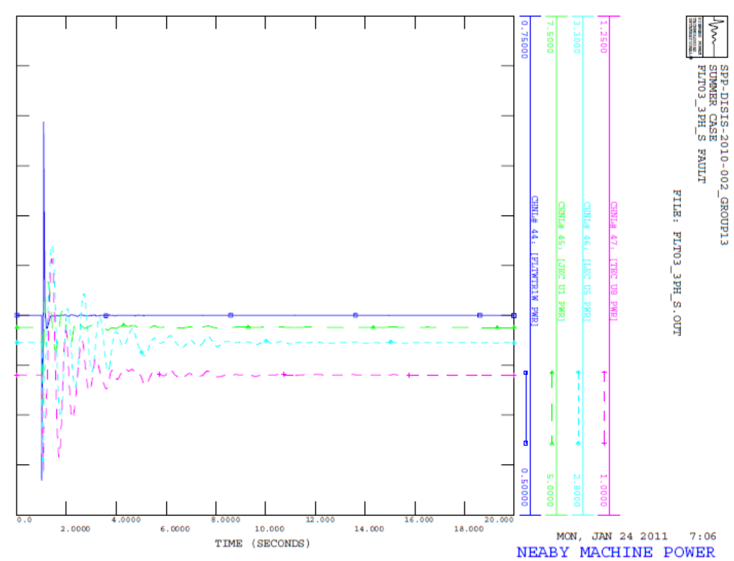
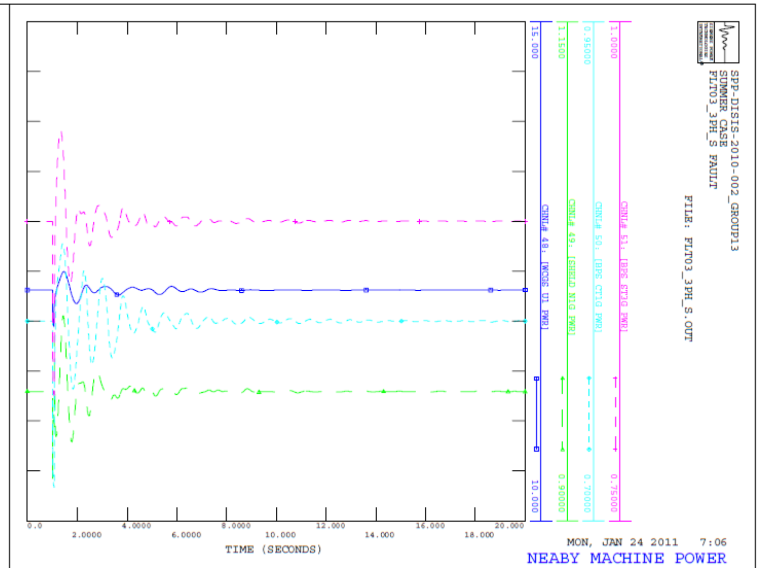


Figure 5: System Responses for FLT03-3PH (cont'd)





Q: Stability Study for Group 14

Pterra Consulting

Technical Report R101-11

Definitive Impact Study DISIS 2010-002 Group 14 Final Report

Submitted to

Southwest Power Pool

January 2011

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Executive Summary

This report presents the results of the definitive impact study DISIS 2010-002 (Group 14) comprising of power factor and stability analyses. Group 14 includes one generation interconnection request: GEN-2010-040 (the "Project"). The Project has a nominal 300.3 MW maximum rating studied using Suzlon 2.1 MW wind turbine generators ("WTGs"). The Point of Interconnection ("POI") is the Cimarron 345 kV substation.

The analysis was conducted through the Southwest Power Pool ("SPP") Tariff. Power factor analysis and transient stability simulations were conducted with the Project in service at full output of 300.3 MW.

Two base cases, 2011 summer and winter conditions, each comprising of a power flow and corresponding dynamics database, were provided by SPP. The project plant and previous queued project have already been modeled in the base cases.

Power Factor Test

The results of the Power Factor analysis showed that with the MVAR capability of the Suzlon WTG and without reactive compensation, the wind farm will not be able to keep the voltage schedule at the POI consistent with the voltage schedule in the provided power flow cases for summer and winter. Additional VAR compensating devices need to be installed in order to control the power factor at the POI to be within ±0.95 range.

Stability Simulations

Thirty-five (35) faults were considered for transient stability simulations which included 3-phase faults as well as 1-phase-to-ground faults at the locations defined by SPP. The results of the simulations showed neither angular nor voltage instability problems for the thirty-five faults. The study finds that the interconnection of the proposed 300.3 MW Project does not impact stability performance of the SPP system for the faults tested on the supplied base cases.

1.1. Project Overview

This report presents the results of impact study comprising of power factor and stability analyses for the proposed interconnection GEN-2010-040 (the "Project"). The Project has a nominal 300.3 MW maximum rating studied using Suzlon 2.1 MW wind turbine generators ("WTGs"). The Point of Interconnection ("POI") is the Cimarron 345 kV substation. Figure 1-1 shows the interconnection diagram of the Project to SPP's 345 kV system as modeled in the power flow cases.

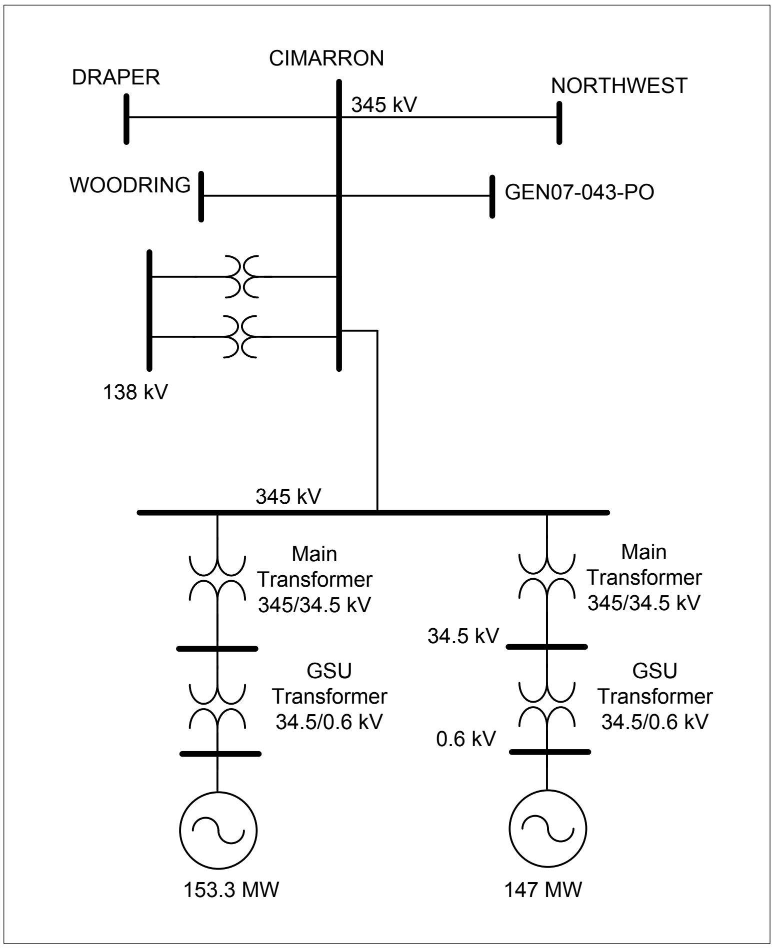

Figure 1-1 Power Flow Model for Gen-2010-040

Table 1- shows the list of previous queued projects modeled in the base cases.

Table 1-1 List of Prior Queued Projects

Request	Size (MW)	Wind Turbine Model	Point of Interconnection
Blue Canyon I	74	CIMTR	Washita 138kV (521089)
Blue Canyon II (GEN-2003-004)	151	Vestas V80	Washita 138kV (521089)
Weatherford	147	G.E. 1.5MW	Weatherford 138kV (511506)
GEN-2003-005	100	G.E. 1.5MW	Anadarko – Paradise 138kV (560916)
GEN-2006-002	150	Gamesa	Beckham County 230kV (560012)
GEN-2006-035	224	Gamesa	Beckham County 230kV (560012)
GEN-2006-043	99	G.E. 1.5MW	Beckham County 230kV (560012)
GEN-2007-032	150	Acciona 1.5MW	Clinton Jct. – Clinton 138kV (560939)
GEN-2007-043	300	G.E. 1.5MW	Cimarron – Anadarko 345kV (210431)
GEN-2007-052	150	Gas Turbine	Anadarko 138kV (520814)
GEN-2008-023	150	G.E. 1.5MW	Hobart Junction (511463) 138kV
GEN-2009-016	170	Siemens 2.3MW	Falcon Road 138KV (511511)
GEN-2008-037	100.8	Vestas V90 1.8MW	Washita (521089) – Blue Canyon (521103) 138kV (Bus 573570)
GEN-2009-030	100.8	GE 1.6MW	Weatherford 138kV (521092)
GEN-2009-060	85.5	GE 1.5MW	Gotebo 69kV (520925)

1.2. Objectives

The objectives of the study are to conduct power factor analysis and to determine the impact on the system stability of interconnecting a proposed 300.3 MW wind farm to SPP’s 345 kV transmission system.

Section 2. Power Factor Analysis

2.1. Methodology

Power factor analysis was conducted for the Project using a methodology which is summarized as follows:

1. Turn off the Project wind farm as modeled (as well as previous queued projects at the same point of interconnection). Replace the wind farms by a generator at the high side bus with the MW of the wind farms and no VAR capability.

2. Model a VAR generator at the wind farm's substation high voltage bus. The VAR generator is set to hold a voltage schedule at the POI consistent with the voltage schedule in the provided power flow cases for summer and winter or 1.0 p.u. voltage, whichever is higher.

3. Conduct steady state contingency analysis to determine the power factor necessary at the POI for each contingency.

4. According to the contingency analysis results, determine whether capacitors are required for the Project or not.

5. If the required power factor at the POI is beyond the capability of the studied wind turbines, capacitor banks are considered. The preference is to locate the capacitance banks on the 34.5 kV customer side. Factors to sizing capacitor banks include:

    5.1. The ability of the wind farm to meet FERC Order 661A (low voltage ride through) with and without capacitor banks.
    5.2. The ability of the wind farm to meet FERC Order 661A (wind farm recovery to pre-fault voltage).
    5.3. If wind farms trips on high voltage, power factor lower than unity may be required.

2.2. Analysis

The Project wind farm was turned off in the provided power flow cases; no previous queued projects were connected to the same POI. In the provided power flow models for 2011 summer and winter, a VAR generator was modeled at the wind farm's 345 kV bus to hold a voltage schedule of 1.0 p.u. at the POI since both cases originally have 0.988 p.u. voltage at the POI.

Contingency analysis was run for all the specified contingencies. Results showed that the VAR generator either supplies or absorbs reactive power at different contingencies as summarized in Table 2-2. The highest values obtained are as follows:

1. For the outage of Sunnyside-Lawton Eastside 345 kV line, the var generator supplies 50.4 MVAR in the summer case and 87.8 MVAR in the winter case.
2. For the outage of Cimarron-Northwest 345 kV line, the var generator absorbs 62.7 MVAR in the summer case and 79.2 MVAR in the winter case.

Table 2-1 VAR Generator Output in Summer and Winter Peak Cases

CASE	CONTINGENCY	PF @ POI	PF	PROJECT MW	MVAR @ POI
SP	BASE CASE	0.99	Lag	300.3	50.0
	Foster (514959) - Discovery (514962) 138kV line	0.99	Lag	300.3	50.0
	Foster (514959) - Newdomi (515387) 138kV line	0.99	Lag	300.3	48.5
	Oak Creek (514960) - Santa Fe (514926) 138kV line	0.99	Lag	300.3	50.2
	Oak Creek (514960) - Moore (514955) 138kV line	0.99	Lag	300.3	50.0
	Oak Creek (514960) - Wild Mry (514984) 138kV line	0.99	Lag	300.3	48.8
	Trosper (514963) - Lighting Creek (514923) 138kV line	0.99	Lag	300.3	46.9
	Draper 345/138/13.8 kV (514934) transformer	0.99	Lag	300.3	50.0
	Sunnyside 345/138/13.8 kV (515136) transformer	0.99	Lag	300.3	40.6
	Sunnyside (515136) - Pittsburgh (510907) 345kV line	0.99	Lag	300.3	50.0
	Sunnyside (515136) - Lawton Eastside (511468) 345kV line	0.99	Lead	300.3	50.4
	Gracemont (515800) - Lawton Eastside (511468) 345kV line	1.00	Lag	300.3	29.0
	Oklaunion (511456) - Lawton Eastside (511468) 345kV line	1.00	Lag	300.3	22.7
	Pittsburg (510907) - Kiowa (510925) 345kV line	0.99	Lag	300.3	50.0
	Pittsburg (510907) - Seminole (515045) 345kV line	0.98	Lag	300.3	57.6
	Pittsburg (510907) - Muskogee (515224) 345kV line	0.99	Lag	300.3	49.3
	Cimarron (514901) - GEN-2007-043 (210431) 345kV line	1.00	Lead	300.3	3.2
	Cimarron (514901) - Northwest (514880) 345kV line	0.98	Lag	300.3	62.7
	Cimarron (514901) - Woodring (514715) 345kV line	1.00	Lead	300.3	15.3
	Cimarron (514901) - Draper (514934) 345kV line	1.00	Lag	300.3	26.1
	Cimarron 345/138/13.8 kV (514901 transformer	0.98	Lag	300.3	54.8
WP	BASE CASE	0.99	Lag	300.3	36.4
	Foster (514959) - Discovery (514962) 138kV line	0.99	Lag	300.3	36.4
	Foster (514959) - Newdomi (515387) 138kV line	0.99	Lag	300.3	34.7
	Oak Creek (514960) - Santa Fe (514926) 138kV line	0.99	Lag	300.3	36.3
	Oak Creek (514960) - Moore (514955) 138kV line	0.99	Lag	300.3	36.0
	Oak Creek (514960) - Wild Mry (514984) 138kV line	0.99	Lag	300.3	34.9
	Trosper (514963) - Lighting Creek (514923) 138kV line	0.99	Lag	300.3	35.9
	Draper 345/138/13.8 kV (514934) transformer	0.99	Lag	300.3	34.2
	Sunnyside 345/138/13.8 kV (515136) transformer	0.99	Lag	300.3	31.1
	Sunnyside (515136) - Pittsburgh (510907) 345kV line	0.99	Lag	300.3	36.4
	Sunnyside (515136) - Lawton Eastside (511468) 345kV line	0.96	Lead	300.3	87.8
	Gracemont (515800) - Lawton Eastside (511468) 345kV line	1.00	Lag	300.3	16.3
	Oklaunion (511456) - Lawton Eastside (511468) 345kV line	1.00	Lag	300.3	4.7
	Pittsburg (510907) - Kiowa (510925) 345kV line	0.99	Lag	300.3	36.4
	Pittsburg (510907) - Seminole (515045) 345kV line	0.99	Lag	300.3	43.8
	Pittsburg (510907) - Muskogee (515224) 345kV line	0.99	Lag	300.3	35.6
	Cimarron (514901) - GEN-2007-043 (210431) 345kV line	1.00	Lead	300.3	14.3
	Cimarron (514901) - Northwest (514880) 345kV line	0.97	Lag	300.3	79.2
	Cimarron (514901) - Woodring (514715) 345kV line	0.99	Lead	300.3	41.1
	Cimarron (514901) - Draper (514934) 345kV line	1.00	Lead	300.3	4.0
	Cimarron 345/138/13.8 kV (514901 transformer	0.98	Lag	300.3	54.6

2.3. Conclusions

In order to hold a voltage schedule of 1.0 p.u. at the POI, the wind farm should be able to control the power factor at the POI to be within the ± 0.95 range.

Section 3. Stability Analysis

3.1. Assumptions

The following assumptions were adopted for the dynamic simulations:

1. Constant maximum and uniform wind speed for the entire period of study.
2. Wind turbine control models with their default values.
3. Under/over voltage/frequency protection use manufacturer settings.

3.2. Faults Simulated

Thirty-five (35) faults were considered for the transient stability simulations which included three phase faults as well as single phase line faults at the locations defined by SPP. Single-phase line faults were simulated by applying a 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. Prior queued projects shown in Table 1- and units in areas 520, 524, 525, 526, 531, 534, and 536 were monitored in the simulations.

Table 3-1 shows the list of simulated contingencies. It also shows the fault clearing time and the time delay before re-closing for all the study contingencies.

Table 3-1 List of Simulated Faults

Cont. No.	Cont. Name	Description
1	FLT01-3PH	3 phase fault on the Foster (514959) to Discovery (514962) 138kV line, near Discovery. a. Apply fault at the Discovery 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
2	FLT02-1PH	Single phase fault and sequence like previous
3	FLT03-3PH	3 phase fault on the Foster (514959) to Newdomi (515387) 138kV line, near Newdomi. a. Apply fault at the Newdomi 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
4	FLT04-1PH	Single phase fault and sequence like previous
5	FLT05-3PH	3 phase fault on the Oak Creek (514960) to Santa Fe (514926) 138kV line, near Oak Creek. a. Apply fault at the Oak Creek 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
6	FLT06-1PH	Single phase fault and sequence like previous
7	FLT07-3PH	3 phase fault on the Oak Creek (514960) to Moore (5114955) 138kV line, near Moore. a. Apply fault at the Moore 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
8	FLT08-1PH	Single phase fault and sequence like previous

Cont. No.	Cont. Name	Description
9	FLT09-3PH	3 phase fault on the Oak Creek (514960) to Wild Mry (514984) 138kV line, near Wild Mry. a. Apply fault at the Wild Mry 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
10	FLT10-1PH	Single phase fault and sequence like previous
11	FLT11-3PH	3 phase fault on the Trosper (514963) to Lighting Creek (514923) 138kV line, near Trosper. a. Apply fault at the Trosper 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
12	FLT12-1PH	Single phase fault and sequence like previous
13	FLT13-3PH	3 phase fault on one circuit of the Draper (514933) 138 kV to Draper (514934) 345kV transformer, on the 138kV bus. a. Apply fault at the Draper 138kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
14	FLT14-3PH	3 phase fault on the Sunnyside 345/138kV autotransformer on the 345kV bus (515136). a. Apply fault at Sunnyside 345kV. b. Clear fault after 5 cycles by tripping the faulted line.
15	FLT23-3PH	3 phase fault on the Sunnyside (515136) to Pittsburgh (510907) 345kV line, near Sunnyside. a. Apply fault at the Sunnyside 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
16	FLT24-1PH	Single phase fault and sequence like previous
17	FLT25-3PH	3 phase fault on the Sunnyside (515136) to Lawton Eastside (511468) 345kV line, near Sunnyside. a. Apply fault at the Sunnyside 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
18	FLT26-1PH	Single phase fault and sequence like previous
19	FLT29-3PH	3 phase fault on the Gracemont (515800) to Lawton Eastside (511468) 345kV line, near Lawton Eastside. a. Apply fault at the Lawton Eastside 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
20	FLT30-1PH	Single phase fault and sequence like previous
21	FLT31-3PH	3 phase fault on the Oklaunion (511456) to Lawton Eastside (511468) 345kV line, near Lawton Eastside. a. Apply fault at the Lawton Eastside 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
22	FLT32-1PH	Single phase fault and sequence like previous
23	FLT40-3PH	3 phase fault on the Pittsburg (510907) – Seminole (515045) 345kV line, near Seminole. a. Apply fault at the Seminole 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
24	FLT41-1PH	Single phase fault and sequence like previous

Cont. No.	Cont. Name	Description
25	FLT42-3PH	3 phase fault on the Pittsburg (510907) – Muskogee (515224) 345kV line, near Muskogee. a. Apply fault at the Muskogee 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
26	FLT43-1PH	Single phase fault and sequence like previous
27	FLT44-3PH	3 phase fault on the Cimarron (514901) – GEN-2007-043 (210431) 345kV line, near Cimarron. a. Apply fault at the Cimarron 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
28	FLT45-1PH	Single phase fault and sequence like previous
29	FLT46-3PH	3 phase fault on the Cimarron (514901) – Northwest (514880) 345kV line, near Cimarron. a. Apply fault at the Cimarron 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
30	FLT47-1PH	Single phase fault and sequence like previous
31	FLT48-3PH	3 phase fault on the Cimarron (514901) – Woodring (514715) 345kV line, near Cimarron. a. Apply fault at the Cimarron 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
32	FLT49-1PH	Single phase fault and sequence like previous
33	FLT50-3PH	3 phase fault on the Cimarron (514901) – Draper (514934) 345kV line, near Cimarron. a. Apply fault at the Cimarron 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
34	FLT51-1PH	Single phase fault and sequence like previous
35	FLT52-3PH	3 phase fault on one circuit of the Cimarron (514898) 138 kV to Cimarron (514901) 345kV transformer, on the 138kV bus. a. Apply fault at the Cimarron 138kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.

Table 3-2 shows the contingencies from the list provided by SPP which are not found valid in the power flow case provided and therefore not simulated.

Table 3-2 List of Faults Not Simulated

No.	Cont. Name	Description
1	FLT38-3PH	3 phase fault on the Pittsburg (510907) – Kiowa (510925) 345kV line, near Kiowa. a. Apply fault at the Kiowa 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
2	FLT39-1PH	Single phase fault and sequence like previous

Simulations were performed with a 0.1-second steady-state run followed by the appropriate disturbance as described in Table 3-1. Simulations were run for a minimum 10-second duration to confirm proper machine damping.

3.3. Simulation Results

The stability simulations for the thirty-five specified test faults did not find any angular or voltage instability problems in the SPP system. The study finds that the interconnection of the proposed 300 MW Project does not impact the stability performance of the SPP system for the contingencies tested on the supplied base cases.

Section 4. Conclusions

The findings of the definitive impact study DISIS 2010-002 (Group 14), which includes one generation interconnection request GEN-2010-040 studied at 100% of the proposed 300.3 MW installed capacity, are as follows:

1. The results of the power factor analysis showed that with the MVAR capability of the Suzlon WTG and without reactive compensation, the wind farm will not be able to keep the voltage schedule at the POI consistent with the voltage schedule in the provided power flow cases for summer and winter. Additional VAR compensating devices need to be installed in order to control the power factor at the POI to be within ±0.95 range.
2. The stability simulations for the thirty-five (35) specified test faults did not find any angular or voltage instability problems in the SPP system. The study finds that the interconnection of the proposed 300.3 MW Project does not impact the stability performance of the SPP system for the contingencies tested on the supplied base cases.