N: Stability Study for Group 6

R23-10

Generator Interconnection Preliminary Impact study: PISIS-2009-001- Group 6

Prepared for

Southwest Power Pool, Inc.

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Section

1

Introduction

1.1 Background

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Siemens PTI performed the Impact Study R100-09 *"Generator Interconnection Preliminary Impact Study: PISIS-2009-001 - Group 6"* to satisfy the Impact Study Agreement executed by the customers. The requests for interconnection were placed with SPP in accordance to SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system.

The purpose of this report is to present the results of the stability and power factor analysis performed to evaluate the impact of the proposed cluster of interconnections of the PISIS-2009-001 with regard to Group 6 wind projects on the Southwest Power Pool system. Eventual indicative solutions to the identified issues are proposed based on the impact of each generation interconnection on the Southwest Power Pool system.

Six projects in this cluster are connected to five different points of interconnection at different voltage levels, ranging from 69 kV to 345 kV. Section 2 describes all proposed wind farms projects in detail.

Transient stability analysis was performed using the package provide by SPP. It contains the latest stability database in PSS™E version 30.3.3. The stability package also includes the dynamic data for the previously queued projects.

1.2 Purpose

The steady state and stability restudy was carried out to:

1. Determine the ability of the proposed generation facilities to remain in synchronism and within applicable planning standards following two types of system faults tested a) unsuccessful reclosing b) normally cleared faults.
2. Determine the amount of transient support required from the costumer to meet the power factor requirement at the POI.
3. 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 support.

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Section

2

Model Development

The study has considered the 2010 Summer Peak and 2009 Winter Peak load flow models with the required interconnection generation modeled. The base cases also contain all the significant previous queued generation interconnection projects in the interconnection queue.

2.1 Power Flow Data

The Group 6 of PISIS-2009-001 comprises six different projects. Table 2-1 presents the size of the wind generation projects, the Wind Turbine Generator (WTG) manufacturers, the reactive capability of each generation project point of interconnection, as well as the PSS®E bus numbers in the load flow model.

Table 2-1 – Details of the Interconnection Requests

Request	Size	Wind Turbine Model	Reactive Capability of Wind Farm		Point of Interconnection	Bus Number
			Max (Mvar)	Min (Mvar)		
GEN-2008-022	860	GE 2.5MW	412.8	120.3	Tolk – Eddy 345kV	571226
GEN-2008-050	201	Vestas V90 3.0MW	0 (*)	0 (*)	Tolk– Eddy 345kV	571226
GEN-2008-058	200.1	Siemens SMK203 2.3MW	118.7	-118.7	Roosevelt 230kV	524909
GEN-2008-064	200.1	Siemens SMK203 2.3MW	118.7	-118.7	Oasis 230kV	524875
GEN-2008-083	99	Vestas V90 1.8MW	0 (*)	0 (*)	Grassland 69kV	526676
GEN-2008-085	100.5	GE 1.5MW	33.03	-33.03	Tolk– Lamb County	572000

(*) – For voltage control within 0.95 p.u. – 1.050 p.u.

The analysis was carried out using the database package provided by SPP which also includes the modeling data for the previously queued projects, as listed in the Table 2-2 below:

Table 2-2 – Details of the Prior Queue Interconnection Requests

Request	Size	Wind Turbine Model	Point of Interconnection	Bus Number
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-2007-034	150	GE 1.5MW	Tolk – Eddy County 345kV	210340
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
GEN-2008-016	248	Vestas V90	Grassland 230kV	526677
GEN-2009-017	150	Siemens 2.3MW	Tap Pembrook (522966) – Stiles (522960) 138kV.	570917

The 34.5 connector bus for each of the group 6 projects has no capacitor connected. Some of the prior queue projects have capacitor connected to provide additional reactive power. All the Vestas wind farm both in prior queue and current projects were modeled having no reactive power capability due to the Vestas machine's design.

Figures 2-1 and 2-2 present the surrounding area of the Group 2 points of interconnection. The single line diagrams show the line flows and voltage profile for the base cases considered in the study: summer and winter peak scenarios, respectively.

Figure 2-1 - Group 6 Points of Interconnection Surrounding Area – Summer Peak

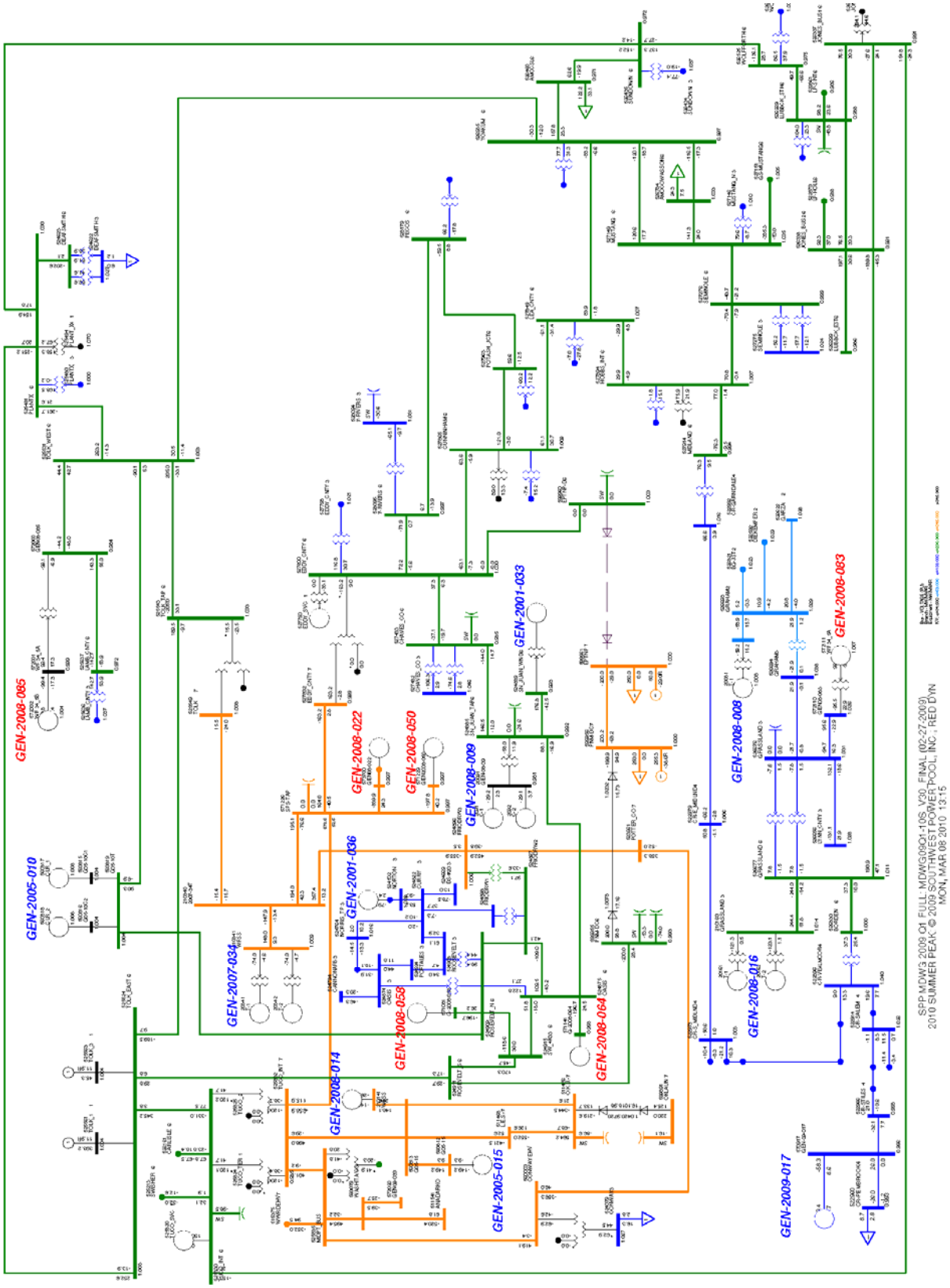
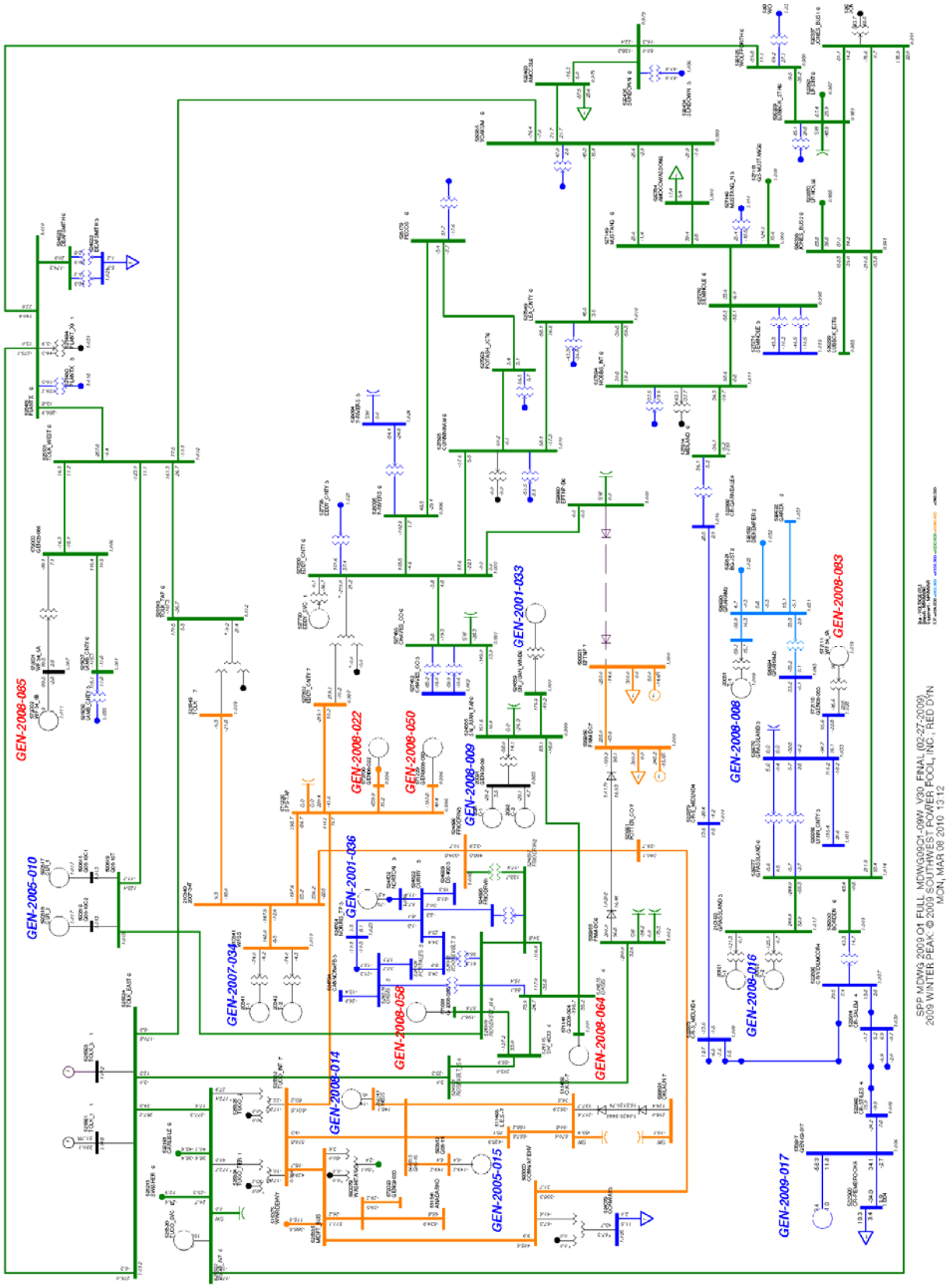


Figure 2-2 - Group 2 Points of Interconnection Surrounding Area – Winter Peak



Figures A-1 trough A-6 in Appendix A present the single line diagrams showing, for each of the Group 6 projects, the modeling details and impedance data of the transformers and collector systems.

2.2 Stability Database

The transient stability analysis was performed using the data provided by SPP. Stability models for the Group 6 interconnection requests were added to the dynamic database, based on the technical documentation given. All turbine parameters used in the simulation models are the default parameters in the wind turbine package. It is assumed that each wind turbine generators (WTGs) controls the voltage of its own bus.

The default voltage protection model set points recommended by the manufacturer were used, that is, the wind units were modeled with their built-in voltage ride through capability. Also, the default frequency protection model set points recommended by the manufacturer were used.

The PSS®E dynamic models output list is shown in Appendix B, documenting the model parameters of each one of the Group 6 wind turbines modeled in the stability analysis.

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Section

3

Methodology and Assumptions

The study considered the 2010 Summer Peak and 2009 Winter Peak power flow cases with the required interconnection generation requests modeled as described in Section 2. The base case also contains all the significant previous queued projects in the interconnection queue.

The monitored areas in this study are shown in Table 3-1.

Table 3-1 – Areas of Interest

Area Number	Area Name
520	AEPW
524	OKGE
525	WFEC
526	SPS
531	MIDW
534	SUNC
536	WERE

3.1 Methodology

3.1.1 Stability Simulations

The stability simulations were performed using the PSS®E version 30.3.3 with the latest stability database provided by SPP. Three-phase faults and single-phase faults in the neighborhood of the project's POIs were simulated. Any adverse impact on the system stability was documented and further investigated with appropriate solutions to determine whether a static or dynamic VAR device is required or not.

The group 6 projects were also evaluated on the matter of ability to meet FERC Order 661A (low voltage ride through and wind farm recovery to pre-fault voltage) with and without additional reactive support.

3.1.2 Steady State Simulations

3.1.2.1 N-1 Contingency Analysis

An N-1 contingency analysis was performed to evaluate voltage violations, if any, caused by disturbances (tripping of the faulted line). The voltages at each POI were monitored for deviations from the base case voltage and the percentage deviations were documented.

The summer peak and winter peak load flow cases were adjusted to ensure there are no relevant pre contingency voltage criteria violations. During contingency analysis it was reported in Section 4 voltages of any monitored bus found to be outside the range of the post-contingency criteria and having more than 1% of project impact.

3.1.2.2 Power Factor Analysis

The analysis will determine what power factor is necessary at the POI for each contingency.

If the required power factor at the POI is beyond the capability of the studied wind turbines to meet the requirement at the POI, capacitor banks will be considered.

A QV analysis was performed to determine the reactive support requirement at each project's POI. Mvar injections, tabulated for base case and contingency conditions, are used to determine the reactive power support required at each POI, in order to maintain the bus scheduled pre contingency voltages.

These tables are obtained through a series of AC load flow calculations. Starting with no reactive support at a bus, the voltage is computed for a series of power flows as the reactive support is changed in steps, until the power flow experiences convergence difficulties as the system approaches the voltage collapse point.

3.2 Disturbances for Stability Analysis

The faults are defined as single line to ground, and three phase faults. The fault clearing includes reclosing for selected contingencies.

For faults with unsuccessful line reclosing, the complete fault clearing process includes the following sequence of events:

1) Line fault, cleared after 5 cycles by tripping the both line terminals

2) After 20 cycles the line is reclosed under fault conditions (unsuccessful reclosing)

3) The fault is cleared by tripping both ends of the faulted line. Once again, 5 cycles later,

For faults with normal clearing, the fault is cleared by tripping the both line terminals after 5 cycles.

The disturbances evaluated are listed in the following Table 3-2:

Table 3-2: Disturbances for Stability Analysis

#	Fault Location	Fault Type	Clearing	Fault Clearing
1	At the Eddy Co. 230kV end	3PH	No reclosure	Trip Eddy Co. 230kV (527800) to 345kV (527802) transformer.
2	At the GEN-2007-034 345kV end	3PH	Unsuccessful reclosure	Trip GEN-2007-034 (210340) to Eddy County (527802) 345kV line
3	At the GEN-2007-034 345kV end	SLG	Unsuccessful reclosure	Trip GEN-2007-034 (210340) to Eddy County (527802) 345kV line
4	At the GEN-2007-034 345kV end	3PH	Unsuccessful reclosure	Trip GEN-2007-034 (210340) to Tolk (525549) 345kV line
5	At the GEN-2007-034 345kV end	SLG	Unsuccessful reclosure	Trip GEN-2007-034 (210340) to Tolk (525549) 345kV line
6	At the Tolk 230kV end	3PH	No reclosure	Trip Tolk 230kV (525543) to 345kV (525549) transformer
7	At the Tolk E 230kV end	3PH	Unsuccessful reclosure	Trip Tolk E (525524) to Tuco (525830) 230kV line
8	At the Tolk E 230kV end	SLG	Unsuccessful reclosure	Trip Tolk E (525524) to Tuco (525830) 230kV line
9	At the Grassland 115 KV end	3PH	Unsuccessful reclosure	Trip Grassland (526676) to Lynn Co. (526656) 115kV line
10	At the Grassland 115 KV end	SLG	Unsuccessful reclosure	Trip Grassland (526676) to Lynn Co. (526656) 115kV line
11	At the Grassland 230kV end	3PH	No reclosure	Trip the Grassland 230kV (526677) to 115kV (526676) transformer
12	At the Grassland 230kV end	SLG	No reclosure	Trip the Grassland 230kV (526677) to 115kV (526676) transformer
13	At the Grassland 230kV end	3PH	Unsuccessful reclosure	Trip the Grassland (526677) to Borden (526830) 230kV line
14	At the Grassland 230kV end	SLG	Unsuccessful reclosure	Trip the Grassland (526677) to Borden (526830) 230kV line
15	At the Grassland 230kV end	3PH	Unsuccessful reclosure	Trip the Grassland (526677) to Jones (526338) 230kV line
16	At the Grassland 230kV end	SLG	Unsuccessful reclosure	Trip the Grassland (526677) to Jones (526338) 230kV line
17	At the Jones 230 KV end	3PH	Unsuccessful reclosure	Trip the Jones (526338) to Lubbock E (526299) 230kV line

#	Fault Location	Fault Type	Clearing	Fault Clearing
18	At the Jones Bus1 230 KV end	3PH	Unsuccessful reclosure	Trip the Jones (526337) to Tuco (525830) 230kV line
19	At the Jones Bus1 230 KV end	SLG	Unsuccessful reclosure	Trip the Jones (526337) to Tuco (525830) 230kV line
20	At the the Tuco 230 KV end	3PH	Unsuccessful reclosure	Trip the Tuco (525830) to Swisher (525213) 230kV line
21	At the the Tuco 230 KV end	SLG	Unsuccessful reclosure	Trip the Tuco (525830) to Swisher (525213) 230kV line
22	At the the Tuco 230 KV end	3PH	No reclosure	Trip the Tuco 230kV (525830) to 345kV (525832) transformer
23	At the GEN-2005-015 345 KV end	3PH	Unsuccessful reclosure	Trip the GEN-2005-015 (560813) to Tuco (525832) 345kV line
24	At the GEN-2005-015 345 KV end	SLG	Unsuccessful reclosure	Trip the GEN-2005-015 (560813) to Tuco (525832) 345kV line
25	At the GEN-2005-015 345 KV end	3PH	Unsuccessful reclosure	Trip the GEN-2005-015 (560813) to Oklaunion (511456) 345kV line
26	At the GEN-2005-015 345 KV end	SLG	Unsuccessful reclosure	Trip the GEN-2005-015 (560813) to Oklaunion (511456) 345kV line
27	At the Oklaunion 345KV end	3PH	Unsuccessful reclosure	Trip the Oklaunion (511456) to Lawton Eastside (511468) 345kV line
28	At the Oklaunion 345KV end	SLG	Unsuccessful reclosure	Trip the Oklaunion (511456) to Lawton Eastside (511468) 345kV line
29	At the Tuco 345 KV end	3PH	Unsuccessful reclosure	Trip the Tuco (525832) to Wheeler/Midpoint (525835) 345kV line
30	At the Tuco 345 KV end	SLG	Unsuccessful reclosure	Trip the Tuco (525832) to Wheeler/Midpoint (525835) 345kV line
31	At the Roosevelt S 230 KV end	3PH	Unsuccessful reclosure	Trip the Roosevelt S (524911) to Tolk (525554) 230kV line
32	At the Roosevelt S 230 KV end	SLG	Unsuccessful reclosure	Trip the Roosevelt S (524911) to Tolk (525554) 230kV line
33	At the Oasis 230 KV end	3PH	Unsuccessful reclosure	Trip the San Juan (524885) to Oasis (524875) 230kV line

#	Fault Location	Fault Type	Clearing	Fault Clearing
34	At the Oasis 230 KV end	SLG	Unsuccessful reclosure	Trip the San Juan (524885) to Oasis (524875) 230kV line
35	At the Oasis 230 KV end	3PH	Unsuccessful reclosure	Trip the Roosevelt (524915) to Oasis (524875) 230kV line
36	At the Oasis 230 KV end	SLG	Unsuccessful reclosure	Trip the Roosevelt (524915) to Oasis (524875) 230kV line
37	At the Graham 69 KV end	3PH	Unsuccessful reclosure	Trip the Graham (526693) to Garza (526622) 69kV line
38	At the Graham 69 KV end	SLG	Unsuccessful reclosure	Trip the Graham (526693) to Garza (526622) 69kV line
39	At the Graham 69 KV end	3PH	No reclosure	Trip the Graham 69kV (526693) to 115kV (526694) transformer
40	At the Lynn Co. 115 KV end	3PH	Unsuccessful reclosure	Trip the Grassland (526676) to Lynn Co. (526656) 115kV line
41	At the Lynn Co. 115 KV end	SLG	Unsuccessful reclosure	Trip the Grassland (526676) to Lynn Co. (526656) 115kV line
42	At the Grassland 115kV end	3PH	No reclosure	Trip the Grassland 115kV (526676) to 230kV (526677) transformer
43	At the Grassland 115kV end	SLG	No reclosure	Trip the Grassland 115kV (526676) to 230kV (526677) transformer
45	At the Curry 115KV end	3PH	Unsuccessful reclosure	Trip the Curry (524822) to DS#20 (524669) 115kV line
46	At the Curry 115KV end	SLG	Unsuccessful reclosure	Trip the Curry (524822) to DS#20 (524669) 115kV line
47	At the Roosevelt S 115 KV end	3PH	Unsuccessful reclosure	Trip the Curry (524822) to Roosevelt (524908) 115kV line
48	At the Roosevelt S 115 KV end	SLG	Unsuccessful reclosure	Trip the Curry (524822) to Roosevelt (524908) 115kV line
49	At the Tolk 230 KV end	3PH	Unsuccessful reclosure	Trip the Roosevelt S (524911) to Tolk (525554) 230kV line
50	At the Tolk 230 KV end	SLG	Unsuccessful reclosure	Trip the Roosevelt S (524911) to Tolk (525554) 230kV line

#	Fault Location	Fault Type	Clearing	Fault Clearing
51	At the Curry 115kV end	3PH	Unsuccessful reclosure	Trip the Curry (524822) to Norris (524764) 115kV line
52	At the Curry 115kV end	SLG	Unsuccessful reclosure	Trip the Curry (524822) to Norris (524764) 115kV line
53	At the Roosevelt S 115 KV end	3PH	No reclosure	Trip the Roosevelt 115kV (524908) to 230kV (524909) transformer
54	At the Roosevelt S 115 KV end	SLG	No reclosure	Trip the Roosevelt 115kV (524908) to 230kV (524909) transformer
55	At the Roosevelt S 230 KV end	3PH	Unsuccessful reclosure	Trip the Roosevelt (524915) to Oasis (524875) 230kV line
56	At the Roosevelt S 230 KV end	SLG	Unsuccessful reclosure	Trip the Roosevelt (524915) to Oasis (524875) 230kV line
57	At the Oasis 230 KV end	3PH	No reclosure	Trip the Oasis (524874) to Oasis (524875) 230/115kV autotransformer
58	At the Oasis 230 KV end	SLG	No reclosure	Trip the Oasis (524874) to Oasis (524875) 230/115kV autotransformer
59	At the Roosevelt S 115 KV end	3PH	Unsuccessful reclosure	Trip the Roosevelt (524908) to Portales (524924) 115kV line
60	At the Roosevelt S 115 KV end	SLG	Unsuccessful reclosure	Trip the Roosevelt (524908) to Portales (524924) 115kV line
61	At the Oasis 115 KV end	3PH	Unsuccessful reclosure	Trip the Oasis (524874) to Portales (524924) 115kV line
62	At the Oasis 115 KV end	SLG	Unsuccessful reclosure	Trip the Oasis (524874) to Portales (524924) 115kV line
63	At the Oasis 115 KV end	3PH	Unsuccessful reclosure	Trip the Oasis (524874) to Cannon AFB (524974) 115kV line
64	At the Oasis 115 KV end	SLG	Unsuccessful reclosure	Trip the Oasis (524874) to Cannon AFB (524974) 115kV line
65	At the Frio Draw 230kV end	3PH	No reclosure	Trip the Frio Draw (524897) to Oasis (524875) 230kV line
66	At the Potter 345kV end	3PH	No reclosure	Trip the Potter (523961) to Frio Draw (524896) 345kV lines

#	Fault Location	Fault Type	Clearing	Fault Clearing
67	At the Frio Draw 230kV end	3PH	No reclosure	Trip the Frio Draw (524897) to Roosevelt (524909) 230kV line
68	At the 2005-015 345kV end	3PH	No reclosure	Trip the 2005-015 (560813) to Lawton Eastside (511468) 345kV line
69	At the Tuco 345kV end	3PH	No reclosure	Trip the GEN-207-034 (210340) to Tuco (525832) 345kV line
70	At the GEN-2007-034 345kV end	3PH	No reclosure	Trip the GEN-2007-034 (210340) to Frio Draw (524896) 345kV line
71	At the Washita Co 345kV end	3PH	No reclosure	Trip the Washita Co (560079) to Anadarko (511541) 345kV line
72	At the Washita Co 345kV end	3PH	No reclosure	Trip the Washita Co (560079) to MidPoint (525835) 345kV line
73	At the Potter 345 KV end	3PH	No reclosure	Trip the the Potter (523961) to Conway (560000) 345kV line

In order to simulate single line to ground faults, equivalent reactances were calculated. Table 3-3 and 3-4 presents the reactances applied to the buses in the stability simulations:

Table 3-3: Equivalent Reactances – Line to Ground Faults, Summer Peak

Bus Number	Name	Equivalent Reactance (Mvar)
210340	GEN-2007-034 345kV	3200
525524	Tolk E 230kV BUS	7200
526676	Grassland 115 KV	900
526677	Grassland 230kV	1600
526337	Jones Bus1 230 KV	2900
525830	Tuco 230 KV	3500
560813	GEN-2005-015 345 KV	2300
511456	Oklaunion 345KV	1450
525832	Tuco 345 KV	3500
524911	Roosevelt S 230 KV	3000
524875	Oasis 230 KV	2600

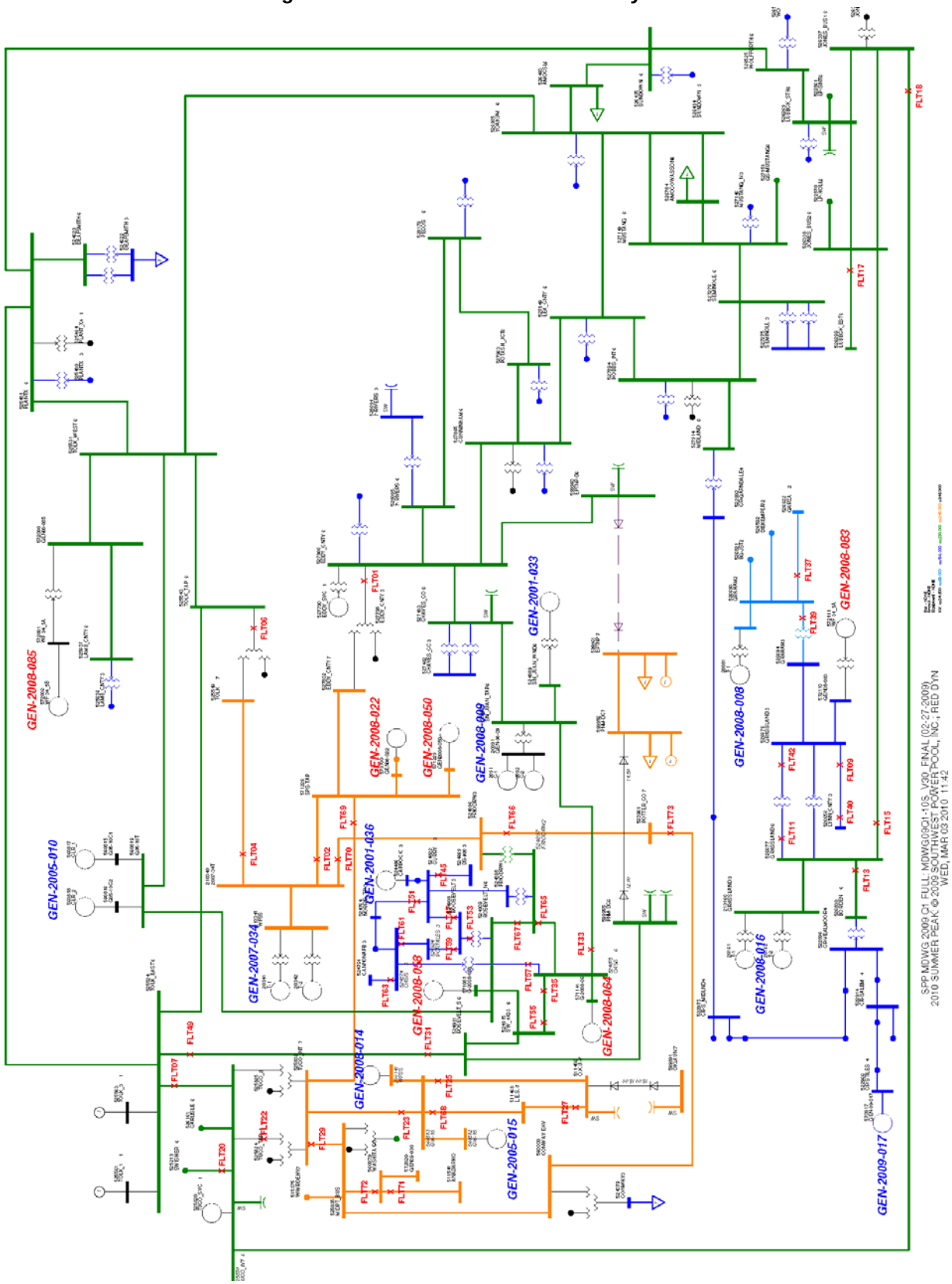
Bus Number	Name	Equivalent Reactance (Mvar)
526693	Graham 69 KV BUS	160
526656	Lynn Co. 115 KV BUS	850
524822	Curry 115KV BUS	1400
525554	Tolk 230 KV BUS	7300
524908	Roosevelt S 115 KV BUS	1400
524874	Oasis 115 KV BUS	2600

Table 3-4: Equivalent Reactances – Line to Ground Faults, Winter Peak

Bus Number	Name	Equivalent Reactance (Mvar)
210340	GEN-2007-034 345kV BUS	3250
525524	Tolk E 230kV BUS 525524	7200
526676	Grassland 115 KV BUS	900
526677	Grassland 230kV BUS	1600
526337	Jones Bus1 230 KV BUS	2850
525830	Tuco 230 KV BUS	3400
560813	GEN-2005-015 345 KV BUS	2300
511456	Oklaunion 345KV BUS	1450
525832	Tuco 345 KV BUS	3400
524911	Roosevelt S 230 KV BUS	3000
524875	Oasis 230 KV BUS	2500
526693	Graham 69 KV BUS	160
526656	Lynn Co. 115 KV BUS	850
524822	Curry 115KV BUS	1400
525554	Tolk 230 KV BUS	7300
524908	Roosevelt S 115 KV BUS	1400
524874	Oasis 115 KV BUS	2500

The following Figures 3-1 present the 3 phase fault locations within the study area.

Figure 3-1 – Fault Locations in the Study Area



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Section

4

Analysis Performed

4.1 Steady State Performance

Table 4-1 and Table 4-2 summarize the results obtained from the steady state analysis for Summer Peak and Winter Peak base cases, respectively. The tables list the voltage deviations at the Points of Interconnection of the proposed study projects of Group 3, as well as the prior queued projects. Note that the tables list only the contingencies that cause violation in the voltage criteria or have an impact of at least 1% in the POI's voltages.

It is important to note that, shunt reactive support of 25 Mvar at bus 524885 SN_JUAN_TAP6 and 52 Mvar at bus 210160 WFSS were added in the base cases, as specified in the previous Group 2 study "R179-09_ICS-2008-001-Group 6_Impact-Re-Study dated December 2009.

The complete set of results for both summer peak and winter peak scenarios are presented in Appendix C.

Table 4-1: Results Obtained – Steady State Analysis – Summer Peak Base Case

Bus #	Bus Name	KV	ContVolt	BaseVolt	% Deviation
FLT02					
560813	G05-15	345.0	***0.9706***	0.9834	-1.30
571226	SPS-TAP	345.0	***0.9810***	0.9973	-1.63
FLT09					
526676	GRASSLAND 3	115.0	***1.0130***	1.0311	-1.76
FLT13					
570917	GEN-09-017	138.0	***0.9422***	0.9958	-5.38
FLT15					
526676	GRASSLAND 3	115.0	***1.0852***	1.0311	5.25
526677	GRASSLAND 6	230.0	***1.0896***	1.0107	7.81
526693	GRAHAM2	69.0	***1.0563***	1.0294	2.61
570917	GEN-09-017	138.0	***1.0239***	0.9958	2.82
FLT23					
560813	G05-15	345.0	***1.1270***	0.9834	14.60
FLT25					
560813	G05-15	345.0	***0.9720***	0.9834	-1.16
FLT27					
560813	G05-15	345.0	***0.9262***	0.9834	-5.82
FLT29					

Bus #	Bus Name	KV	ContVolt	BaseVolt	% Deviation
560813	G05-15	345.0	***0.9530***	0.9834	-3.09
FLT33					
524885	SN_JUAN_TAP6	230.0	***0.9409***	0.9916	-5.11
FLT47					
524822	CURRY 3	115.0	***1.0024***	1.0163	-1.37
FLT53					
524822	CURRY 3	115.0	***0.9991***	1.0163	-1.69
FLT57					
524822	CURRY 3	115.0	***1.0043***	1.0163	-1.18
FLT66					
560813	G05-15	345.0	***0.9529***	0.9834	-3.10
FLT68					
560813	G05-15	345.0	***0.9461***	0.9834	-3.79
FLT69					
560813	G05-15	345.0	***1.0011***	0.9834	1.80
210340	2007-34T	345.0	***0.9880***	1.0087	-2.05
FLT70					
560813	G05-15	345.0	***0.9708***	0.9834	-1.28
FLT71					
560813	G05-15	345.0	***0.9530***	0.9834	-3.09
FLT72					
560813	G05-15	345.0	***0.9553***	0.9834	-2.86

Table 4-2: Results Obtained – Steady State Analysis – Winter Peak Base Case

Bus #	Bus Name	KV	ContVolt	BaseVolt	% Deviation
FLT02					
210340	2007-34T	345.0	***1.0200***	1.0099	1.00
560813	G05-15	345.0	***0.9465***	0.9598	-1.39
571226	SPS-TAP	345.0	***0.9781***	0.9956	-1.76
FLT09					
526693	GRAHAM2	69.0	***1.0214***	1.0311	-0.94
526676	GRASSLAND 3	115.0	***1.0136***	1.0329	-1.87
FLT13					
570917	GEN-09-017	138.0	***0.9704***	1.0061	-3.55
FLT15					
526677	GRASSLAND 6	230.0	***1.1115***	1.0143	9.58
526676	GRASSLAND 3	115.0	***1.1002***	1.0329	6.52
526693	GRAHAM2	69.0	***1.0649***	1.0311	3.28
570917	GEN-09-017	138.0	***1.0350***	1.0061	2.87
FLT23					
560813	G05-15	345.0	***1.1085***	0.9598	15.49
FLT25					

Bus #	Bus Name	KV	ContVolt	BaseVolt	% Deviation
560813	G05-15	345.0	***0.9446***	0.9598	-1.58
			FLT27		
560813	G05-15	345.0	***0.8859***	0.9598	-7.70
			FLT29		
560813	G05-15	345.0	***0.9233***	0.9598	-3.80
			FLT33		
524885	SN_JUAN_TAP6	230.0	***0.9460***	0.9987	-5.28
			FLT37		
526693	GRAHAM2	69.0	***1.0186***	1.0311	-1.21
			FLT53		
524822	CURRY 3	115.0	***1.0098***	1.0229	-1.28
			FLT66		
560813	G05-15	345.0	***0.9274***	0.9598	-3.38
			FLT68		
560813	G05-15	345.0	***0.9181***	0.9598	-4.34
			FLT69		
560813	G05-15	345.0	***0.9717***	0.9598	1.24
210340	2007-34T	345.0	***0.9925***	1.0099	-1.72
			FLT70		
560813	G05-15	345.0	***0.9477***	0.9598	-1.26
			FLT71		
560813	G05-15	345.0	***0.9250***	0.9598	-3.63
			FLT72		
560813	G05-15	345.0	***0.9276***	0.9598	-3.35

In both scenarios, several contingencies cause voltage rise or drop equal to or greater than 0.01 p.u. However, the voltage profile of the Group 6 project POI's buses remain within the limits. The violations identified occurs in other buses in the surrounding area. The results can be summarized as follows:

- Voltage deviation of -1.63% and -1.761% in FLT 2 (summer peak and winter peak respectively) at POI bus 571226 SPS-TAP (GEN-2008-022 and GEN-2008-050). This contingency is related to loss of 345 kV segment 2007-034T to SPS-TAP.

- Voltage deviation of about -1.76% and -1.87% in FLT 09 (summer and winter peak respectively) at POI bus 526676 GRASSLAND 3(GEN-2008-083). This contingency is related to outage of 115 kV circuit between LYNN CO. and GRASSLAND. No voltage violation at bus 526676 for this contingency.

- Voltage deviation of about 5.25% and 6.52% in FLT 15 (summer and winter peak) at POI bus 526676 GRASSLAND 3(GEN-2008-083). This contingency is related to outage of 230 kV circuit between JONES_BUS1 6 and GRASSLAND 6. No voltage violation at bus 526676 for this contingency.

- It was identified severe voltage violations at bus 560813 (Tap Tuco_Int 7 – Oklaunion 7 345 kV), which is the POI for the previous queue project G05-015. Several contingencies cause low voltage such as 27, 29, 66, 68, 71 and 72.

- On the other hand, FLT 23 causes high voltage at the same bus 560813 (Tap Tuco_Int 7 – Oklaunion 7 345 kV) in both scenarios. The winter peak scenario presents once again the worst results: and 1.12 p.u. It is important to note that the high voltages identified at the bus 560813 and surrounding area can be mitigated by switching off line the capacitor banks located at the 34.5 kV costumer's side of the Gen-2005-015 and Gen-2008-014 projects.

- Voltage violation at bus 524885 SN_JUAN_TAP6 (POI for previous projects GEN-2001-033 and GEN-2008-009) was identified during contingency FLT 33. The post contingency voltage is approximately 0.94 for both summer and winter peak scenarios.

- Voltage violation at bus 526677 GRASSLAND 6 (POI for previous projects GEN-2008-016) was identified during contingency FLT 15. The post contingency voltage is above 1.08 p.u. For both summer and winter peak scenarios. Under this contingency, in order to control de voltages, it is necessary to switch off-line capacitor banks located at the 34.5 kV costumer's side of the Gen-2008-016 project.

- Voltage violation at bus 526693 GRAHAM2 (POI for previous projects GEN-2008-008) was identified during contingency FLT 15. The post contingency voltage is above 1.05 p.u. for both summer and winter peak scenarios. This issues is mitigated when the capacitor banks of the Gen-2008-016 project are switched off line.

4.2 Power Factor Analysis

A QV analysis was performed to determine the amount of reactive support required from the projects to maintain the scheduled voltages at the respective points of interconnection. The contingencies described in Table 3-2 were evaluated in steady state conditions for summer and winter peak base cases, with variable Mvar injection at the POIs.

Table 4-3 presents for each one of the proposed wind facilities in Group 6, the Mvar requirements and the associated power factor that the projects must be able to provide under contingencies. It should be noted that the projects connecting at SPS-TAP 345 kV bus were modeled in cases, with different combinations, based on their queue positions.

The maximum amount of Mvar i.e. 148 Mvar is required at SPS-TAP 345 kV bus, when the two projects (Gen-2008-022, and 050) were modeled in the base case simultaneously. The contingency that defined the requirement was the outage of the 345 kV line between GEN-2007-034 to Eddy County (FLT02). In the winter peak scenario.

Table 4-3: Mvar Requirements and Power Factor at the POI for the Proposed Projects Interconnection

Project	Point of Interconnection	V Scheduled (p.u)	Project Injection at POI in Base Case (Mvar)	QV Injection (Mvar)	Project Requirement (Net Mvar at POI)	Contingency	Power Factor at POI (lagging)
GEN-2008-022	Tolk – Eddy 345kV	1.004	-62.2	98.8	36.6	FLT02 (WP)	0.999
GEN-2008-022 and 050	Tolk – Eddy 345kV	1.000	-51.3	199.1	147.8	FLT02 (WP)	0.990
GEN-2008-058	Roosevelt 230kV	1.000	-26.2	97.8	71.6	FLT69 (SP)	0.941
GEN-2008-064	Oasis 230kV	1.000	-24.5	95.6	71.1	FLT69(SP)	0.942
GEN-2008-083	Grassland 115 kV	1.033	-16.1	21.9	5.8	FLT09(WP)	0.998
GEN-2008-085	Tolk – Lamb County	1.000	-6.9	70.9	64	FLT69 (SP)	0.842

The power factor requirement for Gen-2008-085 is defined to be 64 Mvar. Given that the maximum output of Gen-2008-085 is 100.5 MW, the power factor required at the POI comes out to be 0.842. The Gen-2008-085 power factor requirement will be limited to 95%.

QV Tables, showing the Mvar injection for each voltage level in base case and contingencies conditions, are presented in Appendix D for both summer peak and winter peak scenarios. The values chosen are the highest between the two scenarios.

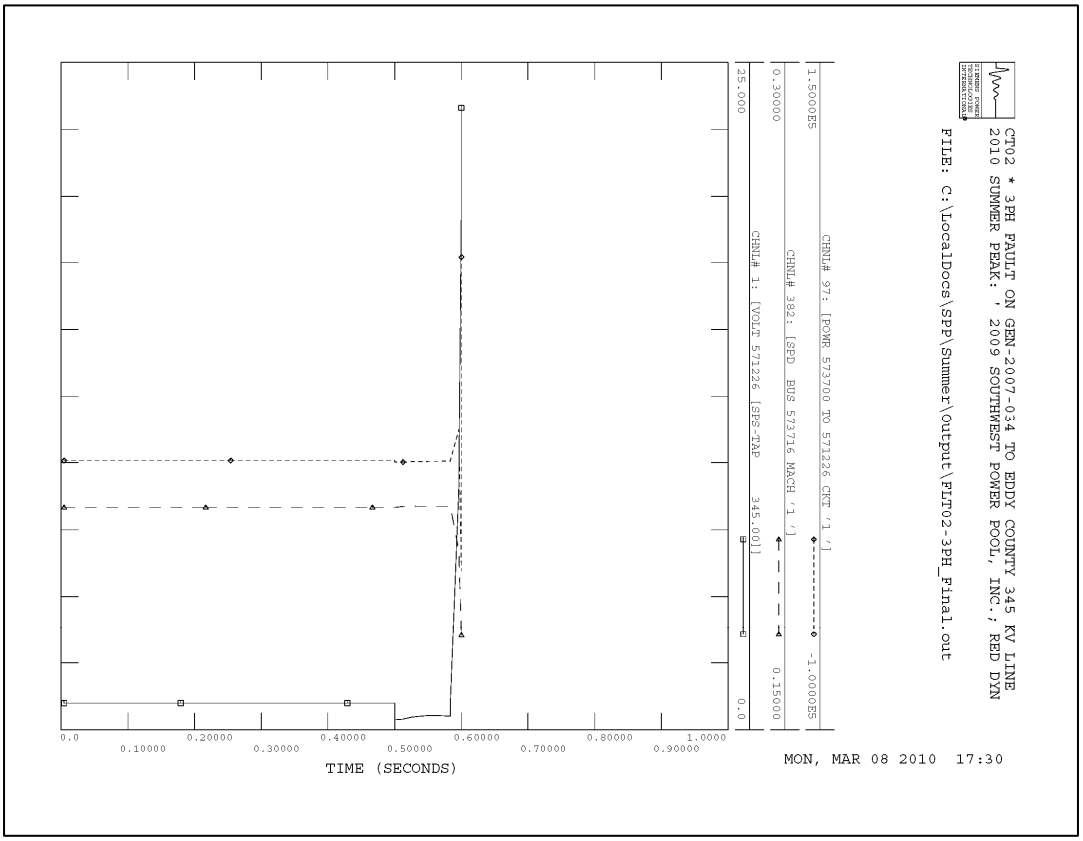
4.3 Stability Results

The stability analysis was carried out for both summer and winter peak load flow models.

In order to determine the impact of the project on the overall system dynamics as well as to determine the requirements to meet the FERC Order 661-A Guidelines, 72 contingencies listed by Table 3-2 were simulated. The results obtained are described in this sub-section.

It is important to note that the stability model of GEN-2008-022 project (GE2.5 MW) causes the simulation to crash right after the fault is cleared for the first time. Figure 4-1 shows the simulation crashing under FLT 02, outage of the 345 kV line between GEN-2007-034 to Eddy County. The plot presents, for Gen-2008-022, terminal voltage, speed deviation and electric power.

Figure 4-1: FLT02, simulation with Gen-2008-022 GE 2.5MW stability model, causing the simulation to crash



The original stability model for Gen-2008-022 (GE2.5 MW) was then replaced by the GE1.5MW stability model. The same contingency was re-simulated until 15 seconds without crashing. Therefore, the study assumed the GE 1.5 MW stability model to represent Gen-2008-022 in the stability analysis performed.

Tables 4-5 and 4-6 summarize the results obtained from the stability simulations for both summer and winter peak base cases, respectively. The table lists the dynamic performance of the proposed study projects of Group 6, as well as the prior queued ones. Note that only the critical contingencies that lead to trips due to LVRT, overvoltage or frequency protection are listed.

Table 4-5: Results Obtained – Summer Peak Base Case

Name	Wind Projects Dynamic Performance
FLT06-3PH	GEN-2005-010 (560817, 560818) tripped for under voltage at 0.6083 s
FLT07-3PH	GEN-2005-010 (560817, 560818) tripped for under voltage at 0.6083 s
FLT49-3PH	GEN-2005-010 (560817, 560818) tripped for under voltage at 0.6083 s
FLT23-3PH	GEN-2008-014 (1141) tripped for over voltage at 0.7875 s
FLT24-1PH	GEN-2008-014 (1141) tripped for over voltage at 0.8083 s
FLT33-3PH	GEN-2001-033 (1141) tripped for over voltage at 1.175 s

Name	Wind Projects Dynamic Performance
FLT39-3PH	GEN-2008-008 (1081) islanded

Table 4-6: Results Obtained – Winter Peak Base Case

Name	Wind Projects Dynamic Performance
FLT06-3PH	GEN-2005-010 (560817, 560818) tripped for under voltage at 0.6083 s
FLT07-3PH	GEN-2005-010 (560817, 560818) tripped for under voltage at 0.6083 s
FLT49-3PH	GEN-2005-010 (560817, 560818) tripped for under voltage at 0.6083 s
FLT23-3PH	GEN-2008-014 (1141) tripped for overvoltage at 0.8 s
FLT24-1PH	GEN-2008-014 (1141) tripped for overvoltage at 0.8375 s
FLT33-3PH	GEN-2001-033 (1141) tripped for overvoltage at 1.179 s
FLT39-3PH	GEN-2008-008 (1081) islanded tripped by frequency protection at 0.7667 s

In summer and winter cases, contingencies FLT 06, 07, 49, 33 and 39 were re-run with the protection of the respective projects disabled. The results show satisfactory voltage recovery, as no other trips were identified in the monitored area.

The trips in Gen-2008-014 due to high voltage protection occurring in the FLTs 23 and 24 can be prevented by switching off line the capacitor banks located at the 34.5 kV costumer's side of the Gen-2005-015 and Gen-2008-014 projects, whenever these contingencies happen.

In general, the results obtained show for the SPP's system dynamic performance:

- The new proposed projects, did not trip during any of the contingencies tested, that is, no trips occurred due to LVRT or frequency protection.
- All synchronous generators in the monitored areas were stable and remained in synchronism during all contingencies and the system conditions considered.
- Acceptable damping and voltage recovery was observed, within applicable standards.

Stability plots of the main contingencies evaluated for both summer peak and winter peak scenarios are presented in Appendix E.

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Section

5

Conclusions

The six projects of PISIS-2009-001 Group 6 have been evaluated to determine the impact of the proposed cluster of interconnections on the Southwest Power Pool system.

Steady state and stability analysis were carried out to evaluate the system performance under contingencies. Also to identify the system requirements to meet the FERC Order 661-A Guidelines for Low Voltage Ride Through (LVRT) and therefore, to allow the group 6 projects to deliver their full power to the SPP transmission system.

In general the interconnection requests in Group 6 do have significant impact on the voltage profile of the monitored system, under certain contingency conditions. However, no voltage criteria violations were identified in the project's points of interconnection through the simulations performed.

It is important to note that the high voltages identified at the bus 560813 and surrounding area under the outage of the 345 kV line between GEN-2005-015 and Tuco substations (FLT 23) can be mitigated by switching off line the capacitor banks located at the 34.5 kV costumer's side of the Gen-2005-015 and Gen-2008-014 projects.

The outage of the 230 kV line between Grassland and Jones substations (FLT 15) also requires switching off line capacitor banks. In order to control de voltages, it is necessary to switch off-line the capacitor banks located at the 34.5 kV costumer's side of the Gen-2008-016 project.

The power factor analysis determined the amount of reactive support required to maintain the scheduled voltages at each one of the points of interconnection under contingency conditions. For Gen-2008-085, the power factor requirement shall be limited to 95%, according to SPP's Open Access Transmission Tariff. For the other Projects, the amount of reactive support indicated by Table 4-3 must be provided by each interconnection request using the wind turbine generator (WTG) reactive capabilities and/or adding capacitor banks to the system.

It is important to note that the projects GEN-2008-22 and GEN-2008-050 are connected at the same point of interconnection: SPS-TAP 345 kV bus. Thus the requirements at the respective POI changes as the projects go on line, according to their queue numbers. Moreover, both projects must share the Mvar requirement specified.

In the stability set-up it was identified a simulation crash caused by Gen-2008-022 stability model (GE 2.5MW). The analysis performed then assumed the GE 1.5 MW model to represent Gen-2008-022 project in the simulations. Continued work is required on the GE 2.5MW model in order to identify the causes of the error, such that the project can be represented as specified in its interconnection request.

The results obtained in the stability simulations demonstrate that none the new proposed projects trip during any of the contingencies tested.

However, the contingency results also showed that several prior queue project trips due to under voltage protection. By disabling each project's protection, no other project trips occurred, meaning that the voltage recovery is satisfactory.

Furthermore, Gen-2008-014 trips due to high voltage protection for contingencies FLT 23 and 24. This stability issue can be prevented by switching off line the capacitor banks located at the 34.5 kV costumer's side of the Gen-2005-015 and Gen-2008-014 projects, whenever these contingencies happen.

In general, the synchronous generators in the monitored areas were stable and remained in synchronism. Therefore, the Group 6 projects do not have an adverse impact on the dynamic performance of the SPP system, for the contingencies and system conditions tested.

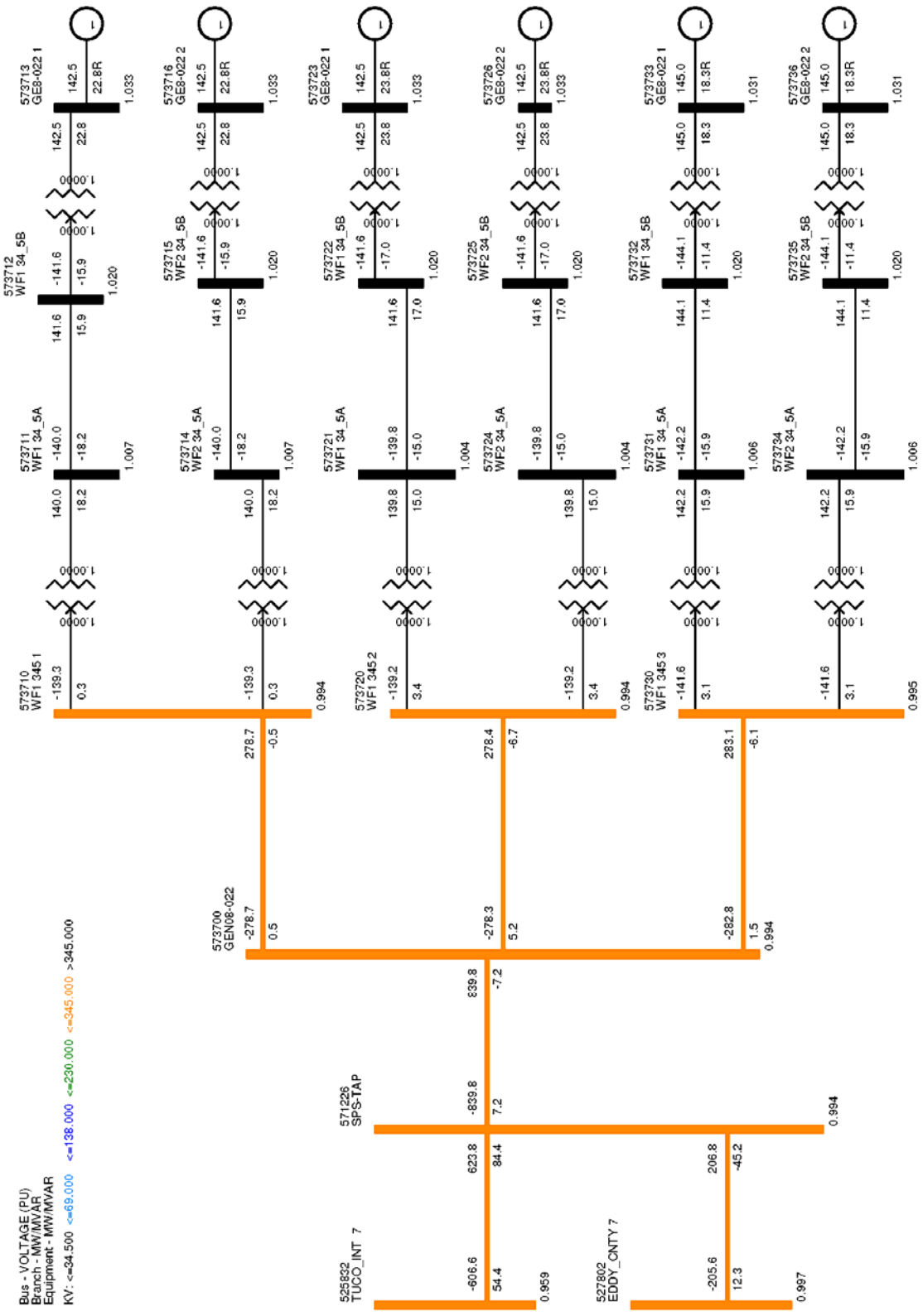
Appendix

A

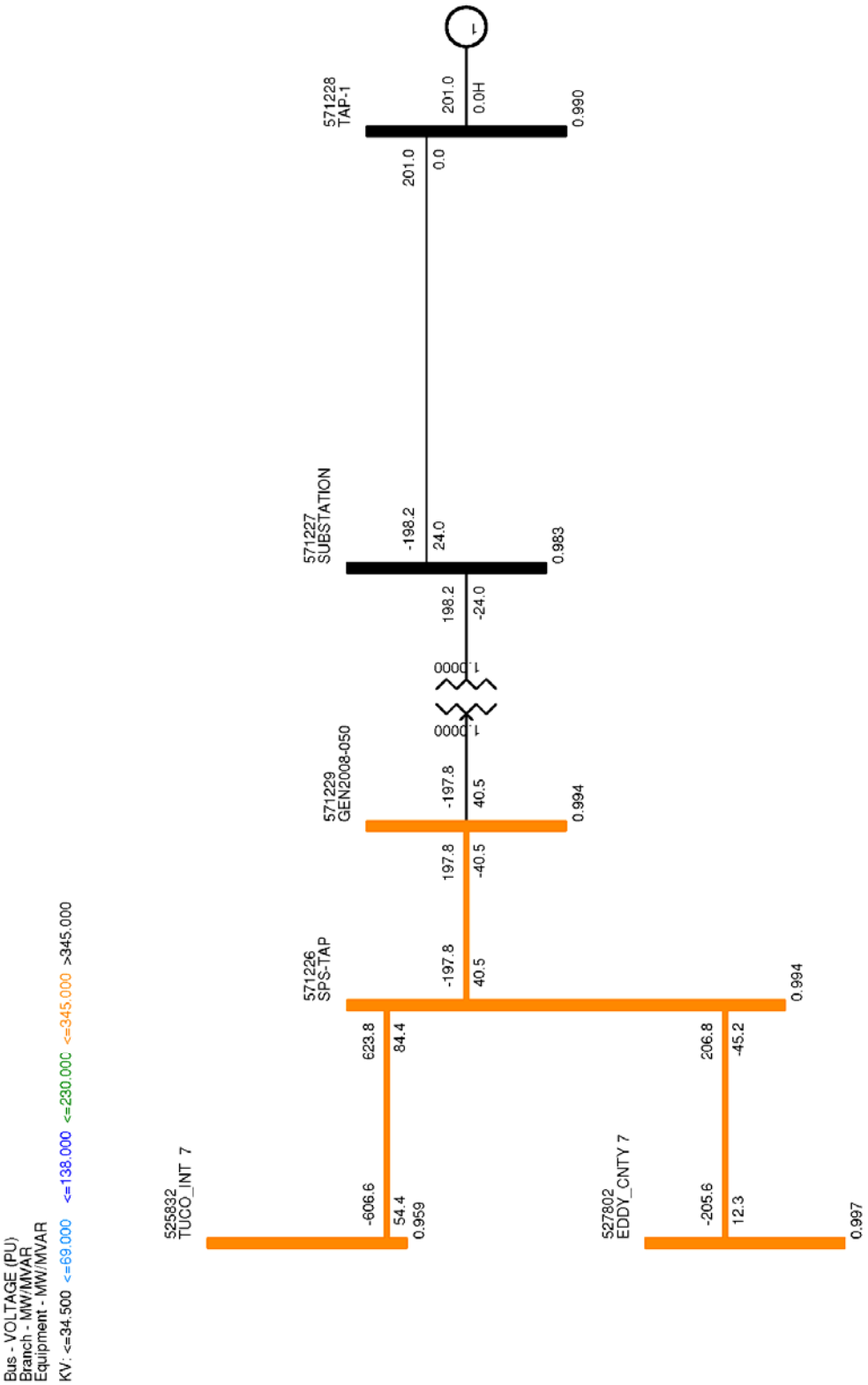
WTG Single Line Diagrams

This appendix contains the single line diagrams, showing the modeling details of each Group 6 project.

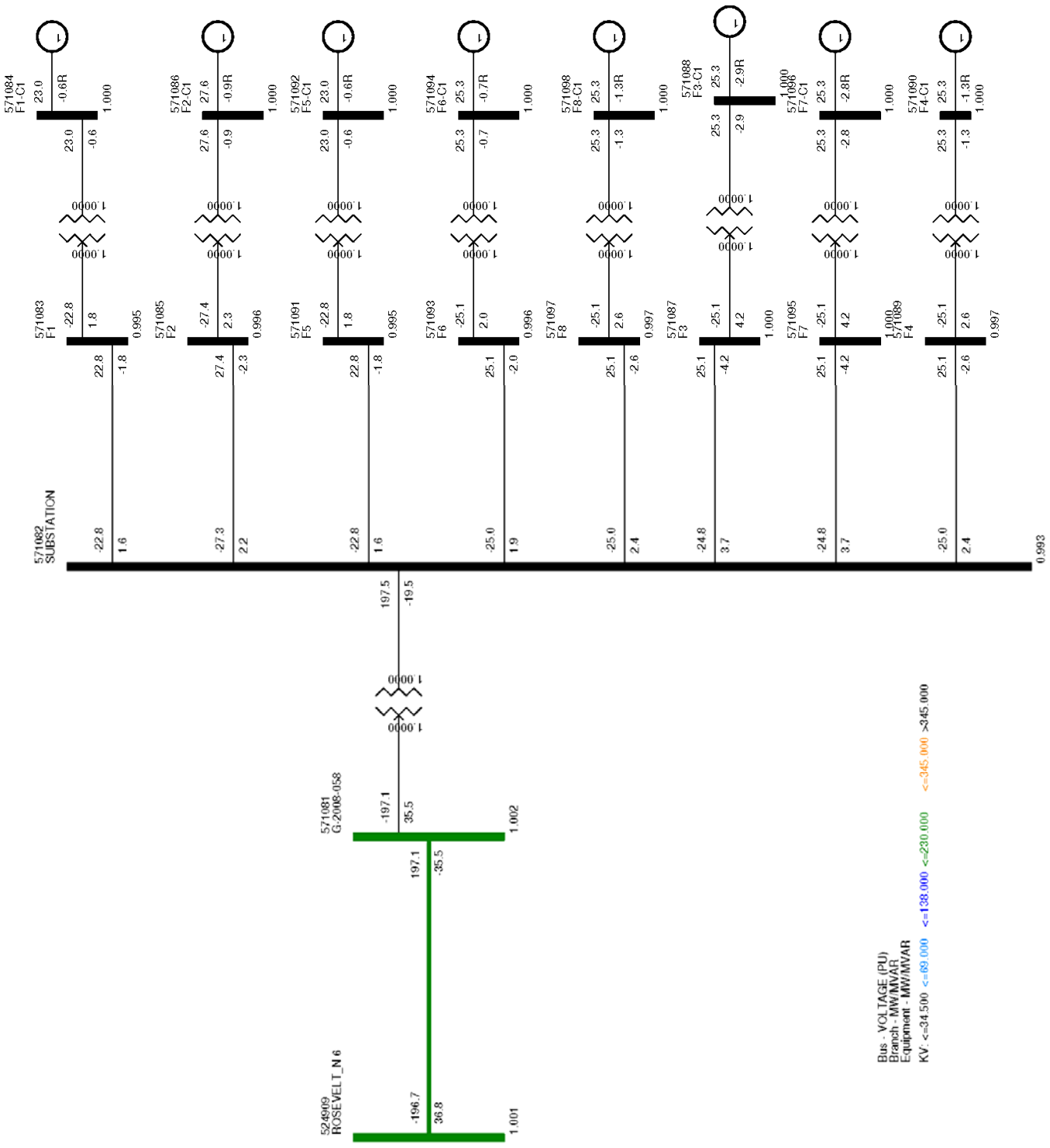
A.1 Gen -2008-022 – GE 2.5 MW



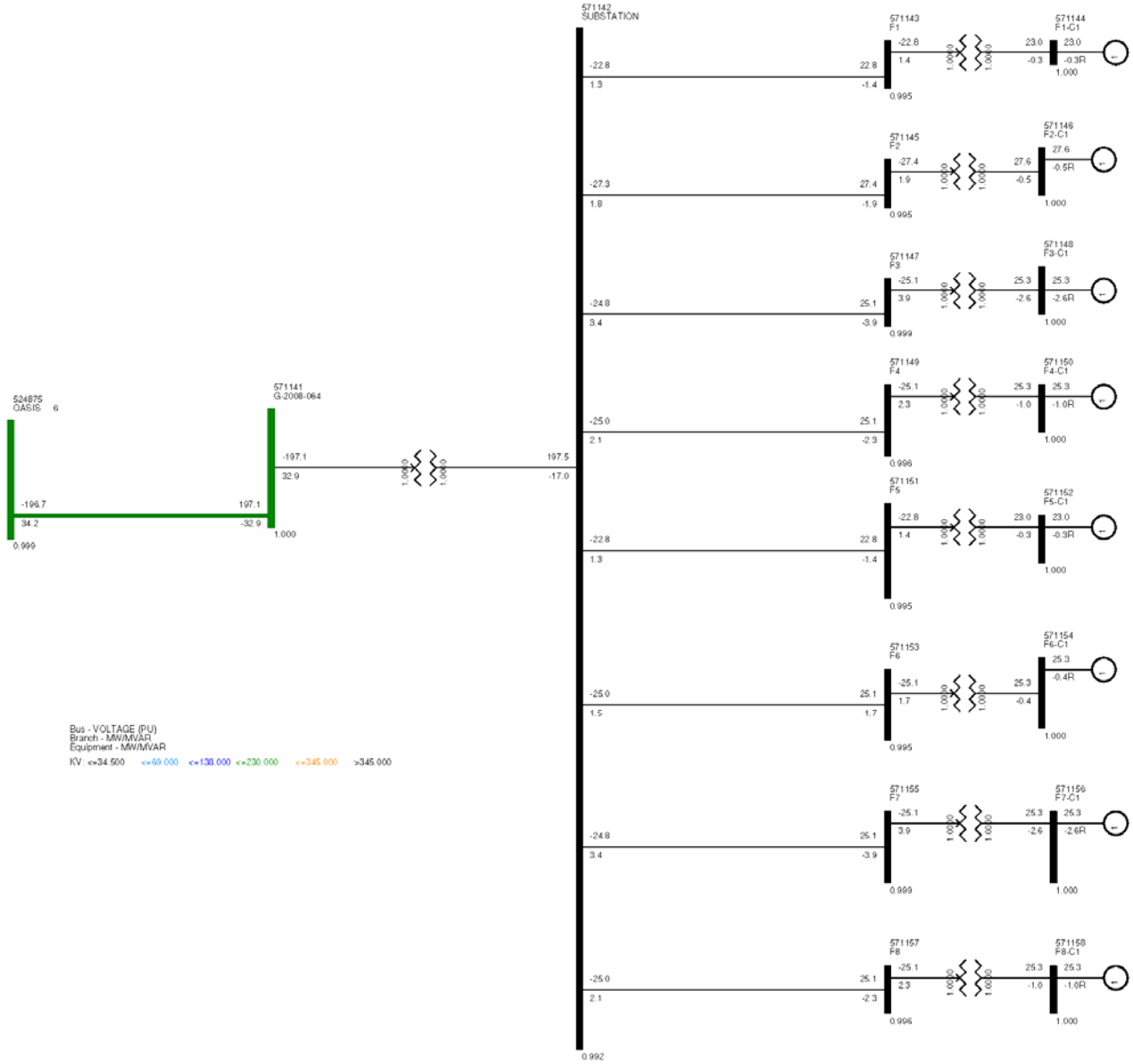
A.2 GEN-2008-050 – Vestas V90 3.0MW



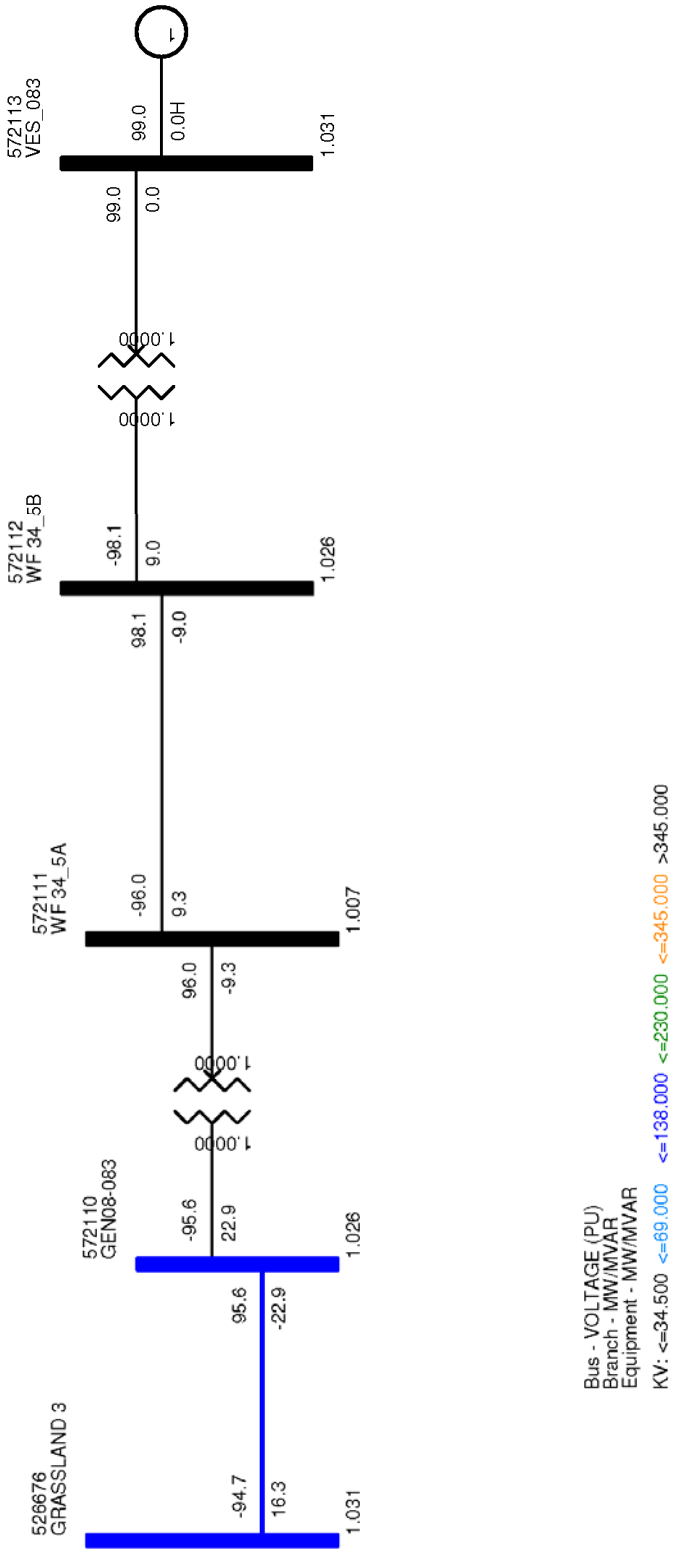
A.3 GEN-2008-058—Siemens SMK 203 2.3 MW



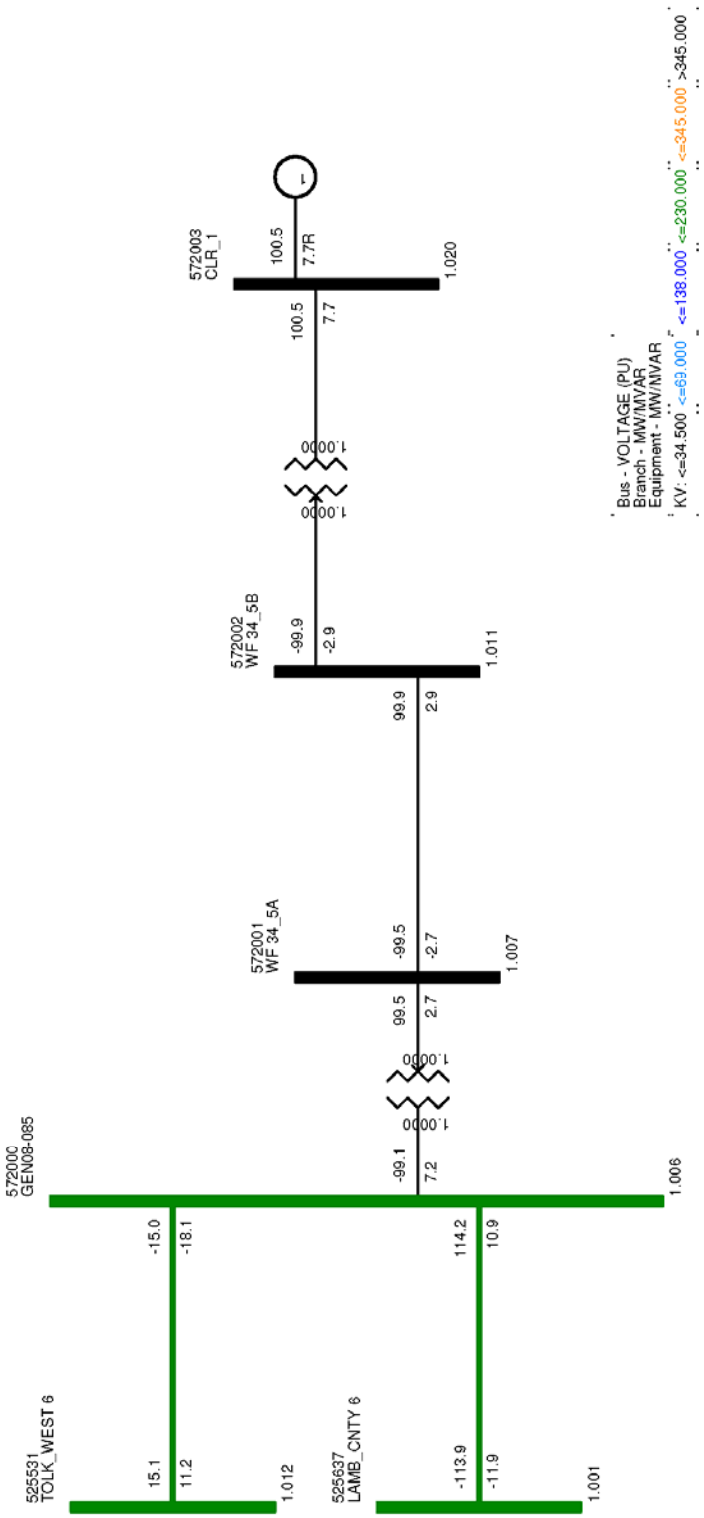
A.4 GEN-2008-064—Siemens SMK 203 2.3 MW



A.5 GEN-2008-083—Vestas V90 1.8 MW



A.6 GEN-2008-085—GE 1.5 MW



O: Stability Study for Group 7

R14-10

Generator Interconnection Impact Study for PISIS-2009-001 - Group 7

Prepared for

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Contents

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Section

1

Introduction

1.1 Background

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Siemens PTI performed the following Impact Study to satisfy the Impact Study Agreement executed by the requesting customers and SPP. The requests for interconnection were placed in accordance to SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system.

The purpose of this report is to present the results of the stability and power factor analysis performed to evaluate the impact of the proposed PISIS-2009-001 cluster of interconnections with regard to Group 7 projects on the Southwest Power Pool system. Eventual indicative solutions to the identified issues are proposed based on the impact of each generation interconnection on the Southwest Power Pool system.

Three projects in this cluster are connected to three different points of interconnection at different voltage levels, ranging from 69 kV to 345 kV. Section 2 describes all proposed wind farms projects in detail.

Transient stability analysis was performed using the package provide by SPP. It contains the latest stability database in PSS®E version 30.3.3. The stability package also includes the dynamic data for the previously queued projects.

1.2 Purpose

The steady state and stability study was carried out to:

(a) Determine the ability of the proposed generation facility to remain in synchronism and within applicable planning standards following system faults with unsuccessful reclosing.

(b) Determine the amount of transient support required from the costumer to meet the power factor requirement at the POI.

(c) 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 support.

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Section

2

Model Development

The study has considered the 2010 Summer Peak and 2009 Winter Peak load flow models provided by SPP with the required interconnection generations modeled. The base cases also contain all the significant previous queued generation interconnection projects in the interconnection queue.

2.1 Power Flow Data

The Group 7 of PISIS-2009-001 contains three proposed wind generation projects. Table 2-1 presents the size of the wind generation projects, the Wind Turbine Generator (WTG) manufacturers, the reactive capability of the wind farm as well as the point of interconnection and the PSS®E bus number in the load flow models.

Table 2-1 – Details of the Interconnection Requests

Request	Size (MW)	Model	Reactive Capability of Wind Farm		Point of Interconnection	Bus Number
			Max (Mvar)	Min (Mvar)		
GEN-2007-049	59.4	Vestas V90 1.8MW	0 (*)	0 (*)	Carter Junction 69kV	520846
GEN-2008-037	100.8	Vestas V90 1.8MW	0 (*)	0 (*)	Blucan1 - Washita 138 kV	521089
GEN-2009-030	201	GE 1.5MW	66	-66	Anadarko – Midpoint 345kV line	560079

(*) – For voltage control within 0.95 p.u. – 1.050 p.u.

The analysis was carried out using the database package provided by SPP which also includes the modeling data for the previously queued projects, as shown in Table 2-2:

Table 2-2 – Details of the Prior Queued Interconnection Requests

Request	Size	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)

Request	Size	Wind Turbine Model	Point of Interconnection
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)

Figures 2-1 and 2-2 present the surrounding area of the Group 7 points of interconnection, showing the line flows and voltage profile for the load flow models considered in the study for summer and winter peak scenarios, respectively.

Figure 2-1 - Group 7 Point of Interconnection Surrounding Area – Summer Peak

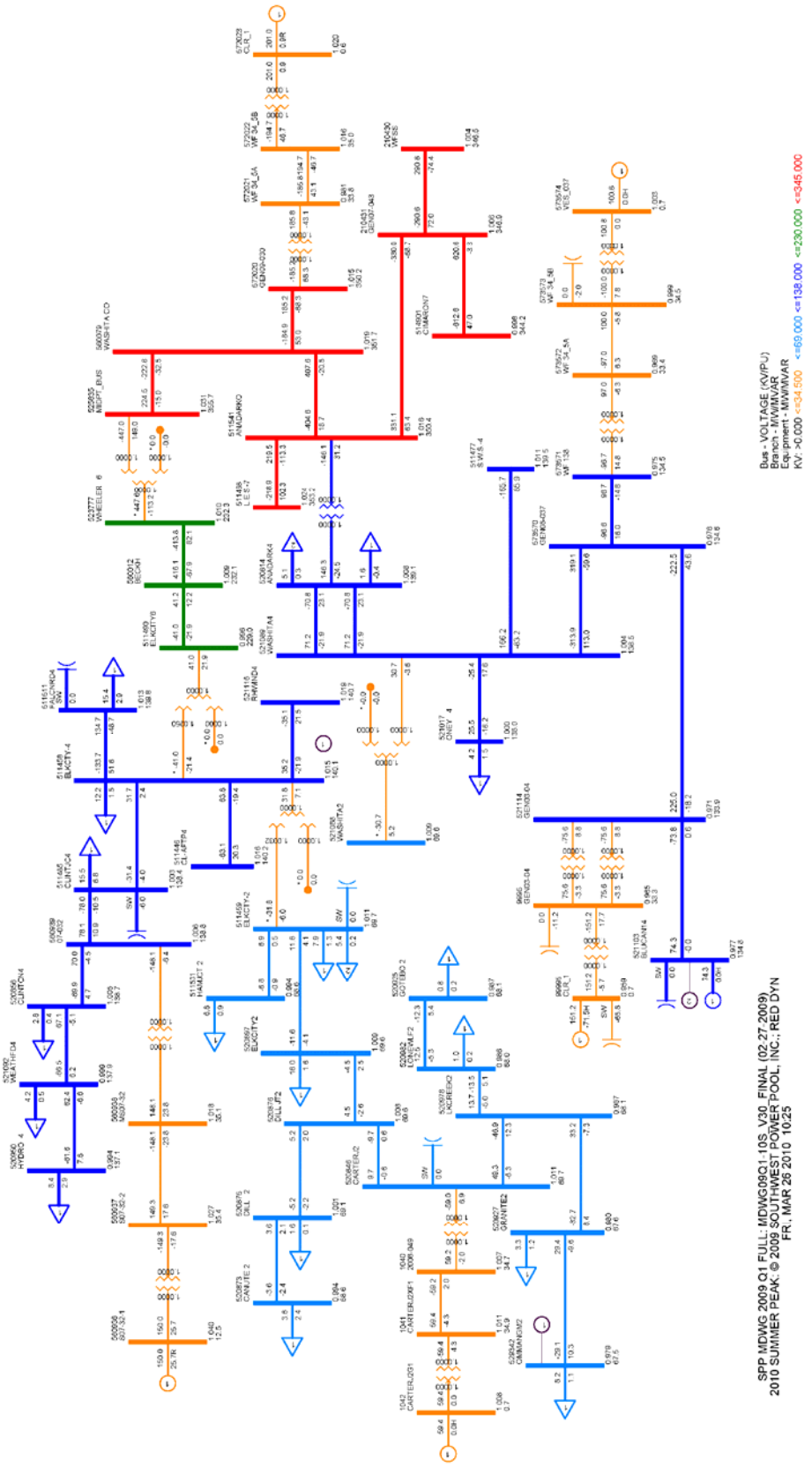
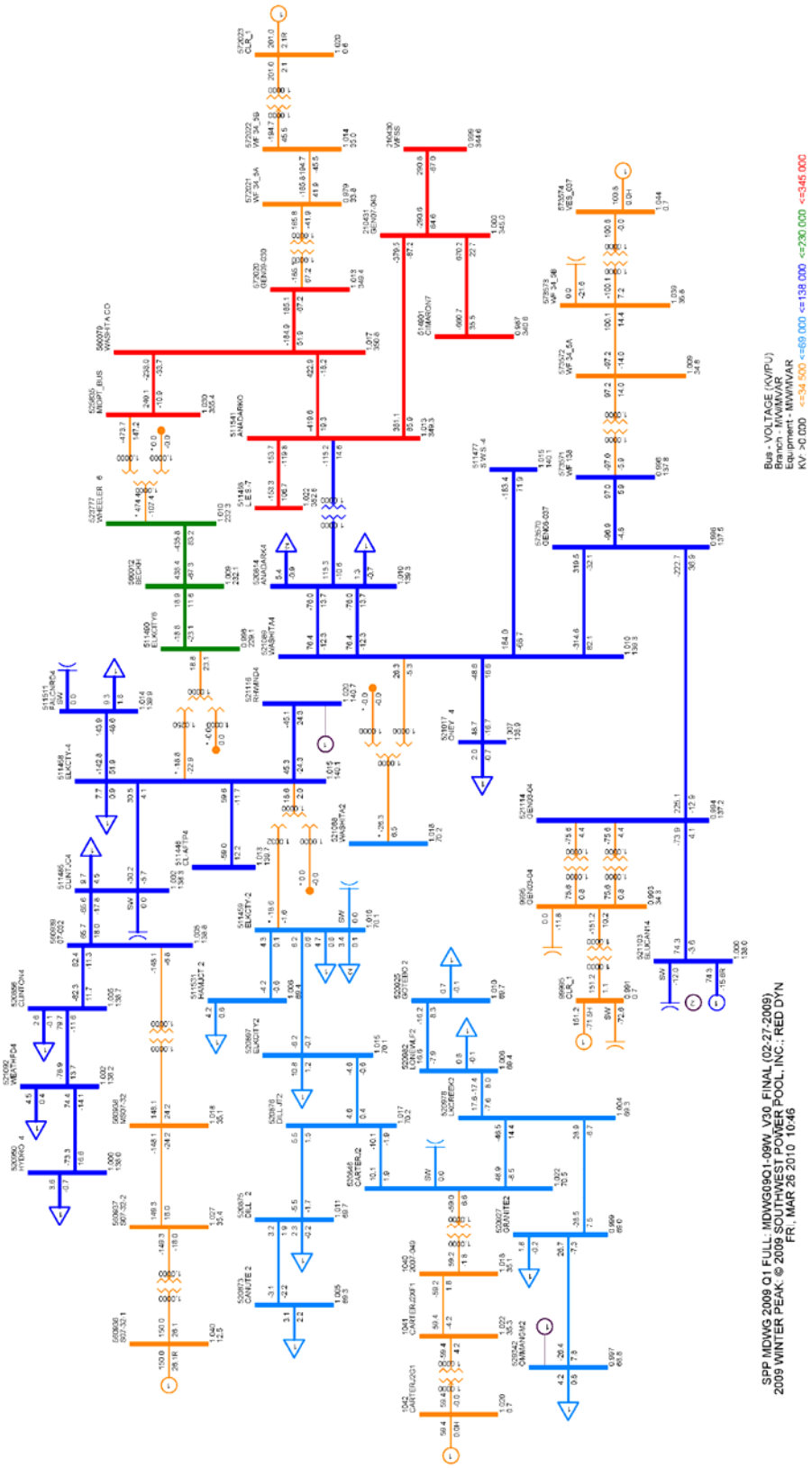


Figure 2-2 - Group 7 Points of Interconnection Surrounding Area – Winter Peak



Figures A-1 to A-3 in Appendix A present the single line diagrams showing, for each of the Group 7 projects, the modeling details and impedance data of the transformers and collector systems.

2.2 Stability Database

The transient stability analysis was performed using the data provided by SPP. Stability models for the Group 7 interconnection requests were already added to the dynamic database. All turbine parameters used in the simulation models are the default parameters in the wind turbine package. It is assumed that each wind turbine generators (WTGs) controls the voltage of its own bus.

The default voltage protection model set points recommended by the manufacturer were used. The wind units were modeled with their built-in voltage ride through capability. Also, the default frequency protection model set points recommended by the manufacturer were used.

The PSS®E dynamic models output list is shown in Appendix B, documenting the model parameters for the Group 7 wind turbines modeled in the stability study.

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Section

3

Methodology and Assumptions

The study considered the 2010 summer peak and 2009 winter peak power flow cases with the required interconnection generation requests modeled as described in Section 2. The base case also contains all the significant previous queued projects in the interconnection queue.

The monitored areas in this study are shown in Table 3-1.

Table 3-1 – Areas of Interest

Area Number	Area Name
520	AEPW
524	OKGE
525	WFEC
526	SPS
531	MIDW
534	SUNC
536	WERE

3.1 Methodology

3.1.1 Stability Simulations

The stability simulations were performed using the PSS®E version 30.3.3 with the latest stability database provided by SPP. Three-phase faults and single line to ground faults in the neighborhood of PISIS-2009-001 – Group 3 Points of interconnection were simulated. Any adverse impact on the system stability was documented and further investigated with appropriate solutions to determine whether a static or dynamic reactive support device is required or not.

The group 7 projects were also evaluated on the matter of ability to meet FERC Order 661A (low voltage ride through and wind farm recovery to pre-fault voltage) with and without additional reactive support.

3.1.2 Steady State Simulations

3.1.2.1 N-1 Contingency Analysis

An N-1 contingency analysis was performed to evaluate voltage violations, if any, caused by disturbances (tripping of the faulted line). The voltages at each POI were monitored for deviations from the base case voltage and the percentage deviations were documented.

The summer peak and winter peak load flow cases were adjusted to ensure that there are no relevant pre contingency voltage criteria violations. During contingency analysis, voltages of any monitored bus found to be outside the range of the post-contingency criteria and having more than 1% of project impact were reported in Section 4.

3.1.2.2 Power Factor Analysis

The analysis will determine what power factor is necessary at the POI for each contingency.

If the required power factor at the POI is beyond the capability of the studied wind turbines to meet the requirement at the POI, capacitor banks will be considered.

A QV analysis was performed to determine the reactive support requirement at each project's POI. Mvar injections, tabulated for base case and contingency conditions, are used to determine the reactive power support required at each POI, in order to maintain the bus scheduled pre contingency voltages.

These tables are obtained through a series of AC load flow calculations. Starting with no reactive support at a bus, the voltage is computed for a series of power flows as the reactive support is changed in steps, until the power flow experiences convergence difficulties as the system approaches the voltage collapse point.

3.2 Disturbances for Stability Analysis

The stability simulations considered three-phase (3PH) faults and single line-to-ground (SLG) faults. For all contingencies the fault complete clearing process includes the following sequence of events:

1) Line fault, cleared after 5 cycles by tripping the both line terminals

2) After 20 cycles the line is reclosed under fault conditions (unsuccessful reclosing)

3) The fault is cleared by tripping both ends of the faulted line, again 5 cycles later.

The disturbances evaluated are listed in the following Table 3-2:

Table 3-2: Disturbances for Stability Analysis

#	Fault Location	Fault Type	Clearing	Fault Clearing
1	At GEN-2007-043 end of 345kV line to Anadarko	3PH	Unsuccessful Reclosing	trip GEN-2007-043 to Anadarko 345kV line
2	At GEN-2007-043 end of 345kV line to Anadarko	SLG	Unsuccessful Reclosing	trip GEN-2007-043 to Anadarko 345kV line
3	At Anadarko end of 345kV line to Washita Co	3PH	Unsuccessful Reclosing	trip Anadarko to GEN-2009-030 345kV line
4	At Anadarko end of 345kV line to Washita Co	SLG	Unsuccessful Reclosing	trip Anadarko to GEN-2009-030 345kV line
5	At Lawton Eastside end of 345kV line to Sunnyside	3PH	Unsuccessful Reclosing	trip Lawton Eastside to Sunnyside 345kV line
6	At Lawton Eastside end of 345kV line to Sunnyside	SLG	Unsuccessful Reclosing	trip Lawton Eastside to Sunnyside 345kV line
7	At Weatherford WFEC end of 138kV line to Clinton.	3PH	Unsuccessful Reclosing	trip Weatherford WFEC to Clinton. 138kV line
8	At Weatherford WFEC end of 138kV line to Clinton.	SLG	Unsuccessful Reclosing	trip Weatherford WFEC to Clinton. 138kV line
9	At Clinton Jct. end of 138kV line to Elk City	3PH	Unsuccessful Reclosing	trip Clinton Jct. to Elk City 138kV line
10	At Clinton Jct. end of 138kV line to Elk City	SLG	Unsuccessful Reclosing	trip Clinton Jct. to Elk City 138kV line
11	At Weatherford WFEC end of 138kV line to Hydro.	3PH	Unsuccessful Reclosing	trip Weatherford WFEC to Hydro. 138kV line
12	At Weatherford WFEC end of 138kV line to Hydro.	SLG	Unsuccessful Reclosing	trip Weatherford WFEC to Hydro. 138kV line
13	At Elk City end of 138kV line to Red Hill	3PH	Unsuccessful Reclosing	trip Elk City to Red Hill 138kV line
14	At Elk City end of 138kV line to Red Hill	SLG	Unsuccessful Reclosing	trip Elk City to Red Hill 138kV line
15	At Elk City end of 138kV line to Clinton AFB	3PH	Unsuccessful Reclosing	trip Elk City to Clinton AFB 138kV line
16	At Elk City end of 138kV line to Clinton AFB	SLG	Unsuccessful Reclosing	trip Elk City to Clinton AFB 138kV line
17	At Elk City end of 138/230 kV transformer	3PH	Unsuccessful Reclosing	trip Elk City 138/230kV transformer
18	At Elk City end of 138/230 kV transformer	SLG	Unsuccessful Reclosing	trip Elk City 138/230kV transformer
19	At Anadarko end of 138/345 kV transformer	3PH	Unsuccessful Reclosing	trip Anadarko 138/345kV transformer
20	At Anadarko end of 138/345 kV transformer	SLG	Unsuccessful Reclosing	trip Anadarko 138/345kV transformer
21	At Hobart Jct end of 138kV line to Clinton AFB	3PH	Unsuccessful Reclosing	trip Hobart Jct to Clinton AFB 138kV line

#	Fault Location	Fault Type	Clearing	Fault Clearing
22	At Hobart Jct end of 138kV line to Clinton AFB	SLG	Unsuccessful Reclosing	trip Hobart Jct to Clinton AFB 138kV line
23	At Hobart Jct end of 138kV line to Carnegie South	3PH	Unsuccessful Reclosing	trip Hobart Jct to Carnegie South 138kV line
24	At Hobart Jct end of 138kV line to Carnegie South	SLG	Unsuccessful Reclosing	trip Hobart Jct to Carnegie South 138kV line
25	At Hobart Jct. end of 138kV line to Tamarack Tap	3PH	Unsuccessful Reclosing	trip Hobart Jct. to Tamarack Tap 138kV line
26	At Hobart Jct. end of 138kV line to Tamarack Tap	SLG	Unsuccessful Reclosing	trip Hobart Jct. to Tamarack Tap 138kV line
27	At Hobart Jct. end of 138/69kv transformer.	3PH	Unsuccessful Reclosing	trip Hobart Jct. 138/69kv transformer
28	At Hobart Jct. end of 138/69kv transformer.	SLG	Unsuccessful Reclosing	trip Hobart Jct. 138/69kv transformer
29	At Elk City end of 230kV line to Beckham	3PH	Unsuccessful Reclosing	trip Elk City to Beckham 230kV line
30	At Elk City end of 230kV line to Beckham	SLG	Unsuccessful Reclosing	trip Elk City to Beckham 230kV line
31	At Altus end of 138kV line to Snyder	3PH	Unsuccessful Reclosing	trip Altus to Snyder 138kV line
32	At Altus end of 138kV line to Snyder	SLG	Unsuccessful Reclosing	trip Altus to Snyder 138kV line
33	At Morewood end of 138kV line to Mooreland	3PH	Unsuccessful Reclosing	trip Morewood to Mooreland 138kV line
34	At Morewood end of 138kV line to Mooreland	SLG	Unsuccessful Reclosing	trip Morewood to Mooreland 138kV line
35	At Anadarko end of 138kV line to Southwest	3PH	Unsuccessful Reclosing	trip Anadarko to Southwest 138kV line
36	At Anadarko end of 138kV line to Southwest	SLG	Unsuccessful Reclosing	trip Anadarko to Southwest 138kV line
37	At Southwest end of 138kV line to Verden	3PH	Unsuccessful Reclosing	trip Southwest to Verden 138kV line
38	At Southwest end of 138kV line to Verden	SLG	Unsuccessful Reclosing	trip Southwest to Verden 138kV line
39	At Southwest end of 138kV line to Elgin Jct.	3PH	Unsuccessful Reclosing	trip Southwest to Elgin Jct. 138kV line
40	At Southwest end of 138kV line to Elgin Jct.	SLG	Unsuccessful Reclosing	trip Southwest to Elgin Jct. 138kV line
41	At Anadarko end of 138kV line to Cornville Tap	3PH	Unsuccessful Reclosing	trip Anadarko to Cornville Tap 138kV line
42	At Anadarko end of 138kV line to Cornville Tap	SLG	Unsuccessful Reclosing	trip Anadarko to Cornville Tap 138kV line

#	Fault Location	Fault Type	Clearing	Fault Clearing
43	At Southwest end of 138kV line to Washita	3PH	Unsuccessful Reclosing	trip Southwest to Washita 138kV line
44	At Southwest end of 138kV line to Washita	SLG	Unsuccessful Reclosing	trip Southwest to Washita 138kV line
45	At Anadarko end of 138kV line to Washita	3PH	Unsuccessful Reclosing	trip Anadarko to Washita 138kV line
46	At Anadarko end of 138kV line to Washita	SLG	Unsuccessful Reclosing	trip Anadarko to Washita 138kV line
47	At Oney end of 138kV line to Washita	3PH	Unsuccessful Reclosing	trip Oney to Washita 138kV line
48	At Oney end of 138kV line to Washita	SLG	Unsuccessful Reclosing	trip Oney to Washita 138kV line
49	At Carter Jct. end of 69kV line to Dill Jct.	3PH	Unsuccessful Reclosing	trip Carter Jct. to Dill Jct. 69kV line
50	At Carter Jct. end of 69kV line to Dill Jct.	SLG	Unsuccessful Reclosing	trip Carter Jct. to Dill Jct. 69kV line
51	At Carter Jct. end of 69kV line to Lake Creek	3PH	Unsuccessful Reclosing	trip Carter Jct. to Lake Creek 69kV line
52	At Carter Jct. end of 69kV line to Lake Creek	SLG	Unsuccessful Reclosing	trip Carter Jct. to Lake Creek 69kV line
53	At Lake Creek end of 69kV line to Lone Wolf	3PH	Unsuccessful Reclosing	trip Lake Creek to Lone Wolf 69kV line
54	At Lake Creek end of 69kV line to Lone Wolf	SLG	Unsuccessful Reclosing	trip Lake Creek to Lone Wolf 69kV line
55	At Lake Creek end of 69kV line to Granite	3PH	Unsuccessful Reclosing	trip Lake Creek to Granite 69kV line
56	At Lake Creek end of 69kV line to Granite	SLG	Unsuccessful Reclosing	trip Lake Creek to Granite 69kV line
57	At Clinton Jct end of 138kV line to GEN-2007-032	3PH	Unsuccessful Reclosing	trip Clinton Jct to GEN-2007-032 138kV line
58	At Clinton Jct end of 138kV line to GEN-2007-033	SLG	Unsuccessful Reclosing	trip Clinton Jct to GEN-2007-032 138kV line
59	At Washita Co end of 345kV line to Wheeler	3PH	Unsuccessful Reclosing	trip Wheeler to GEN-2009-030 345kV line
60	At Washita Co end of 345kV line to Wheeler	SLG	Unsuccessful Reclosing	trip Wheeler to GEN-2009-030 345kV line

In order to simulate single line to ground faults, equivalent reactances were determined to be applied at the buses. Table 3-3 presents the equivalent reactances obtained for the summer peak case and Table 3-4 presents the equivalent reactance for the winter peak case.:

Table 3-3: Equivalent Reactances – Single Line to Ground Faults – Summer Peak

BUS	Equivalent Reactance (Mvar)
210431	3800
511541	4800
511468	4300
521092	700
511485	1000
511458	1500
520814	4400
511463	900
511490	1300
511440	600
521001	800
511477	3700
521017	1400
520846	300
520978	300
560079	2700

Table 3-4: Equivalent Reactances – Single Line to Ground Faults – Winter Peak

BUS	Equivalent Reactance (Mvar)
210431	3500
511541	4600
511468	4200
521092	700
511485	1000

BUS	Equivalent Reactance (Mvar)
511458	1500
520814	4100
511463	900
511490	1300
511440	600
521001	800
511477	3600
521017	1400
520846	300
520978	300
560079	2700

The following Figures 3-1 and 3-2 present the fault locations within the study area.

Figure 3-1 – Fault Locations in the Study Area – *Diagram1*

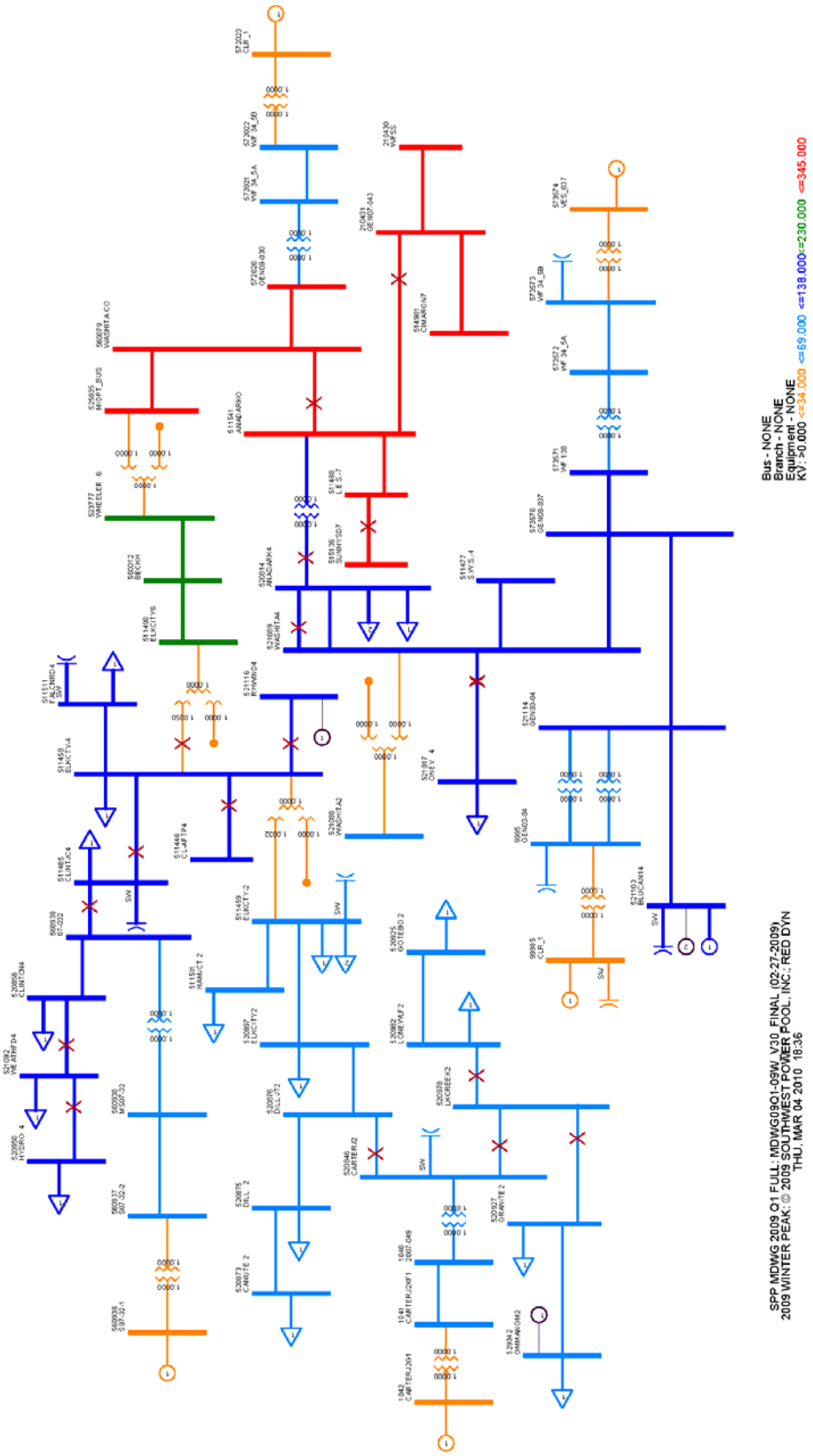
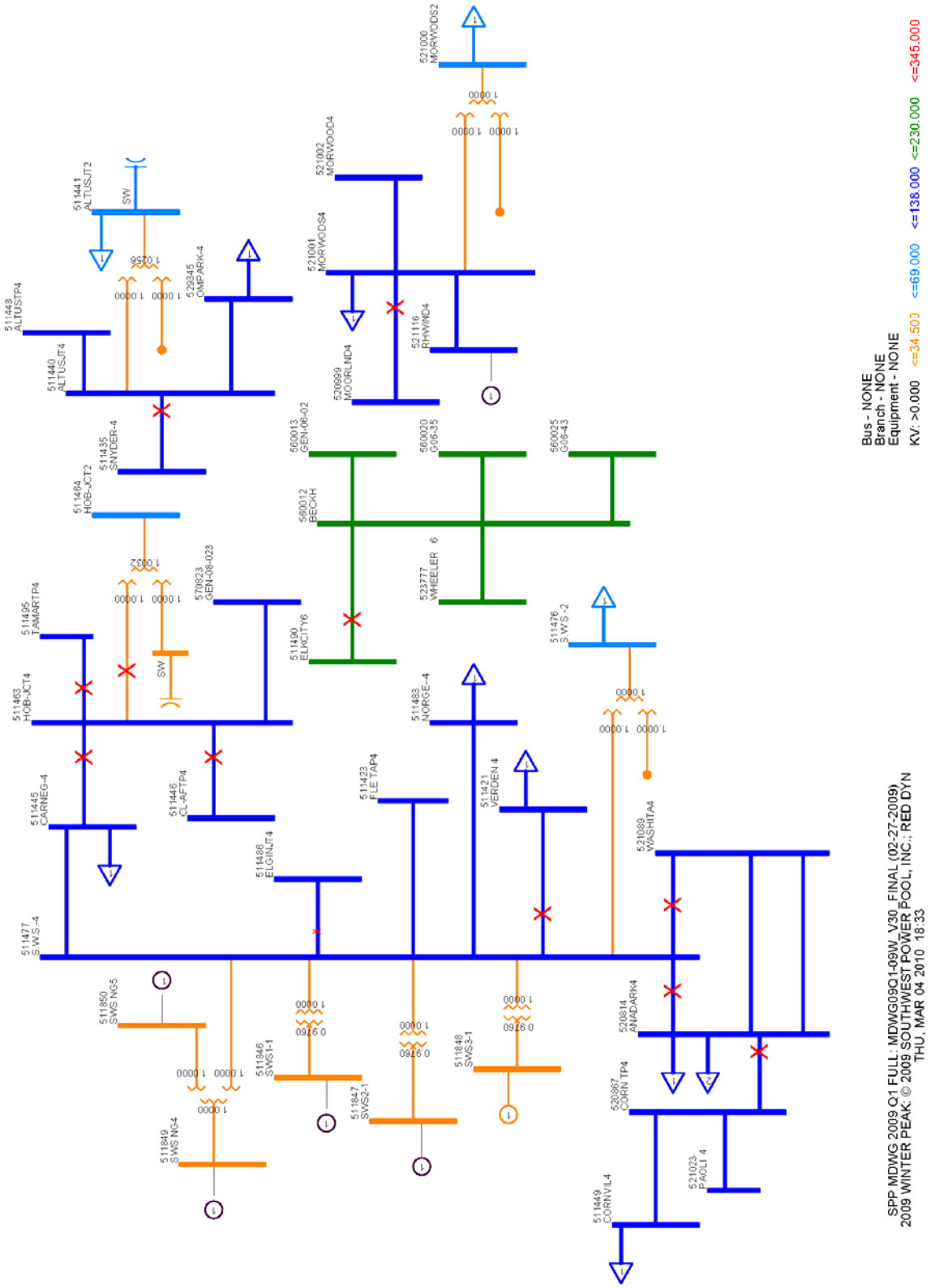


Figure 3-2 – Fault Locations in the Study Area – *Diagram2*



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Section

4

Analysis Performed

4.1 Steady State Performance

Table 4-1 and Table 4-2 summarize the results obtained from the steady state analysis for Summer Peak and Winter Peak base cases, respectively. The tables list the voltage deviations at the Points of Interconnection of the proposed study projects of Group 7, as well as the prior queued projects. Note that the tables list only the contingencies that cause violation in the voltage criteria or have an impact of at least 1% in the POI's voltages.

The complete set of results for both summer peak and winter peak scenarios are presented in Appendix C.

Table 4-1: Results Obtained – Steady State Analysis – Summer Peak Base Case

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
Base Case					
210431	GEN07-043	345.0	-	1.0071	-
511463	HOB-JCT4	138.0	-	1.0200	-
511506	WTH WF 4	138.0	-	0.9906	-
511511	FALCNRD4	138.0	-	1.0138	-
520814	ANADARK4	138.0	-	1.0149	-
520846	CARTERJ2	69.0	-	1.0128	-
521089	WASHITA4	138.0	-	1.0202	-
560012	BECKH	230.0	-	1.0094	-
560079	WASHITA CO	345.0	-	1.0209	-
560916	G03-005T	138.0	-	1.0159	-
560939	07-032	138.0	-	1.0087	-
FLT 01					
210431	GEN07-043	345.0	0.9923	1.0071	-1.47%
FLT 43					
520814	ANADARK4	138.0	1.0038	1.0149	-1.1%
521089	WASHITA4	138.0	0.9840	1.0040	-2.0%
560916	G03-005T	138.0	1.0060	1.0159	-1.0%

Table 4-2: Results Obtained – Steady State Analysis – Winter Peak Base Case

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
Base Case					
210431	GEN07-043	345.0	-	1.0014	-
511463	HOB-JCT4	138.0	-	1.0123	-
511506	WTH WF 4	138.0	-	0.9873	-
511511	FALCNRD4	138.0	-	1.0146	-
520814	ANADARK4	138.0	-	1.0159	-
520846	CARTERJ2	69.0	-	1.0239	-
521089	WASHITA4	138.0	-	1.0040	-
560012	BECKH	230.0	-	1.0095	-
560079	WASHITA CO	345.0	-	1.0183	-
560916	G03-005T	138.0	-	1.0183	-
560939	07-032	138.0	-	1.0073	-
FLT 01					
210431	GEN07-043	345.0	0.9830	1.0014	-1.84%
560079	WASHITA CO	345.0	1.0288	1.0183	1.03%
FLT 43					
520814	ANADARK4	138.0	1.0026	1.0159	-1.33%
521089	WASHITA4	138.0	0.9800	1.0030	-2.3%
560916	G03-005T	138.0	1.0065	1.0183	-1.18%
FLT 49					
520846	CARTERJ2	69.0	1.0467	1.0239	2.23%
FLT 57					
560939	07-032	138.0	1.0194	1.0073	1.20%

The winter peak scenario is more stressed, leading to a greater number of contingencies that causes significant deviations in the voltage profile, when compared to the summer peak scenario. Although few contingencies cause voltage rise or drop greater than 0.01 p.u in both scenarios, the voltage profile of the POI's surrounding area remains within the limits.

The Group 7 projects have minimal impact on the voltages of the buses monitored in the study system under contingencies. The exception is the outage of the 138 kV line between Southwest and Washita substations. This contingency causes about 2 % voltage dip in the 138 kV system in the Washita surrounding area, with no further consequences.

4.2 Power Factor Analysis

A QV analysis was performed to determine the amount of reactive support required to maintain the scheduled voltages at the points of interconnection of each one of the proposed wind facilities. The contingencies described in Table 3-2 were evaluated in steady state conditions for summer and winter peak base cases, with variable Mvar injection at the POIs.

Table 4-3 presents for each one of the proposed wind facilities in Group 7, the Mvar requirements and the associated power factor that the projects must be able to provide under contingencies.

Table 4-3: Mvar Requirements and Power Factor at the POI for the Proposed Projects Interconnection

Project	Point of Interconnection	V Scheduled (p.u)	Project Injection at POI in Base Case (Mvar)	QV Injection (Mvar)	Project Requirement (Net Mvar at POI)	Contingency	Power Factor at POI
GEN-2007-049	Carter Jct. 69 kV	1.0128	-6.9	3.93	-2.97	FLT 25 (SP)	1.000
GEN-2008-037	Blucan1 - Washita 138 kV	1.000	-18.6	51.16	32.60	FLT 57 (WP)	0.951 (lagging)
GEN-2009-030	Washita Co 345 kV	1.0183	-53.6	34.00	-19.6	FLT 59 (WP)	0.995 (leading)

QV Tables, showing the Mvar injection for each voltage level in base case and contingencies conditions, are presented in Appendix D for both summer peak and winter peak scenarios. The values chosen are the highest between the two scenarios.

4.3 Dynamic Results

The stability analysis was carried out using both Summer Peak and Winter Peak load flow models.

In order to determine the impact of the project on the overall system dynamics as well as to determine the requirements to meet the FERC Order 661-A Guidelines, 60 contingencies listed in Table 3-2 were simulated. The results obtained are described in this sub-section.

None of the units, neither in the study projects nor in the prior queued wind facilities, trip due to LVRT or frequency protection under the contingencies studied.

However, Gen-2008-037 goes unstable for several contingencies in the Washita surrounding area, in particular FLT 43 and 44: outage of the 138 kV line between Southwest and Washita substations, both in summer and winter scenarios.

It is important to note that Gen-2008-037 does not have reactive capability whatsoever. Therefore, during contingencies there is no contribution from this project in the overall system post- contingency voltage recovery. Figure 4-1 shows plots for POI and WTG terminal voltages, WTG's Pelec and Qelec, demonstrating the system stability performance under FLT 43 in the winter peak scenario.

The dynamic behavior of Gen-2008-037 indicated that a transient reactive support is required to prevent stability issues in the system of the monitored area. A series of shunt and static Var devices was tested, as the adoption of only static var solution would escalate the interconnection costs. Figure 4-2 shows the Gen-2008-037 satisfactory stability performance under FLT 43 in the winter peak scenario, considering 20 Mvar shunt capacitor bank plus a 20 MVA SVC, both connected at the 34.5 kV bus on the Customer's side. The plot shows the POI and WTG terminal voltages, WTG's Pelec and Qelec, as well as the Mvar output of the SVC.

Figure 4-1: Gen-2008-037 Stability Performance under FLT 44 in the winter peak scenario.

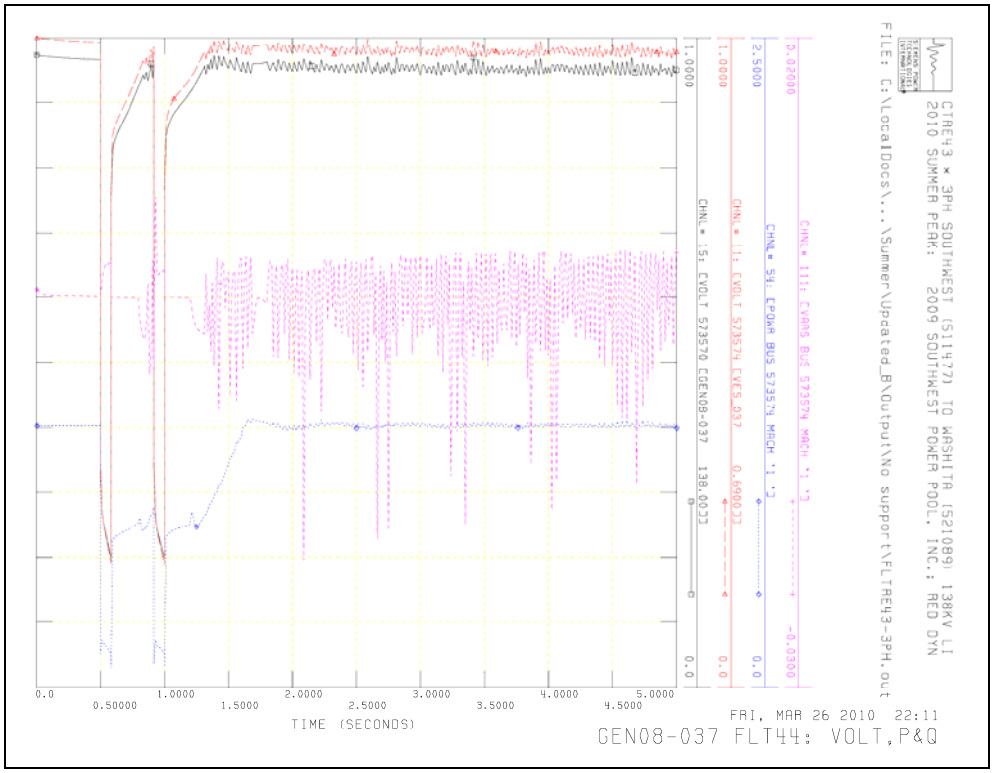
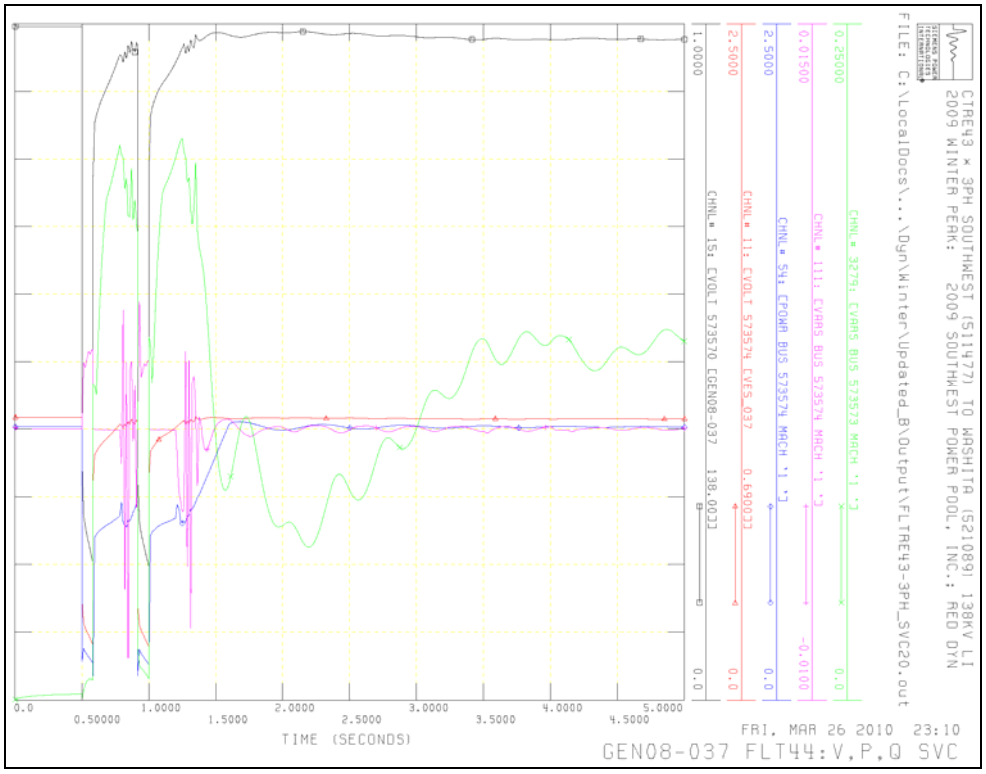


Figure 4-2: Gen-2008-037 Stability Performance under FLT 44 in the winter peak scenario 20 Mvar Shunt Capacitor + 20 MVA SVC at 34.5 kV Costumer's Side



For the other contingencies the results show, In general:

- The new proposed projects did not trip during any of the contingencies tested. That is, no trips occurred due to LVRT.
- All other generators in the monitored areas were stable and remained in synchronism during all contingencies and the system conditions considered.
- Acceptable damping and voltage recovery within applicable standards was observed.

The Plots for both the summer and winter cases are included in Appendix E1 and E2, respectively.

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Section

5

Conclusions

The three projects of PISIS-2009-001 - Group 7 have been evaluated to determine the impact of the proposed cluster of interconnections on the Southwest Power Pool system.

Steady state and stability analysis were carried out to evaluate the system performance under contingencies. Also to identify the system requirements to meet the FERC Order 661-A Guidelines for Low Voltage Ride Through (LVRT) and therefore, to allow the group 3 projects to deliver their full power to the SPP transmission system.

In general the Group 7 projects have minimal impact on the voltage profile of the monitored system, under contingencies conditions. The exception is the the outage of the 138 kV line between Southwest and Washita substations. This contingency causes about 2 % voltage dip in the 138 kV system in the Washita surrounding area, with no further consequences. No voltage criteria violations were identified through the simulations performed.

The power factor analysis determined the amount of reactive support required to maintain the scheduled voltages at each one of the points of interconnection. The amount of reactive support indicated by Table 4-3 must be provided by each interconnection request using their wind turbine generator (WTG) capabilities and/or adding capacitor banks to the system.

From the stability standpoint, the outage of the 138 kV line between Southwest and Washita causes the Gen-2008-037 to go unstable. The results indicate that, for both scenarios, Gen2008-037 requires reactive support in order to prevent stability issues. It is required a 20 Mvar shunt capacitor bank plus a 20 MVA SVC, both connected at the 34.5 kV bus on the Customer's side of the project.

The other results obtained in the stability simulations demonstrate that none the new proposed or prior queued projects trip during any of the contingencies tested. That is, no trips occurred due to LVRT. Also, all other generators in the monitored areas were stable and remained in synchronism. Therefore, the three Group 7 projects do not have an adverse impact on the dynamic performance of the SPP system, for the contingencies and system conditions tested.

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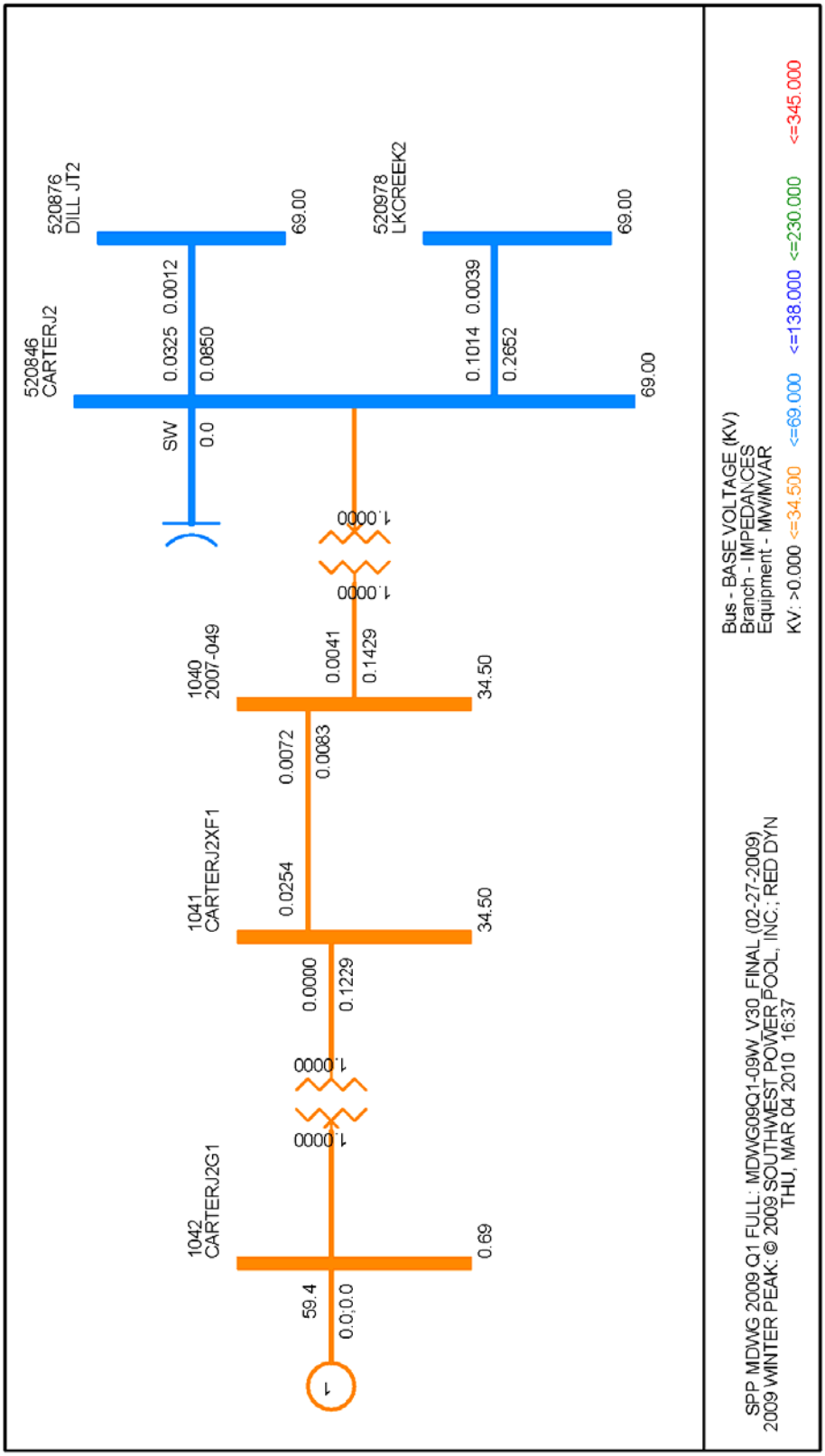
Appendix

A

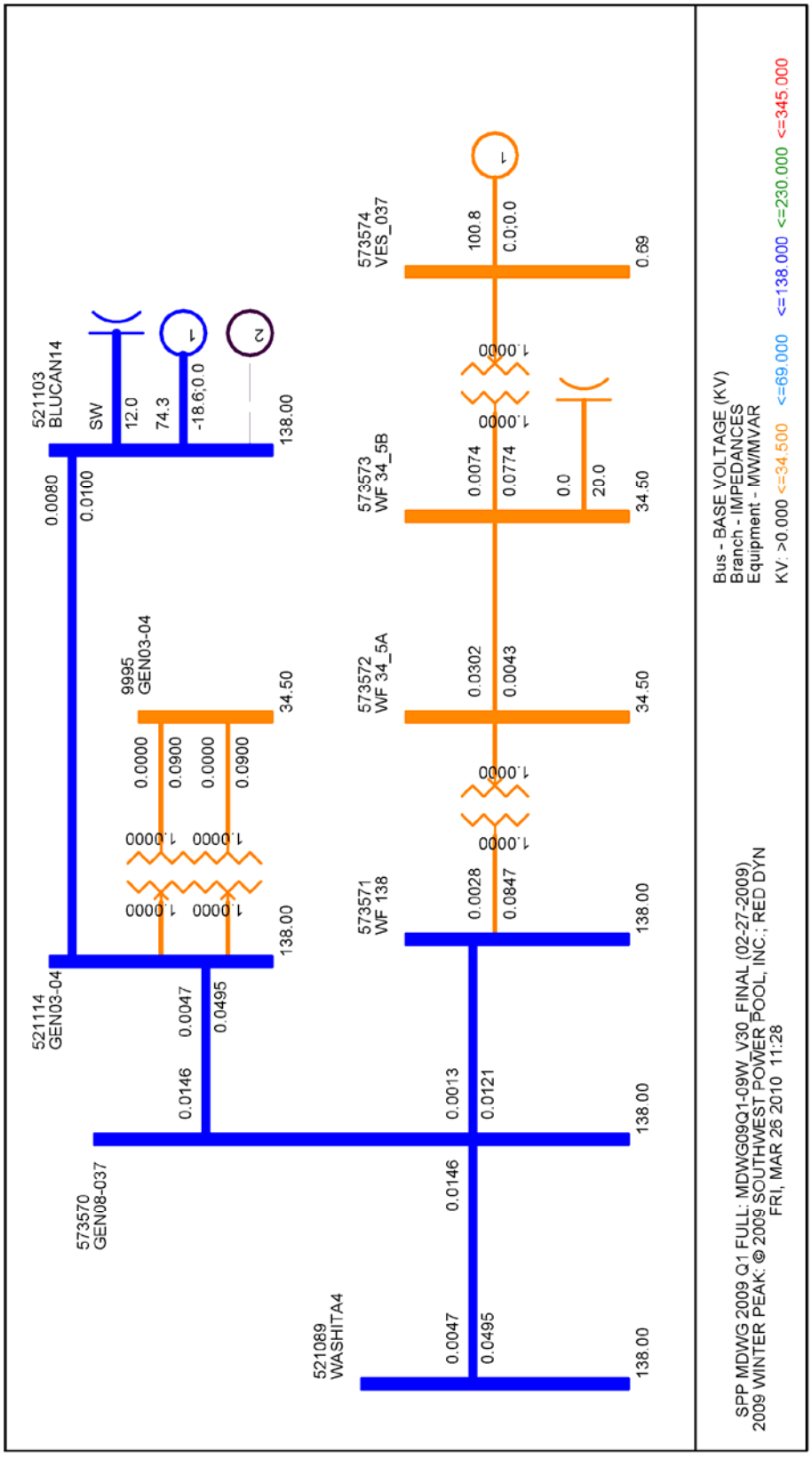
WTG Single Line Diagrams

This appendix contains single line diagrams for each of the Group 7 projects, showing the modeling details and impedance data of the transformers and collector systems.

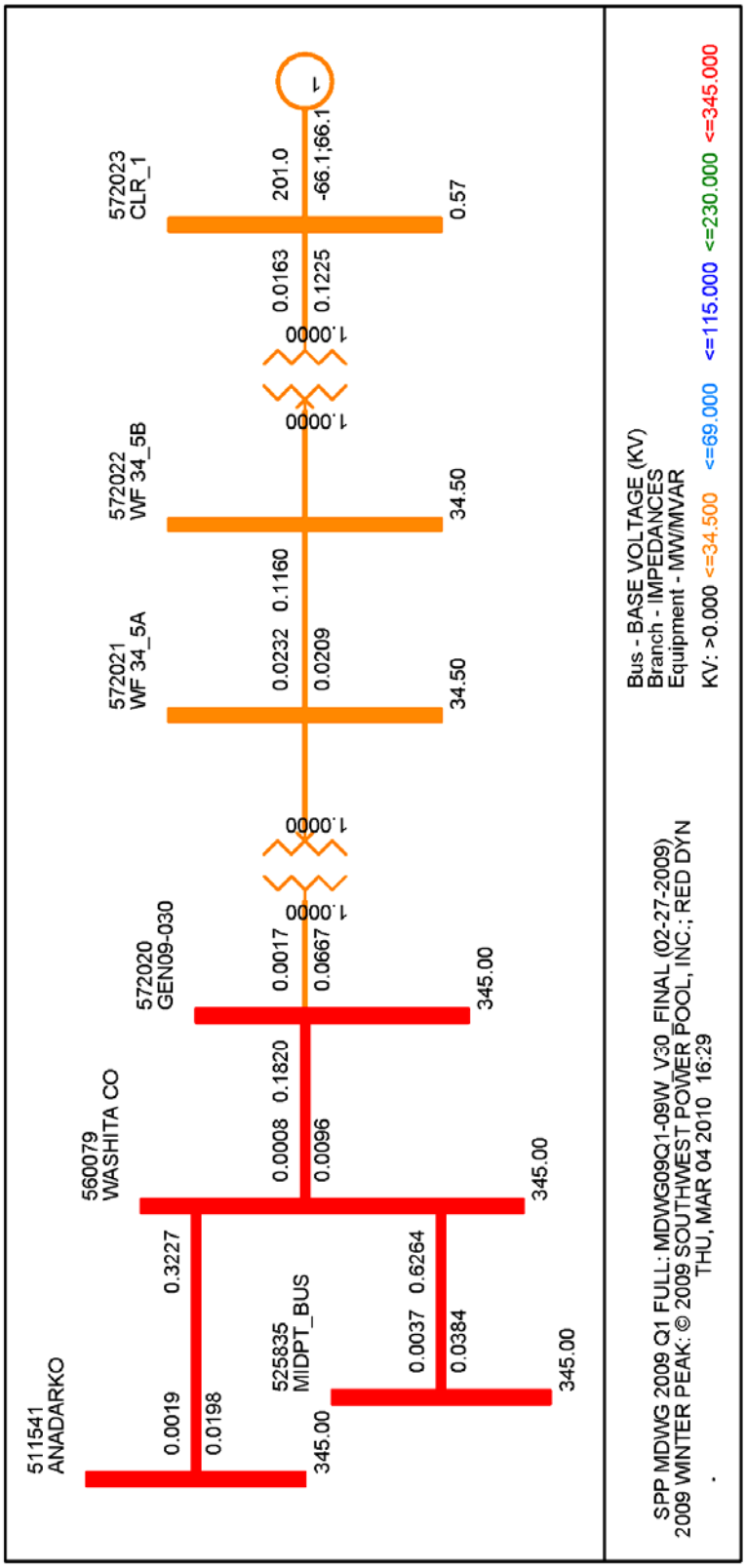
A.1 GEN-2007-049



A.2 GEN-2008-037



A.3 GEN-2009-030



Appendix

B

WTG Stability Models

This appendix shows the model data used to represent the wind turbines in the simulations.

B.1 GEN-2007-049 – Vestas V90 1.8 MW

```
PLANT MODELS
 REPORT FOR ALL MODELS                      BUS 1042 [CARTERJ2G1  0.6900] MODELS

      ** VWCORE ** at bus 1042 machine 1

      Uses CONs 38738-38757   ICON 841-842   STATEs 16325-16327   VARs 4756-4778
CONEC MODELS
 REPORT FOR ALL MODELS                      BUS 1042 [CARTERJ2G1  0.6900] MODELS
      ** VWVARS ** at bus 1042 machine 1

      Uses ICONs 15369-15370   VARs 28686-28703

      ** VWLVRT ** at bus 1042 machine 1

      Uses CONs 132889-132909   ICONs 15371-15373   VARs 28704-28713

      ** VWPWRC ** at bus 1042 machine 1

      Uses CONs 132910-132930   ICONs 15374-15376   STATEs 45592-45593   VARs 28714-28718

      ** VWMECH ** at bus 1042 machine 1

      Uses CONs 132931-132937   ICONs 15377-15378   STATEs 45594-45596

      ** VWMEAS ** at bus 1042 machine 1

      Uses CONs 132938-132940   ICONs 15379-15380   STATEs 45597-45599


CONET MODELS
 REPORT FOR ALL MODELS                      BUS 1042 [CARTERJ2G1  0.6900] MODELS

      ** VWVPRT **   Uses CONs 142867-142886   ICONs 25542-25548   VARs 32980-32990

      Vestas voltage relay monitoring bus 1042

      ** VWFPRT **   Uses CONs 142887-142890   ICONs 25549-25551   VAR 32991

      Vestas frequency relay monitoring bus 1042
```

B.2 GEN-2008-037 – Vestas V90 1.8 MW

```
PLANT MODELS

 REPORT FOR ALL MODELS                    BUS 573574 [VES_037     0.6900] MODELS

      ** VWCORE ** at bus 573574 machine 1

      Uses CONs 44073-44092   ICON 1510-1511   STATEs 17553-17555   VARs 10174-10196

CONEC MODELS

 REPORT FOR ALL MODELS                    BUS 573574 [VES_037     0.6900] MODELS

      ** VWVARS ** at bus 573574 machine 1

      Uses ICONs 15539-15540   VARs 29188-29205

      ** VWLVRT ** at bus 573574 machine 1

      Uses CONs 133906-133926   ICONs 15541-15543   VARs 29206-29215

      ** VWPWRC ** at bus 573574 machine 1

      Uses CONs 133927-133947   ICONs 15544-15546   STATEs 45692-45693   VARs 29216-29220

      ** VWMECH ** at bus 573574 machine 1

      Uses CONs 133948-133954   ICONs 15547-15548   STATEs 45694-45696

      ** VWMEAS ** at bus 573574 machine 1

      Uses CONs 133955-133957   ICONs 15549-15550   STATEs 45697-45699

CONET MODELS

 REPORT FOR ALL MODELS                    BUS 573574 [VES_037     0.6900] MODELS

      ** VWVPRT **   Uses CONs 142959-142978   ICONs 25628-25634   VARs 33015-33025

      Vestas voltage relay monitoring bus 573574

      ** VWFPRT **   Uses CONs 142979-142982   ICONs 25635-25637   VAR 33026

      Vestas frequency relay monitoring bus 573574
```

B.3 GEN-2009-030 – GE 1.5 MW

```
PLANT MODELS

 REPORT FOR ALL MODELS                    BUS 572023 [CLR_1       0.5750] MODELS


 ** GEDFA **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S        VAR         ICON
            572023 CLR_1        0.5750 1   44093-44105   17556-17560   10197-10218    1512

     XEQ        LA        LM        R1        L1        H         DAMP
   0.8000    0.1714    2.9040    0.0050    0.1563    0.5580    0.0000

      -SLIP        TIpcmd      TEqcmd
       0.2000      0.0200      0.0200

      Kpll        PLLMX      PLLMN
      30.0000      0.1000     -0.1000


 ** GECNA for GEDFA **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S        VAR
ICON
                       572023 CLR_1        0.5750 1   91774-91799   35170-35179   15925-15934
5051-5054

     TFV      KPV      KIV       RC        XC        TFP         KPP
   0.1500   18.0000    5.0000    0.0000    0.0000    0.0500    2.7000

     KIP       PMX      PMN        QMX        QMN      IPMAX     TRV
   0.5400    1.0100    0.0900    0.2960   -0.4360    1.1100    0.0500

     RPMX      RPMN    T_POWER
   0.4000   -0.4000    5.0000

     KQi     VMINCL    VMAXCL    KVi    XIQmin    XIQmax
   0.0000    0.9000    1.1000   40.0000 -0.5000    0.4000

     Tv       Tp          Fn
   0.0500    0.0500    1.0000


CONEC MODELS

 REPORT FOR ALL MODELS                    BUS 572023 [CLR_1       0.5750] MODELS
                *** CALL WGUSTA( 15551,133958,     0, 29221) ***
```

```
 ** WGUSTA ** BUS X-- NAME --X BASEKV MC    C O N S       V A R S        ICONS
          572023 CLR_1        0.5750 1  133958-133964  29221-29223   15551-15552

    VWB     T1G      TG    MAXG     T1R     T2R    MAXR
 12.0009999.000   5.000  30.0009999.0009999.000  30.000

              Wind generator Bus # 572023
              Wind Generator ID        1


 ** W2MSFA for a machine **  BUS X-- NAME --X BASEKV MC    C O N S          STATE         VAR
ICON
                       572023 CLR_1        0.5750 1  133965-133969   45700-45701   29224-29226
15553-15555

          D12       K12         Ta1            p         Rq
      1.3500       1.0000       7.7840       3.0000      72.0000


              Wind Generator Bus # 572023
              Wind Generator ID        1


 ** GEAERA for GEDFA **      BUS X-- NAME --X BASEKV MC    C O N S        STATE         VAR
ICON
                       572023 CLR_1        0.5750 1  133970-133981   45702-45702   29227-29230
15556-15558

     VWinit      Lambda_Max      Lambda_Min    PITCH_MAX    PITCH_MIN      Ta
      11.9999       20.0000       0.0000       27.0000      -4.0000       0.0000

       RHO       Radius          GB_RATIO     SYNCHR       Power_Rate      MBASE1
       1.2250       35.2500      72.0000       1200.0       1500.0       1.6670


              Wind Generator Bus # 572023
              Wind Generator ID        1


 ** GEPCHA for GEDFA **  BUS X-- NAME --X BASEKV MC    C O N S         STATE         VAR
ICON
                       572023 CLR_1        0.5750 1  133982-133991   45703-45705   29231-29233
15559-15561

        Tp             Kpp        Kip            Kpc           Kic
       0.3000     150.0000      25.0000       3.0000      30.0000
```

```
         TetaMin   TetaMax   RTetaMin   RTetaMax    PMX
         -4.0000   27.0000  -10.0000   10.0000    0.9100

CONET MODELS
 REPORT FOR ALL MODELS                    BUS 572023 [CLR_1       0.5750] MODELS

               *** CALL VTGTPA( 25638,142983,     0, 33027) ***

                 BUS    NAME  BSKV        GENR BUS    NAME  BSKV    ID
               572023 CLR_1   .575          572023 CLR_1   .575     1

                    I C O N S      C O N S       V A R
                   25638-25643  142983-142986   33027

                      VLO       VUP      PICKUP     TB
                      0.150     5.000     0.625     0.080


               *** CALL VTGTPA( 25644,142987,     0, 33028) ***

                 BUS    NAME  BSKV        GENR BUS    NAME  BSKV    ID
               572023 CLR_1   .575          572023 CLR_1   .575     1

                    I C O N S      C O N S       V A R
                   25644-25649  142987-142990   33028

                      VLO       VUP      PICKUP     TB
                      0.700     5.000     0.625     0.080


               *** CALL VTGTPA( 25650,142991,     0, 33029) ***

                 BUS    NAME  BSKV        GENR BUS    NAME  BSKV    ID
               572023 CLR_1   .575          572023 CLR_1   .575     1

                    I C O N S      C O N S       V A R
                   25650-25655  142991-142994   33029

                      VLO       VUP      PICKUP     TB
                      0.750     5.000     1.000     0.080


               *** CALL VTGTPA( 25656,142995,     0, 33030) ***

                 BUS    NAME  BSKV        GENR BUS    NAME  BSKV    ID
```

```
572023 CLR_1   .575          572023 CLR_1   .575    1

      I C O N S      C O N S       V A R
     25656-25661  142995-142998   33030

        VLO       VUP      PICKUP     TB
        0.850     5.000    10.000     0.080


  *** CALL VTGTPA( 25662,142999,     0, 33031) ***

   BUS   NAME  BSKV        GENR BUS   NAME  BSKV   ID
572023 CLR_1   .575          572023 CLR_1   .575    1

      I C O N S      C O N S       V A R
     25662-25667  142999-143002   33031

        VLO       VUP      PICKUP     TB
        0.000     1.100     1.000     0.080


  *** CALL VTGTPA( 25668,143003,     0, 33032) ***

   BUS   NAME  BSKV        GENR BUS   NAME  BSKV   ID
572023 CLR_1   .575          572023 CLR_1   .575    1

      I C O N S      C O N S       V A R
     25668-25673  143003-143006   33032

        VLO       VUP      PICKUP     TB
        0.000     1.150     0.100     0.080


  *** CALL VTGTPA( 25674,143007,     0, 33033) ***

   BUS   NAME  BSKV        GENR BUS   NAME  BSKV   ID
572023 CLR_1   .575          572023 CLR_1   .575    1

      I C O N S      C O N S       V A R
     25674-25679  143007-143010   33033

        VLO       VUP      PICKUP     TB
        0.000     1.300     0.020     0.080


  *** CALL FRQTPA( 25680,143011,     0, 33034) ***
```

```
   BUS    NAME    BSKV      GEN BUS   NAME   BSKV   ID
572023  CLR_1     .575      572023  CLR_1     .575    1

      I C O N S      C O N S       V A R
     25680-25685  143011-143014   33034

        FLO       FUP      PICKUP     TB
       56.500    66.000     0.020     0.080


  *** CALL FRQTPA( 25686,143015,     0, 33035) ***

   BUS    NAME    BSKV      GEN BUS   NAME   BSKV   ID
572023  CLR_1     .575      572023  CLR_1     .575    1

      I C O N S      C O N S       V A R
     25686-25691  143015-143018   33035

        FLO       FUP      PICKUP     TB
       57.500    66.000    10.000     0.080


  *** CALL FRQTPA( 25692,143019,     0, 33036) ***

   BUS    NAME    BSKV      GEN BUS   NAME   BSKV   ID
572023  CLR_1     .575      572023  CLR_1     .575    1

      I C O N S      C O N S       V A R
     25692-25697  143019-143022   33036

        FLO       FUP      PICKUP     TB
       54.000    61.500    30.000     0.080


  *** CALL FRQTPA( 25698,143023,     0, 33037) ***

   BUS    NAME    BSKV      GEN BUS   NAME   BSKV   ID
572023  CLR_1     .575      572023  CLR_1     .575    1

      I C O N S      C O N S       V A R
     25698-25703  143023-143026   33037

        FLO       FUP      PICKUP     TB
       54.000    62.500     0.020     0.080
```

Appendix

C

Steady State Results

This Appendix shows the voltage analysis results. The voltages at each POI were monitored for any deviations from the base case voltage and the percentages of the deviation were documented.

C.1 Summer Peak Voltage Analysis Results

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
Base Case					
210431	GEN07-043	345.0	-	1.0071	-
511463	HOB-JCT4	138.0	-	1.0200	-
511506	WTH WF 4	138.0	-	0.9906	-
511511	FALCNRD4	138.0	-	1.0138	-
520814	ANADARK4	138.0	-	1.0149	-
520846	CARTERJ2	69.0	-	1.0128	-
521089	WASHITA4	138.0	-	1.0202	-
560012	BECKH	230.0	-	1.0094	-
560079	WASHITA CO	345.0	-	1.0209	-
560916	G03-005T	138.0	-	1.0159	-
560939	07-032	138.0	-	1.0087	-
FLT 01					
210431	GEN07-043	345.0	0.9923	1.0071	-1.47%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9870	0.9906	-0.36%
511511	FALCNRD4	138.0	1.0135	1.0138	-0.03%
520814	ANADARK4	138.0	1.0163	1.0149	0.14%
520846	CARTERJ2	69.0	1.0132	1.0128	0.04%
521089	WASHITA4	138.0	1.0206	1.0202	0.04%
560012	BECKH	230.0	1.0105	1.0094	0.11%
560079	WASHITA CO	345.0	1.0292	1.0209	0.81%
560916	G03-005T	138.0	1.0172	1.0159	0.13%
560939	07-032	138.0	1.0071	1.0087	-0.16%
FLT 03					
210431	GEN07-043	345.0	1.0077	1.0071	0.06%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9871	0.9906	-0.35%
511511	FALCNRD4	138.0	1.0127	1.0138	-0.11%
520814	ANADARK4	138.0	1.0142	1.0149	-0.07%
520846	CARTERJ2	69.0	1.0084	1.0128	-0.43%
521089	WASHITA4	138.0	1.0199	1.0202	-0.03%
560012	BECKH	230.0	1.0084	1.0094	-0.10%
560079	WASHITA CO	345.0	1.0238	1.0209	0.28%
560916	G03-005T	138.0	1.0153	1.0159	-0.06%
560939	07-032	138.0	1.0052	1.0087	-0.35%
FLT 05					
210431	GEN07-043	345.0	1.0002	1.0071	-0.69%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9868	0.9906	-0.38%
511511	FALCNRD4	138.0	1.0128	1.0138	-0.10%
520814	ANADARK4	138.0	1.0120	1.0149	-0.29%
520846	CARTERJ2	69.0	1.0121	1.0128	-0.07%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
521089	WASHITA4	138.0	1.0180	1.0202	-0.22%
560012	BECKH	230.0	1.0082	1.0094	-0.12%
560079	WASHITA CO	345.0	1.0181	1.0209	-0.27%
560916	G03-005T	138.0	1.0134	1.0159	-0.25%
560939	07-032	138.0	1.0065	1.0087	-0.22%
FLT 07					
210431	GEN07-043	345.0	1.0070	1.0071	-0.01%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9853	0.9906	-0.54%
511511	FALCNRD4	138.0	1.0117	1.0138	-0.21%
520814	ANADARK4	138.0	1.0153	1.0149	0.04%
520846	CARTERJ2	69.0	1.0095	1.0128	-0.33%
521089	WASHITA4	138.0	1.0207	1.0202	0.05%
560012	BECKH	230.0	1.0082	1.0094	-0.12%
560079	WASHITA CO	345.0	1.0203	1.0209	-0.06%
560916	G03-005T	138.0	1.0163	1.0159	0.04%
560939	07-032	138.0	1.0067	1.0087	-0.20%
FLT 09					
210431	GEN07-043	345.0	1.0070	1.0071	-0.01%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9923	0.9906	0.17%
511511	FALCNRD4	138.0	1.0149	1.0138	0.11%
520814	ANADARK4	138.0	1.0149	1.0149	0.00%
520846	CARTERJ2	69.0	1.0128	1.0128	0.00%
521089	WASHITA4	138.0	1.0204	1.0202	0.02%
560012	BECKH	230.0	1.0092	1.0094	-0.02%
560079	WASHITA CO	345.0	1.0205	1.0209	-0.04%
560916	G03-005T	138.0	1.0160	1.0159	0.01%
560939	07-032	138.0	1.0082	1.0087	-0.05%
FLT 11					
210431	GEN07-043	345.0	1.0070	1.0071	-0.01%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9858	0.9906	-0.48%
511511	FALCNRD4	138.0	1.0119	1.0138	-0.19%
520814	ANADARK4	138.0	1.0153	1.0149	0.04%
520846	CARTERJ2	69.0	1.0098	1.0128	-0.30%
521089	WASHITA4	138.0	1.0206	1.0202	0.04%
560012	BECKH	230.0	1.0083	1.0094	-0.11%
560079	WASHITA CO	345.0	1.0203	1.0209	-0.06%
560916	G03-005T	138.0	1.0163	1.0159	0.04%
560939	07-032	138.0	1.0071	1.0087	-0.16%
FLT 13					
210431	GEN07-043	345.0	1.0069	1.0071	-0.02%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9887	0.9906	-0.19%
511511	FALCNRD4	138.0	1.0101	1.0138	-0.36%
520814	ANADARK4	138.0	1.0147	1.0149	-0.02%
520846	CARTERJ2	69.0	1.0089	1.0128	-0.39%
521089	WASHITA4	138.0	1.0201	1.0202	-0.01%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560012	BECKH	230.0	1.0081	1.0094	-0.13%
560079	WASHITA CO	345.0	1.0205	1.0209	-0.04%
560916	G03-005T	138.0	1.0158	1.0159	-0.01%
560939	07-032	138.0	1.0066	1.0087	-0.21%
FLT 15					
210431	GEN07-043	345.0	1.0068	1.0071	-0.03%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9871	0.9906	-0.35%
511511	FALCNRD4	138.0	1.0097	1.0138	-0.40%
520814	ANADARK4	138.0	1.0149	1.0149	0.00%
520846	CARTERJ2	69.0	1.0069	1.0128	-0.58%
521089	WASHITA4	138.0	1.0201	1.0202	-0.01%
560012	BECKH	230.0	1.0073	1.0094	-0.21%
560079	WASHITA CO	345.0	1.0200	1.0209	-0.09%
560916	G03-005T	138.0	1.0159	1.0159	0.00%
560939	07-032	138.0	1.0050	1.0087	-0.37%
FLT 17					
210431	GEN07-043	345.0	1.0070	1.0071	-0.01%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9902	0.9906	-0.04%
511511	FALCNRD4	138.0	1.0051	1.0138	-0.86%
520814	ANADARK4	138.0	1.0150	1.0149	0.01%
520846	CARTERJ2	69.0	1.0065	1.0128	-0.62%
521089	WASHITA4	138.0	1.0203	1.0202	0.01%
560012	BECKH	230.0	1.0142	1.0094	0.48%
560079	WASHITA CO	345.0	1.0209	1.0209	0.00%
560916	G03-005T	138.0	1.0160	1.0159	0.01%
560939	07-032	138.0	1.0069	1.0087	-0.18%
FLT 19					
210431	GEN07-043	345.0	1.0082	1.0071	0.11%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9900	0.9906	-0.06%
511511	FALCNRD4	138.0	1.0135	1.0138	-0.03%
520814	ANADARK4	138.0	1.0148	1.0149	-0.01%
520846	CARTERJ2	69.0	1.0129	1.0128	0.01%
521089	WASHITA4	138.0	1.0202	1.0202	0.00%
560012	BECKH	230.0	1.0091	1.0094	-0.03%
560079	WASHITA CO	345.0	1.0211	1.0209	0.02%
560916	G03-005T	138.0	1.0157	1.0159	-0.02%
560939	07-032	138.0	1.0088	1.0087	0.01%
FLT 21					
210431	GEN07-043	345.0	1.0069	1.0071	-0.02%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9873	0.9906	-0.33%
511511	FALCNRD4	138.0	1.0099	1.0138	-0.38%
520814	ANADARK4	138.0	1.0149	1.0149	0.00%
520846	CARTERJ2	69.0	1.0073	1.0128	-0.54%
521089	WASHITA4	138.0	1.0201	1.0202	-0.01%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560012	BECKH	230.0	1.0074	1.0094	-0.20%
560079	WASHITA CO	345.0	1.0200	1.0209	-0.09%
560916	G03-005T	138.0	1.0159	1.0159	0.00%
560939	07-032	138.0	1.0053	1.0087	-0.34%
FLT 23					
210431	GEN07-043	345.0	1.0070	1.0071	-0.01%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9891	0.9906	-0.15%
511511	FALCNRD4	138.0	1.0129	1.0138	-0.09%
520814	ANADARK4	138.0	1.0151	1.0149	0.02%
520846	CARTERJ2	69.0	1.0110	1.0128	-0.18%
521089	WASHITA4	138.0	1.0202	1.0202	0.00%
560012	BECKH	230.0	1.0086	1.0094	-0.08%
560079	WASHITA CO	345.0	1.0204	1.0209	-0.05%
560916	G03-005T	138.0	1.0161	1.0159	0.02%
560939	07-032	138.0	1.0071	1.0087	-0.16%
FLT 25					
210431	GEN07-043	345.0	1.0066	1.0071	-0.05%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9886	0.9906	-0.20%
511511	FALCNRD4	138.0	1.0120	1.0138	-0.18%
520814	ANADARK4	138.0	1.0139	1.0149	-0.10%
520846	CARTERJ2	69.0	1.0036	1.0128	-0.91%
521089	WASHITA4	138.0	1.0191	1.0202	-0.11%
560012	BECKH	230.0	1.0082	1.0094	-0.12%
560079	WASHITA CO	345.0	1.0200	1.0209	-0.09%
560916	G03-005T	138.0	1.0143	1.0159	-0.16%
560939	07-032	138.0	1.0067	1.0087	-0.20%
FLT 27					
210431	GEN07-043	345.0	1.0070	1.0071	-0.01%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9901	0.9906	-0.05%
511511	FALCNRD4	138.0	1.0135	1.0138	-0.03%
520814	ANADARK4	138.0	1.0148	1.0149	-0.01%
520846	CARTERJ2	69.0	1.0114	1.0128	-0.14%
521089	WASHITA4	138.0	1.0202	1.0202	0.00%
560012	BECKH	230.0	1.0091	1.0094	-0.03%
560079	WASHITA CO	345.0	1.0207	1.0209	-0.02%
560916	G03-005T	138.0	1.0158	1.0159	-0.01%
560939	07-032	138.0	1.0082	1.0087	-0.05%
FLT 29					
210431	GEN07-043	345.0	1.0069	1.0071	-0.02%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9902	0.9906	-0.04%
511511	FALCNRD4	138.0	1.0051	1.0138	-0.86%
520814	ANADARK4	138.0	1.0149	1.0149	0.00%
520846	CARTERJ2	69.0	1.0065	1.0128	-0.62%
521089	WASHITA4	138.0	1.0203	1.0202	0.01%
560012	BECKH	230.0	1.0114	1.0094	0.20%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560079	WASHITA CO	345.0	1.0205	1.0209	-0.04%
560916	G03-005T	138.0	1.0160	1.0159	0.01%
560939	07-032	138.0	1.0069	1.0087	-0.18%
FLT 31					
210431	GEN07-043	345.0	1.0070	1.0071	-0.01%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9903	0.9906	-0.03%
511511	FALCNRD4	138.0	1.0137	1.0138	-0.01%
520814	ANADARK4	138.0	1.0148	1.0149	-0.01%
520846	CARTERJ2	69.0	1.0129	1.0128	0.01%
521089	WASHITA4	138.0	1.0202	1.0202	0.00%
560012	BECKH	230.0	1.0093	1.0094	-0.01%
560079	WASHITA CO	345.0	1.0208	1.0209	-0.01%
560916	G03-005T	138.0	1.0159	1.0159	0.00%
560939	07-032	138.0	1.0084	1.0087	-0.03%
FLT 33					
210431	GEN07-043	345.0	1.0067	1.0071	-0.04%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9876	0.9906	-0.30%
511511	FALCNRD4	138.0	1.0109	1.0138	-0.29%
520814	ANADARK4	138.0	1.0146	1.0149	-0.03%
520846	CARTERJ2	69.0	1.0088	1.0128	-0.39%
521089	WASHITA4	138.0	1.0201	1.0202	-0.01%
560012	BECKH	230.0	1.0078	1.0094	-0.16%
560079	WASHITA CO	345.0	1.0202	1.0209	-0.07%
560916	G03-005T	138.0	1.0157	1.0159	-0.02%
560939	07-032	138.0	1.0059	1.0087	-0.28%
FLT 35					
210431	GEN07-043	345.0	1.0068	1.0071	-0.03%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9904	0.9906	-0.02%
511511	FALCNRD4	138.0	1.0137	1.0138	-0.01%
520814	ANADARK4	138.0	1.0135	1.0149	-0.14%
520846	CARTERJ2	69.0	1.0125	1.0128	-0.03%
521089	WASHITA4	138.0	1.0200	1.0202	-0.02%
560012	BECKH	230.0	1.0093	1.0094	-0.01%
560079	WASHITA CO	345.0	1.0206	1.0209	-0.03%
560916	G03-005T	138.0	1.0147	1.0159	-0.12%
560939	07-032	138.0	1.0086	1.0087	-0.01%
FLT 37					
210431	GEN07-043	345.0	1.0063	1.0071	-0.08%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9899	0.9906	-0.07%
511511	FALCNRD4	138.0	1.0136	1.0138	-0.02%
520814	ANADARK4	138.0	1.0136	1.0149	-0.13%
520846	CARTERJ2	69.0	1.0125	1.0128	-0.03%
521089	WASHITA4	138.0	1.0200	1.0202	-0.02%
560012	BECKH	230.0	1.0092	1.0094	-0.02%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560079	WASHITA CO	345.0	1.0204	1.0209	-0.05%
560916	G03-005T	138.0	1.0147	1.0159	-0.12%
560939	07-032	138.0	1.0084	1.0087	-0.03%
FLT 39					
210431	GEN07-043	345.0	1.0068	1.0071	-0.03%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9904	0.9906	-0.02%
511511	FALCNRD4	138.0	1.0137	1.0138	-0.01%
520814	ANADARK4	138.0	1.0142	1.0149	-0.07%
520846	CARTERJ2	69.0	1.0124	1.0128	-0.04%
521089	WASHITA4	138.0	1.0201	1.0202	-0.01%
560012	BECKH	230.0	1.0093	1.0094	-0.01%
560079	WASHITA CO	345.0	1.0205	1.0209	-0.04%
560916	G03-005T	138.0	1.0152	1.0159	-0.07%
560939	07-032	138.0	1.0087	1.0087	0.00%
FLT 41					
210431	GEN07-043	345.0	1.0066	1.0071	-0.05%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9902	0.9906	-0.04%
511511	FALCNRD4	138.0	1.0137	1.0138	-0.01%
520814	ANADARK4	138.0	1.0153	1.0149	0.04%
520846	CARTERJ2	69.0	1.0128	1.0128	0.00%
521089	WASHITA4	138.0	1.0202	1.0202	0.00%
560012	BECKH	230.0	1.0094	1.0094	0.00%
560079	WASHITA CO	345.0	1.0208	1.0209	-0.01%
560916	G03-005T	138.0	1.0162	1.0159	0.03%
560939	07-032	138.0	1.0085	1.0087	-0.02%
FLT 43					
210431	GEN07-043	345.0	1.0048	1.0071	-0.23%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.0%
511506	WTH WF 4	138.0	0.9867	0.9906	-0.39%
511511	FALCNRD4	138.0	1.0123	1.0138	-0.15%
520814	ANADARK4	138.0	1.0038	1.0149	-1.1%
520846	CARTERJ2	69.0	1.0088	1.0128	-0.4%
521089	WASHITA4	138.0	0.9840	1.0040	-2.0%
560012	BECKH	230.0	1.0086	1.0094	-0.08%
560079	WASHITA CO	345.0	1.0186	1.0209	-0.23%
560916	G03-005T	138.0	1.0060	1.0159	-1.0%
560939	07-032	138.0	1.0032	1.0087	-0.55%
FLT 45					
210431	GEN07-043	345.0	1.0070	1.0071	-0.01%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9905	0.9906	-0.01%
511511	FALCNRD4	138.0	1.0138	1.0138	0.00%
520814	ANADARK4	138.0	1.0142	1.0149	-0.07%
520846	CARTERJ2	69.0	1.0127	1.0128	-0.01%
521089	WASHITA4	138.0	1.0206	1.0202	0.04%
560012	BECKH	230.0	1.0094	1.0094	0.00%
560079	WASHITA CO	345.0	1.0208	1.0209	-0.01%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560916	G03-005T	138.0	1.0154	1.0159	-0.05%
560939	07-032	138.0	1.0087	1.0087	0.00%
FLT 47					
210431	GEN07-043	345.0	1.0070	1.0071	-0.01%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9848	0.9906	-0.59%
511511	FALCNRD4	138.0	1.0118	1.0138	-0.20%
520814	ANADARK4	138.0	1.0152	1.0149	0.03%
520846	CARTERJ2	69.0	1.0105	1.0128	-0.23%
521089	WASHITA4	138.0	1.0212	1.0202	0.10%
560012	BECKH	230.0	1.0086	1.0094	-0.08%
560079	WASHITA CO	345.0	1.0206	1.0209	-0.03%
560916	G03-005T	138.0	1.0163	1.0159	0.04%
560939	07-032	138.0	1.0013	1.0087	-0.73%
FLT 49					
210431	GEN07-043	345.0	1.0071	1.0071	0.00%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9907	0.9906	0.01%
511511	FALCNRD4	138.0	1.0134	1.0138	-0.04%
520814	ANADARK4	138.0	1.0148	1.0149	-0.01%
520846	CARTERJ2	69.0	1.0122	1.0128	-0.06%
521089	WASHITA4	138.0	1.0202	1.0202	0.00%
560012	BECKH	230.0	1.0094	1.0094	0.00%
560079	WASHITA CO	345.0	1.0210	1.0209	0.01%
560916	G03-005T	138.0	1.0158	1.0159	-0.01%
560939	07-032	138.0	1.0087	1.0087	0.00%
FLT 51					
210431	GEN07-043	345.0	1.0070	1.0071	-0.01%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9888	0.9906	-0.18%
511511	FALCNRD4	138.0	1.0124	1.0138	-0.14%
520814	ANADARK4	138.0	1.0149	1.0149	0.00%
520846	CARTERJ2	69.0	1.0163	1.0128	0.35%
521089	WASHITA4	138.0	1.0201	1.0202	-0.01%
560012	BECKH	230.0	1.0085	1.0094	-0.09%
560079	WASHITA CO	345.0	1.0204	1.0209	-0.05%
560916	G03-005T	138.0	1.0157	1.0159	-0.02%
560939	07-032	138.0	1.0070	1.0087	-0.17%
FLT 53					
210431	GEN07-043	345.0	1.0071	1.0071	0.00%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9902	0.9906	-0.04%
511511	FALCNRD4	138.0	1.0135	1.0138	-0.03%
520814	ANADARK4	138.0	1.0149	1.0149	0.00%
520846	CARTERJ2	69.0	1.0108	1.0128	-0.20%
521089	WASHITA4	138.0	1.0202	1.0202	0.00%
560012	BECKH	230.0	1.0092	1.0094	-0.02%
560079	WASHITA CO	345.0	1.0208	1.0209	-0.01%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560916	G03-005T	138.0	1.0160	1.0159	0.01%
560939	07-032	138.0	1.0083	1.0087	-0.04%
FLT 55					
210431	GEN07-043	345.0	1.0070	1.0071	-0.01%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9902	0.9906	-0.04%
511511	FALCNRD4	138.0	1.0139	1.0138	0.01%
520814	ANADARK4	138.0	1.0147	1.0149	-0.02%
520846	CARTERJ2	69.0	1.0207	1.0128	0.78%
521089	WASHITA4	138.0	1.0202	1.0202	0.00%
560012	BECKH	230.0	1.0093	1.0094	-0.01%
560079	WASHITA CO	345.0	1.0208	1.0209	-0.01%
560916	G03-005T	138.0	1.0153	1.0159	-0.06%
560939	07-032	138.0	1.0083	1.0087	-0.04%
FLT 57					
210431	GEN07-043	345.0	1.0068	1.0071	-0.03%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9823	0.9906	-0.84%
511511	FALCNRD4	138.0	1.0108	1.0138	-0.30%
520814	ANADARK4	138.0	1.0137	1.0149	-0.12%
520846	CARTERJ2	69.0	1.0113	1.0128	-0.15%
521089	WASHITA4	138.0	1.0183	1.0202	-0.19%
560012	BECKH	230.0	1.0092	1.0094	-0.02%
560079	WASHITA CO	345.0	1.0211	1.0209	0.02%
560916	G03-005T	138.0	1.0148	1.0159	-0.11%
560939	07-032	138.0	1.0154	1.0087	0.66%
FLT 59					
210431	GEN07-043	345.0	1.0067	1.0071	-0.04%
511463	HOB-JCT4	138.0	1.0200	1.0200	0.00%
511506	WTH WF 4	138.0	0.9887	0.9906	-0.19%
511511	FALCNRD4	138.0	1.0133	1.0138	-0.05%
520814	ANADARK4	138.0	1.0143	1.0149	-0.06%
520846	CARTERJ2	69.0	1.0105	1.0128	-0.23%
521089	WASHITA4	138.0	1.0200	1.0202	-0.02%
560012	BECKH	230.0	1.0087	1.0094	-0.07%
560079	WASHITA CO	345.0	1.0123	1.0209	-0.84%
560916	G03-005T	138.0	1.0154	1.0159	-0.05%
560939	07-032	138.0	1.0069	1.0087	-0.18%

C.2 Winter Peak Voltage Analysis Results

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
Base Case					
210431	GEN07-043	345.0	-	1.0014	-
511463	HOB-JCT4	138.0	-	1.0123	-
511506	WTH WF 4	138.0	-	0.9873	-
511511	FALCNRD4	138.0	-	1.0146	-
520814	ANADARK4	138.0	-	1.0159	-
520846	CARTERJ2	69.0	-	1.0239	-
521089	WASHITA4	138.0	-	1.0200	-
560012	BECKH	230.0	-	1.0095	-
560079	WASHITA CO	345.0	-	1.0183	-
560916	G03-005T	138.0	-	1.0183	-
560939	07-032	138.0	-	1.0073	-
FLT 01					
210431	GEN07-043	345.0	0.9830	1.0014	-1.84%
511463	HOB-JCT4	138.0	1.0135	1.0123	0.12%
511506	WTH WF 4	138.0	0.9826	0.9873	-0.48%
511511	FALCNRD4	138.0	1.0143	1.0146	-0.03%
520814	ANADARK4	138.0	1.0179	1.0159	0.20%
520846	CARTERJ2	69.0	1.0244	1.0239	0.05%
521089	WASHITA4	138.0	1.0205	1.0200	0.05%
560012	BECKH	230.0	1.0108	1.0095	0.13%
560079	WASHITA CO	345.0	1.0288	1.0183	1.03%
560916	G03-005T	138.0	1.0201	1.0183	0.18%
560939	07-032	138.0	1.0055	1.0073	-0.18%
FLT 03					
210431	GEN07-043	345.0	1.0018	1.0014	0.04%
511463	HOB-JCT4	138.0	1.0077	1.0123	-0.45%
511506	WTH WF 4	138.0	0.9831	0.9873	-0.43%
511511	FALCNRD4	138.0	1.0129	1.0146	-0.17%
520814	ANADARK4	138.0	1.0149	1.0159	-0.10%
520846	CARTERJ2	69.0	1.0184	1.0239	-0.54%
521089	WASHITA4	138.0	1.0194	1.0200	-0.06%
560012	BECKH	230.0	1.0086	1.0095	-0.09%
560079	WASHITA CO	345.0	1.0230	1.0183	0.46%
560916	G03-005T	138.0	1.0174	1.0183	-0.09%
560939	07-032	138.0	1.0032	1.0073	-0.41%
FLT 05					
210431	GEN07-043	345.0	0.9938	1.0014	-0.76%
511463	HOB-JCT4	138.0	1.0129	1.0123	0.06%
511506	WTH WF 4	138.0	0.9829	0.9873	-0.45%
511511	FALCNRD4	138.0	1.0134	1.0146	-0.12%
520814	ANADARK4	138.0	1.0128	1.0159	-0.31%
520846	CARTERJ2	69.0	1.0231	1.0239	-0.08%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
521089	WASHITA4	138.0	1.0181	1.0200	-0.19%
560012	BECKH	230.0	1.0080	1.0095	-0.15%
560079	WASHITA CO	345.0	1.0153	1.0183	-0.29%
560916	G03-005T	138.0	1.0156	1.0183	-0.27%
560939	07-032	138.0	1.0050	1.0073	-0.23%
FLT 07					
210431	GEN07-043	345.0	1.0011	1.0014	-0.03%
511463	HOB-JCT4	138.0	1.0090	1.0123	-0.33%
511506	WTH WF 4	138.0	0.9791	0.9873	-0.83%
511511	FALCNRD4	138.0	1.0108	1.0146	-0.37%
520814	ANADARK4	138.0	1.0165	1.0159	0.06%
520846	CARTERJ2	69.0	1.0186	1.0239	-0.52%
521089	WASHITA4	138.0	1.0208	1.0200	0.08%
560012	BECKH	230.0	1.0075	1.0095	-0.20%
560079	WASHITA CO	345.0	1.0173	1.0183	-0.10%
560916	G03-005T	138.0	1.0188	1.0183	0.05%
560939	07-032	138.0	1.0029	1.0073	-0.44%
FLT 09					
210431	GEN07-043	345.0	1.0012	1.0014	-0.02%
511463	HOB-JCT4	138.0	1.0119	1.0123	-0.04%
511506	WTH WF 4	138.0	0.9885	0.9873	0.12%
511511	FALCNRD4	138.0	1.0162	1.0146	0.16%
520814	ANADARK4	138.0	1.0159	1.0159	0.00%
520846	CARTERJ2	69.0	1.0243	1.0239	0.04%
521089	WASHITA4	138.0	1.0202	1.0200	0.02%
560012	BECKH	230.0	1.0093	1.0095	-0.02%
560079	WASHITA CO	345.0	1.0179	1.0183	-0.04%
560916	G03-005T	138.0	1.0184	1.0183	0.01%
560939	07-032	138.0	1.0061	1.0073	-0.12%
FLT 11					
210431	GEN07-043	345.0	1.0012	1.0014	-0.02%
511463	HOB-JCT4	138.0	1.0092	1.0123	-0.31%
511506	WTH WF 4	138.0	0.9797	0.9873	-0.77%
511511	FALCNRD4	138.0	1.0111	1.0146	-0.34%
520814	ANADARK4	138.0	1.0164	1.0159	0.05%
520846	CARTERJ2	69.0	1.0189	1.0239	-0.49%
521089	WASHITA4	138.0	1.0208	1.0200	0.08%
560012	BECKH	230.0	1.0076	1.0095	-0.19%
560079	WASHITA CO	345.0	1.0174	1.0183	-0.09%
560916	G03-005T	138.0	1.0188	1.0183	0.05%
560939	07-032	138.0	1.0033	1.0073	-0.40%
FLT 13					
210431	GEN07-043	345.0	1.0011	1.0014	-0.03%
511463	HOB-JCT4	138.0	1.0098	1.0123	-0.25%
511506	WTH WF 4	138.0	0.9848	0.9873	-0.25%
511511	FALCNRD4	138.0	1.0100	1.0146	-0.45%
520814	ANADARK4	138.0	1.0157	1.0159	-0.02%
520846	CARTERJ2	69.0	1.0190	1.0239	-0.48%
521089	WASHITA4	138.0	1.0199	1.0200	-0.01%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560012	BECKH	230.0	1.0078	1.0095	-0.17%
560079	WASHITA CO	345.0	1.0178	1.0183	-0.05%
560916	G03-005T	138.0	1.0181	1.0183	-0.02%
560939	07-032	138.0	1.0046	1.0073	-0.27%
FLT 15					
210431	GEN07-043	345.0	1.0011	1.0014	-0.03%
511463	HOB-JCT4	138.0	1.0164	1.0123	0.41%
511506	WTH WF 4	138.0	0.9841	0.9873	-0.32%
511511	FALCNRD4	138.0	1.0121	1.0146	-0.25%
520814	ANADARK4	138.0	1.0159	1.0159	0.00%
520846	CARTERJ2	69.0	1.0199	1.0239	-0.39%
521089	WASHITA4	138.0	1.0199	1.0200	-0.01%
560012	BECKH	230.0	1.0077	1.0095	-0.18%
560079	WASHITA CO	345.0	1.0174	1.0183	-0.09%
560916	G03-005T	138.0	1.0184	1.0183	0.01%
560939	07-032	138.0	1.0042	1.0073	-0.31%
FLT 17					
210431	GEN07-043	345.0	1.0014	1.0014	0.00%
511463	HOB-JCT4	138.0	1.0096	1.0123	-0.27%
511506	WTH WF 4	138.0	0.9858	0.9873	-0.15%
511511	FALCNRD4	138.0	1.0059	1.0146	-0.86%
520814	ANADARK4	138.0	1.0159	1.0159	0.00%
520846	CARTERJ2	69.0	1.0168	1.0239	-0.69%
521089	WASHITA4	138.0	1.0200	1.0200	0.00%
560012	BECKH	230.0	1.0148	1.0095	0.53%
560079	WASHITA CO	345.0	1.0188	1.0183	0.05%
560916	G03-005T	138.0	1.0183	1.0183	0.00%
560939	07-032	138.0	1.0047	1.0073	-0.26%
FLT 19					
210431	GEN07-043	345.0	1.0013	1.0014	-0.01%
511463	HOB-JCT4	138.0	1.0122	1.0123	-0.01%
511506	WTH WF 4	138.0	0.9868	0.9873	-0.05%
511511	FALCNRD4	138.0	1.0143	1.0146	-0.03%
520814	ANADARK4	138.0	1.0167	1.0159	0.08%
520846	CARTERJ2	69.0	1.0240	1.0239	0.01%
521089	WASHITA4	138.0	1.0203	1.0200	0.03%
560012	BECKH	230.0	1.0090	1.0095	-0.05%
560079	WASHITA CO	345.0	1.0174	1.0183	-0.09%
560916	G03-005T	138.0	1.0190	1.0183	0.07%
560939	07-032	138.0	1.0075	1.0073	0.02%
FLT 21					
210431	GEN07-043	345.0	1.0011	1.0014	-0.03%
511463	HOB-JCT4	138.0	1.0156	1.0123	0.33%
511506	WTH WF 4	138.0	0.9843	0.9873	-0.30%
511511	FALCNRD4	138.0	1.0125	1.0146	-0.21%
520814	ANADARK4	138.0	1.0159	1.0159	0.00%
520846	CARTERJ2	69.0	1.0203	1.0239	-0.35%
521089	WASHITA4	138.0	1.0199	1.0200	-0.01%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560012	BECKH	230.0	1.0079	1.0095	-0.16%
560079	WASHITA CO	345.0	1.0174	1.0183	-0.09%
560916	G03-005T	138.0	1.0184	1.0183	0.01%
560939	07-032	138.0	1.0045	1.0073	-0.28%
FLT 23					
210431	GEN07-043	345.0	1.0010	1.0014	-0.04%
511463	HOB-JCT4	138.0	1.0040	1.0123	-0.82%
511506	WTH WF 4	138.0	0.9843	0.9873	-0.30%
511511	FALCNRD4	138.0	1.0113	1.0146	-0.33%
520814	ANADARK4	138.0	1.0160	1.0159	0.01%
520846	CARTERJ2	69.0	1.0188	1.0239	-0.50%
521089	WASHITA4	138.0	1.0199	1.0200	-0.01%
560012	BECKH	230.0	1.0076	1.0095	-0.19%
560079	WASHITA CO	345.0	1.0173	1.0183	-0.10%
560916	G03-005T	138.0	1.0184	1.0183	0.01%
560939	07-032	138.0	1.0041	1.0073	-0.32%
FLT 25					
210431	GEN07-043	345.0	1.0012	1.0014	-0.02%
511463	HOB-JCT4	138.0	1.0196	1.0123	0.72%
511506	WTH WF 4	138.0	0.9859	0.9873	-0.14%
511511	FALCNRD4	138.0	1.0144	1.0146	-0.02%
520814	ANADARK4	138.0	1.0155	1.0159	-0.04%
520846	CARTERJ2	69.0	1.0187	1.0239	-0.51%
521089	WASHITA4	138.0	1.0199	1.0200	-0.01%
560012	BECKH	230.0	1.0088	1.0095	-0.07%
560079	WASHITA CO	345.0	1.0178	1.0183	-0.05%
560916	G03-005T	138.0	1.0176	1.0183	-0.07%
560939	07-032	138.0	1.0063	1.0073	-0.10%
FLT 27					
210431	GEN07-043	345.0	1.0013	1.0014	-0.01%
511463	HOB-JCT4	138.0	1.0114	1.0123	-0.09%
511506	WTH WF 4	138.0	0.9868	0.9873	-0.05%
511511	FALCNRD4	138.0	1.0142	1.0146	-0.04%
520814	ANADARK4	138.0	1.0158	1.0159	-0.01%
520846	CARTERJ2	69.0	1.0229	1.0239	-0.10%
521089	WASHITA4	138.0	1.0200	1.0200	0.00%
560012	BECKH	230.0	1.0092	1.0095	-0.03%
560079	WASHITA CO	345.0	1.0181	1.0183	-0.02%
560916	G03-005T	138.0	1.0182	1.0183	-0.01%
560939	07-032	138.0	1.0069	1.0073	-0.04%
FLT 29					
210431	GEN07-043	345.0	1.0013	1.0014	-0.01%
511463	HOB-JCT4	138.0	1.0096	1.0123	-0.27%
511506	WTH WF 4	138.0	0.9858	0.9873	-0.15%
511511	FALCNRD4	138.0	1.0058	1.0146	-0.87%
520814	ANADARK4	138.0	1.0159	1.0159	0.00%
520846	CARTERJ2	69.0	1.0168	1.0239	-0.69%
521089	WASHITA4	138.0	1.0200	1.0200	0.00%
560012	BECKH	230.0	1.0117	1.0095	0.22%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560079	WASHITA CO	345.0	1.0182	1.0183	-0.01%
560916	G03-005T	138.0	1.0183	1.0183	0.00%
560939	07-032	138.0	1.0047	1.0073	-0.26%
FLT 31					
210431	GEN07-043	345.0	1.0013	1.0014	-0.01%
511463	HOB-JCT4	138.0	1.0135	1.0123	0.12%
511506	WTH WF 4	138.0	0.9870	0.9873	-0.03%
511511	FALCNRD4	138.0	1.0147	1.0146	0.01%
520814	ANADARK4	138.0	1.0158	1.0159	-0.01%
520846	CARTERJ2	69.0	1.0244	1.0239	0.05%
521089	WASHITA4	138.0	1.0200	1.0200	0.00%
560012	BECKH	230.0	1.0093	1.0095	-0.02%
560079	WASHITA CO	345.0	1.0181	1.0183	-0.02%
560916	G03-005T	138.0	1.0183	1.0183	0.00%
560939	07-032	138.0	1.0071	1.0073	-0.02%
FLT 33					
210431	GEN07-043	345.0	1.0008	1.0014	-0.06%
511463	HOB-JCT4	138.0	1.0088	1.0123	-0.35%
511506	WTH WF 4	138.0	0.9829	0.9873	-0.45%
511511	FALCNRD4	138.0	1.0103	1.0146	-0.42%
520814	ANADARK4	138.0	1.0155	1.0159	-0.04%
520846	CARTERJ2	69.0	1.0180	1.0239	-0.58%
521089	WASHITA4	138.0	1.0198	1.0200	-0.02%
560012	BECKH	230.0	1.0070	1.0095	-0.25%
560079	WASHITA CO	345.0	1.0173	1.0183	-0.10%
560916	G03-005T	138.0	1.0179	1.0183	-0.04%
560939	07-032	138.0	1.0033	1.0073	-0.40%
FLT 35					
210431	GEN07-043	345.0	1.0011	1.0014	-0.03%
511463	HOB-JCT4	138.0	1.0122	1.0123	-0.01%
511506	WTH WF 4	138.0	0.9871	0.9873	-0.02%
511511	FALCNRD4	138.0	1.0145	1.0146	-0.01%
520814	ANADARK4	138.0	1.0146	1.0159	-0.13%
520846	CARTERJ2	69.0	1.0236	1.0239	-0.03%
521089	WASHITA4	138.0	1.0198	1.0200	-0.02%
560012	BECKH	230.0	1.0093	1.0095	-0.02%
560079	WASHITA CO	345.0	1.0180	1.0183	-0.03%
560916	G03-005T	138.0	1.0172	1.0183	-0.11%
560939	07-032	138.0	1.0073	1.0073	0.00%
FLT 37					
210431	GEN07-043	345.0	1.0007	1.0014	-0.07%
511463	HOB-JCT4	138.0	1.0122	1.0123	-0.01%
511506	WTH WF 4	138.0	0.9866	0.9873	-0.07%
511511	FALCNRD4	138.0	1.0144	1.0146	-0.02%
520814	ANADARK4	138.0	1.0148	1.0159	-0.11%
520846	CARTERJ2	69.0	1.0236	1.0239	-0.03%
521089	WASHITA4	138.0	1.0198	1.0200	-0.02%
560012	BECKH	230.0	1.0092	1.0095	-0.03%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560079	WASHITA CO	345.0	1.0178	1.0183	-0.05%
560916	G03-005T	138.0	1.0173	1.0183	-0.10%
560939	07-032	138.0	1.0071	1.0073	-0.02%
FLT 39					
210431	GEN07-043	345.0	1.0011	1.0014	-0.03%
511463	HOB-JCT4	138.0	1.0119	1.0123	-0.04%
511506	WTH WF 4	138.0	0.9871	0.9873	-0.02%
511511	FALCNRD4	138.0	1.0145	1.0146	-0.01%
520814	ANADARK4	138.0	1.0153	1.0159	-0.06%
520846	CARTERJ2	69.0	1.0236	1.0239	-0.03%
521089	WASHITA4	138.0	1.0200	1.0200	0.00%
560012	BECKH	230.0	1.0093	1.0095	-0.02%
560079	WASHITA CO	345.0	1.0180	1.0183	-0.03%
560916	G03-005T	138.0	1.0178	1.0183	-0.05%
560939	07-032	138.0	1.0074	1.0073	0.01%
FLT 41					
210431	GEN07-043	345.0	1.0009	1.0014	-0.05%
511463	HOB-JCT4	138.0	1.0122	1.0123	-0.01%
511506	WTH WF 4	138.0	0.9869	0.9873	-0.04%
511511	FALCNRD4	138.0	1.0145	1.0146	-0.01%
520814	ANADARK4	138.0	1.0160	1.0159	0.01%
520846	CARTERJ2	69.0	1.0239	1.0239	0.00%
521089	WASHITA4	138.0	1.0200	1.0200	0.00%
560012	BECKH	230.0	1.0094	1.0095	-0.01%
560079	WASHITA CO	345.0	1.0182	1.0183	-0.01%
560916	G03-005T	138.0	1.0184	1.0183	0.01%
560939	07-032	138.0	1.0072	1.0073	-0.01%
FLT 43					
210431	GEN07-043	345.0	0.9985	1.0014	-0.29%
511463	HOB-JCT4	138.0	1.0095	1.0123	-0.28%
511506	WTH WF 4	138.0	0.9827	0.9873	-0.46%
511511	FALCNRD4	138.0	1.0124	1.0146	-0.22%
520814	ANADARK4	138.0	1.0026	1.0159	-1.33%
520846	CARTERJ2	69.0	1.0190	1.0239	-0.49%
521089	WASHITA4	138.0	0.9800	1.0030	-2.3%
560012	BECKH	230.0	1.0083	1.0095	-0.12%
560079	WASHITA CO	345.0	1.0154	1.0183	-0.29%
560916	G03-005T	138.0	1.0065	1.0183	-1.18%
560939	07-032	138.0	1.0012	1.0073	-0.61%
FLT 45					
210431	GEN07-043	345.0	1.0012	1.0014	-0.02%
511463	HOB-JCT4	138.0	1.0122	1.0123	-0.01%
511506	WTH WF 4	138.0	0.9872	0.9873	-0.01%
511511	FALCNRD4	138.0	1.0146	1.0146	0.00%
520814	ANADARK4	138.0	1.0153	1.0159	-0.06%
520846	CARTERJ2	69.0	1.0238	1.0239	-0.01%
521089	WASHITA4	138.0	1.0203	1.0200	0.03%
560012	BECKH	230.0	1.0094	1.0095	-0.01%
560079	WASHITA CO	345.0	1.0181	1.0183	-0.02%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560916	G03-005T	138.0	1.0179	1.0183	-0.04%
560939	07-032	138.0	1.0074	1.0073	0.01%
FLT 47					
210431	GEN07-043	345.0	1.0012	1.0014	-0.02%
511463	HOB-JCT4	138.0	1.0103	1.0123	-0.20%
511506	WTH WF 4	138.0	0.9825	0.9873	-0.49%
511511	FALCNRD4	138.0	1.0125	1.0146	-0.21%
520814	ANADARK4	138.0	1.0163	1.0159	0.04%
520846	CARTERJ2	69.0	1.0208	1.0239	-0.30%
521089	WASHITA4	138.0	1.0207	1.0200	0.07%
560012	BECKH	230.0	1.0083	1.0095	-0.12%
560079	WASHITA CO	345.0	1.0177	1.0183	-0.06%
560916	G03-005T	138.0	1.0187	1.0183	0.04%
560939	07-032	138.0	1.0050	1.0073	-0.23%
FLT 49					
210431	GEN07-043	345.0	1.0014	1.0014	0.00%
511463	HOB-JCT4	138.0	1.0123	1.0123	0.00%
511506	WTH WF 4	138.0	0.9873	0.9873	0.00%
511511	FALCNRD4	138.0	1.0137	1.0146	-0.09%
520814	ANADARK4	138.0	1.0159	1.0159	0.00%
520846	CARTERJ2	69.0	1.0467	1.0239	2.23%
521089	WASHITA4	138.0	1.0200	1.0200	0.00%
560012	BECKH	230.0	1.0094	1.0095	-0.01%
560079	WASHITA CO	345.0	1.0183	1.0183	0.00%
560916	G03-005T	138.0	1.0184	1.0183	0.01%
560939	07-032	138.0	1.0072	1.0073	-0.01%
FLT 51					
210431	GEN07-043	345.0	1.0012	1.0014	-0.02%
511463	HOB-JCT4	138.0	1.0097	1.0123	-0.26%
511506	WTH WF 4	138.0	0.9849	0.9873	-0.24%
511511	FALCNRD4	138.0	1.0117	1.0146	-0.29%
520814	ANADARK4	138.0	1.0160	1.0159	0.01%
520846	CARTERJ2	69.0	1.0180	1.0239	-0.58%
521089	WASHITA4	138.0	1.0200	1.0200	0.00%
560012	BECKH	230.0	1.0081	1.0095	-0.14%
560079	WASHITA CO	345.0	1.0177	1.0183	-0.06%
560916	G03-005T	138.0	1.0183	1.0183	0.00%
560939	07-032	138.0	1.0049	1.0073	-0.24%
FLT 53					
210431	GEN07-043	345.0	1.0013	1.0014	-0.01%
511463	HOB-JCT4	138.0	1.0116	1.0123	-0.07%
511506	WTH WF 4	138.0	0.9867	0.9873	-0.06%
511511	FALCNRD4	138.0	1.0138	1.0146	-0.08%
520814	ANADARK4	138.0	1.0159	1.0159	0.00%
520846	CARTERJ2	69.0	1.0192	1.0239	-0.46%
521089	WASHITA4	138.0	1.0201	1.0200	0.01%
560012	BECKH	230.0	1.0091	1.0095	-0.04%
560079	WASHITA CO	345.0	1.0181	1.0183	-0.02%

Bus #	Bus Name	Base kV	Contingency Voltage	Base Voltage	% Deviation
560916	G03-005T	138.0	1.0183	1.0183	0.00%
560939	07-032	138.0	1.0067	1.0073	-0.06%
FLT 55					
210431	GEN07-043	345.0	1.0013	1.0014	-0.01%
511463	HOB-JCT4	138.0	1.0110	1.0123	-0.13%
511506	WTH WF 4	138.0	0.9867	0.9873	-0.06%
511511	FALCNRD4	138.0	1.0143	1.0146	-0.03%
520814	ANADARK4	138.0	1.0158	1.0159	-0.01%
520846	CARTERJ2	69.0	1.0286	1.0239	0.46%
521089	WASHITA4	138.0	1.0200	1.0200	0.00%
560012	BECKH	230.0	1.0092	1.0095	-0.03%
560079	WASHITA CO	345.0	1.0181	1.0183	-0.02%
560916	G03-005T	138.0	1.0180	1.0183	-0.03%
560939	07-032	138.0	1.0068	1.0073	-0.05%
FLT 57					
210431	GEN07-043	345.0	1.0012	1.0014	-0.02%
511463	HOB-JCT4	138.0	1.0122	1.0123	-0.01%
511506	WTH WF 4	138.0	0.9776	0.9873	-0.98%
511511	FALCNRD4	138.0	1.0113	1.0146	-0.33%
520814	ANADARK4	138.0	1.0153	1.0159	-0.06%
520846	CARTERJ2	69.0	1.0221	1.0239	-0.18%
521089	WASHITA4	138.0	1.0193	1.0200	-0.07%
560012	BECKH	230.0	1.0093	1.0095	-0.02%
560079	WASHITA CO	345.0	1.0186	1.0183	0.03%
560916	G03-005T	138.0	1.0178	1.0183	-0.05%
560939	07-032	138.0	1.0194	1.0073	1.20%
FLT 59					
210431	GEN07-043	345.0	1.0010	1.0014	-0.04%
511463	HOB-JCT4	138.0	1.0099	1.0123	-0.24%
511506	WTH WF 4	138.0	0.9850	0.9873	-0.23%
511511	FALCNRD4	138.0	1.0138	1.0146	-0.08%
520814	ANADARK4	138.0	1.0152	1.0159	-0.07%
520846	CARTERJ2	69.0	1.0211	1.0239	-0.27%
521089	WASHITA4	138.0	1.0197	1.0200	-0.03%
560012	BECKH	230.0	1.0090	1.0095	-0.05%
560079	WASHITA CO	345.0	1.0092	1.0183	-0.89%
560916	G03-005T	138.0	1.0177	1.0183	-0.06%
560939	07-032	138.0	1.0051	1.0073	-0.22%

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Appendix

D

QV Tables – Power Factor Analysis

This appendix shows tables presenting the injected Mvar for each voltage level in base case and contingencies for both summer peak and winter peak scenarios.

D.1 GEN-2007-049 – POI Carter Junction 69 kV

D.1.1 Summer Peak

			CONTINGENCY: BASE CASE		Plant (MVAR)			
VOLTAGE SETPOINT->			1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846	CARTERJ2	69	0.016	-4.217	-8.351	-12.379	-16.297	-20.106	-23.804

			CONTINGENCY: FLT 01		Plant (MVAR)			
VOLTAGE SETPOINT->			1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846	CARTERJ2	69	-0.170	-4.402	-8.531	-12.550	-16.460	-20.256	-23.936

			CONTINGENCY: FLT 03		Plant (MVAR)			
VOLTAGE SETPOINT->			1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846	CARTERJ2	69	1.903	-2.347	-6.492	-10.521	-14.445	-18.246	-21.940

			CONTINGENCY: FLT 05		Plant (MVAR)			
VOLTAGE SETPOINT->			1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846	CARTERJ2	69	0.284	-3.947	-8.070	-12.083	-15.986	-19.770	-23.450

			CONTINGENCY: FLT 07		Plant (MVAR)			
VOLTAGE SETPOINT->			1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846	CARTERJ2	69	1.394	-2.842	-6.967	-10.986	-14.881	-18.673	-22.361

			CONTINGENCY: FLT 09		Plant (MVAR)			
VOLTAGE SETPOINT->			1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846	CARTERJ2	69	0.018	-4.162	-8.242	-12.214	-16.079	-19.829	-23.464

			CONTINGENCY: FLT 11		Plant (MVAR)			
VOLTAGE SETPOINT->			1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846	CARTERJ2	69	1.285	-2.953	-7.078	-11.100	-14.995	-18.786	-22.474

			CONTINGENCY: FLT 13		Plant (MVAR)			
VOLTAGE SETPOINT->			1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846	CARTERJ2	69	1.640	-2.556	-6.652	-10.646	-14.538	-18.326	-22.012

			CONTINGENCY: FLT 15		Plant (MVAR)			
VOLTAGE SETPOINT->			1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846	CARTERJ2	69	2.481	-1.659	-5.683	-9.606	-13.429	-17.150	-20.771

			CONTINGENCY: FLT 17		Plant (MVAR)			
VOLTAGE SETPOINT->			1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846	CARTERJ2	69	2.595	-1.517	-5.530	-9.442	-13.254	-16.965	-20.575

			CONTINGENCY: FLT 19		Plant (MVAR)			
VOLTAGE SETPOINT->			1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846	CARTERJ2	69	-0.033	-4.270	-8.401	-12.428	-16.342	-20.150	-23.836

	CONTINGENCY: FLT 21	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	2.314	-1.833	-5.856	-9.778	-13.599	-17.319	-20.937

	CONTINGENCY: FLT 23	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.760	-3.479	-7.616	-11.640	-15.558	-19.357	-23.045

	CONTINGENCY: FLT 25	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	3.930	-0.322	-4.469	-8.504	-12.433	-16.239	-19.941

	CONTINGENCY: FLT 27	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.579	-3.661	-7.796	-11.827	-15.744	-19.556	-23.247

	CONTINGENCY: FLT 29	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	2.603	-1.508	-5.522	-9.434	-13.246	-16.958	-20.568

	CONTINGENCY: FLT 31	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	-0.042	-4.276	-8.405	-12.430	-16.343	-20.149	-23.839

	CONTINGENCY: FLT 33	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	1.676	-2.534	-6.612	-10.588	-14.463	-18.235	-21.904

	CONTINGENCY: FLT 35	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.123	-4.116	-8.249	-12.278	-16.196	-20.005	-23.701

	CONTINGENCY: FLT 37	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.143	-4.095	-8.229	-12.258	-16.174	-19.984	-23.676

	CONTINGENCY: FLT 39	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.162	-4.077	-8.211	-12.241	-16.159	-19.969	-23.665

	CONTINGENCY: FLT 41	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.002	-4.231	-8.358	-12.381	-16.293	-20.097	-23.785

	CONTINGENCY: FLT 43	Plant (MVAR)					
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.042	-4.195	-8.328	-12.355	-16.273	-20.081	-23.778

CONTINGENCY: FLT 45				Plant (MVAR)			
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.055	-4.182	-8.316	-12.344	-16.262	-20.071	-23.768

CONTINGENCY: FLT 47				Plant (MVAR)			
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.988	-3.248	-7.372	-11.392	-15.287	-19.076	-22.762

CONTINGENCY: FLT 49				Plant (MVAR)			
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.062	-0.877	-1.776	-2.634	-3.452	-4.227	-4.961

CONTINGENCY: FLT 51				Plant (MVAR)			
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	-0.974	-3.688	-6.321	-8.881	-11.346	-13.739	-16.060

CONTINGENCY: FLT 53				Plant (MVAR)			
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.755	-2.978	-6.617	-10.162	-13.604	-16.952	-20.190

CONTINGENCY: FLT 55				Plant (MVAR)			
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	-2.894	-6.478	-9.969	-13.367	-16.665	-19.871	-22.964

CONTINGENCY: FLT 57				Plant (MVAR)			
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.622	-3.587	-7.690	-11.673	-15.544	-19.313	-22.980

CONTINGENCY: FLT 59				Plant (MVAR)			
VOLTAGE SETPOINT->	1.013	1.003	0.993	0.983	0.973	0.963	0.953
520846 CARTERJ2 69	0.984	-3.260	-7.399	-11.432	-15.352	-19.168	-22.857

D.1.2 Winter Peak

			CONTINGENCY: BASE CASE		Plant (MVAR)				
VOLTAGE SETPOINT->			1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846	CARTERJ2	69	0.005	-4.233	-8.371	-12.402	-16.328	-20.140	-23.843	-27.422

			CONTINGENCY: FLT 01		Plant (MVAR)				
VOLTAGE SETPOINT->			1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846	CARTERJ2	69	-0.214	-4.448	-8.578	-12.599	-16.511	-20.303	-23.983	-27.561

			CONTINGENCY: FLT 03		Plant (MVAR)				
VOLTAGE SETPOINT->			1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846	CARTERJ2	69	2.352	-1.889	-6.025	-10.049	-13.959	-17.750	-21.440	-25.029

			CONTINGENCY: FLT 05		Plant (MVAR)				
VOLTAGE SETPOINT->			1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846	CARTERJ2	69	0.358	-3.865	-7.983	-11.990	-15.881	-19.655	-23.329	-26.901

			CONTINGENCY: FLT 07		Plant (MVAR)				
VOLTAGE SETPOINT->			1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846	CARTERJ2	69	2.269	-1.960	-6.063	-10.060	-13.956	-17.751	-21.446	-25.039

			CONTINGENCY: FLT 09		Plant (MVAR)				
VOLTAGE SETPOINT->			1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846	CARTERJ2	69	-0.162	-4.326	-8.392	-12.356	-16.213	-19.954	-23.583	-27.072

			CONTINGENCY: FLT 11		Plant (MVAR)				
VOLTAGE SETPOINT->			1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846	CARTERJ2	69	2.107	-2.120	-6.233	-10.228	-14.123	-17.917	-21.610	-25.201

			CONTINGENCY: FLT 13		Plant (MVAR)				
VOLTAGE SETPOINT->			1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846	CARTERJ2	69	2.085	-2.102	-6.190	-10.178	-14.065	-17.852	-21.538	-25.123

			CONTINGENCY: FLT 15		Plant (MVAR)				
VOLTAGE SETPOINT->			1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846	CARTERJ2	69	1.697	-2.497	-6.582	-10.534	-14.378	-18.123	-21.767	-25.312

			CONTINGENCY: FLT 17		Plant (MVAR)				
VOLTAGE SETPOINT->			1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846	CARTERJ2	69	2.909	-1.167	-5.146	-9.028	-12.812	-16.498	-20.085	-23.573

			CONTINGENCY: FLT 19		Plant (MVAR)				
VOLTAGE SETPOINT->			1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846	CARTERJ2	69	-0.061	-4.299	-8.434	-12.464	-16.382	-20.195	-23.882	-27.461

	CONTINGENCY: FLT 21			Plant (MVAR)				
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	1.533	-2.666	-6.749	-10.715	-14.557	-18.300	-21.943	-25.486

	CONTINGENCY: FLT 23			Plant (MVAR)				
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	2.171	-2.050	-6.162	-10.150	-14.038	-17.825	-21.512	-25.097

	CONTINGENCY: FLT 25			Plant (MVAR)				
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	2.231	-2.025	-6.180	-10.228	-14.171	-18.002	-21.721	-25.306

	CONTINGENCY: FLT 27			Plant (MVAR)				
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	0.447	-3.795	-7.934	-11.968	-15.890	-19.706	-23.396	-26.979

	CONTINGENCY: FLT 29			Plant (MVAR)				
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	2.923	-1.153	-5.133	-9.015	-12.799	-16.485	-20.072	-23.561

	CONTINGENCY: FLT 31			Plant (MVAR)				
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	-0.214	-4.442	-8.569	-12.590	-16.505	-20.307	-23.995	-27.565

	CONTINGENCY: FLT 33			Plant (MVAR)				
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	2.493	-1.688	-5.756	-9.724	-13.593	-17.362	-21.028	-24.582

	CONTINGENCY: FLT 35			Plant (MVAR)				
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	0.110	-4.129	-8.266	-12.298	-16.223	-20.036	-23.735	-27.315

	CONTINGENCY: FLT 37			Plant (MVAR)				
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	0.124	-4.116	-8.253	-12.286	-16.208	-20.022	-23.716	-27.296

	CONTINGENCY: FLT 39			Plant (MVAR)				
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	0.136	-4.104	-8.242	-12.274	-16.199	-20.013	-23.710	-27.291

	CONTINGENCY: FLT 41			Plant (MVAR)				
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	-0.008	-4.246	-8.383	-12.414	-16.338	-20.150	-23.848	-27.427

	CONTINGENCY: FLT 43	Plant (MVAR)					
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	0.033	-4.205	-8.342	-12.372	-16.297	-20.109	-23.809	-27.388

	CONTINGENCY: FLT 45	Plant (MVAR)					
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	0.047	-4.192	-8.330	-12.361	-16.287	-20.099	-23.800	-27.379

	CONTINGENCY: FLT 47	Plant (MVAR)					
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	1.337	-2.899	-7.023	-11.043	-14.932	-18.719	-22.405	-25.990

	CONTINGENCY: FLT 49	Plant (MVAR)					
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	-2.302	-3.233	-4.125	-4.977	-5.790	-6.562	-7.293	-7.982

	CONTINGENCY: FLT 51	Plant (MVAR)					
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	1.628	-1.121	-3.795	-6.379	-8.882	-11.314	-13.675	-15.964

	CONTINGENCY: FLT 53	Plant (MVAR)					
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	1.776	-1.960	-5.602	-9.152	-12.598	-15.951	-19.184	-22.325

	CONTINGENCY: FLT 55	Plant (MVAR)					
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	-1.720	-5.334	-8.856	-12.285	-15.614	-18.847	-21.969	-25.001

	CONTINGENCY: FLT 57	Plant (MVAR)					
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	0.775	-3.434	-7.535	-11.510	-15.373	-19.128	-22.783	-26.337

	CONTINGENCY: FLT 59	Plant (MVAR)					
VOLTAGE SETPOINT->	1.024	1.014	1.004	0.994	0.984	0.974	0.964	0.954
520846 CARTERJ2 69	1.210	-3.038	-7.180	-11.218	-15.141	-18.956	-22.646	-26.234

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D.2.1 Summer Peak

			CONTINGENCY: BASE CASE	Plant (MVAR)					
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	31.153	30.111	29.073	28.039	27.009	25.982	24.960	23.941

			CONTINGENCY: FLT 01	Plant (MVAR)					
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	29.631	28.596	27.565	26.538	25.515	24.495	23.480	22.468

			CONTINGENCY: FLT 03	Plant (MVAR)					
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	34.143	33.100	32.061	31.026	29.994	28.966	27.942	26.922

			CONTINGENCY: FLT 05	Plant (MVAR)					
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	36.614	35.568	34.527	33.489	32.455	31.425	30.399	29.376

			CONTINGENCY: FLT 07	Plant (MVAR)					
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	29.333	28.315	27.301	26.290	25.283	24.280	23.281	22.285

			CONTINGENCY: FLT 09	Plant (MVAR)					
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	30.691	29.652	28.616	27.584	26.556	25.531	24.510	23.494

			CONTINGENCY: FLT 11	Plant (MVAR)					
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	29.551	28.532	27.518	26.507	25.500	24.496	23.496	22.501

			CONTINGENCY: FLT 13	Plant (MVAR)					
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	31.890	30.848	29.810	28.775	27.744	26.717	25.694	24.675

			CONTINGENCY: FLT 15	Plant (MVAR)					
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	30.343	29.302	28.266	27.232	26.203	25.177	24.156	23.138

			CONTINGENCY: FLT 17	Plant (MVAR)					
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	30.472	29.432	28.395	27.362	26.332	25.307	24.285	23.267

			CONTINGENCY: FLT 19	Plant (MVAR)					
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	33.578	32.564	31.554	30.547	29.544	28.545	27.549	26.558

CONTINGENCY: FLT 21 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	30.388	29.347	28.311	27.277	26.248	25.222	24.200	23.182

CONTINGENCY: FLT 23 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	29.545	28.524	27.507	26.493	25.484	24.478	23.476	22.478

CONTINGENCY: FLT 25 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	35.111	34.067	33.026	31.988	30.955	29.925	28.900	27.878

CONTINGENCY: FLT 27 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	32.150	31.108	30.069	29.034	28.003	26.976	25.952	24.932

CONTINGENCY: FLT 29 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	30.540	29.499	28.462	27.429	26.399	25.374	24.352	23.334

CONTINGENCY: FLT 31 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	31.566	30.524	29.486	28.452	27.421	26.394	25.371	24.352

CONTINGENCY: FLT 33 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	32.726	31.683	30.645	29.609	28.578	27.550	26.527	25.507

CONTINGENCY: FLT 35 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	29.392	28.381	27.373	26.369	25.369	24.373	23.380	22.391

CONTINGENCY: FLT 37 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	29.468	28.435	27.406	26.381	25.359	24.341	23.327	22.317

CONTINGENCY: FLT 39 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	30.667	29.646	28.628	27.615	26.605	25.599	24.596	23.598

CONTINGENCY: FLT 41 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	33.526	32.483	31.443	30.407	29.375	28.347	27.322	26.302

			CONTINGENCY: FLT 43			Plant (MVAR)				
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	44.470	43.596	42.725	41.857	40.993	40.133	39.276	38.422

			CONTINGENCY: FLT 45			Plant (MVAR)				
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	31.956	30.983	30.013	29.047	28.085	27.126	26.171	25.220

			CONTINGENCY: FLT 47			Plant (MVAR)				
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	26.420	25.406	24.395	23.388	22.385	21.385	20.390	19.398

			CONTINGENCY: FLT 49			Plant (MVAR)				
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	31.327	30.286	29.249	28.216	27.187	26.161	25.139	24.121

			CONTINGENCY: FLT 51			Plant (MVAR)				
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	31.679	30.638	29.600	28.565	27.535	26.508	25.485	24.466

			CONTINGENCY: FLT 53			Plant (MVAR)				
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	31.141	30.101	29.063	28.030	27.001	25.975	24.953	23.935

			CONTINGENCY: FLT 55			Plant (MVAR)				
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	31.463	30.421	29.383	28.349	27.318	26.291	25.268	24.249

			CONTINGENCY: FLT 57			Plant (MVAR)				
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	37.229	36.191	35.157	34.126	33.099	32.076	31.057	30.042

			CONTINGENCY: FLT 59			Plant (MVAR)				
	VOLTAGE SETPOINT->		1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570	GEN08-037	138	33.135	32.093	31.055	30.020	28.989	27.962	26.938	25.919

D.2.2 Winter Peak

CONTINGENCY: BASE CASE Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	42.024	40.985	39.949	38.918	37.890	36.866	35.845	34.829

CONTINGENCY: FLT 01 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	39.107	38.077	37.051	36.029	35.010	33.995	32.984	31.977

CONTINGENCY: FLT 03 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	46.547	45.505	44.467	43.433	42.402	41.376	40.353	39.334

CONTINGENCY: FLT 05 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	48.229	47.186	46.146	45.111	44.079	43.051	42.027	41.007

CONTINGENCY: FLT 07 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	38.316	37.303	36.294	35.288	34.286	33.288	32.294	31.303

CONTINGENCY: FLT 09 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	41.543	40.505	39.471	38.441	37.414	36.391	35.373	34.357

CONTINGENCY: FLT 11 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	38.535	37.522	36.512	35.506	34.504	33.506	32.511	31.520

CONTINGENCY: FLT 13 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	43.425	42.385	41.349	40.317	39.288	38.263	37.243	36.226

CONTINGENCY: FLT 15 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	40.489	39.453	38.420	37.391	36.365	35.344	34.326	33.312

CONTINGENCY: FLT 17 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	42.155	41.117	40.083	39.053	38.026	37.004	35.985	34.970

CONTINGENCY: FLT 19 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	41.879	40.877	39.879	38.884	37.893	36.906	35.923	34.943

CONTINGENCY: FLT 21 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	40.619	39.582	38.549	37.519	36.494	35.472	34.454	33.440

CONTINGENCY: FLT 23 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	38.982	37.679	36.380	35.320	34.309	33.301	32.298	31.298

CONTINGENCY: FLT 25 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	44.697	43.656	42.619	41.585	40.556	39.530	38.508	37.490

CONTINGENCY: FLT 27 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	42.984	41.944	40.908	39.876	38.847	37.822	36.801	35.784

CONTINGENCY: FLT 29 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	42.252	41.214	40.180	39.149	38.123	37.100	36.081	35.066

CONTINGENCY: FLT 31 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	42.562	41.522	40.487	39.455	38.426	37.402	36.382	35.365

CONTINGENCY: FLT 33 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	44.922	43.881	42.844	41.811	40.782	39.756	38.734	37.716

CONTINGENCY: FLT 35 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	40.169	39.159	38.152	37.149	36.150	35.155	34.163	33.176

CONTINGENCY: FLT 37 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	40.624	39.593	38.567	37.544	36.525	35.509	34.498	33.490

CONTINGENCY: FLT 39 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	41.455	40.439	39.426	38.417	37.412	36.411	35.413	34.419

CONTINGENCY: FLT 41 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	44.089	43.048	42.011	40.978	39.949	38.923	37.901	36.884

CONTINGENCY: FLT 43 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	55.548	54.664	53.784	52.907	52.034	51.164	50.297	49.435

CONTINGENCY: FLT 45 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	42.689	41.716	40.746	39.779	38.817	37.858	36.902	35.951

CONTINGENCY: FLT 47 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	38.737	37.724	36.714	35.708	34.705	33.707	32.712	31.721

CONTINGENCY: FLT 49 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	41.908	40.870	39.835	38.805	37.778	36.755	35.736	34.720

CONTINGENCY: FLT 51 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	42.685	41.646	40.610	39.578	38.550	37.526	36.506	35.489

CONTINGENCY: FLT 53 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	41.998	40.959	39.924	38.893	37.866	36.842	35.822	34.806

CONTINGENCY: FLT 55 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	42.448	41.409	40.373	39.341	38.312	37.288	36.267	35.250

CONTINGENCY: FLT 57 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	46.896	45.862	44.831	43.803	42.780	41.760	40.744	39.732

CONTINGENCY: FLT 59 Plant (MVAR)

VOLTAGE SETPOINT->	1.005	1.004	1.003	1.002	1.001	1.000	0.999	0.998
573570 GEN08-037 138	44.882	43.842	42.805	41.772	40.742	39.717	38.695	37.677

D.3 GEN-2009-030 – POI Anadarko – Midpoint 345 kV Line

D.3.1 Summer Peak

CONTINGENCY: BASE CASE	Plant (MVAR)						
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	-0.142	-55.133	-108.997	-161.242	-212.324	-262.307	-310.580

CONTINGENCY: FLT 01	Plant (MVAR)						
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	-41.271	-91.164	-139.757	-186.790	-232.826	-277.796	-321.340

CONTINGENCY: FLT 03	Plant (MVAR)						
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	-6.308	-27.675	-48.602	-69.078	-89.107	-108.136	-126.567

CONTINGENCY: FLT 05	Plant (MVAR)						
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	14.831	-38.988	-91.798	-143.643	-194.413	-243.826	-291.686

CONTINGENCY: FLT 07	Plant (MVAR)						
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	3.329	-51.635	-105.504	-158.265	-209.695	-259.219	-307.362

CONTINGENCY: FLT 09	Plant (MVAR)						
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	1.957	-52.976	-106.818	-159.221	-210.295	-260.195	-308.344

CONTINGENCY: FLT 11	Plant (MVAR)						
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	3.093	-51.872	-105.740	-158.500	-209.860	-259.425	-307.566

CONTINGENCY: FLT 13	Plant (MVAR)						
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	1.939	-53.003	-106.643	-158.809	-209.878	-259.311	-307.595

CONTINGENCY: FLT 15	Plant (MVAR)						
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	5.217	-49.684	-103.495	-156.200	-207.247	-256.381	-304.429

CONTINGENCY: FLT 17	Plant (MVAR)						
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	-0.118	-54.642	-108.081	-160.278	-210.974	-260.579	-309.095

	CONTINGENCY: FLT 19		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	-0.791	-52.114	-102.418	-151.684	-199.858	-246.888	-292.271

	CONTINGENCY: FLT 21		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	4.836	-50.068	-103.877	-156.580	-207.641	-256.771	-304.819

	CONTINGENCY: FLT 23		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	2.636	-52.328	-106.199	-158.962	-210.611	-260.341	-308.446

	CONTINGENCY: FLT 25		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	4.648	-49.736	-103.035	-155.305	-206.561	-256.299	-304.615

	CONTINGENCY: FLT 27		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	0.967	-53.994	-107.449	-159.635	-210.723	-260.675	-308.994

	CONTINGENCY: FLT 29		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	2.367	-52.185	-105.652	-157.874	-208.597	-258.229	-305.776

	CONTINGENCY: FLT 31		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	0.561	-54.396	-108.132	-160.312	-211.395	-261.362	-309.648

	CONTINGENCY: FLT 33		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	3.632	-51.318	-104.606	-156.765	-207.827	-257.220	-305.490

	CONTINGENCY: FLT 35		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	1.616	-53.186	-106.900	-159.506	-211.007	-261.402	-309.857

	CONTINGENCY: FLT 37		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	2.670	-52.299	-106.177	-158.945	-210.605	-260.731	-308.898

	CONTINGENCY: FLT 39		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	1.942	-52.996	-106.844	-159.582	-210.852	-260.839	-309.003

	CONTINGENCY: FLT 41		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	0.365	-53.992	-107.269	-159.448	-210.580	-260.714	-309.027

	CONTINGENCY: FLT 43		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	0.083	-54.845	-108.681	-160.870	-211.952	-262.011	-310.353

	CONTINGENCY: FLT 45		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	0.739	-54.160	-107.967	-160.666	-211.838	-261.825	-310.013

	CONTINGENCY: FLT 47		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	1.492	-53.465	-107.325	-160.077	-211.720	-261.958	-310.206

	CONTINGENCY: FLT 49		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	-0.444	-55.399	-109.260	-161.449	-212.529	-262.506	-310.779

	CONTINGENCY: FLT 51		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	2.588	-52.379	-106.171	-158.360	-209.451	-259.109	-307.382

	CONTINGENCY: FLT 53		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	0.364	-54.594	-108.458	-160.715	-211.799	-261.736	-309.969

	CONTINGENCY: FLT 55		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	0.810	-54.152	-107.996	-160.183	-211.272	-261.250	-309.525

	CONTINGENCY: FLT 57		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	-1.208	-55.563	-108.877	-161.205	-212.419	-262.430	-310.696

	CONTINGENCY: FLT 59		Plant (MVAR)				
VOLTAGE SETPOINT->	1.021	1.011	1.001	0.991	0.981	0.971	0.961
560079 WASHITA CO 345	32.174	-5.495	-42.239	-77.867	-112.746	-146.875	-180.366

D.3.2 Winter Peak

	CONTINGENCY: BASE CASE Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	0.091	-54.116	-107.622	-159.723	-210.272	-259.709	-307.465

	CONTINGENCY: FLT 01 Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	-52.061	-101.063	-149.179	-195.844	-241.222	-285.391	-328.326

	CONTINGENCY: FLT 03 Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	-10.090	-31.310	-52.092	-72.428	-92.324	-111.110	-129.390

	CONTINGENCY: FLT 05 Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	15.618	-37.129	-89.187	-140.510	-190.771	-239.491	-286.834

	CONTINGENCY: FLT 07 Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	5.318	-49.086	-102.583	-154.974	-206.223	-255.295	-302.847

	CONTINGENCY: FLT 09 Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	2.242	-52.017	-105.493	-157.745	-208.283	-257.593	-305.239

	CONTINGENCY: FLT 11 Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	4.996	-49.396	-102.901	-155.290	-206.576	-255.592	-303.143

	CONTINGENCY: FLT 13 Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	2.943	-51.342	-104.652	-156.272	-206.803	-255.607	-303.379

	CONTINGENCY: FLT 15 Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	5.020	-49.342	-102.829	-155.207	-206.464	-255.287	-302.818

	CONTINGENCY: FLT 17 Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	-2.505	-56.242	-109.314	-161.041	-211.259	-260.391	-308.563

	CONTINGENCY: FLT 19 Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	4.831	-45.895	-95.935	-144.941	-192.912	-239.716	-284.870

	CONTINGENCY: FLT 21 Plant (MVAR)						
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	4.728	-49.629	-103.114	-155.495	-206.760	-255.557	-303.087

	CONTINGENCY: FLT 23	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	5.620	-48.774	-102.281	-154.667	-205.949	-255.383	-303.629
	CONTINGENCY: FLT 25	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	2.763	-51.401	-104.157	-155.819	-206.493	-255.897	-303.717
	CONTINGENCY: FLT 27	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	1.023	-53.244	-106.697	-158.345	-208.902	-258.306	-306.109
	CONTINGENCY: FLT 29	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	0.317	-53.513	-106.645	-158.397	-208.645	-257.805	-305.138
	CONTINGENCY: FLT 31	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	1.167	-53.112	-106.621	-158.459	-209.013	-258.416	-306.217
	CONTINGENCY: FLT 33	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	5.597	-48.637	-101.336	-152.947	-203.281	-252.118	-299.872
	CONTINGENCY: FLT 35	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	1.895	-52.159	-105.477	-157.693	-208.807	-258.796	-306.629
	CONTINGENCY: FLT 37	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	2.692	-51.581	-105.096	-157.504	-208.808	-258.265	-305.854
	CONTINGENCY: FLT 39	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	1.684	-52.592	-106.076	-158.453	-209.379	-258.777	-306.392
	CONTINGENCY: FLT 41	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	0.679	-53.553	-106.347	-157.984	-208.556	-258.146	-305.939
	CONTINGENCY: FLT 43	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	0.439	-53.764	-107.236	-159.246	-209.796	-259.397	-307.197
	CONTINGENCY: FLT 45	Plant (MVAR)					
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	1.011	-53.157	-106.591	-158.922	-209.704	-259.131	-306.725

	CONTINGENCY: FLT 47			Plant (MVAR)			
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	3.297	-51.042	-104.546	-156.943	-208.236	-257.491	-305.032

	CONTINGENCY: FLT 49			Plant (MVAR)			
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	-0.228	-54.449	-107.950	-160.101	-210.646	-260.019	-307.757

	CONTINGENCY: FLT 51			Plant (MVAR)			
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	3.382	-50.948	-104.457	-156.285	-206.819	-255.673	-303.448

	CONTINGENCY: FLT 53			Plant (MVAR)			
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	1.017	-53.243	-106.749	-158.838	-209.389	-258.660	-306.409

	CONTINGENCY: FLT 55			Plant (MVAR)			
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	1.062	-53.203	-106.713	-158.658	-209.214	-258.552	-306.354

	CONTINGENCY: FLT 57			Plant (MVAR)			
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	-1.396	-55.078	-107.799	-159.503	-210.227	-259.642	-307.392

	CONTINGENCY: FLT 59			Plant (MVAR)			
VOLTAGE SETPOINT->	1.018	1.008	0.998	0.988	0.978	0.968	0.958
560079 WASHITA CO 345	33.999	-3.481	-40.123	-75.437	-110.006	-143.894	-177.151

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Appendix

E

Stability Results - Summary

The plots of selected contingencies are shown in this appendix. There are 4 plots per Project, showing the dynamic performance under each contingency, making a total of three pages/contingency, which include the following channels:

- Bus Voltages.
- Speed Deviation.
- Active and Reactive Power Injection at the POI.
- Electric Power of the Proposed WTGs

E.1 Summer Peak Stability Results

E.1.1 Three Phase Faults

E.1.2 Single Line to Ground Faults

E.2 Winter Peak Stability Results

E.2.1 Three Phase Faults

E.2.2 Single Line to Ground Faults